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Towards New Knowledge Based Policies for Development in the Arab Economies & Comparisons with Eastern and Central European Countries

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Directed By
Ahmed Driouchi
Institute of Economic Analysis & Prospective Studies (IEAPS)
Al Akhawayn University, Ifrane, Morocco

Authors:

Ahmed Driouchi, IEAPS,Al Akhawayn University, Ifrane, Morocco
Amale Achehboune, IEAPS,Al Akhawayn University, Ifrane, Morocco
Rodrigues Andrès Antonio, School of Business Administration, Al Akhawayn University, Ifrane, Morocco

Cristina Boboc, Academy of Economics, University of Bucharest, Romania
Emilia Titan, Academy of Economics, University of Bucharest, Romania
Daniel Pele, Academy of Economics, University of Bucharest, Romania

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Team Leader & Coordinator: Ahmed Driouchi
Institute of Economic Analysis & Prospective Studies (IEAPS)
Al Akhawayn University, Ifrane, Morocco

Authors:

Ahmed Driouchi
Amale Achehboune
Institute of Economic Analysis & Prospective Studies (IEAPS)
Al Akhawayn University, Ifrane, Morocco
&
Rodrigues Andrès Antonio
School of Business Administration,
Al Akhawayn University, Ifrane, Morocco

&
Cristina Boboc
Emilia Titan
Daniel Pele
Academy of Economics, University of Bucharest, Romania

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Abbreviations

ADI: Africa Development Indicators

AGGDP: Agricultural GDP

AGIP: Abu-Ghazaleh Intellectual Property

BDI: Business Disclosure Index

BDMs: business decision-makers

BI: Business intelligence

BMDA : Bureau Marocain des Droits d'Auteurs

BRPM: Bureau des Recherches et des Prospections Minières

BSA: Business Software Alliance

CARIM: Consortium for Applied Research on International Migration

CDLP: Commercial Development Law Program

CEEC: Central Eastern European Countries

CEI: Corporate Ethics Index

CERPHOS: Phosphate Research Centre

CGI: Corporate Governance Index

CICI: Corporate Illegal Corruption Index Component

CIM: Contract Intensive Money

CLCI: Corporate Legal Corruption Index

CLFS: Community labor force survey

COSQC: Central Organization on Standards and Quality Control

CRI: Regional Investment Centers

CRM: Customer Relationship Management

CURS : Centre Universitaire de Recherche Scientifique

ED: Education Index

EEE: East European Economies

EEE: Eastern European Economies

EFI: Economic Freedom Index

EH: Environmental Health

EHAIR: Air (effect on human health)

EHEH: Environmental Burden of Disease

EHWATER: Water (effect on human health)

EI: Employment Initiative

EIA: Energy Information Agency

EIR: Economic and institutional regime Index

ELT: English Language and Teaching

EPI: Environmental Performance Index

EPO: European Patent Office

ERA: European Research Area

ERP: Enterprise Resource Planning

EU: European Union

Euro-PCT: Patent Co-operation Treaty

EV: Ecosystem Vitality

EVAG: Ecosystem Vitality Agriculture

EVAIR: Air (ecosystem effect)

EVBH: Biodiversity and Habitat

EVCLIMATE: Ecosystem Vitality Climate change and Energy

EVFISH: Ecosystem Vitality Fisheries

EVFOREST: Ecosystem Vitality Forests

EVWATER: Water resources (ecosystem effect)

FDI: Foreign Direct Investment

FTAs: Free Trade Agreements

GATS: General Agreement on Trade and Services

GATT: General Agreement on Tariffs and Trade

GCC: Gulf Cooperation Council

GDP: Gross Domestic Product

GE: Government Effectiveness

GERD: Gross domestic expenditure on R&D

GII: Global Innovation Index

GPI: Global Peace Index

GRC: global rationalization center

GRL: Global Research Laboratory

GTL: Gas-to Liquid

HAC: Autocorrelation

HDI: Human Development Index

HRST: Human resources in science and technology

IASP: International Association of Science Parks

ICSID: International Center for the Settlement of Investment Disputes

ICTs: Information and communications technologies

IDA: International Desalination Association

IDV: Individualism

IEF: Index of Economic Freedom

IFC: International Finance Corporation

ILC: Intensity of Local Competition

ILO: International Labor Office

IMF: International Monetary Fund

INAPI: National Algerian Institute for Industrial Property

INDGDP: Industrial GDP

INN: Innovation Index

INNORPI: Institut de la Normalisation et de la Propriété Industrielle

INRA : Institut National de la Recherche Agronomique

IPC: International Patent Classification

IPRs: Intellectual Property Rights

IS: Information System

ISCED: International Standard Classification of Education

ISESCO: Islamic Educational Scientific & Cultural Organization

ITU: International Telecommunications Union

IURS : Institut Universitaire de Recherche Scientifique

KBE: Knowledge-Bases Economy

KEI: Knowledge Economy Index

KI: Knowledge Index

KIBS: Knowledge Intensive business services

KISR: Kuwait Institute for Scientific Research

KOICA: Korean International Cooperation Agency

LDC: Local Development Units

LNG: Liquefied Natural Gas

LPEE: Laboratoire Public d'Études et d'Essais

LTO: Long-Term Orientation

MAS: Masculinity

MENA: Middle East & North Africa

MIS: Management Information Systems

MNCs: Multinational Companies

MPC: Mediterranean Partner Countries

MSMEs: Micro, Small and Medium Enterprises

MSP: Mediterranean Solar Plan

NECTAR: Network for the Expansion of Converging Technologies in the Arab Region

NEPC: National Company of Electricity

NOSSTIA: Network of Syrian Scientists, Technologists and Innovators Abroad

NSI: National System of Innovation

OCP: Office Chérifien des Phosphates

OECD: Organization for Economic Cooperation and Development

OIR: Over-Identifying Restrictions

OLS: Ordinary Least Squares

OMC: Organisation Mondiale du Commerce

ONDA: National Copyright Office

OPEC: Organization of the Petroleum Exporting Countries

OTPDA : Organisme Tunisien de Protection des Droit d'Auteur

PCA: Principal Component Analysis

PDI: Power Distance

PISA: Program for International Student Assessment

PLT: Patent Law Treaty

QSTP: Qatar Science & Technology Park

R&D: Research & Development

RE: Renewable Energies

REI: Rigidity of Employment Index

RIC: Regional Investment Centers

RQ: Regulatory Quality

S&T: Science and Technology

SB: Soundness of Banks

SME's: Small to Medium Enterprises

SPCs: Supplementary Protection Certificates

SPO: Syrian Patent Office

STI: Science, Technology and Innovation

SUMED: Suez Canal and Suez-Mediterranean

TAI: Technology Achievement Index

THM: Triple Helix Model

TLT: Trademarks Law Treaty
TNA: Technology Needs Assessment
TRIPS: Aspects of Intellectual Property Rights
UAE: United Arab Emirates
UAV: Uncertainty Avoidance
UN: United Nations
UNCTAD: United Nations Conference on Trade and Development
UNDP: United Nations Development Program
UNESCO: United Nations Educational, Scientific and Cultural Organization
UNIDO: United Nations Industrial Development Organization
USA: United States of America
USPTO: United States Patent and Trademark Office
WCT: WIPO Copyright Treaty
WIPO: World Intellectual Property Organization
WPPT: WIPO Performance and Phonograms Treaty
WTA: World Technopolis Association
WTO: World Trade Organization
YUT: Yearly Urbanization Trend

Executive Summary

This research project has characterized the main trends taking place in Arab countries, in relation to different components of the knowledge economy. Its main objectives is to suggest new economic and social policies that are likely to enhance the benefits from the knowledge economy in countries and in the region while ensuring a benchmarking with Central and Eastern European economies.

The conduct of this research is based on the analysis of series of issues related to the knowledge economy in both Arab and Eastern and Central Europe. These issues are grouped into four major interdependent areas:

1. Methodological matters, where more emphasis is placed on the central research questions, the methods pursued and the data used. It also underlines the main reasons for choosing the benchmark with Eastern and central Europe.

2. Characterization of the situation of knowledge economy in both groups of countries while accounting for global, local and regional development.

3. Main Issues related to knowledge economy in education, production, trade and energy the Arab countries

4. Directions of economic and social policies that, are likely to be promising for the enhancement of the benefits from the knowledge economy.

The methods used in this study include descriptive statistics, trend analysis, regression analysis, principal components approach and panel data estimation with comparisons of results using the appropriate statistical tests, including that of Chow. The empirical applications vary with the issue discussed for each dimension where a specific analytical tool is used. The data used are mainly secondary and provided by international, regional and national organizations. But most of the data is from international organizations. More details about the methods and data are provided under each specific section in each part of the report.

Several hypotheses are tested based on the above empirical methods and data. All focus on comparisons between Arab and EEE countries. They cover the determinants of migration of students, the links between economic and social outcomes with the variables of the knowledge economy and other hypotheses related to the effects of socioeconomic policies as well as the link between IPRs and development with focus on software as an ICT component.

The results attained include:

1. The highly imperfect adoption and diffusion of the knowledge economy in every country but with a promising trend shown by the oil producing and exporting countries in contrast with North African economies, Jordan, Syria and Yemen. These latter countries and especially Morocco, Tunisia, Jordan and Egypt may need more financial support to accelerate their engagements in education, research, innovation and enterprise creation. The attempts made by these countries towards knowledge economy seem to be constrained by the absence of resources. But, Algeria with abundant resources from oil has made only few steps towards the knowledge economy.

2. The resilience of rent based economies with regard to further adoption of knowledge based activities including the limited creation of new smart enterprises could be changed under new political transformations that lead to further openness to new technological, institutional and social innovations.

3. The clear negative relationships between rents and knowledge economic variables show that abundant financial resources can also be targeted to new knowledge economic based projects and ventures.

4. The great need for a new growth path is clearly expressed for these countries as unemployment is at very high levels, except in countries with limited employment problems (Qatar, UAE and Kuwait). The social and economic needs of the younger generations require changes in the growth and development visions with focus on knowledge economic dimensions. North African countries besides Jordan, Yemen and Sudan need full shifts of their current policies towards the new knowledge path.

5. Local and regional development could be further promoted through knowledge economy as currently there is concentration of growth in major global urban agglomerations. The expansion of knowledge to territories is likely to generate new opportunities for local and global development.

6. The promotion of the political, economic and social policies in favor of knowledge economy are important drivers to researchers and innovators to engage further in technological, institutional and social innovations. These include political accountability with the creation of democratic institutions.

7. The expansion of the intellectual property rights at levels of institutions, groups and researchers globally and at the level of territories constitutes an important facilitator for development incentives. This applies also to enterprise creation and development.

8. There are similarities in some areas of knowledge economy between EEE and Arab countries but there are also promising experiences to be learnt by Arab economies.

9. These experiences include education, research, enterprise incubation and development. Territorial initiatives in EEE are also important sources that show the promising effects of engagement in knowledge economies.

10. Inclusion of all the segments of the population is very concrete process where all find opportunities that they can value and that enhance the welfare, the growth and development of each of the economies.

The prevalence of social and economic imperfections in Arab economies leads to further imperfect adoption of the major ingredients of the knowledge economy. The signals exhibited by some of the countries in relation to the progress in knowledge economy are not consistent with the signals of enterprise creation and employment of skilled labor. Even, skilled labor deficit economies appear to be limited in generating employment for their own graduates. Enterprise development appears to be also lagging but in all Arab countries. The younger generations are those that are paying the costs of the on-going imperfections. They often do not see the immediate and the medium run impacts of the on-going development strateies. This leads to the development of the perception of implicit exclusion as older generations and their international partners enjoy the rents that are dissipated from traditional development modes and the on-going ways of dealing with knowledge economies. This may generate further frustrations as the likely benefits that could be generated from further progress in production, adoption and diffusion of the new knowledge economy components are not attracting the attention of the on-going systems of governance.

Besides these overall results, some specific matters are also attained in this study. They account for the following elements:

1. The advancement in knowledge economy requires more openness and more transparency

2. Knowledge economy provides new alternatives for participative development

3. Enterprise creation needs to be promoted

4. Research and innovation besides the culture of IPR protection is unavoidable source for accelerating investments and then generating new types of growth in the Arab region

5. While EEE countries appear to be smoothly engaged in knowledge economy, their experiences are important for some Arab countries for both global and local engagement in research innovation and enterprise creation

6. There are policy frameworks and initiatives that need further monitoring through global and local engagement of Arab countries in vision setting and pursuit of knowledge friendly development.

There are international institutions and organizations besides countries such as those of the EU that could accompany as partners, the processes of further engagement in knowledge economy of the Arab countries. The frameworks provided by ISESCO, UNESCO as well as World Bank and the European Investment Bank are very promising. These need to be furthered in relation to the existing and potential framework already developed to include GCC, Arab League, Maghreb Arab Union besides the Union for the Mediterranean region and the existing bilateral and regional trade agreements. The Barcelona system of the EU is also promising for the pursuit of the shifts towards new knowledge economy for the Arab economies. New economic and social policies that are targeting the use and contribution to knowledge economy in the Arab countries appear to be possible as each of these economies is facing major challenges of employment, investments and new growth paths.

Résumé

L'objectif de cette investigation est de suggérer de nouvelles voies pour l'accroissement des avantages de l'économie de la connaissance notamment à travers de nouvelles politiques économiques et sociales. Ce travail de recherche a essayé de caractériser les principales tendances liées aux progrès de l'économie de la connaissance dans les pays Arabes en comparaison avec ceux du Centre et Est de l'Europe (EEE). Les analyses poursuivies dans ce travail aussi bien aux niveaux local et global mais aussi au niveau de certains secteurs, ont permis de déterminer le caractère imparfait de la progression de l'économie de la connaissance. Bien que les pays Arabes et ceux de l'EEE, ont montré parfois des similitudes, d'importantes différences sont apparues. Les pays de l'EEE sont ainsi identifés comme pouvant offrir des exemples prometteurs en matière de poursuite des activités innovantes par certains pays Arabes.

Les contraintes dégagées permettent de voir que ce ne sont pas souvent les ressources financières qui manquent mais des politiques et des visions adéquates avec des mises en œuvre appropiées. De telles pistes de progrès doivent privilégier l'emploi, les systèmes éducatifs, la recherche et la création d'entreprises. Les regroupents déjà en cours (UMA, GCC, Union pour la Méditerranée) ainsi que les organisations régionales et internationales sont en mesure d'accompagner de tels efforts car ils permettent de créer les échelles nécessaires pour la poursuite d'initiatives prometteuses à tous les niveaux de la chaîne de l'économie de la connaissance. Il est bien entendu que les innovations désirées n'incluent pas uniquement celles à caractère technologique, mais aussi institutionnel et social. Plus de recherches sont d'ailleurs nécessaires pour mieux répondre aux demandes d'une société civile en pérpétuelle croissance mais aussi à la demande en mécanismes institutionnels. La recherche en sciences sociales ainsi que celles liées à une meilleure connaissance de la culture et de sa valorisation au même titre que les travaux realtifs à la production et diffusion des technologies. Les dimensions culturelles sont aussi importantes que les autres en vue de mieux introduire et mobiliser les avantages économiques et sociaux à dégager à partir des possibilités de l'économie de la connaissance.

Ceci a permis de suggérer une plus grande accélération des politiques économiques vers la mise en oeuvre de toutes les chaînes de l'économie de la connaissance. Elles incluent l'éducation, la recherche, l'innovation mais aussi la création et le développement d'entreprises innovantes. L'esprit d'initiative de créativité est amené à être développé depuis le plus jeune âge. Les corrections des imperfections économiques notamment celles liées aux rentes issues de ressources naturelles constituent une nécessité. De tels efforts visent à changer la trajectoire actuelle de croissance et de développement vers un nouveau sentier de progès qui privilégie l'économie du savoir. Cette nouvelle vision et sa mise en place nécessitent un nouvel environnement en termes de gouvernance ouvrant plus chacune des économies vers plus de transparence, de participation et d'inclusion. Les jeunes constituent le core de ces réformes et de ces nouvelles visions.

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Introduction

This research report is composed of four parts. The first one introduces the issues, problems and the questions that are analyzed and discussed in this document. It also focuses on the reasons for the benchmarking of Arab and EEE economies. The second part deals with knowledge economies in the Arab and EEE countries globally and at the local levels. The third part focuses on the knowledge economy in Arab countries through looking at the internationalization of education, the status of knowledge in local development, the role of intellectual property rights and other sectors such as production, trade and energy. The last part is mainly devoted to showing how knowledge can enhance growth and development under new policies focusing on economic diversification, openness and knowledge acquisition and governance. Besides that, the relationships between economic rents from natural resources and knowledge variables are discussed. A special attention is also paid to enterprise creation in Arab countries. In each part and section, attention is paid to comparisons between Arab and EEE economies. Related references and appendices are introduced for each part, at the end of the document.

Each part is composed of series of sections as underlined in the table of content. But the reader is assumed to go smoothly through the report that is a block composed of the above three parts and where under each part, series of questions are discussed.

Part I: Methodological Matters

This research aims at suggesting new economic and social policies and actions devoted to intensifying the likely benefits to occur under further knowledge based economies. This investigation consists first, in assessing qualitatively and quantitatively past and current trends of the current knowledge economy components in the Arab countries. Comparisons with some East European economies (EEE) besides consideration of their best practices are also included. The first objective is to identify empirically, the determinants and trends from the available data of countries in both Arab economies and EEE. The special focus on the EEE countries is related to their proximity with the European Union (EU). The link with local and territorial economies in the region is the second objective pursued under this research where evidence about promising knowledge niches is discussed. Finally, new economic policy options for the overall and for each country are introduced as means to accelerate the mobilization of the components of the knowledge based economy with larger benefits to the population.

These objectives are suggested using mainly qualitative information besides descriptive statistics and regression analyzes and other techniques with the international secondary available panels of data. A special focus is placed on the Knowledge Economy and the Knowledge Indices (KEI and KI) besides other measures as developed elsewhere (World Bank Institute, 2009; UNDP, 2001; INSEAD, 2010 to 2012 besides Arab Reports). The diversity of indices used, allow to better capture the knowledge situation of the countries under study. The global and local development related variables are also selected for the purpose of linking the knowledge components to country performances. Shifts and changes from different knowledge modes and their implications for the studied economies are also ways for understanding the constraints and opportunities provided in the countries and region. The roles of different components included in each knowledge measure are assessed to account for the likely effects of education, intellectual property rights, research and innovation at both global and local levels. The enlargement of the population segments benefiting from the spillovers of the knowledge based economy is at the heart of the new economic and social policies suggested.

I. Statement of the Research Issue

The theoretical literature with series of applications has been showing consistently, new growth trajectories and paths that are induced under the new economics of knowledge. Different studies and publications have been devoted, since 2001 with the Technology Achievement Index (TAI) (UNDP, 2001) and with the development of the Knowledge Economy Index (KEI) (WB, 2001) and the Global Innovation measure of INSEAD, to the role of knowledge as engine for development. Formal models have been promoted to establish the link between KEI and development (A.Driouchi et al., 2006). This latter paper analyzed the KEI and its different components for the period 1995-2001 (6 years) to show that GDP can be explained by KEI and that knowledge is definitely an engine for economic development. Contributions related to the region of Arab Countries and pioneered by J.E Aubert and J.L.Reiffers (2003) as well as by World Bank have focused on the knowledge deficiencies and the new paths for growth and development of the countries in this region. This trend of literature has also been developing with the Arab Human Development Reports (UNDP, 2002; 2003; 2004; 2005 and 2009). Recently the media are reporting that some Arab countries are progressing in the knowledge economy. Major efforts have been deployed in the measurement of knowledge and knowledge for development. Measures such as those developed by the World Bank Institute have been largely mobilized to underline the specific trends pursued by Arab countries (J.E. Aubert and J.J. Reiffers, 2003 among others). Special reports and documents are also produced by A. Driouchi and A. Djeflat (2004), A. Driouchi and A. Dejeflat (2005) and A. Driouchi and N. Zouag (2008) for the case of the Moroccan economy. These publications show the level of deficiencies in the knowledge economy with suggestions of economic policy options for Morocco in comparisons with some other Arab economies.

Another study investigates the links between urbanization, knowledge and competitiveness in developing economies. Among its outcomes, urban development is set to be achieved through the adoption of knowledge economy components (Driouchi, 2005 and Driouchi, 2008). These studies among others highlight the strong link between knowledge economy and local development.

A series of studies and publications are still referring to the increasing quantitative and qualitative diversities of needs of the population in developing economies and mainly in Africa (De Pee et al., 2010; McTavish et al., 2010; Quisumbing, 2010; Kebede et al., 2010; Anderson et al., 2010 and Beneria, 2010). According to these studies, these needs concern almost every component related to health, education, employment, income and infrastructure. Furthermore, as these needs are expressed locally by households in both rural and urban areas, their satisfaction cannot be only from local supplies. But, responses and supplies can sometimes be locally provided with possibilities of the development of further trade and exchange with other localities in the same country or outside. But potential suppliers may need further knowledge and also inputs from research and innovations ensuring thus, the competitiveness of the new products and services. Several authors have looked at different dimensions of the links between R&D and local supplies. These include Rothwell (1977), Pavitt (1984), Reinert (2006), Bengt-Åke Lundvall (2007), Amsden (1989), Freeman (2004), Mazzoleni and Nelson (2005), Peres (2006), Stiglitz (2001) and Reinert (2007).

Furthermore, evidence about spatial development inequities in developing countries has been increasingly showing the resulting negative welfare impacts on large population segments in remote and in the peripheries of series of regions and cities. These regional and local inequalities have also been generated by the existence of both highly centralized development systems with rent based mechanisms in localities and regions. These latter processes are generally supported by traditional knowledge systems with little room provided for more knowledge based intensive processes. Knowledge and modern technologies that are centrally provided coexist with old practices as observed most of the time in the majority of regions and localities of the same economy, especially in the regions of Middle East and North Africa. While major shifts towards knowledge based industries are taking place, old technologies but also traditional economies are still operating, mainly at the local levels. At the local and regional level, universities and research centers can play an important role in providing the knowledge to contribute to the supply of the desired and growing needs of local populations but also of international markets. This can be shown to be related to the generation and development of integrated technological and socio-economic platforms related to the valuation of new and specific local and regional niches and opportunities.

These trends are happening in other economies given their engagement and proximity with developed economies. Such is the case of the Eastern European Economies (EEE).

Based on the above, it appears that further knowledge and new policies are need for both accelerating the shifts from traditional and old knowledge to advance and intensive knowledge economies in the Arab countries. While some countries in the region have been progressing in this domain during the last years, most of them are still under limited access. EEE countries can be used as both bases for comparisons but also to supply the best practices in the area of advancement of knowledge based economies for the Arab Countries. Qualitative and quantitative analyzes of the EEE experiences and policies are assumed to be important sources for new policies.

1. Objectives:

The major objectives of this proposal are to identify knowledge economy trends that are taking place in Arab economies and EEE. The research aims to understand the determinants and major drivers of these trends as well as look at how they are represented at the local level. This will help gain understanding of reasons why some countries succeed in their process to development based on knowledge economies while others fail or stagnate. Finally, the research will suggest policies in order to enhance the implementation of knowledge in those economies an efficient economic policy to accelerate development and growth.

For this purpose, series of sub-objectives are to be attained in order to gain an understanding of all knowledge economies dynamics: reasons of failures, main drivers, and representations at local levels among others. The research also aims to establish comparisons and develop policies to enhance the implementation of knowledge based economies. Below are the sub-objectives:

a. Define a conceptual framework to analyze the major trends of development based on knowledge economies in Arab economies and EEE regions.
b. Understand some of the reasons why some Arab countries have been progressing in knowledge based economies while others have been experiencing a decline or stagnation.
c. Identify the major drivers of the advancement in knowledge economy with a focus on Arab and EEE countries.
d. Highlight the ways by witch knowledge economy can be evaluated at local and regional levels in addition to eventual comparisons with other countries.
e. Develop an economic policy framework that would enhance the benefits from the knowledge economy on development.

2. Rationale:

The empirical evidence collected on the role of the new economics of knowledge emphasizes its development driving functions globally and in each economy (A. Driouchi et al., 2006). While some Arab countries have been experiencing deficiencies (J.E Aubert, J.L. Reiffers (2003), World Bank), others have shown recently some progress in terms of knowledge economy. The rationale of this research relies on analyzing the different trends of knowledge evolution through the period 1995-2010 in Arab and EEE countries based on series of indices and measures. This analysis will help understand the reasons behind the success of some economies of these regions and failure of others. In addition, it will guide assess the impact of knowledge economy on local and regional development. The overall goal is to establish a set of policies in order to enhance the role of knowledge economy to achieve performance.

3. Research Questions:

From the above, the following research questions are to be addressed:

a. Why some Arab countries have progressed in the knowledge based economy while others have been showing declines or stagnation?
b. What are the major drivers of eventual progress in the knowledge economy based on the experiences of Arab and other countries?
c. How progress in knowledge economy can be assessed at the local levels and what can be learnt from other countries with a focus on Eastern European Economies?
d. What new economic and social policies can be promoted to accelerate the benefits from further spillovers and the enhancement of the driving role of knowledge to account for larger segments of the population?

II. Conceptual framework

This proposal is within the conceptual framework of new economics of knowledge as based on several pillars (Dahlman, 2005) and endogenous growth. The empirical evidence accumulated on knowledge economy and its close relationship to development and growth make this concept appealing for most economies. In fact, the idea of knowledge economy is first introduced by Schumpeter (1939) in the context of economic analysis of the quality of the input factors in the production process (Cooke & Leydesdorff, 2006). Since then, modern literature addresses the concept as a motor for development and growth. Innovation generated by competitive research sectors is found to be the underlying source of growth (Aghion & Howitt, 1992). Cortright (2001) argues that knowledge is considered to be the central notion behind new growth theories. He adds that it is considered as unique good having different properties than other economic goods such as non rivalry and partial excludability (Cortright, 2001). Such properties have made of it an important engine for development in economies nowadays. The enhancement of knowledge within economies rather than labor or capital can lead to boundless growth as suggested by Cortright (2001).

This theoretical framework presents a fertile area to explore in order to help determine the trends of knowledge based economy in Arab and EEE countries. As these sets of countries are considered to be emerging, this research will investigate the trends and the drivers in addition to the impacts of knowledge economies on the local and regional levels. Within the tradition of knowledge economy presented above, and as a follow up to series of papers (Driouchi et al. 2004, 2005, 2006, 2008), this research is considered as a snapshot of the situation today in Arab and EEE countries. It will help determine what hinders the implementation of knowledge economies in some of those countries and the elements to be enhanced to accelerate the development and growth.

For the conceptual determination of the sectors that are to be considered in the Arab economies, this framework accounts for the existence of three areas. These are the traditional sector, the industrial sector, and the knowledge based sector. This is developed in the following paragraphs.

As formalized by V. Kotelnikov (2011), there are today three forces that drive the economies. These are interdependent and account for knowledge, change and globalization. But, if the latter author has characterized the two eras of old industrial and knowledge economy, for developing countries very old technologies are to be mentioned as important. They may represent a set of very old technologies, modes of consumption and attitudes that could constrain both industrial and knowledge based economies but that can also be better valued under most modern and advanced technologies and markets. The following table addresses the major differences characterizing both industrial and knowledge based economies.

Table I.1: Comparisons between old industrial economy and knowledge economy

Issue	Old Industrial Economy	New Knowledge Economy
Markets		
Economic Development	Steady and linear, quite predictable	Volatile - extremely fast change, with explosive upsurges and sudden downturns, and chaotic – the direction of the economy's changes is not perfectly clear
Market changes	Slow and linear	Fast and unpredictable

Economy	Supplier-driven	Customer- driven
Lifecycle of Products and Technologies	Long	Short
Key Economy Drivers	Large industrial firms	Innovative entrepreneurial Knowledge- based firms
Scope of Competition	Local	Global Hyper-competition
Competition: Name of the Game	Size: The big eats the small	Speed: The fast eats the slow
Marketing: Name of the Game	Mass marketing	Differentiation
Enterprise		
Pace of Business	Slow	Appreciably faster with ever-rising customer expectations
Emphasis on	Stability	Change Management
Business Development Approach	Strategy pyramid: vision, mission, goals, action plans	Opportunity- driven, dynamic strategy
Success Measure	Profit	Market capitalization (the market price of an entire company)
Organization of Production	Mass production	Flexible and lean production
Key Drivers to Growth	Capital	People, Knowledge, Capabilities
Key Sources of Innovation	Research	Research, systemic innovation, knowledge management, integration, new business creation, venture strategies, new business models
Key Technology Drivers	Automation and mechanization	Information and communication technology, e-business, computerized design and manufacturing
Main Sources of Competitive Advantage	Access to raw materials, cheap labor, and capital for conversion; cost reduction through economies of scale	Distinctive capabilities: institutional excellence, moving with speed; human resources, customer partnership; differentiation strategies; competitive strategies
Scarce Resource	Financial capital	Human Capital
Decision Making	Vertical	Distributed

Innovation Processes	Periodic, linear	Continuous, Systemic Innovation
Production Focus	Internal processes	Enterprise- wide business process and entire value chain
Strategic Alliances with other Firms	Rare, "go alone" mindset	Teaming- up to add complementary resources
Organizational Structures	Hierarchical, bureaucratic, functional, pyramid structure	Interconnected subsystems, flexible, devolved, employee empowerment, flat, or networked structure
Business Model	Traditional: command-and-control	New business model: refocused on people, knowledge, and coherence
	Workforce	
Leadership	Vertical	Shared: employee empowerment & self- leadership
Work force characteristics	Mainly male, high proportion of semi-skilled or unskilled	No gender bias; high proportion of graduates
Skills	Mono-skilled, standardized	Multi-skilled, flexible
Education Requirements	A skill or a degree	Continuous learning:: It's not what you know, it's how fast you can learn
Management-Employee Relations	Confrontation	Cooperation, teamwork
Employment	Stable	Affected by market opportunity / risk factors
Employees Seen as	Expense	Investment
Sectors	Manufacturing-Metallic-Electrical-Large constructions-Chemical and food processing.	Electronic-Pharmaceuticals-Aeronautic-Processed food and new equipments but mainly Information Technologies and others.

Source: Vadim Kotelnikov at http://www.1000ventures.com/vk.html with the row on sector added by the authors of the proposal

But, when considering the economies of Arab countries, the traditional sector does seem to be important even though its sustainability seems to not be evident. The most important characteristics of this area of production are that formal education is not the main driving force of this sector. The following table introduces the main elements that relate to this traditional area of skills.

Table I.2: Descriptive elements of traditional economy

Issue	Traditional Economy
Markets	
Economic Development	Steady and linear, quite predictable and seasonal
Market changes	Slow and linear
Economy	Supply driven
Lifecycle of Products and Technologies	Short
Key Economy Drivers	Small familial businesses
Scope of Competition	Local and proximity
Competition	Not important
Marketing: Name of the Game	None
Enterprise	
Pace of Business	Very slow
Emphasis on	Stability
Business Development Approach	Family organization
Success Measure	Other small businesses
Organization of Production	Small production
Key Drivers to Growth	Involvement of family members
Key Sources of Innovation	None and transmission within the family
Key Technology Drivers	Manual with limited tools
Main Sources of Competitive Advantages	Access to raw materials, unpaid family labor,
Scarce Resource	Financial capital
Decision Making	Hierarchical and family
Innovation Process	Limited to transmission within the family
Production Focus	Internal processes
Strategic Alliances with Other Firms	Rare, "go alone" mindset
Organizational Structures	Pyramid structure
Business Model	Traditional: command-and-control

Work Force	
Leadership	Old and male led
Work force characteristics	Mainly male, high proportion of semi-skilled or unskilled
Skills	Mono-skilled, standardized
Education Requirements	A skill acquired from the family or experience; traditional education can be a plus.
Management-Employee Relations	Patriarchal
Employment	Stable
Employees Seen as	Expense
Sectors	Agriculture, Handicrafts and commerce

Source: Using the above model with information from A. Driouchi (2004): Introduction to knowledge economy in Morocco, pp: 7-10.

A qualitative description of the presence of knowledge based economies in the Arab region is provided by S. Oukil (2011). The following table shows that most new industries and related enterprises are present in the region and that most countries have a variety of new knowledge based industries.

Table I.3: Public and private technology development through industrialization efforts in the Arab region

Industry	Country													Sector	
Industry and technology	1	2	3	4	5	6	7	8	9	10	11	12	13	Public	Private
Aerospace industry	✓		✓	✓		✓				✓			✓	✓	✓
Car manufacturing	✓	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓
Capital goods	✓													✓	✓
Chemical	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓
IC technologies	✓	✓	✓	✓		✓			✓	✓		✓	✓	✓	✓
Micro-electronics	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓
Pharmaceutical industry	✓		✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Software industries	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Nanotechnology	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Biotechnology	✓		✓	✓						✓		✓	✓	✓	
1=Algeria, 2=Bahrain, 3=Egypt, 4=Jordan, 5=Kuwait, 6=Lebanon, 7=Libya, 8=Morocco, 9=Oman, 10=Qatar, 11=Saudi Arabia, 12=Tunisia, 13=UAE															

Source: S. Oukil (2011)

East European Countries still struggle with the shift from inefficient, centralized economies to the more effective market ones. This process is still in progress and many years are required in order to catch up with the old members of the European Union. However after the European Union integration, by adopting the EU goals and based on its best practices (as well as of the United States), EEE countries moved to a second phase of the transition towards the knowledge-based economy. As long as Arab countries are in the transition stage as EE countries in the end of 20th century, a valuable knowledge transfer could be established between them.

The accumulated literature suggests that most countries that are doing well in today's competitive economy have economies built on advanced knowledge. Scholars have tackled the concept of knowledge driven growth and suggest it to be core of the future economic growth and social wellbeing (Oxley et al., 2008; Okkonen 2004; Artelaris et al. 2007 and others). In this context, the UK has adopted knowledge economy as the core policy aiming the country economic growth. Other developed countries also put emphasis on innovation economy as a stimulant to the economic growth such as the USA and Australia (Oxley et al., 2008). In addition, in Korea, the accumulation of knowledge was the main contributor to long-term economic Growth (World Bank Institute, 2006). More recent work on this subject found that in Lithuania, knowledge economy and information society are among the most important elements to sustainable development (Baležentis, and Valkauskas, 2010).

Cooke and Leydesdorff (2006) have looked at the regional development in knowledge based economy and they suggested that regions provide a relevant system of reference. That is, the regional dimension to knowledge based economy constitutes that engine to the national development wealth.

The concept of knowledge economies have been linked to endogenous growth models as defined by Chen and Kee (2005). Grossman and Helpman (1991), and Aghion and Howitt (1992) considered innovation generated by competitive research as the primary source of growth. They introduced research and development (R&D) as a major driver for growth considering human capital and skilled labor as inputs. In this sense, policies encouraging R&D and presenting educational subsidies are used to promote technological progress and therefore act as accelerators to long term economic growth (Chen and Kee (2005). R&D is then used to endogenize the accumulation of knowledge via the promotion of technical development as this latter is considered the primary source of long-term economic growth (Chen and Kee, 2005).

In the Arab countries, there are increasing trends toward the mobilization of knowledge economy (Deutsche International Development report, 2006). Many countries in this region recognize the need toward commitment to strengthen the pillars of knowledge economy as steps toward development and growth (International conference on building knowledge economy to foster sustainable economic growth in the Middle East and North Africa, Tunis declaration, 2009). Aubert and Reiffers (2003) pointed out that Arab countries were left behind by the industrial revolution, and over dependency on oil resources; they are facing the need for a new form of development. This need has also been highlighted in different Arab Human development reports of 2002, 2003, 2005, 2007 and 2009.

In the current context, some Arab countries have embraced knowledge economy as a development strategy while others are making important progress (World Bank, 2009). There is urgent need to diversify many of the these economies to overcome the over dependency on specific industries such as those based on oil and gas that need to derive their revenues from alternative sources (UNESCO Science report 2010). Other highlights are based on rethinking the development strategies in order to take advantage of transformative policies, innovation projects and renovation plans, which have become associated with moving towards a knowledge economy, through the provision of technical support, preparation of reference documents and offering scientific advice as declared in International conference on building knowledge economy to foster sustainable economic growth in the Middle East and North Africa in Tunis (2009). Other factors consider enhancing the educational systems as one of the important pillars of knowledge economy (Weber and Cornell (2011); Hillard and Siebold and Nord (2011)).

The move and shifts to knowledge economy have also been highlighted in UNESCO Science Report (2010). Indeed, Arab countries have no choice but to stimulate science, technology and innovation along in order to overcome issues related to food, water, energy shortages besides unemployment and insecurity. As a step to enhance knowledge economy, national policies and development strategies for science and technology started to take place in Arab area but, they are either too ambitious or too ambiguous (UNESCO Science Report, 2010). However, efforts are to be made for enhancing innovation through R&D and Intellectual Property Rights (IPRs) as pointed out in UNESCO Science Report (2010). Some countries already started this process such as Tunisia and UAE. Tunisia has carried out innovation survey as a step to evaluate it current state and remediate their situation. The United Arab Emirates (UAE) is the highest-ranking country in terms of its capacity for innovation. It comes 27nd out of the 133 economies covered by the Global Competitiveness Index 2010. In addition, four Arab countries (Qatar, UAE, Bahrain, and Kuwait) are among the top 50 countries in the world most prepared to utilize ICT, one of the essential pillars of a knowledge society (World Economic Forum, 2010). Egypt has been part of European Union–Egypt Innovation Fund as a program aiming to enhance R&D and innovation. Other countries such as Morocco, Bahrain, Qatar, and Saudi Arabia have started science parks in order to enhance innovation as a joint R&D efforts between private and public sectors (elements discussed in UNESCO Science Report (2010); Deutsche International Development report, (2006)).

Morocco, for example, during the last decade, has focused its public spending on the creation of knowledge based platforms aiming to accelerate the shift from traditional and industrial economy to more knowledge based one (Driouchi, and Kadiri, 2010). This is approached through the engagement of investment projects aiming to accelerate growth and development with a specific focus on regions. The overall objective is to alleviate the weights of investments among its regions through investment projects with regional orientations. They are dispersed through the

Moroccan territory defining every region as agricultural, logistical, and industrial poles among others (Driouchi, and Kadiri, 2010). However, effects of such projects on the on the local and regional welfare are still ambiguous and not yet known and measured.

But, most available documents show that the above moves in the Arab countries are constrained by the educational system, the limited research infrastructure besides the availability of skilled labor. With regard to education, Arab countries have gone through many reforms with a shift of focus toward quality and efficiency. However, the region is still experiencing huge gaps between what education systems have attained and what the region needs to achieve in terms of current and future development objectives (World Bank MENA development reports, 2007). The on-going levels of unemployment for both skilled and unskilled labor are major indications for the limitations for Arab countries to accelerate the access and the benefits from knowledge based economy. These constraints have been underlined in series of international reports and publications. These include World Bank, UNDP, UNESCO and others. The Arab Human development reports of 2002, 2003, 2005, 2007 and 2009 have tackled series of the constraints facing different countries in the region.

Many studies showed that some recommended solutions, implemented in EE countries, in order to enhance the knowledge-based growth could be: correct macroeconomic and structural policies (increase the openness of the economy; effective privatization, etc), creation of competitive R&D market and increasing the efficiency of use of the research funds; education policy and a reform of the education system (increasing the number of students, the quality of education and the correlation to the market needs).

III. Research Methods and data

This section introduces the methods and data used to tackle this research. Both qualitative and quantitative analyzes are pursued. This includes descriptive statistics and statistical analysis mainly on variables related to the penetration of new knowledge components such as Information of Communication Technologies (ICT), education and research with emphasis on their impacts. This consists mainly in linking knowledge related variables to global and local development measures. It also accounts for the use of quantitative techniques such as principal component analysis (PCA) and others for the determination of the most relevant factors. Access to Granger-Causality tests is also expected under the availability of longer time series.

This is based on data about development and knowledge economy as captured by different indices. These measures are Knowledge for Development Index (KEI) and Knowledge Index (KI) by World Bank Institute and Global Innovation Index (GII) by INSEAD. Each of these indices encompasses specific variables that are used in this research.

KI measures the country's ability to adopt, generate and diffuse knowledge. It focuses on three main pillars: education, innovation, and ICT. KEI on the other hand measures the environment suitability of a given country or a region for knowledge to be used a motor to economic development and prosperity. In addition to the three elements of the KI, KEI captures elements related to economic incentives and institutional regimes. The stream of data available is up to 2009.

GII ranks 125 economies across the world in terms of their innovation capabilities and results. It is calculated as a subtotal of two sub indices embracing the following elements: Institutions, Human capital and research, Infrastructure, Market sophistication, and Business sophistication, scientific outputs and finally Creative outputs. These pillars are by themselves divided into many sub-pillars based on significant variables. The stream of data available is up to 2011.

The set of countries to base the analysis on includes mainly Arab countries as part of Arab economies (Morocco, Algeria, Tunisia, Egypt, Bahrain, UAE, Syria, El Yemen, and Oman among others) and selected EE countries (Poland, Romania, Bulgaria, Hungary, Czech Republic, Slovenia, Slovakia, Latvia, Lithuania, and Estonia).

The analysis also accounts for the regions within each country in order to help gain more insight and capture elements encompassing development and growth as related to knowledge economy. To test for the relationship between knowledge and local development measures, panels of regionalized data per country are needed. Elements such as annual rates of enterprise creation and intellectual property using statistics from intellectually property offices and Doing Business reports of World Bank for the relevant countries will also be used. The analysis will be based on data and information contained in world and Arab Human Development Reports (2001-2010). As there are important deficits in time series data about the Arab countries, most of the analysis uses international data on almost every variable. The data sources include World Bank, UNCTAD, UNIDO, UN statistics, UNESCO, IMF, and ILO besides other sources that are specifically cited with the relevant sections. Some country data are also mobilized to fulfill some specific investigations.

IV. Why Benchmarking Arab economies with EEE

The collapse of communism in 1989 was followed by a very interesting and important period from economical and political point of view. The events began in Poland, the largest country in the region, and they continued in Hungary, East Germany, Bulgaria, Czechoslovakia and Romania. The Soviet Union was dissolved by the end of 1991, resulting 14 countries: Armenia, Azerbaijan, Belarus, Estonia, Georgia, Kazakhstan, Kyrgyzstan, Latvia, Lithuania, Moldova, Tajikistan, Turkmenistan, Ukraine and Uzbekistan. In Albania the communism was abandoned in 1990. Yugoslavia, one of the most developed countries in Eastern region before the fall of the Iron Curtain, abandoned the communism in 1992 and split into six states (Slovenia, Croatia, Macedonia, Bosnia Herzegovina, Serbia and Montenegro) after strong nationalist movements. In 1992, Czechoslovakia split into Czech Republic and Slovakia.

Therefore, from 1989-1992, in Central and East European Region there were happened important changes in borders, governance regimes and economic relations. The countries shifted from centrally planned economies to market economies. Central and East European Region includes nowadays the following countries: Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovenia, Slovakia, Albania, Croatia, Kosovo, Macedonia, Montenegro, Bosnia-Herzegovina, Serbia.

Next sub-sections are a comparative analysis of EEE countries and Arab countries using governance indicators, knowledge economy indicators and regional development indicators which reveals a complex picture of similarities and differences.

Both Arab and EEE economies have been shifting from administered economies to market economies.

The beginning of transition period from a centralized planned economy to a market economy was characterized by a very limited number of laws and decrees passed annually. EEE countries increased significantly the amount of new legislation from 1993. Some exceptions were observed in Czech Republic and Slovakia were the number of new laws and decrees started to increase since 1990, as long as these countries had to prepare their legislation for country split in 1993.

Before the EU accession, in all EEE countries was a legislative boom, since they had to adopt the Acquis Communittaire to national legislations. In Poland the year with the highest number of laws and decrees passed annually was 2004 (six times higher than in 1990), the year of EU accession. In Romania, in 2001 was recorded the highest number of laws and decrees, 25 times higher than in 1990. Latvia was another country with a very high increase of the number of laws and decrees, in 2009 recording a number of 2134 laws and decrees passed, 37 times higher than in 1990 (Table I.4).

Table I.4 - Number of laws and decrees passed annually

	Bulgaria	**Czech Republic**	**Estonia**	**Hungary**	**Latvia**	**Lithuania**	**Poland**	**Romania**	**Slovak Republic**
1990	na	602	6	206	57	157	489	42	602
1991	na	582	90	244	121	179	498	82	582
1992	na	648	37	263	122	161	457	158	648
1993	na	337	394	286	173	146	541	124	328
1994	na	276	544	278	404	220	628	217	374
1995	na	318	480	303	587	270	637	185	308
1996	na	327	423	362	695	403	710	196	388
1997	na	357	442	443	748	418	1029	376	390
1998	na	335	508	336	777	321	1165	452	409
1999	na	373	633	343	730	358	1175	539	400
2000	na	505	690	421	684	558	1157	660	489
2001	na	501	675	446	791	390	1678	1079	600
2002	na	590	682	373	866	454	1901	965	761
2003	na	498	590	420	1092	498	2055	831	621
2004	352	700	621	520	1417	473	2591	838	778
2005	288	554	543	524	1363	241	1935	679	666
2006	363	626	474	498	1365	334	1631	717	698
2007	415	393	477	591	1232	266	1660	592	669
2008	372	486	776	474	1443	368	1438	576	650
2009	409	492	424	524	2134	362	1636	529	602
2010	350	439	391	560	1617	453	1558	452	560

Source data: Kowalewski O. & Rybinski K. (2011)

To analyze various aspects of government efficiency we will use the world governance indicators database created by the World Bank (Kaufmann et al., 2010). The indicators taken into consideration were:

- ***Government effectiveness*** indicator which captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies.
- ***Regulatory quality*** indicator which captures perceptions of the ability of the government to formulate and implement sound policies and regulations that permits and promotes private sector development.
- ***Rule of law*** indicator which captures perceptions of the extent to which agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence.
- ***Control of corruption*** indicator which captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the state by elites and private interests
- ***Voice and accountability*** indicator which captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media.
- ***Political Stability and Absence of Violence/Terrorism*** indicator which captures perceptions of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism.

All these indicators are included in our analysis with their estimated values, which could take values between -2.5 to +2.5.

By using these indicators we will construct three groups of EEE countries. The methodology used is Hierarchical classification method. Then, by using this classification we will classify each Arab country in one of these groups, in order to identify a benchmark.

By using Ward Method with Euclidian distance, we obtain three groups of countries. The first group includes countries with a very low perception about all the governance indicators, all of them recording negative values. Second group, includes countries were the perception about Government Effectiveness, Rule of Law and Control of Corruption still remains very low (with negative values) but Regulatory Quality, Voice and Accountability and Political Stability are higher, recording positive values.

In the third group are the winner countries in all governance indicators, all the analyzed indicators recording positive values.

We observe that some countries change their group during the transition period. In 1997, Bulgaria passed from group 1 to group 2 and Latvia from group 2 to group 3 and in 2005 Montenegro passed from group 1 to group 2. An interesting evolution is observed for Croatia which passed from group 1 to group 2 in 2000 and then to group 3 in 2002. Romania was the only country which recorded a decreasing evolution from group 2 to group 3 in 2000 and then in 2002 reenter in group 2. Between 1995 and 2000 the transition in Romania was very chaotic, which gave a bad perception about governance in 2000. From 2000, the country regained the coherence and stability in reforms and therefore from this year the country recorded a continuous economic growth which improved also the perception about the governance in general (Table I.5).

Table I.5 – The means of indicators for each group

	Group 1	**Group 2**	**Group 3**
Government Effectiveness	-0.471	-0.058	0.741
Regulatory Quality	-0.234	0.340	0.961
Rule of Law	-0.626	-0.101	0.647
Control of Corruption	-0.547	-0.231	0.414
Voice and Accountability	-0.098	0.441	0.933
Political Stability and Absence of Violence/Terrorism	-0.529	0.312	0.755

Nowadays, the classification of countries is:

- **Group 1:** Albania, Bosnia-Herzegovina, Kosovo, Macedonia, Serbia;
- **Group 2:** Bulgaria, Montenegro, Romania;
- **Group 3:** Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovenia, Slovakia.

As long as many Arab countries passed these years through a transition period from a centrally planned economy to a market economy, we would like to use as benchmark EEE countries, taking into consideration the similarities in governance. Therefore, we have used a discriminant analysis for all EEE countries, grouped as previously, and then we have classified each Arab country in one of the three groups, in order to identify the best benchmark for each country.

The results are presented in Annex 1 (Appendicies). 96, 8% of observations from training group (EEE countries) were correctly classified. By using the discriminant scores for the discriminant functions we have represented all the EEE countries and Arab countries for the year 2010 and 1996 (as an indicator of the situation at the beginning of transition). By comparing the evolution of governance indicators in EEE countries which became members of EU in 2004 or 2007, we observe three patterns of evolution:

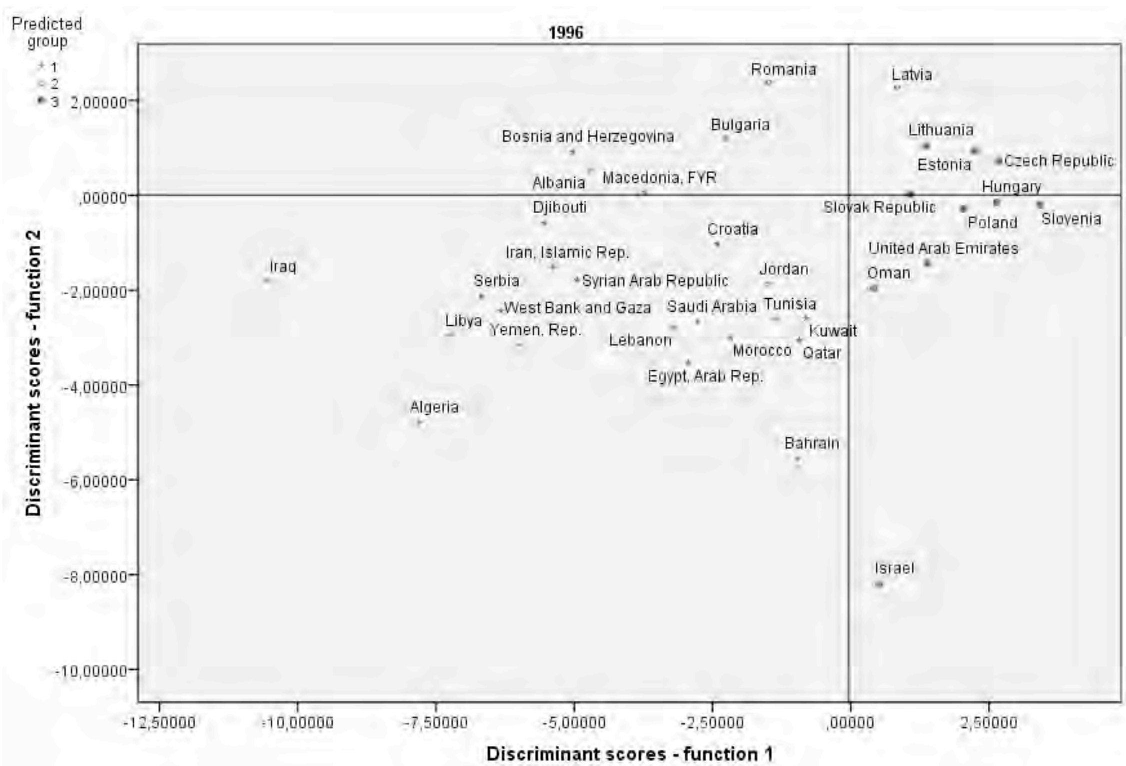
- Both discriminant factors increase during the transition period (Poland, Hungary and Slovak Republic), which means that the indicators *Political Stability and Absence of Violence/Terrorism* and *Voice and accountability* had recorded the highest levels and all the other governance indicators increased during the transition period.
- Only the first discriminant factor increase during the transition period, the second one remaining constant (Bulgaria and Croatia), which means that all the governance indicators improved during the transition period.
- The first discriminant factor increase and the second one decrease during the transition period (Latvia, Romania, Estonia, Slovenia, Czech Republic and Lithuania) which means that all the governance indicators improved during the transition period excepting *Political Stability and Absence of Violence/Terrorism* indicator.

By analyzing the present situation and the past evolution of Arab countries we could formulate some directions of improvement of governance indicators.

First of all, the best classified countries from Arab region, in governance indicators, Qatar, Arab Emirates and Oman are countries which need some increases in the second discriminant function. They should focus their efforts in improving Political Stability and Absence of Violence/Terrorism and/or Voice and Accountability indicators. All the other governance indicators are almost at the level of EEE countries. These countries could follow the example of Poland for example, which have registered very high increases in the second discriminant function.

Algeria, West Bank and Gaza are countries were during the analyzed period (1996-2010) it could be observed an increase in the second discriminant function, which means that these countries have already improved their Political Stability and Absence of Violence/Terrorism and/or Voice and Accountability indicators. Therefore, these countries should focus their efforts in improving the first discriminant function, by increasing the Control of Corruption and Government efficiency. These countries could follow the example of Bulgaria or Croatia.

All the other Arab countries should increase both discriminant functions; therefore all the governance indicators should increase with higher growths for Political Stability and Absence of Violence/Terrorism and/or Voice and Accountability indicators. They could follow the example of Croatia.



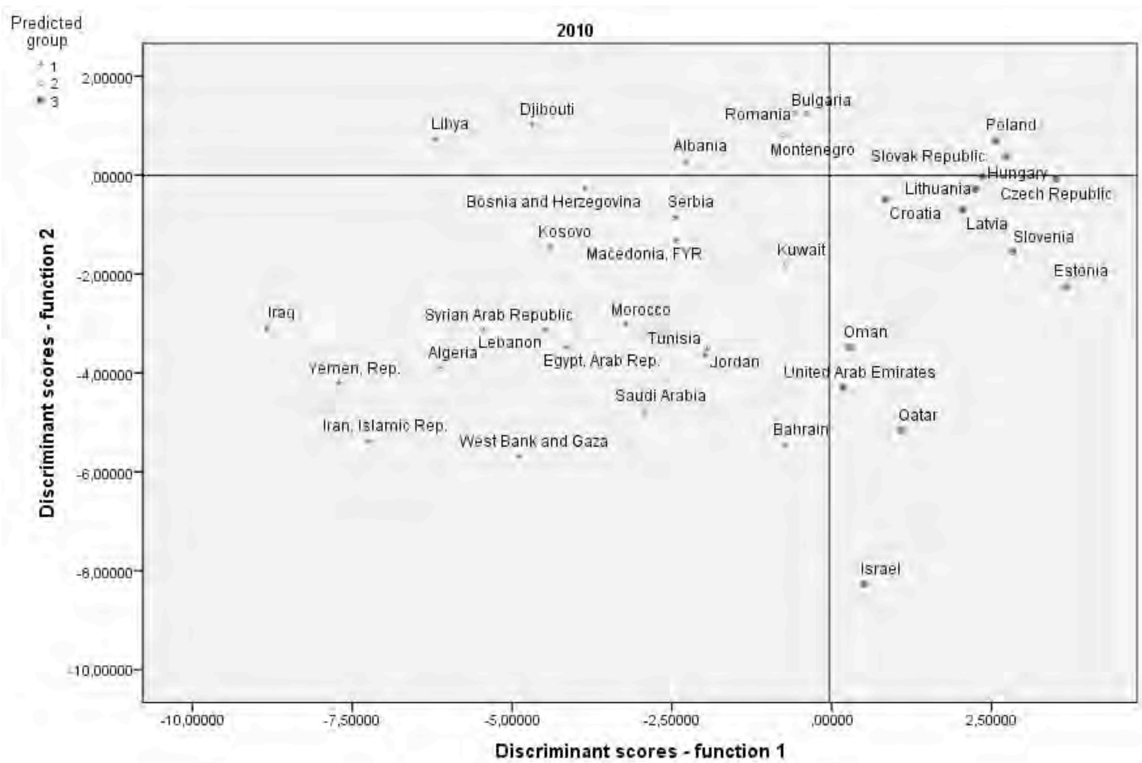


Fig. I.1 – Country projection on the first two discriminant functions for the year 1996 and 2010

Besides the above criteria for selecting the benchmarking of Arab and EEE economies, the proximity and membership in the EU are important factors that play for selecting these comparisons.

The following part deals with the assessments of the situation of the knowledge economy in both Arab and EEE groups of countries. This is conducted at the global and local levels in both types of economies.

Part II: Knowledge Economy in EEE and Arab countries

The characterization of the knowledge economy in the countries under investigation looks respectively at global and local levels. Besides the use of descriptive statistics, regression analysis is also applied in some sections.

I. Global Innovation and Knowledge Processes

In a knowledge based economy the capital is replaced by knowledge as the main source of growth and power. In such an economic system, knowledge replaces capital, innovation replaces tradition and ideas replace manual work as the main source of power and economic growth. In such a society, the demand for workers who are highly skilled and well educated increases (Bell, 1973, Sporer, 2004).

The main forces driven a knowledge based society are the interaction of two principal processes: globalization and new information and communication technologies. Globalization could be measured by indicators related to foreign direct investments and trade with high technology goods and services. Information and communication technology could be measured by indicators such as: the number of telephone lines and the number of internet users.

Orientation toward globalization is present more in some EEE countries than in EU countries, but EEE countries lag substantially behind EU countries in implementing new communication and information technology (Sporer, 2004). In this section we have studied the main indicators related to globalization and information technology in EEE countries, identifying some groups of countries in the level of presence of knowledge based society. As in case of governance indicators, we have tried to identify some similarities and dissimilarities between EEE countries and Arab countries in the stage of development of knowledge based society.

In this section we have taken into consideration the following indicators related to globalization and information technology as main drivers for global innovation and knowledge based society:

- Foreign direct investment, net inflows (% of GDP)
- Foreign direct investment, net outflows (% of GDP)
- Exports of goods and services (% of GDP)
- Imports of goods and services (% of GDP)
- High-technology exports (% of manufactured exports)
- ICT goods exports (% of total goods exports)
- ICT goods imports (% total goods imports)
- ICT service exports (% of service exports, BoP)
- Telephone lines (per 100 people)
- Internet users (per 100 people)

The indicators were extracted from World Bank database, for the period 1996-2010, for all EEE countries and Arab countries. In the first stage of the analysis, as in the previous section, we have constructed three groups of EEE countries by using hierarchical analysis and then by applying discriminant analysis we have classify each Arab country in one of the three groups.

By applying Ward method, we have obtained three groups of countries. The first group includes countries with a very low level of all globalization and ICT indicators. The second group includes countries which started to improve firstly the indicators related to ICT in order to create the conditions for improving the globalization indicators in the second stage. The third group includes countries with very high levels of all globalization and ICT indicators.

Table II.1 – The means of indicators for each group

	Group 1	Group 2	Group 3
Foreign direct investment, net inflows (% of GDP)	4,952	4,504	8,905
Foreign direct investment, net outflows (% of GDP)	0,129	0,772	3,498
Exports of goods and services (% of GDP)	38,824	45,352	69,801
Imports of goods and services (% of GDP)	47,738	54,368	73,687
High-technology exports (% of manufactured exports)	4,395	5,969	12,708
ICT goods exports (% of total goods exports)	3,133	3,931	13,556
ICT goods imports (% total goods imports)	7,141	6,772	13,200
ICT service exports (% of service exports, BoP)	6,440	5,716	4,993
Telephone lines (per 100 people)	26,409	31,225	32,610
Internet users (per 100 people)	8,975	38,191	36,609

In 1996 only one country, Estonia, was classified in the third group of countries, with high level of globalization and ICT. All the other countries were in group 1. Nowadays, all EEE countries which have joined EU were in second or in third group. Romania passed in the second group only in 2009 and many countries during the crisis period, because of the reduction of international transactions (export, import and foreign direct investment) have passed from group 3 to group 2. During the analyzed period, we observe three patters of evolution. The most common behavior is to obtain a knowledge based economy both through the improvement of globalization and ICT indicators. This is the case of Czech Republic, Slovak Republic, Bulgaria, Slovenia, Lithuania, Poland and Croatia. The second pattern of evolution is to improve mainly ICT indicators, without high improvements in globalization indicators. This is the case of Estonia, which has a high level of globalization from the beginning of transition period but also of Latvia and Romania, which do not had a very good performance in globalization neither at the beginning of transition nor nowadays.

The third case is the pattern of Hungary, who improved the globalization indicators, without improving ICT indicators. Because, ICT indicators are under the mean values of EU, Hungary could obtain more performance in knowledge based economy, by focusing on improving the access and use of internet and telephony.

Arab countries should follow three directions in obtaining a true knowledge based economy. The first direction should be followed by Oman, Algeria, Tunisia, Kuwait, Saudi Arabia, by improvements both in ICT use and in globalization indicators. These countries should follow the example of Bulgaria, Slovenia, Lithuania, Poland and Croatia. The second direction should be followed by Morocco, Lebanon and Egypt, where already the ICT use is at a medium level but they have to do efforts in improving mainly the globalization indicators.

These countries should follow the example of Czech Republic, Slovak Republic. The third direction should be followed by Israel, with a very high level of ICT use, but with still a low level of globalization indicators. This country should focus his attention in using all his resources in improving high technology and ICT trade in order to arrive at a high level of knowledge based society. This country should follow the example of Hungary.

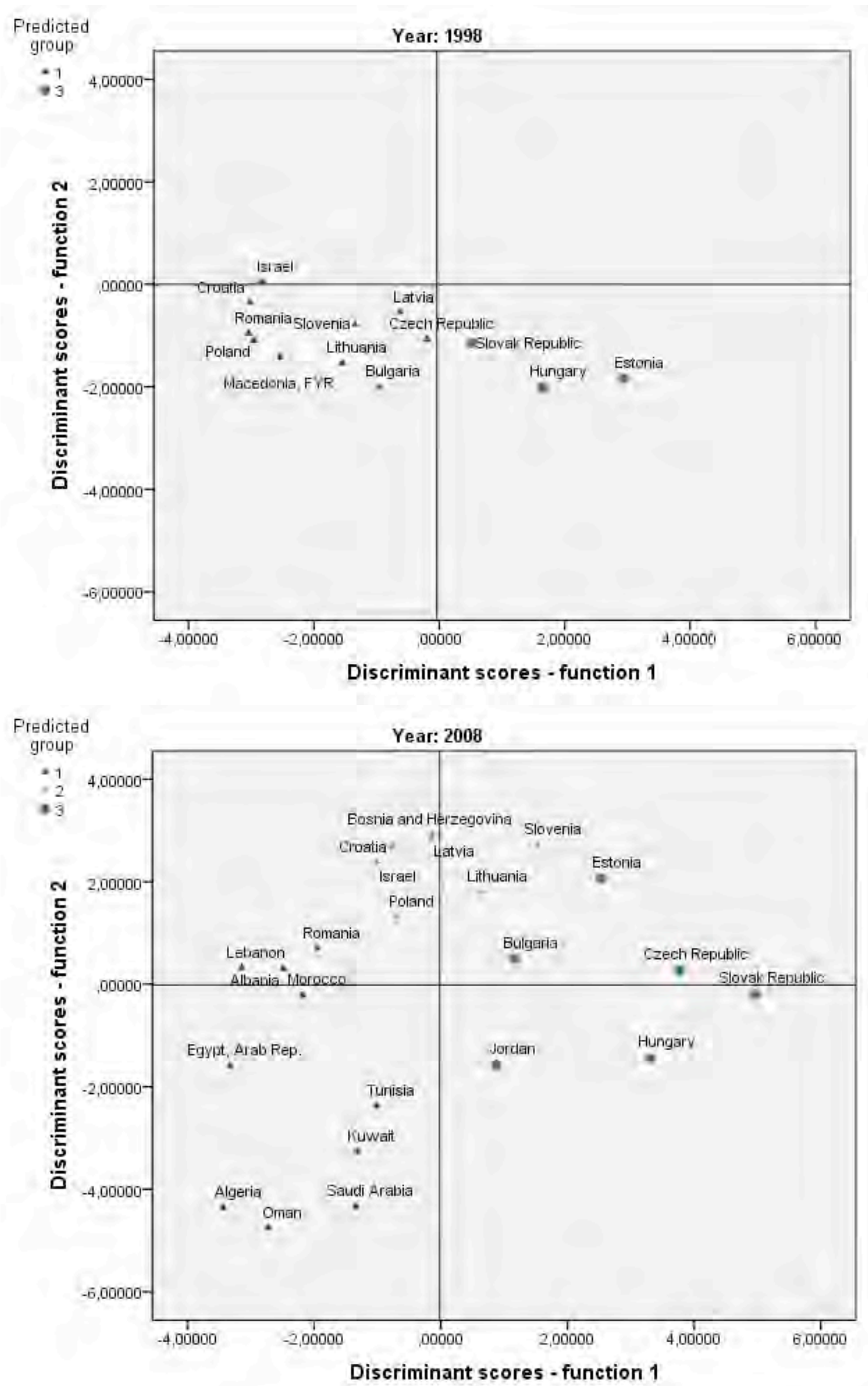


Fig. II.1 - Country projection on the first two discriminant functions for the year 1996 and 2008

II. Local and regional development

Local and regional development is an increasingly important issue for researchers and politicians. The challenge of enhancing prosperity, improving wellbeing and increasing living standards has become acute for localities and regions from developing economies. Moreover, questions about the implications of globalization for local and regional development in transition economies are of strong interest.

In order to see how EEE countries have been developed at regional and local level during the transition period and to identify some examples for Arab countries we have taken into consideration the following indicators:

- Arable land (% of land area)
- Improved water source (% of population with access)
- Improved water source, rural (% of rural population with access)
- Improved water source, urban (% of urban population with access)
- Improved sanitation facilities (% of population with access)
- Improved sanitation facilities, rural (% of rural population with access)
- Improved sanitation facilities, urban (% of urban population with access)
- Employment in agriculture (% of total employment)
- Population in the largest city (% of urban population)
- Roads, paved (% of total roads)
- Rural population (% of total population)

We have used World Bank database, for the period 1996-2010. In the first stage of the analysis, we have constructed three groups of EEE countries by using hierarchical analysis and then by applying discriminant analysis we have classify each Arab country in one of the three groups.

By applying Ward method, we have obtained three groups of countries. The first group (Bulgaria, Croatia, Czech Republic, Slovak Republic, and Slovenia) includes countries where almost all population has access to improved sanitation facilities (97%) and improved water sources (99%), both from rural and urban localities. The countries from this group have a low proportion (21%) of land area arable and a very low level of population employed in agriculture (12%). Moreover, they have the highest proportion of roads paved (95%) and a medium proportion of rural population. These countries are highly developed at regional level with a medium level of rural population. It means that in the new context of globalization and of development of knowledge economy, they could develop more the urban regions.

The second group of countries (Hungary, Latvia, Lithuania, Estonia) have a high proportion of population with access to improved water source (96%) and to improved sanitation facilities (89%), both in rural and urban areas. But these countries have the lowest proportion of paved roads (38%). They have 30% of lands arable but the lowest proportion of population employed in agriculture and living in rural areas. Even if during the transition period and before the accession to EU almost all countries have been invested a lot in regional development, the countries from this group have to concentrate more their attention on the development of communication facilities.

The third group of countries (Romania, Albania) includes agriculture based economies, with very high proportion of population employed in agriculture (54%) and many arable lands (32%). In urban areas, the population has generally access to improved water sources (98%) and to improved sanitation facilities (91%), but in rural areas only 81% have access to improved water sources and only 64% have access to improved sanitation facilities. Only 45% of roads are paved and 54% of population lives in rural areas. The countries from this group must invest more in the development of infrastructure. The globalization and sustainable economic development are not possible without a good infrastructure and a regional development.

Table II.2 – The means of indicators for each group

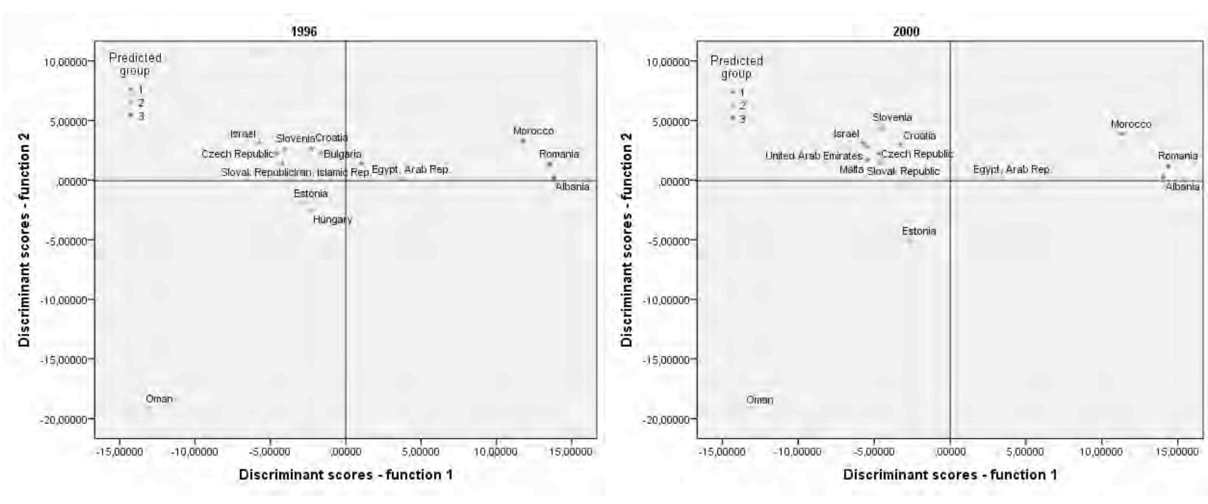
Local or regional indicator	**Group**		
	1	**2**	**3**
Arable land (% of land area)	21.33	29.90	31.89
Improved water source (% of population with access)	99.69	98.17	90.23
Improved water source, rural (% of rural population with access)	98.66	96.03	81.35
Improved water source, urban (% of urban population with access)	100.00	99.40	98.29
Improved sanitation facilities (% of population with access)	98.08	93.06	77.76
Improved sanitation facilities, rural (% of rural population with access)	97.22	89.14	63.94
Improved sanitation facilities, urban (% of urban population with access)	98.53	95.54	91.29
Employment in agriculture (% of total employment)	11.76	10.35	53.71

Population in the largest city (% of urban population)	24.71	34.00	24.30
Roads, paved (% of total roads)	94.62	37.62	44.94
Rural population (% of total population)	40.14	33.53	54.35

In order to see which are the similarities and dissimilarities between EEE countries and Arab countries we have classified the Arab countries in one of the three groups by using the discriminant analysis. The results are presented in Annex 2 (Appendicies). 100% of observations from training group (EEE countries) were correctly classified. First discriminant function is positively determined by Employment in agriculture and negatively determined by improved sanitation facilities in rural areas, and total, improved water source and Population in the largest city. The second discriminant function is positively defined by rural population and improved sanitation facilities in urban areas and negatively defined by Arable land and Roads, paved.

By using the discriminant scores for the discriminant functions we have represented all the EEE countries and Arab countries for the year 2008, 2000 and 1996. The following conclusions could be drawn:

- Jordan, United Arab Emirates and Egypt are classified in the first group. These countries have a very good infrastructure.
- Syria is classified in the second group. Therefore the development of communication facilities should be a priority for this country.
- Morocco is classified in the third group. Therefore the development of infrastructure should be developed in order to obtain a sustainable economic development.



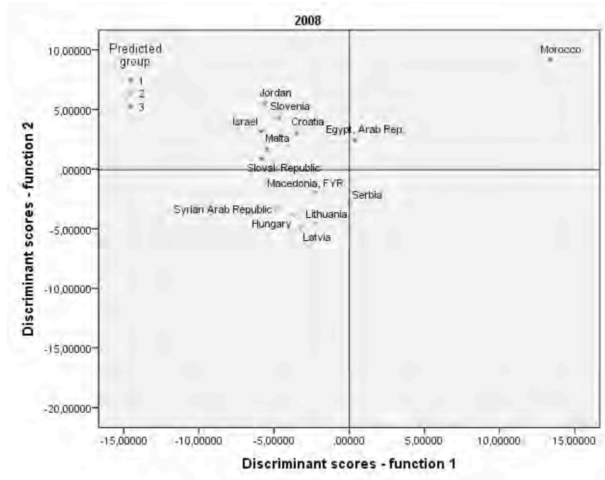


Fig. II.2 - Country projection on the first two discriminant functions for the year 1996, 2000 and 2008

The OECD defines a country with a knowledge based economy as one where "the production, diffusion and use of technology and information are keys to economic activity and sustainable growth (OECD, 1999, p7).

Investment in knowledge refers to investment in areas that generate knowledge such as research and development, software, education and basic science. It also refers to "innovation" and the machinery, equipment and infrastructure to support it (George E.ST., 1996).

Next sub-sections are a comparative analysis of EEE countries and Arab countries about investments in areas that generate knowledge, which reveals a picture of similarities and differences between countries and eventually directions for development.

a. Education

Education has become an important subject of discussion in international economic meetings. The Uruguay Round of the GATT (General Agreement on Tariffs and Trade) and GATS (General Agreement on Trade and Services), classified education as a service and sought to ensure gradual reduction of restrictions on educational services such as technology transfer, consultancy, distance education and so on. The eventual aim was to create an international market place in education (Kelsey 1998, pp 55-56).

Tertiary education institutions support knowledge-driven economic growth strategies and poverty reduction by: a) training a qualified and affordable labour force […]; b) generating new knowledge; c) building the capacity to access existing stores of global knowledge and to adopt that knowledge to local use. Tertiary education institutions are unique in their ability to integrate and create synergy among these three dimensions (World Bank, 2002).

The options for a government wishing to position its higher education system to be in the front line of the knowledge based economy are multiple.

For example, public investment in Asia (the highest performing economies in the last several decades) grew faster than in any other region in the world both as a percentage of total expenditure and on per capita basis during the last decades (Tilak, 1994). The governments of these countries have been used deliberate systems of regulations and incentives to expand higher education sector and to produce graduates in perceived areas of need: science, technology, engineering and scientific research linked to development and to the needs of local industries (George E.ST., 1996).

From a neo-liberal perspective, the World Bank stress three key factors to support knowledge driven development, while ensuring quality, efficiency and equity in tertiary education: a coherent policy framework; an enabling regulatory environment; appropriate financial incentives ((World Bank, 2002, p.83). Tertiary education institutions and entire tertiary systems must become increasingly agile in responding to changes in the labour market. A diverse system that includes a strong set of private providers and autonomous public providers of tertiary education affords the necessary flexibility (World Bank 2002, p.86).

In order to describe the education improvement in EEE during the transition period we have analyzed indicators related to expenditure in education (as investment in education measure) and to enrolment in education (as general level of education measure):

- Expenditure per student, primary (% of GDP per capita)
- Expenditure per student, secondary (% of GDP per capita)
- Expenditure per student, tertiary (% of GDP per capita)
- Public spending on education, total (% of GDP)
- Total expenditure on educational institutions and administration as % of GDP. Public sources. Tertiary
- School enrolment, secondary (% gross)
- School enrolment, tertiary (% gross)

- Number of students in tertiary education per 100 000 inhabitants. Total

The indicators were extracted from World Bank database, for the period 1996-2010, for all EEE countries and Arab countries.

By applying Principal Component Analysis we have obtained new variables, linear combination of the initial variables, Annex 3 (Appendicies). By projection on the first two principal components 75% of the total inertia is explained.

The first principal component is determined mainly by:

- Number of students in tertiary education per 100 000 inhabitants - positively;
- School enrolment, tertiary (% gross) - positively;
- School enrolment, secondary (% gross) - positively;
- Expenditure per student, tertiary (% of GDP per capita) – negatively;
- Public spending on education, total (% of GDP) – positively;
- Expenditure per student, secondary (% of GDP per capita) - positively.

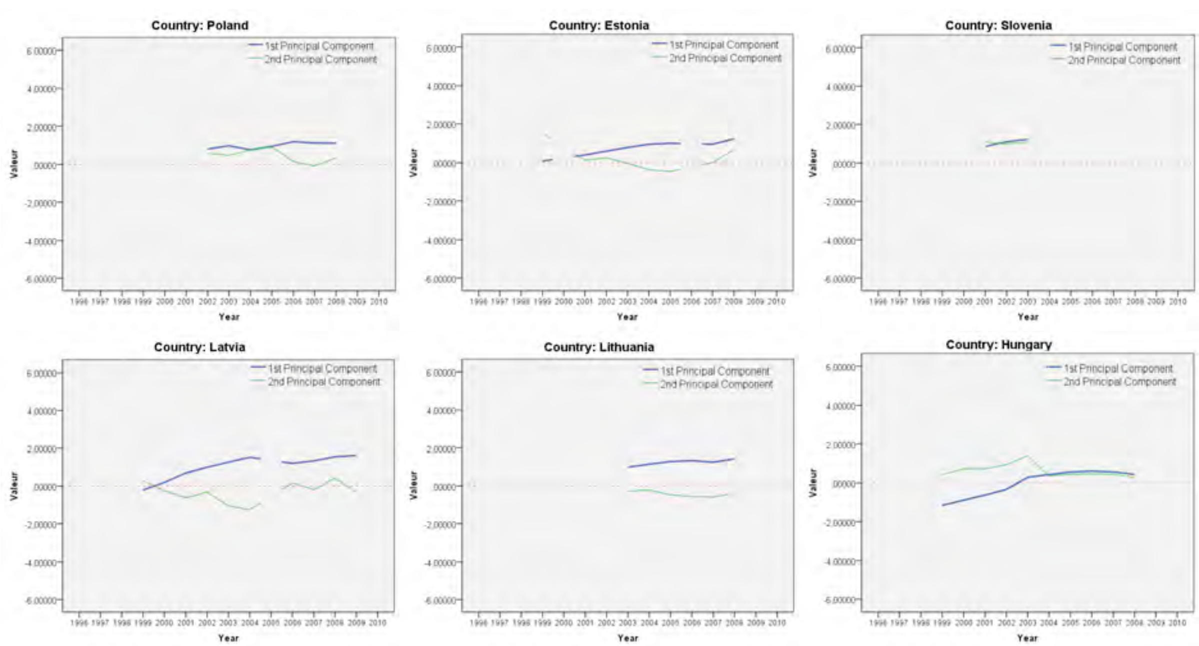
The second principal component is determined mainly by:

- Expenditure per student, tertiary (% of GDP per capita) – positively;
- Public spending on education, total (% of GDP) – positively;
- Total expenditure on educational institutions and administration as % of GDP. Public sources. Tertiary – positively;
- Expenditure per student, primary (% of GDP per capita) – positively.

By analyzing the evolution of these two first principal components for the analyzed EEE countries we observe that there are mainly *three patterns of evolution* of indicators related to education (Figure II.3). *The first pattern* is seen in Estonia, Latvia, Lithuania, Poland, Hungary and Slovenia. In these countries, the number of students in tertiary education per 100 000 inhabitants, was higher than the mean value for all analyzed countries during the entire analyzed period. Moreover, this has increased during the transition, being a way of stimulation and sustaining the economic development. The expenditure per student, for tertiary education as % of GDP per capita is lower than the mean value, while the expenditure per student, for secondary education as % of GDP per capita is higher than the mean value. In these countries the dominant principle was the pursuit of equality in education by using innovative and interactive materials designed to provide tolerance education and discrimination prevention. All these countries have used education as a tool for developing knowledge based economy. They have to invest more in tertiary education and to produce graduated people, highly qualified, in domains like: science, technology, engineering and scientific research.

The second pattern is seen in Romania, Croatia and Czech Republic, where almost all indicators have lower values than the average. At the end of the transition period, these countries arrive to have higher values than the mean for all educational indicators. In order to catch the other EU countries in social development they sustain policies such that to increase the general level of education and the access to education for all.

The third pattern is seen in Bulgaria and Slovak Republic where all indicators have lower values than the average. Even after the transition period and at the moment of accession to EU, they do not arrive to values higher than the mean calculated for all analyzed period and for all countries included in the analysis. These countries must implement some policies for the development of education and the increase of general level of education as the main condition for a knowledge economy.



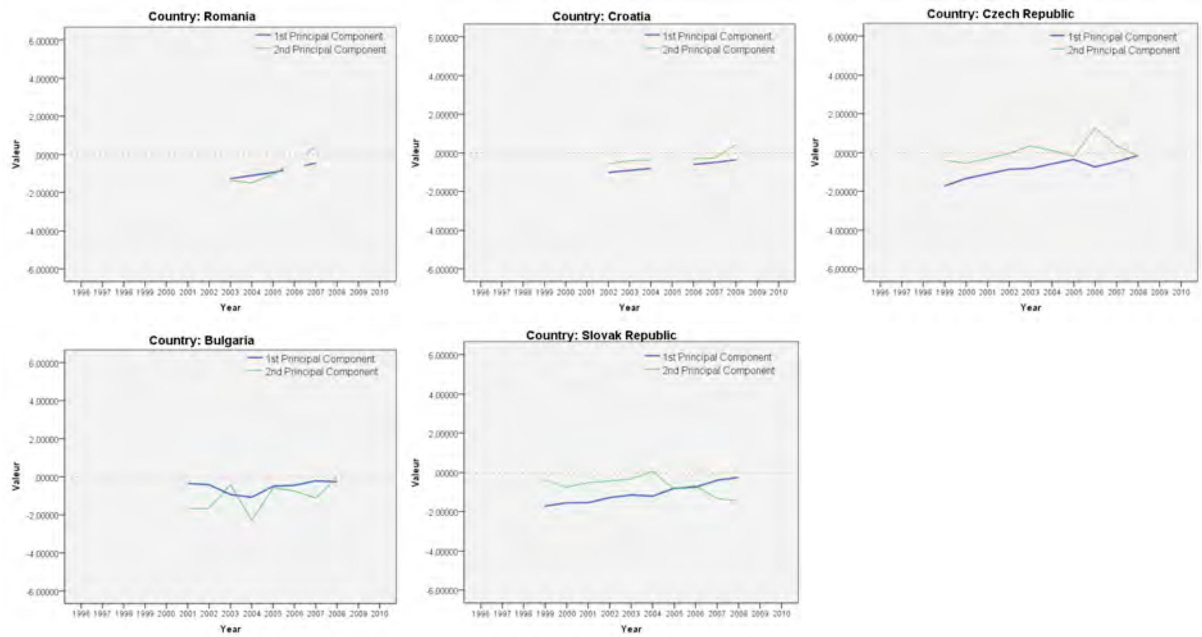


Fig. II.3 – The evolution of the composed indicators of education (the first two principal components) during the analyzed period for EEE countries

By projection, we have calculated the coordinates for Arab countries on the first two principal components. By analyzing their evolution and the educational level attained nowadays, we could conclude that Israel follow the first pattern. This country invests in education more than other Arab countries and the improvement of tertiary education must be a priority such that to obtain knowledge based economy. Morocco and Tunisia follow the second pattern of evolution, and they have to invest more in all educational levels and to support policies for the access at education of all with no discrimination. Only by improving the general level of education for the entire population, they will succeed to obtain a sustainable growth. United Arab Emirates has very low levels for all educational indicators, following mainly the third pattern. This country has to implement many educational policies and to invest more in all educational levels such that to arrive closer to European countries and to be able to implement measures for knowledge based economy.

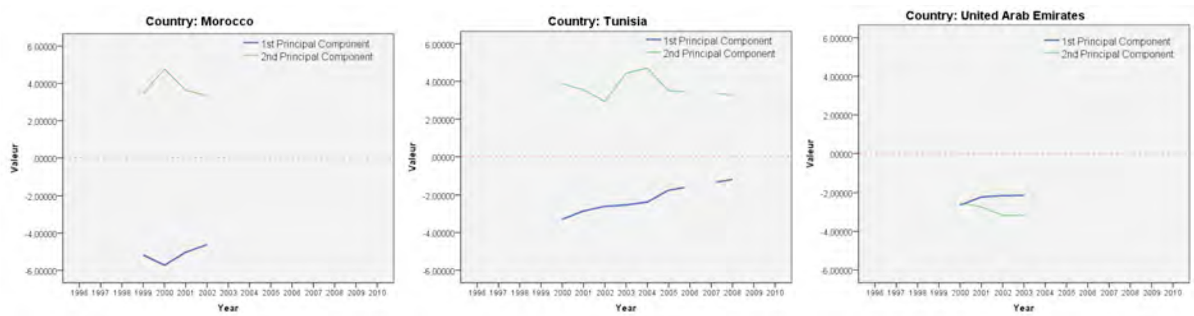


Fig. II.4 – The evolution of the projected indicators of education on the first two principal components during the analyzed period for Arab countries

b. Research and technology development

Universities and research and development institutions are basic organizations for knowledge production and innovation. Knowledge is transmitted through education and training and it is disseminated through information and communication technology.

In this section, by using indicators related to science and technology we will identify the possibilities of development for Arab countries in research and technology in order to be prepared for the transition to knowledge based economy.

From World Bank database we have used the following variables for EEE and Arab countries for the period 1996-2010:

- High-technology exports (% of manufactured exports)
- High-technology exports (current US$)
- Patent applications, nonresidents
- Patent applications, residents
- Research and development expenditure (% of GDP)
- Researchers in R&D (per million people)
- Scientific and technical journal articles
- Technicians in R&D (per million people)
- Trademark applications, total
- Trademark applications, direct nonresident
- Trademark applications, direct resident

c. Enterprise creation

The economic freedom led to flourishing of small businesses and helped to create the entrepreneurial culture in EEE countries. As a result the number of new firms, mostly Micro, Small and Medium Enterprises (MSMEs), rose rapidly in the beginning of ’90 years. In Poland, the number of MSMEs rose to 2 million in 1994. Most of them were microenterprises with less than 10 employees (99 per cent of the new firms). Some of these firms disappeared very quickly, in 2000, Poland having a smaller number of MSMEs than at beginning of transition. A similar situation was observed in Hungary and Romania, where after a period of sharp increase of the number of MSMEs at the beginning of transition (1995-1996), we observed a sharp decrease in 1997. In Czech Republic the evolution was completely different. The number of MSMEs increased continuously from 682 thousand in 1995 to 2.4 million in 2005.

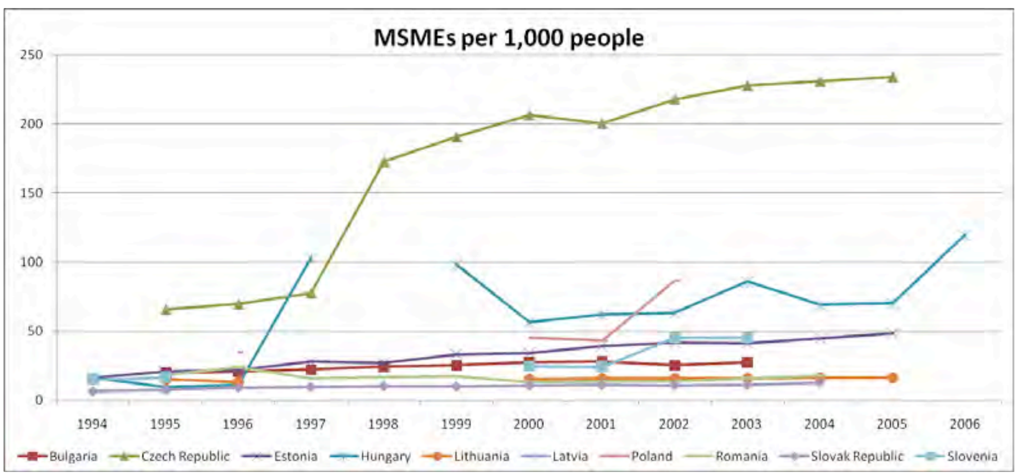


Fig.II.5 – The evolution of the number of Micro, Small and Medium Enterprises per 1000 people during the period 1994-2006 in EEE, members of EU

Source data: Micro, Small, and Medium Enterprises: A Collection of Published Data, Marta Kozak, International Finance Corporation (IFC), Washington, D.C.

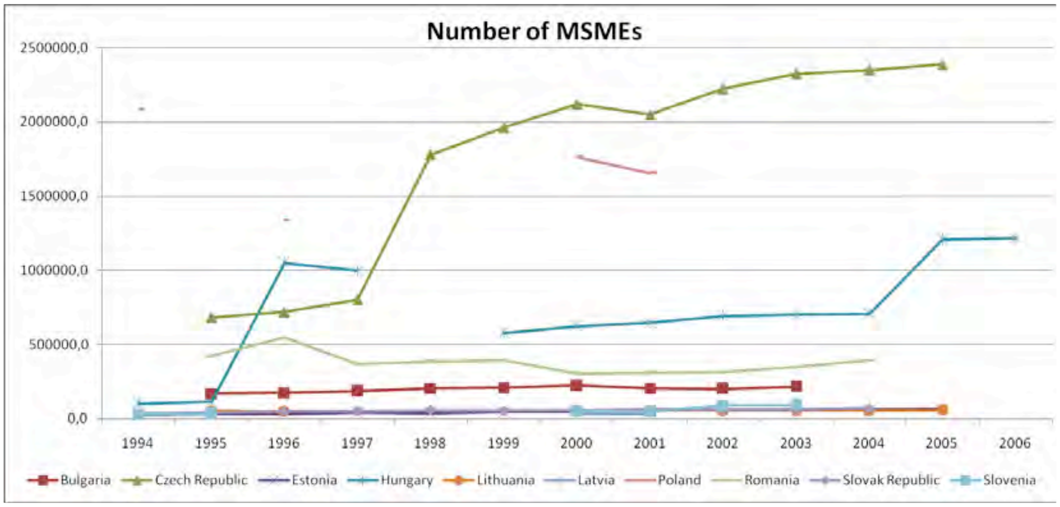


Fig.II.6 - The evolution of the number of Micro, Small and Medium Enterprises during the period 1994-2006 in EEE, members of EU

Source data: Micro, Small, and Medium Enterprises: A Collection of Published Data, Marta Kozak, International Finance Corporation (IFC), Washington, D.C.

III. The situation of knowledge economy in the EEE and Arab regions

In a globalized world, it is rather straightforward to find similarities among regions located in different geographical areas or under different cultural regimes.

EEE - Central and Eastern Europe is a term describing former communist states in Europe, after the collapse of the Iron Curtain in 1989/90. In scholarly literature the abbreviations EEE or CEEC are often used for this concept. EEE includes all the Eastern bloc countries west of the post-World War II border with the former Soviet Union, the independent states in former Yugoslavia (which were not considered part of the Eastern bloc), and the three Baltic states (Estonia, Latvia, Lithuania) that chose not to join the CIS with the other 12 former republics of the USSR. The transition countries in Europe and Central Asia are thus classified today into two political-economic entities: EEE and CIS. The EEE countries are further subdivided by their accession status to the European Union (EU): the eight first-wave accession countries that joined the EU in May 2004 (Estonia, Latvia, Lithuania, Poland, Czech Republic, Slovakia, Hungary, and Slovenia) and the two second-wave accession countries that joined in January 2007 (Romania and Bulgaria). According to the World Bank, "the transition is over" for the 10 countries, that joined the EU in 2004 and 2007.

According to the World Bank definition, MENA” is an economically diverse region that includes both the oil-rich economies in the Gulf and countries that are resource-scarce in relation to population, such as Egypt, Morocco, and Yemen”. The Arab Region includes: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, United Arab Emirates, West Bank and Gaza, Yemen.

EEE and Arab countries are almost at the same level of economic growth, according to the development pattern from Kharas (2010).

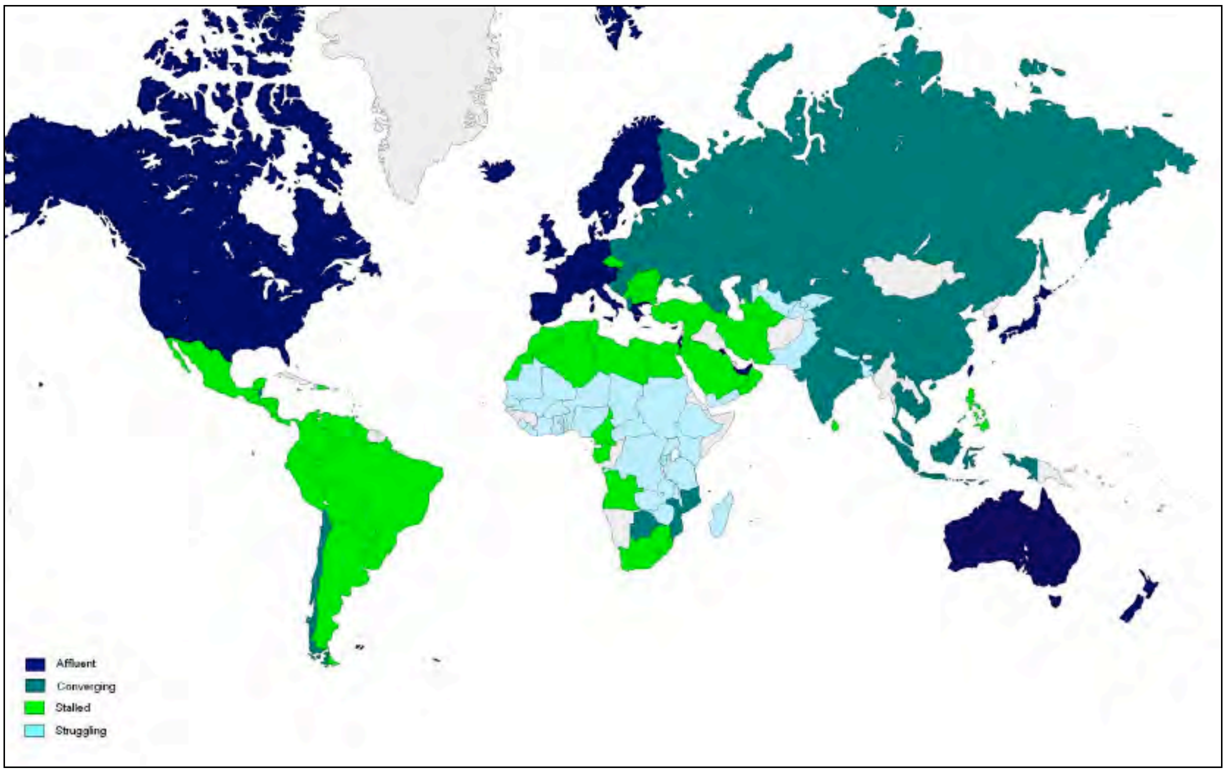


Fig.II.7. the four speed world (Source: Kharas, 2010)

Thus, the author of this study identifies four drivers of global economic growth:

- Technological advance of the global production frontier at the rate of 1.3 per cent per year.
- Catch-up technology in a group of fast-growing converges who are in the midst of a process of shifting resources from low to higher productivity activities; the speed of catch-up depends on each country’s income level relative to the US.
- Capital accumulation, derived by assuming each country maintains its investment rate at its historical average.
- Country specific demographic changes of the 15-64 age groups, assuming constant labour force participation rates in each country.

In the past years, countries like Morocco, Algeria, Tunisia, Libya and North African have become attractive for foreign investment. Until recently, multinational companies looked to the east, when they wanted to establish low-cost offshore production and other operations at the door of Europe. This has led to billions of dollars in investment in the former Soviet bloc countries like Poland, Slovakia, Romania and Bulgaria. But, as wages have risen in Eastern Europe, countries from Arab region became more attractive.

However, while their appeal to potential investors may be similar, Eastern Europe and the Arab countries are totally different, both economically and socially.

Moreover, from a social point of view, the ex-communist states of central Europe can be a role model for nations in North Africa and the Middle East in their fight for democracy and freedom of expression.

In the following sections we will discuss the main aspects regarding the knowledge economy indicators for EEE countries, as a benchmark for Arab countries.

The Work Foundation Report *Defining the Knowledge Economy* reviewed the common definitions used. The knowledge economy has most commonly been defined in terms of technology and knowledge based industries reflecting R&D intensities, high ICT usage, and the deployment of large numbers of graduates and professional and associate professional workers. An industry-based definition is not entirely satisfactory because, the knowledge economy applies across all industries.

However, an industry-based approach has the advantage of being able to draw on official statistics based on internationally agreed definitions of knowledge-based industries. For this report we have drawn on the definitions developed by Eurostat and the OECD.

The Eurostat definition includes high to medium tech manufacturing and communications, financial and business services and health and education. Eurostat also includes recreational, cultural and sporting services and some travel services (sea and air) that the OECD excludes.

Eurostat also breaks the knowledge service sector down into four groups: high tech services (R&D and computing); financial services; market knowledge services (communications, travel and business services) and other knowledge services (health, education, and recreational and cultural services).

The OECD definition: "The knowledge based economy" is an expression coined to describe trends in advanced economies towards greater dependence on knowledge, information and high skill levels, and the increasing need for ready access to all of these by the business and public sectors.

<u>EU Policy history regarding knowledge economy</u>

2000 − The European Council launched the 'Lisbon Strategy', aimed at transforming the EU by 2010 into 'the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion'.
2002 − In Barcelona, a further aim was added, namely to spend by 2010 at least 3 % of GDP on research, of which two thirds should be financed by the business sector.
2005 − The Lisbon Strategy was re-launched with the initiative 'Working together for growth and jobs'.
2006 − At a Council meeting in Brussels, it was recognized that Europe should invest more in knowledge and growth.
2006-07 − At the Spring European Councils, one of the four priority areas agreed upon by the Member States was more investment in knowledge and innovation.
2007 − The European Commission launched the Green Paper 'The European Research Area: New Perspectives', a 'broad institutional and public debate on what should be done to create a unified and attractive European Research Area'.

1. Trends

The current literature in business, academia and market analysis has identified the following trends and opportunities which have never been fully taken advantage of by the stakeholders:

- Technology that facilitates the shift out of survival mode and enables businesses to focus of business expansion has become more important. Companies will seek to enhance existing customer relationships, improve business efficiencies, and grow revenue in the coming months.
- For small businesses, this means increased use of collaborative tools, improved networking and implementing disaster recovery plans. Medium businesses, as well, are focused on more effective collaboration among employees. However, this will come in

the form of more enterprise IT solutions such as Customer Relationship Management (CRM), Enterprise Resource Planning (ERP) and server virtualization.

- Substantiated marketing messages with more quantifiable information will be required to drive ICT purchases beyond basic break/fix purchases. As a result of the economic downturn, business decision-makers (BDMs) are much more involved in the purchase process of ICT.
    - Companies will require stronger justification for ICT purchases, and in a language BDMs can directly translate into bottom line results. Phrases such as "save time" and "save money" will need to be heavily supported with hard numbers and proof of outcome.
- Cloud computing solutions will struggle to capitalize on the full market opportunity presented in the upcoming years
    - Adoption will continue to climb in the near future, but marketers will need to reduce confusion, misinformation and apprehension in order to convert interest into actual purchases.
- The next following years will continue to see accelerated adoption and mainstreaming of key technologies like Cloud computing and Virtualization, as cost savings, operational efficiency and IT disaster recovery are key business drivers. However, marketers will struggle to fully address the growing interest in specific software and virtual infrastructure solutions due to the amount of confusion in the value proposition and offerings that exist in the minds of ICT executives.
- Social media will move beyond its primary role as a promotional tool into the more strategic role of business intelligence.

Businesses will continue to adopt digital marketing media to reach customers, and as usage of social media grows so will the advantages and opportunities for companies to capture valuable competitive feedback. Although the number of companies using social media as a source for business intelligence is small, it will grow significantly in the next few years as the value of the tool becomes more obvious.

In the next upcoming years, companies will continue to find new ways to gain visibility in day-to-day operations in a non-technical, non-IT assisted manner. Business Intelligence (BI) has been traditionally under-utilized by companies compared with large enterprises, and with massive amounts of data assets lying around in these smaller companies, organizations are realizing that they can use existing data resources better to gain clear line of sight into their business and customers for timely decision making. BI tools are now being used by companies to focus more on business growth and results, and not just internal efficiency and cost control.

These trends are illustrated by the following facts and figures.

1.1. Percentage of ICT sector value added

For the EEE countries the percentage of ICT sector value added in the past ten years has almost the same tendency as the European Union as a whole, with an average of around 6% of GDP. Although the trend is positive, there is a clear downturn due the financial crisis period, most of the countries being affected by the economic recession.

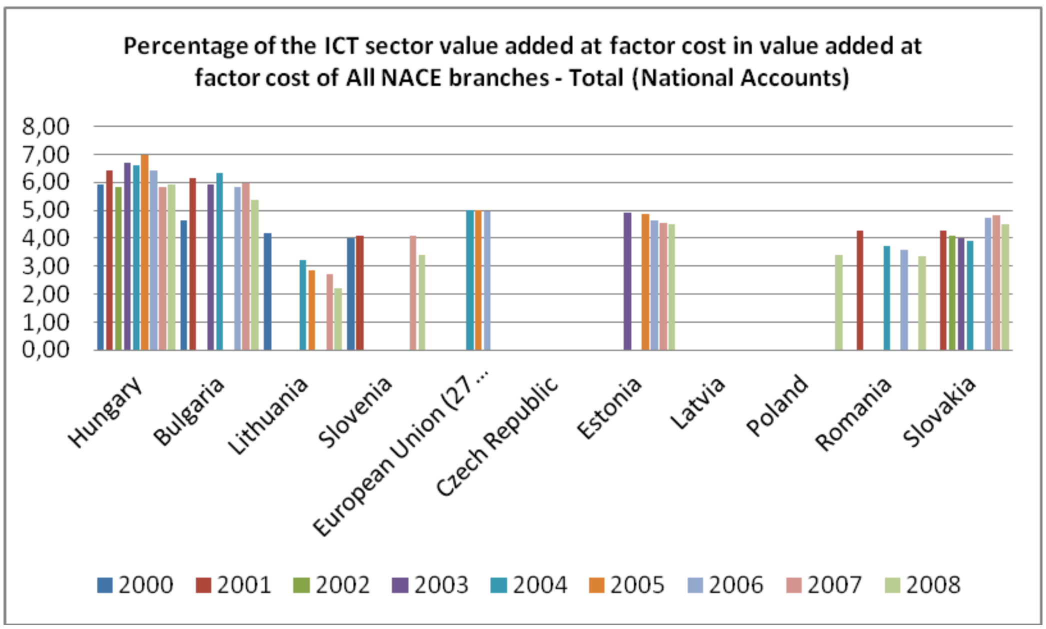


Fig.II.8. Percentage of ICT sector value added

1.2. Gross domestic expenditure on R&D

The following graphs present the relative shares of the different sources of funds in R&D. More specifically the indicators provided are percentage of GERD (Gross domestic expenditure on R&D) financed respectively by industry, government, the higher education and the private non-profit sector. The fifth source of funds shown, which also make the breakdown complete, is GERD financed from abroad. R&D is an activity where there are significant transfers of resources between units, organisations, sectors and countries. The importance of the source of funding has been recognized in one of the Barcelona targets of the Lisbon agenda where it is said that the appropriate split for R&D is 1/3 financed by public funds and 2/3 by private.

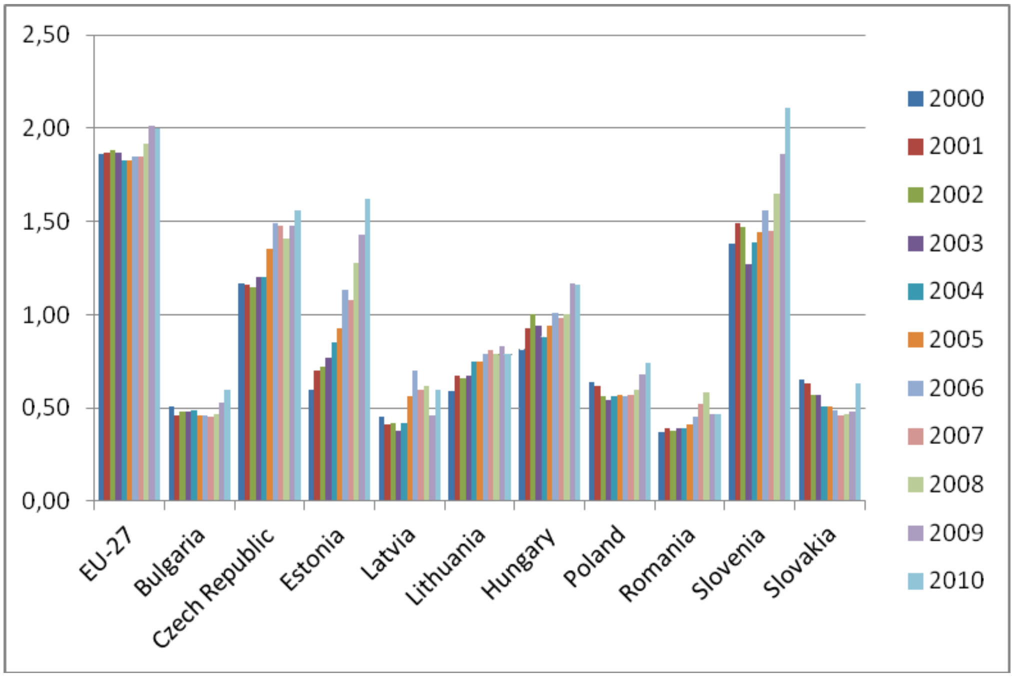


Fig.II.9. Gross domestic expenditure on R&D(% on GDP)

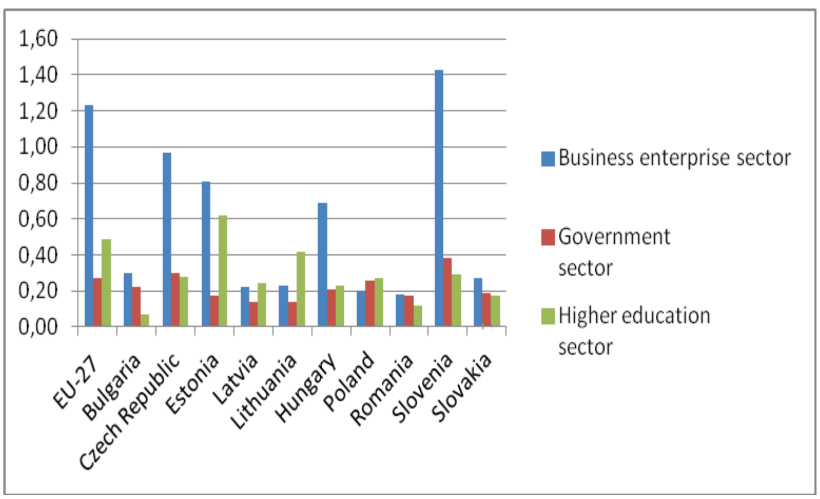


Fig.II.10. Gross domestic expenditure on R&D by sector on 2010(% on GDP)

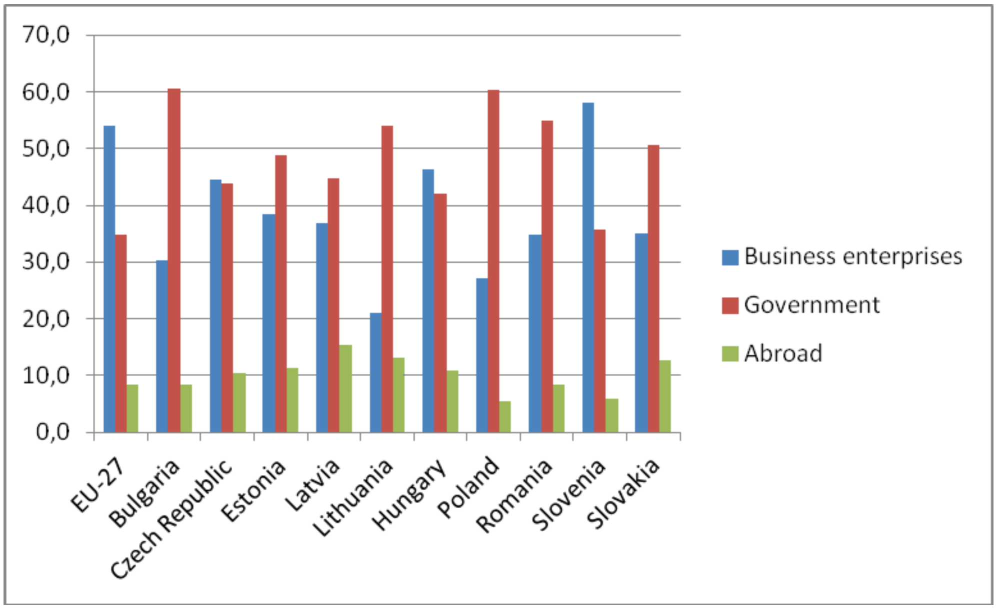


Fig.II.11. Gross domestic expenditure on R&D (GERD) by source of funds (Percentage of total GERD)

As it can be gleaned from the above graph, most countries followed a similar trend along the years.

Gross domestic expenditure on R&D for EEE countries is between 0.5% and 2% of GDP, for the period 2000-2009, and the data are similar to those from Arab countries. According to the latest data from World Bank (2005), the value of this indicator for Arab region is 0.85% of GDP, a value comparable to the EEE region.

1.3. Researchers

Researchers are professionals engaged in the conception or creation of new knowledge, products, processes, methods and systems, and in the management of the projects concerned. Head Count (HC) data measure the total number of researchers who are mainly or partly employed on R&D.

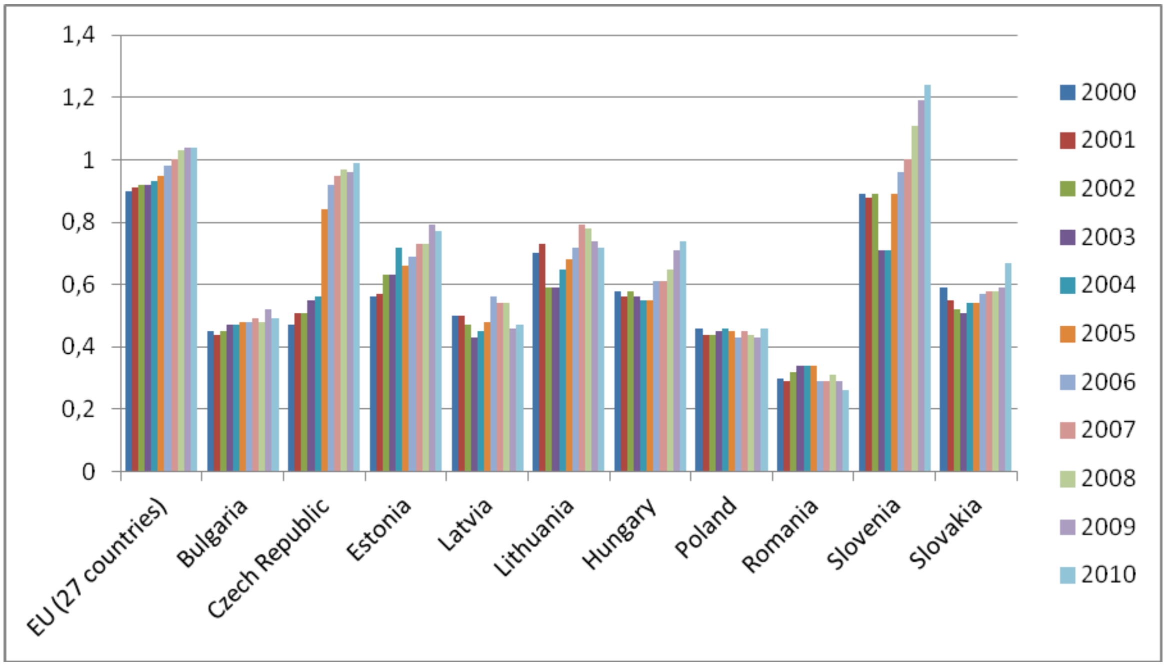


Fig.II.12. Total researchers, by sectors of performance - Head count (% of the labour force)

The number of researchers has an upward trend in almost all the considered countries. The highest number is held by Poland, followed by Czech Republic, Hungary, Romania and Slovakia, only normal relative to the country population.

For the Arab countries, although there are data availability issues, the World Bank reports show also an upward trend in terms of number of researchers in the past decade.

1.4. Turnover from innovation

This indicator is defined as the ratio of turnover from products new to the enterprise and new to the market as a % of total turnover. It is based on the Community innovation survey and covers at least all enterprises with 10 or more employees. An innovation is a new or significantly improved product (good or service) introduced to the market or the introduction within an enterprise of a new or significantly improved process.

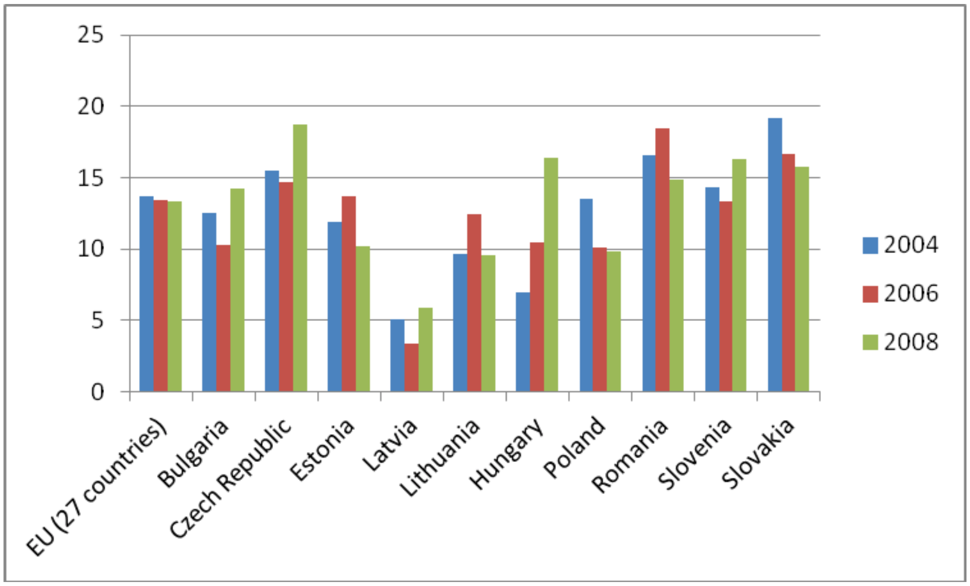


Fig.II.13. Turnover from innovation

A clear upward trend is presented only in Hungary and Portugal, while Slovakia presents a downward trend.

1.5. Venture capital investments

Venture capital investment is defined as private equity rose for investment in companies; management buyouts, management buying and venture purchase of quoted shares are excluded. Data are broken down into two investment stages: Early stage (seed + start-up) and expansion and replacement (expansion and replacement capital).

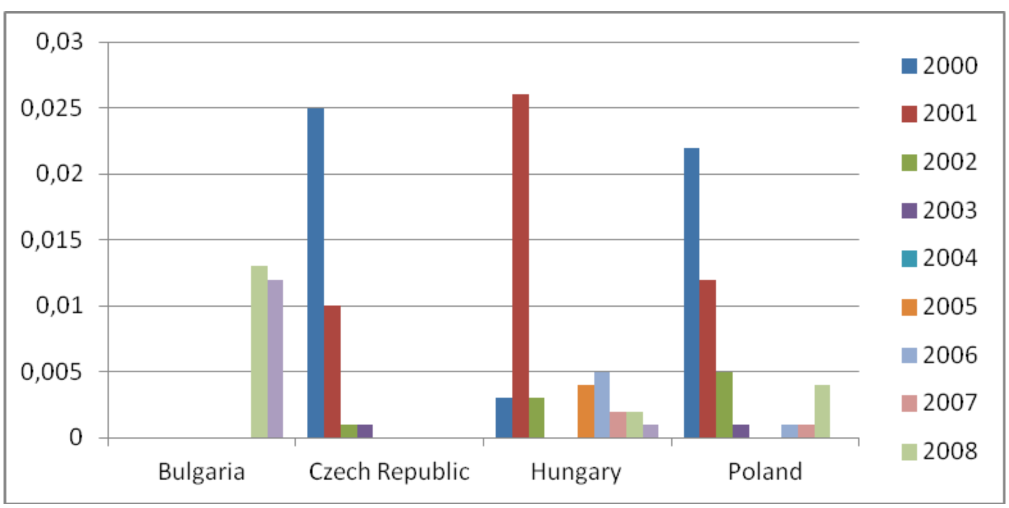


Fig.II.14. Venture capital investments by type of investment stage, Percentage of GDP

1.6. High-tech exports as % of exports

This indicator is calculated as share of exports of all high technology products of total exports. High Technology products are defined as the sum of the following products: Aerospace, Computers-office machines, Electronics-telecommunications, Pharmacy, Scientific instruments, Electrical machinery, Chemistry, Non-electrical machinery, Armament. The total exports for the EU do not include the intra-EU trade.

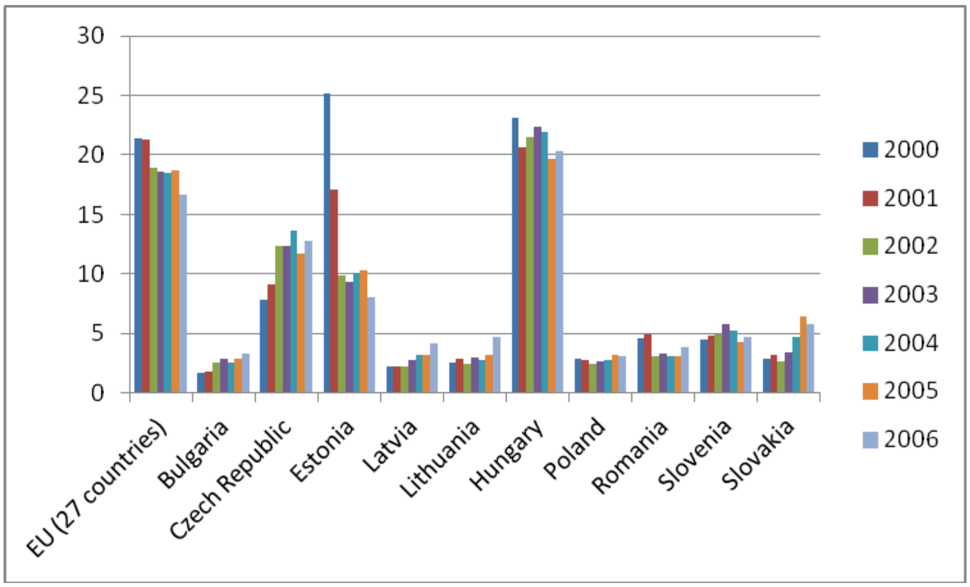


Fig.II.15. High-tech exports as percentage of exports

As it can be seen from the graph, Hungary, Czech Republic and Estonia are on top of all EEE countries.

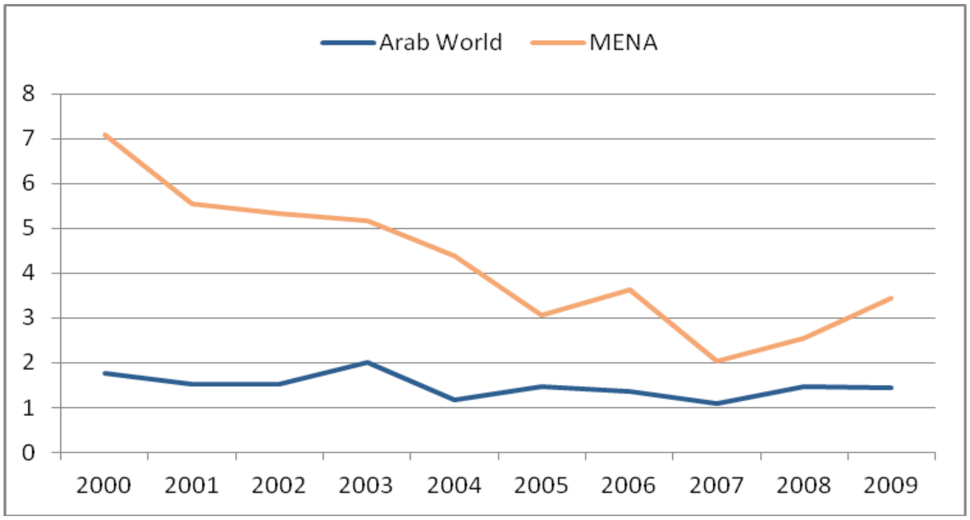


Fig.II.16. High-tech exports as percentage of exports in Arab World and MENA countries

If we consider the values of this indicator, there is a similarity between the Arab World as a whole and EEE countries, but there is a significant difference between the EEE countries and Arab countries.

1.7. Employment in high and medium-high-technology manufacturing sectors

The data shows per country the employment in high and medium-high technology manufacturing sectors as a share of total employment. Data source is the Community Labour Force Survey (CLFS). The definition of high and medium-high technology manufacturing sectors is based on the OECD definition (itself based on the ratio of R&D expenditure to GDP).

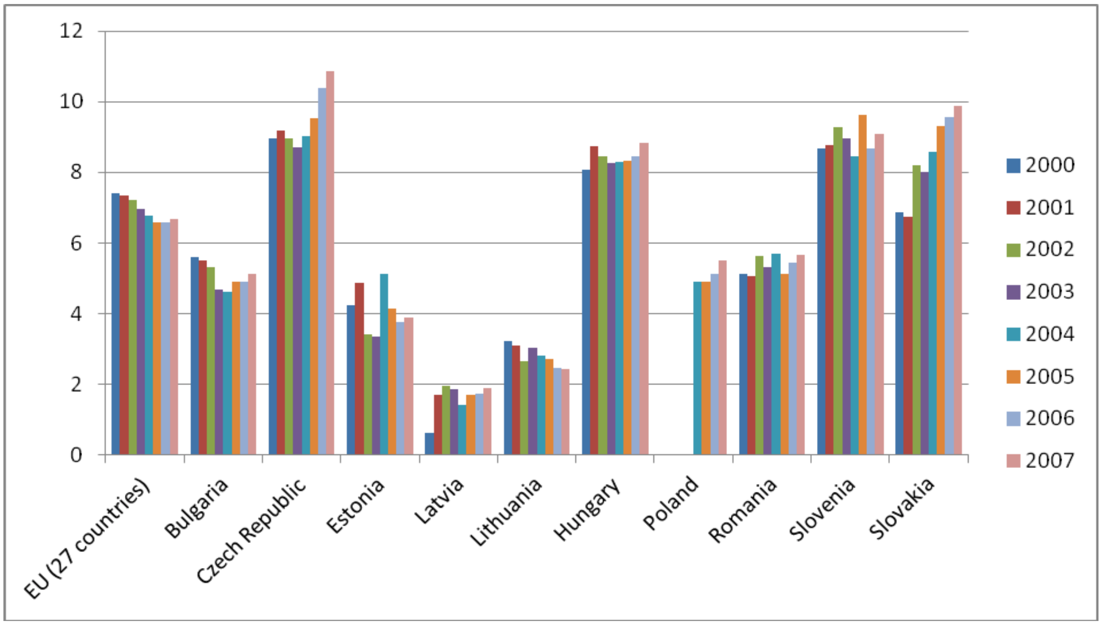


Fig.II.17. Employment in high- and medium-high-technology manufacturing sectors
Share of total employment (%)

Once again, a similar pattern of behavior can be noticed for all EEE countries, less Slovakia.
For Arab countries there is a persistent gap between the skills acquired at university and the requirements of business (O'Sullivan, 2011). Enterprises often cite lack of suitable skills as an important constraint to hiring: according to the World Bank's Enterprise Surveys. Firms identify labor skill levels as a major constraint in Lebanon (38 percent of surveyed firms), Syria (36 percent), Jordan (33 percent), Mauritania and Egypt (31 percent in both countries).

1.8. Employment in knowledge-intensive service sectors

The data shows per country the employment in knowledge-intensive service sectors as a share of total employment. Data source is the Community Labor Force Survey (CLFS). The definition of knowledge-intensive services including high-technology services used by Eurostat is based on a selection of relevant items of NACE Rev. 1 on 2-digit level and is oriented on the ratio of highly qualified working in these areas.

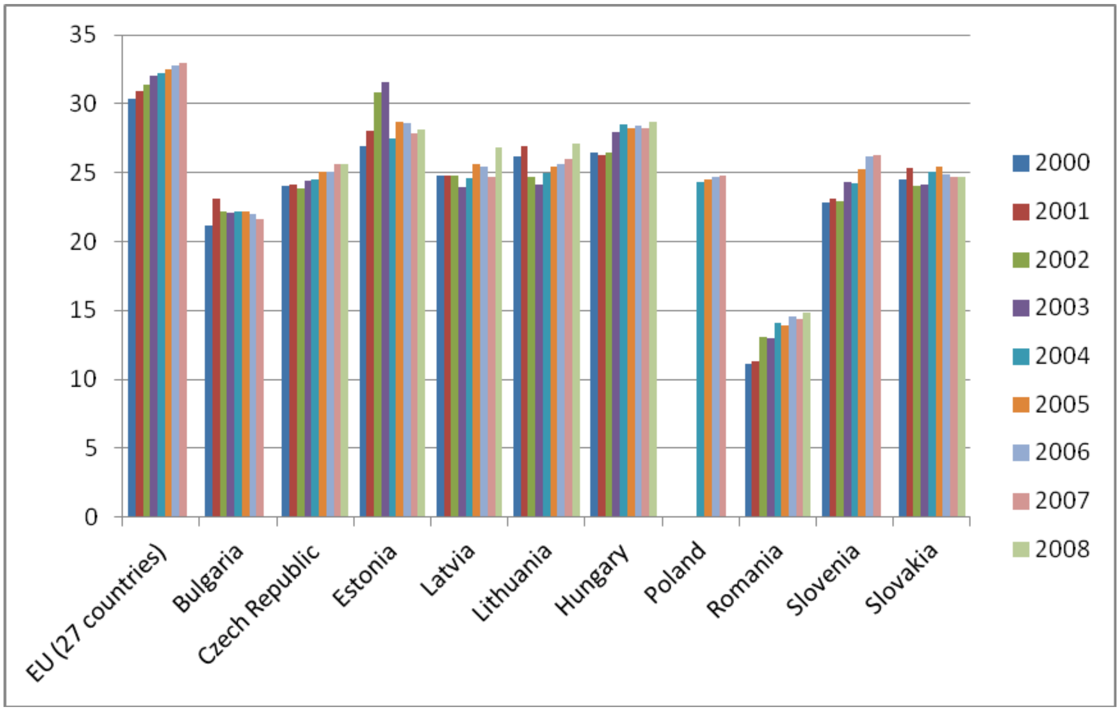


Fig.12. Employment in knowledge-intensive service sectors as share of total employment (%)

For all the countries in EEE region there is a positive trend in employment in knowledge intensive service sectors, as drivers for development.

As a comparison, in Arab countries the general unemployment is fairly high, and as the population increases, youth unemployment also continues to rise.

The Arab region suffers the highest rates of unemployment in the world and a growing deficit of knowledge in both new and traditional forms (Tan Yigitcanlar and Scott Baum. 2010): “The unemployment rate ranges from 56 per cent in Gaza to 15 percent in Oman, and the rate of unemployed youth as a percentage of the entire population sits between 39.5 per cent in Morocco (1999) and 75.4 per cent in Bahrain (1995). In Iran, youth account for 70 per cent of a population of more than 66 million, but youth unemployment has other national and global impacts, notably increased violence, crime, drug use, poverty and political instability (International Youth Parliament 2002). Additionally the rapid rate of urbanisation in many Arab countries has increased levels of youth-specific unemployment, due to the lack of skills required in urban employment compared to rural employment”.

1.9. Human resources in science and technology

Human Resources in Science and Technology (HRST) are an important feature in the new paradigm of knowledge economy: as the investments in high-tech technologies increases, there is an increase in demand for skilled labor force. In Eurostat methodology this fact is measured by the percentage of the total labor force in the age group 25-64, that is classified as HRST, i.e. having either successfully completed an education at the third level in an S field of study or is employed in an occupation where such an education is normally required. HRST are measured mainly using the concepts and definitions laid down in the Canberra Manual, OECD, Paris, 1995.

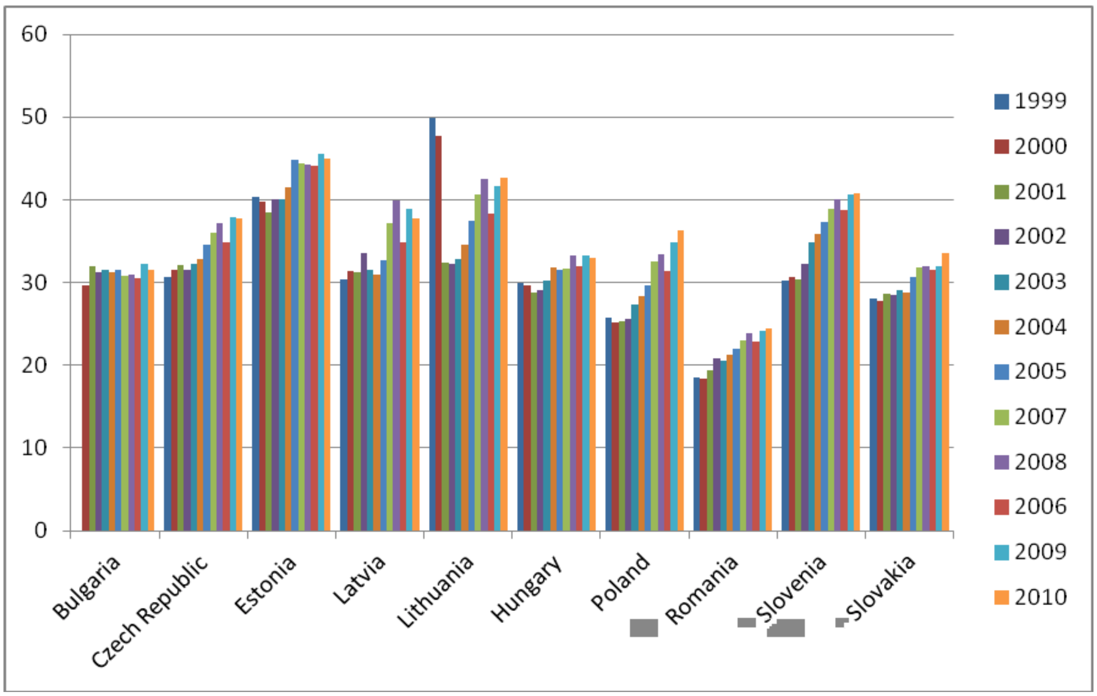


Fig.II.18. Human resources in science and technology as a share of labour force - Total

The trend is up-warding for all countries, due to the fact that they had to adapt to e-governance requirements by the EU, before and after accession.

1.10. Doctorate students in science and technology fields

In the European Union, according to Eurostat definition, a key indicator for knowledge economy is the proportion of doctoral students in science and technology fields. The methodology takes into account the students participating in second stage of tertiary education in science and technology fields of study, as a percentage of the population 20-29 year old. This indicator includes the total number of students in tertiary programs which leads to an advanced research qualification (ISCED level 6), in the educational fields Science, Mathematics and Computing and Engineering, Manufacturing and Construction. The levels and fields of education and training used follow the 1997 version of the International Standard Classification of Education (ISCED97) and the Eurostat Manual of fields of education and training (1999).

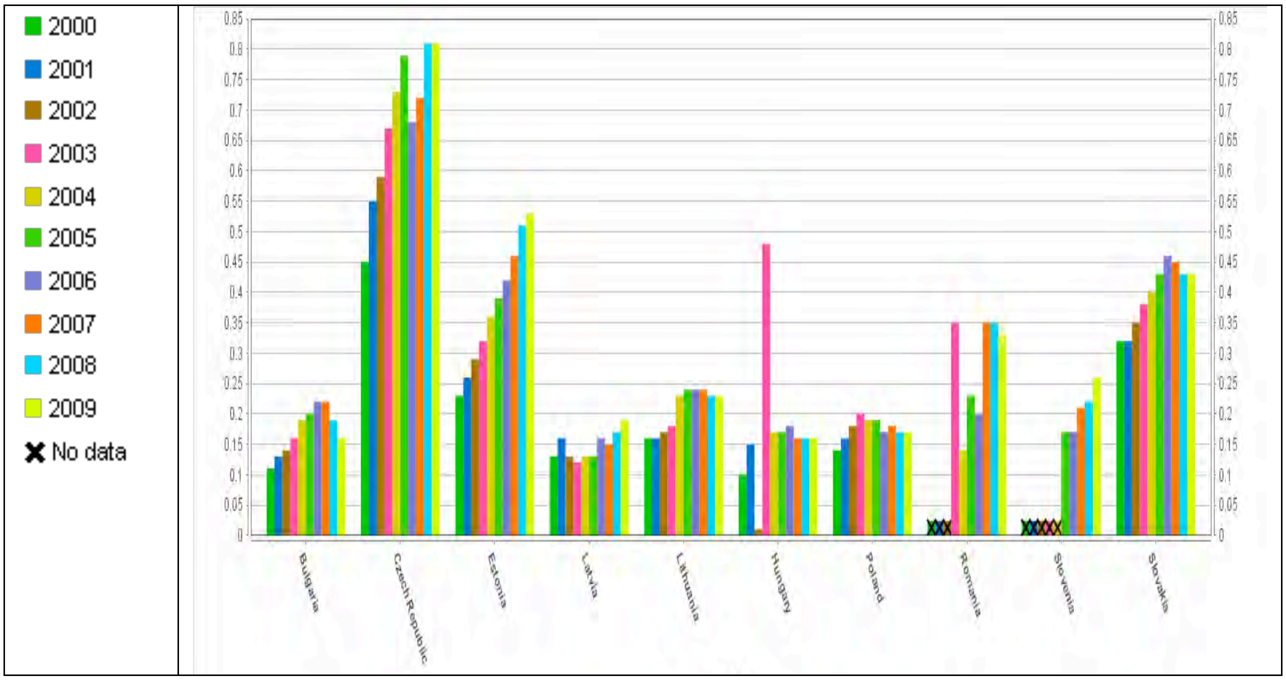


Fig.II.19. Doctorate students in science and technology fields – Total % of the population aged 20-29

For the period 2000-2009, all the countries in EEE region exhibit a significant increase in the number of students enrolled in doctoral programs in the field of science. For example, the proportion of doctorate students ranges between 0.1% in Bulgaria to 0.85% in Czech Republic.

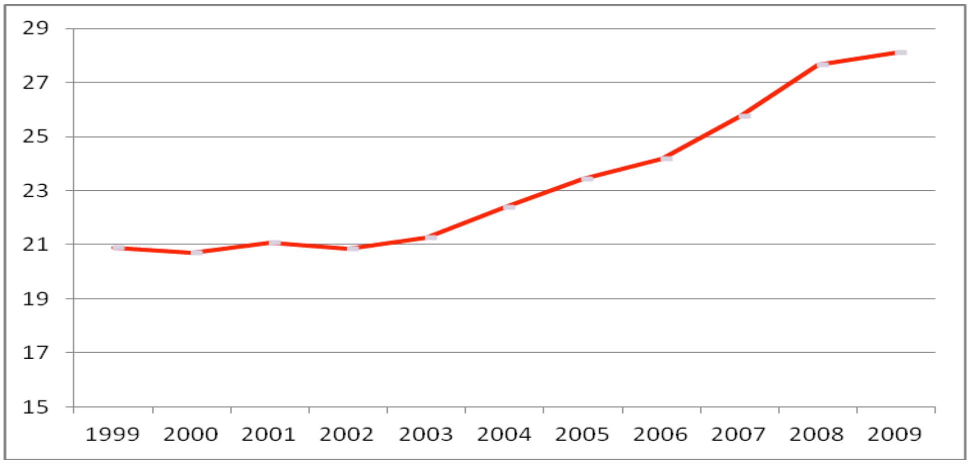


Fig.II.20. School enrolment, tertiary (% gross) in Arab countries

For the Arab countries, there are no specific data available for this indicator, yet there are data regarding the proportion of student enrolled in tertiary education. From the point of view of this indicator, there is an increasing trend, from almost 20% in 1999 up to 28% in 2009.

2. Production of knowledge

Knowledge production is a complex and time consuming process, since for knowledge to be produced someone must think of an idea and decide to pursue it further. Sometimes an idea takes years to germinate in a person's mind. The idea will require time to research and develop fully- regardless of whether it leads to scientific experimentation or research in a library.

In addition to the time needed to do research and produce new knowledge, a person must find the appropriate funding to pursue the research. Scientific research costs a considerable amount of money, and while research in the social sciences and humanities may cost less, both require investments of money and time.

Research is usually done by persons associated with large institutions because of the time and resources needed to produce new knowledge. Most of the research is done by persons who work for government agencies, universities, large non-profit organizations, or large corporations.

Information Produced by the Government

Government, governmental agencies and institutions are knowledge producers. Usually, they produce country official data. The official data can be found in yearbooks, statistical bulletins, newsletters and studies.

Information Produced by Academic Institutions

Universities and colleges are also major producers of knowledge. Faculty performs research in the sciences, humanities and social sciences, the so called scholarly research. The results of this research can sometimes be applied directly to practical and social problems and it sometimes benefits companies or public institutions. Much of the research and knowledge produced by scholars is used by other scholars to advance the state of knowledge in a specific field of study.

Research and knowledge generated by faculty at universities and colleges is most often published in the form of books and scholarly journals. One can locate this knowledge by searching library catalogues and scholarly journal indexes. To be published in a scholarly journal or book, researchers submit their findings to a publication's peer review board. Faculty researchers try to match the content and style of their research to a particular journal's focus and audience. The article or book is then evaluated by a panel of experts in the field for the merit of its ideas, originality, and thoroughness in research, accuracy, and contribution to the body of knowledge in the discipline. The peer review board then makes a recommendation to accept or reject the work for publication. Often the peer review board makes suggestions for revisions or further clarification that may require rewriting and additional research.

The publication of an article or book encourages other scholars to further explore the research to corroborate or dispute it. This exchange and debate of ideas and findings contributes to the production of the larger body of knowledge within a discipline.

The way academic disciplines structure knowledge affects searching. If one wishes to effectively locate information one must have some idea of how academic disciplines and libraries structure knowledge.

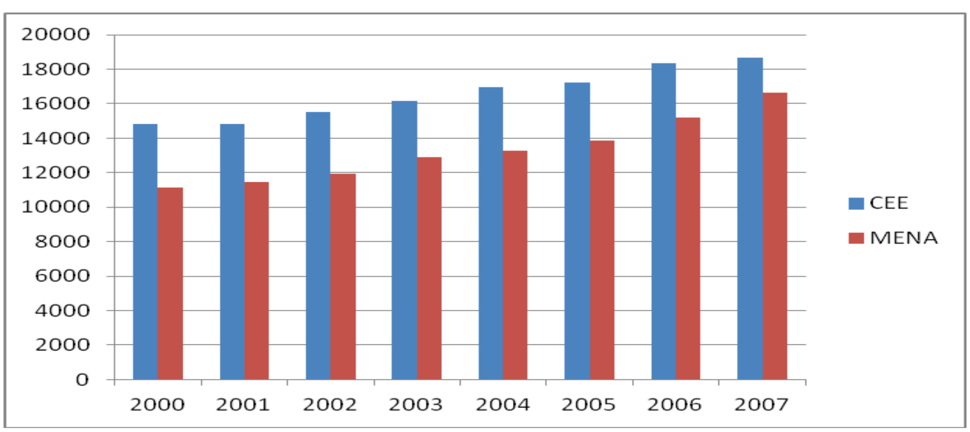


Fig.II.21. Scientific and technical journal articles

One way to assess the similarities between EEE and Arab countries from the point of view of scholarly research is to study the evolution of one indicator reported by the World Bank regarding the number of journal articles. Scientific and technical journal articles refer to the number of scientific and engineering articles published in the following fields: physics, biology, chemistry, mathematics, clinical medicine, biomedical research, engineering and technology, and earth and space sciences.

Taking into account the values of this indicator over time shows us that there is slightly the same pattern for EEE and Arab countries: the number of journal article published by researchers from those two regions was pretty much the same for the period 2000-2007(between10000 and 18000), and the trend is a positive one.

Information Produced in the Private Sector

The private sector (i.e. non-governmental) also produces information and knowledge. Commercial newspapers, magazine and book publishers, the film and television industry, corporate laboratories, business research firms, associations, advocacy groups, and think tanks, all gather data and produce information.

These publications take many forms: magazines, books, bulletins, conferences, pamphlets, videos, technical reports, and company annual reports are but a few. Some are intended for internal use within the organization and may not be available to the general public. Companies and laboratories often; patent or trademark information that is the result of their research. Patents and trademarks give the holder of the patent or trademark exclusive rights to the information.

When using any publication, it is important to know as much as possible about the organization, its goals and motives, and its reputation. Points of view, as well as goals and motives, are reflected in the information organizations produce.

How might the information from a business publication--primarily concerned with the research, development and promotion of a product--differ from that of a consumer advocacy group? Advocacy groups or organizations which are formed around particular issues, political or social agendas, have differing and sometimes conflicting perspectives of the same issue.

3. Technological transfers

Technology transfer is the term used to describe the processes by which technological knowledge moves within or between organizations. International technology transfer refers to the way in which this occurs between countries.

The technological knowledge that is transferred can assume various forms: it can be embodied in goods (including physical goods, plant and animal organisms), services and people, and organizational arrangements, or codified in blueprints, designs, technical documents, and the content of innumerable types of training. Alternatively it can be communicated through flows of tacit knowledge – i.e. knowledge that has not been fully codified, and remains embodied in the skills of people.

All these forms of knowledge may vary in a further important way: at one end of the spectrum, the transfer involved can be concerned with the knowledge for using and operating technology. At the other end, it can be concerned with the knowledge necessary for changing technology and innovating. In between, transferred knowledge may involve the many different kinds of design and engineering knowledge required to replicate and modify technologies.

Moreover, in international technology transfer there is a distinction between horizontal and vertical transfers. Horizontal technology transfer consists of the movement of an established technology from one operational environment to another (for instance from one company to another). Vertical technology transfer, in contrast, refers to the transmission of new technologies from their generation during research and development activities in science and technology organizations, for instance, to application in the industrial and agricultural sectors.

Gaining access to new technologies

Technology transfer is an important means by which developing countries gain access to technologies that are new to them. For example, the acquisition of foreign technologies by East and Central European countries, coupled with domestic 'technological learning' – efforts to accumulate the capability to change technologies – have been key factors in their rapid technological and economic development, mainly after '89.

However the ability of developing countries to use technology transfers to develop their domestic capabilities, allowing such countries to reap the social and economic benefits of existing technologies, has been mixed. There are wide variations between countries and between sectors within individual countries.

The disparities between – and within – developing countries in benefiting from technology transfer suggest that the relationship between technology transfer and the accumulation of domestic technological capability is far from straightforward. In other words, more technology transfer does not necessarily lead to more technological and economic development.

Main indicators that enable the assessment of knowledge transfers are: Technology Needs Assessment (TNA), number of people involved in joint R&D projects, inter-academia collaboration; unfortunately, reliable sources of information on these indicators could not be identified.

4. Trade in knowledge technologies

In 2005, according to statistics of International Monetary Fund (IMF), the output of the emerging countries exceeds half of the world's total output. As stated by the World Trade Organization (WTO), the liberalization in trade and investment regimes has played a central role in this expansion (OMC 2003). Since neo-classical theory predicts that a higher rate of growth and wealth will result from a decrease in trade barriers and tariffs, openness implies higher productivity. The acknowledgement of international trade as one of the main channels of growth goes back to Adam Smith.

More recently, endogenous growth theory predicts that growth rates of countries are related through international trade linkages and associated embodied and disembodied knowledge spillovers, i.e. knowledge externalities (Grossman and Helpman 1991). Knowledge is inherently non-rival in its use, and hence its creation and diffusion are likely to lead spillovers and increasing returns. It is this non-rival property of knowledge that is at the heart of the theoretical models that predict endogenous growth from research and development (R&D) investments (Romer 1990; Grossman and Helpman 1991; Aghion and Howitt 1998). In this context, the development of a country depends heavily on its knowledge capital, which in turn is determined by the rate of national innovation and international technology diffusion.

5. Patents and other intellectual property rights

Many academic papers enforce the idea that innovation is a key driver for economic growth. The creation, dissemination and application of knowledge have become a major engine of economic expansion, especially for developing countries.

There are several statistical indicators describing the situation of innovation in EEE and Arab countries.

5.1. Patent applications to the European Patent Office

Data refer to applications filed directly under the European Patent Convention or to applications filed under the Patent Co-operation Treaty and designated to the EPO (Euro-PCT). Patent applications are counted according to the year in which they were filed at the EPO and are broken down according to the International Patent Classification (IPC). They are also broken down according to the inventor's place of residence, using fractional counting if multiple inventors or IPC classes are provided to avoid double counting.

Patent applications to the European Patent Office - Applications per million inhabitants

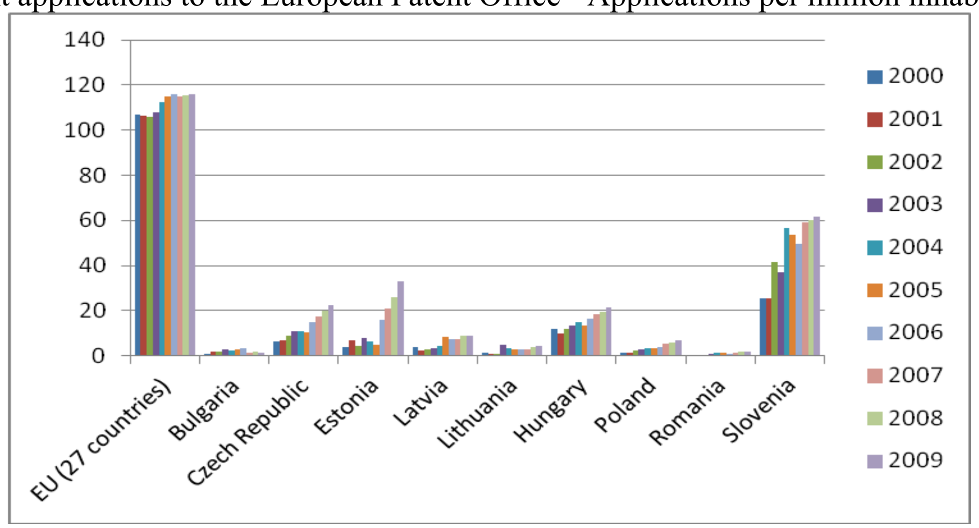


Fig.II.22. Patent applications to the European Patent Office - Applications per million inhabitants

As it can be gleaned from the graph, the most innovative country is Bulgaria, followed by Slovakia. A pertinent conclusion though can only be drawn after we correlate with the rate of success of the patent applications.

For the Arab countries, the data available through the World Bank are aggregated in an indicator pointing to the number of patent applications filed through the Patent Cooperation Treaty procedure or with a national patent office for exclusive rights for an invention--a product or process that provides a new way of doing something or offers a new technical solution to a problem.

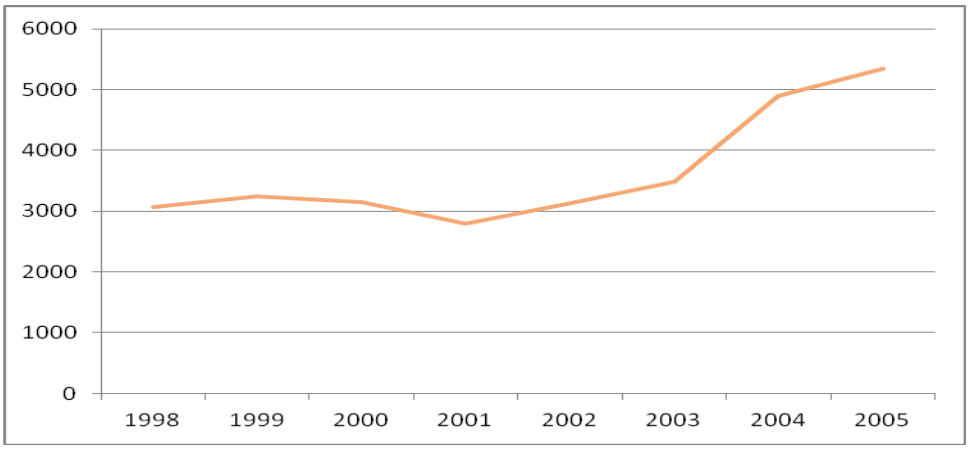


Fig.II.23. Number of patents-residents – Arab countries

5.2. European high-technology patents

The data refers to the ratio of patent applications made directly to the European Patent Office (EPO) or via the Patent Cooperation Treaty and designating the EPO (Euro-PCT), in the field of high-technology patents per million inhabitants of a country. The definition of high-technology patents uses specific subclasses of the International Patent Classification (IPC) as defined in the trilateral statistical report of the EPO, JPO and USPTO.

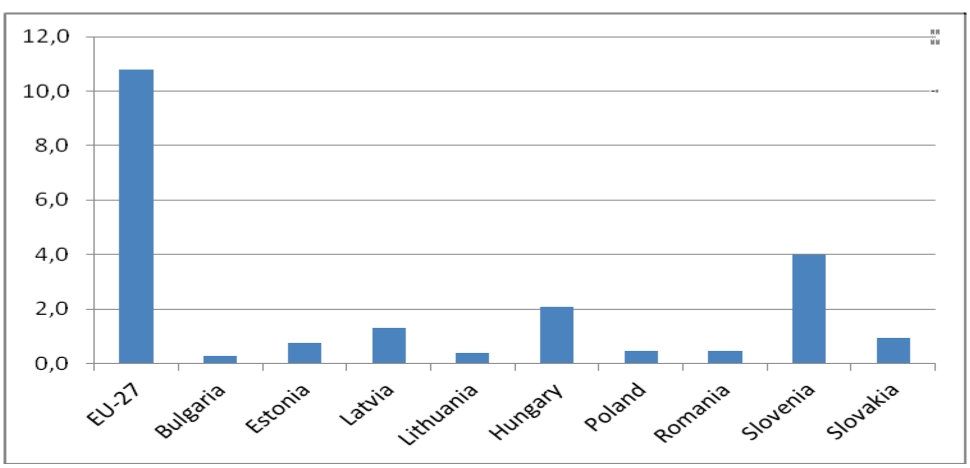


Fig.II.24. High technology patent applications to the EPO (per million ihabitants-2008)

6. Education

It is commonly assumed that education has an important positive effect on economic growth, but to date, the evidence for this assumption has been surprisingly weak. Evidence shows that, at the individual level, more years of schooling lead to higher income. But, at the macroeconomic level, empirical evidence relating changes in education measures to economic growth has so far been ambiguous. In a report from International Institute for Applied Systems (2008), there is a strong evidence of consistently positive, statistically significant effects of education; on a country's economic development, proving that education is the necessary (although not always sufficient) precondition for long-term economic growth.

6.1. Students

A key indicator of educational system is the total number of persons who are enrolled in tertiary education (including university and non-university studies) in the regular education system in each country. It corresponds to the target population for policy in higher education. It provides an indication of the number of persons who had access to tertiary education and are expected to complete their studies, contributing to an increase of the educational attainment level of the population in the country in case they continue to live and work in the country at the end of their studies.

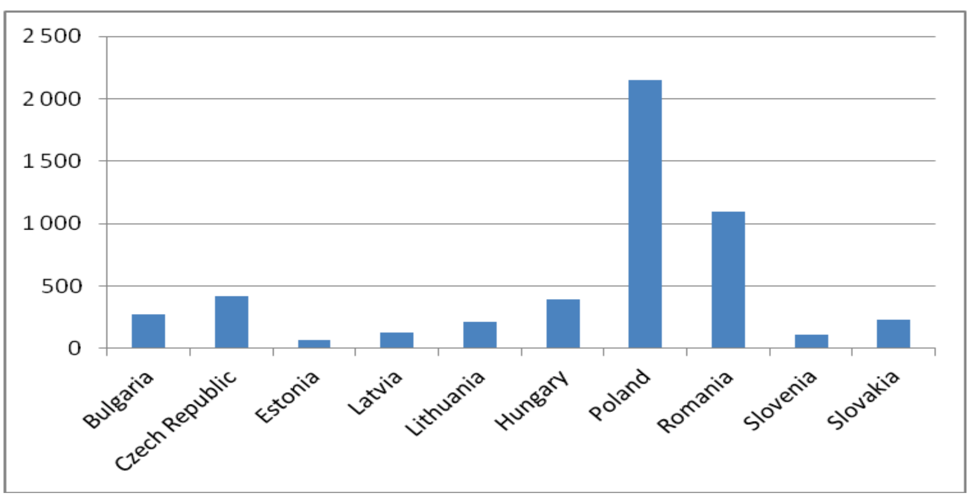


Fig.II.25. Total number of students (1000) – 2009

6.2. Spending on Human Resources

Generally, the public sector funds dedicated to education are reflected either by bearing directly the current and capital expenses of educational institutions (direct expenditure for educational institutions) or by supporting students and their families with scholarships and public loans as well as by transferring public subsidies for educational activities to private firms or non-profit organizations (transfers to private households and firms). Both types of transactions together are reported as total public expenditure on education.

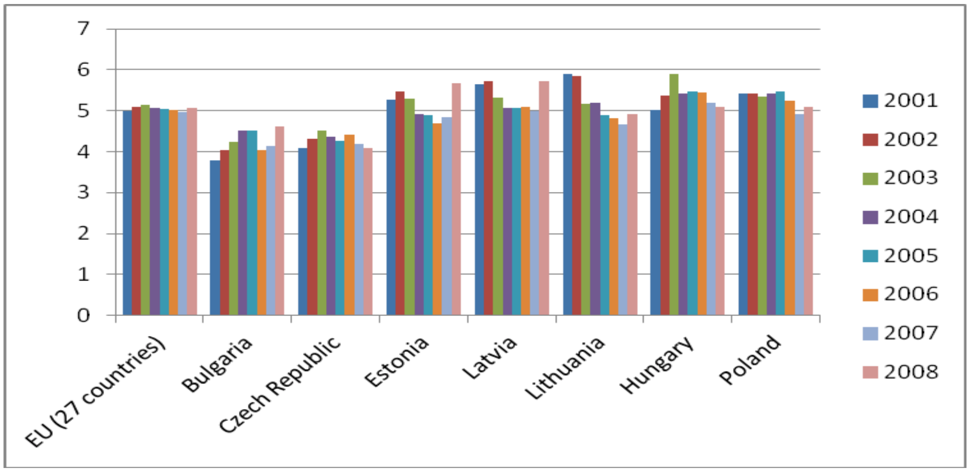


Fig.II.26. Total public expenditure on education as a percentage of GDP

While the average public expenditure on education is 5% of GDP for European Union, there are countries like Bulgaria or Czech Republic, where for the last 10 years, the average public expenditure was less than 5% of GDP.

This situation is actually very similar to the Arab countries, where according to the latest World Bank data; the average public expenditure for education in 2008 was 4.7% of GDP.

6.3. Science and technology graduates

The indicator "Tertiary graduates in science and technology" includes new tertiary graduates in a calendar year from both public and private institutions completing graduate and post graduate studies compared to an age group that corresponds to the typical graduation age in most countries. It does not correspond to the number of graduates in these fields who are available in the labour market in this specific year. The levels and fields of education and training used follow the 1997 version of the International Standard Classification of Education (ISCED97) and the Eurostat Manual of fields of education and training (1999).

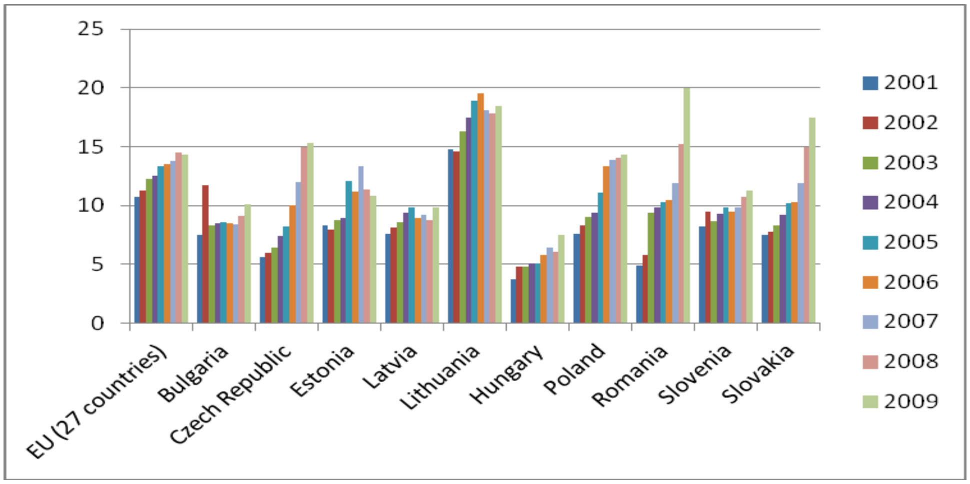


Fig.II.27. Tertiary graduates in science and technology per 1 000 of population aged 20-29 years

All countries from EEE region present an upward trend, following the trend present in the entire European Union.

6.4. Life-long learning

Operating successfully in the knowledge economy requires mastery of asset of knowledge and competencies. Three categories of competencies are the key (Rychen and Salganik 2001; OECD 2002):

- Acting autonomously: Building and exercising a sense of self, making choices and acting in the context of a larger picture, being oriented toward the future, being aware of the environment, understanding how one fits in, exercising one's rights and responsibilities, determining and executing a life plan, and planning and carrying out personal projects.
- Using tools interactively: Using tools as instruments for an active dialogue; being aware of and responding to the potential of new tools; and being able to use language, text, symbols, information and knowledge, and technology interactively to accomplish goals.
- Functioning in socially heterogeneous groups: Being able to interact effectively with other people, including those from different backgrounds; recognizing the social embeddedness of individuals; creating social capital; and being able to relate well to others, cooperate, and manage and resolve conflict.

In this context, one important aspect is the life-long learning process, as a key to developing personal competencies.

For EEE countries, the data related to life-long learning comes from the EU Labour Force Survey, as the percentage of the adult population aged 25 to 64 participating in education and training.

Life-long learning refers to persons aged 25 to 64 who stated that they received education or training in the four weeks preceding the survey (numerator). The denominator consists of the total population of the same age group, excluding those who did not answer to the question 'participation to education and training'. The information collected relates to all education or training whether or not relevant to the respondent's current or possible future job.

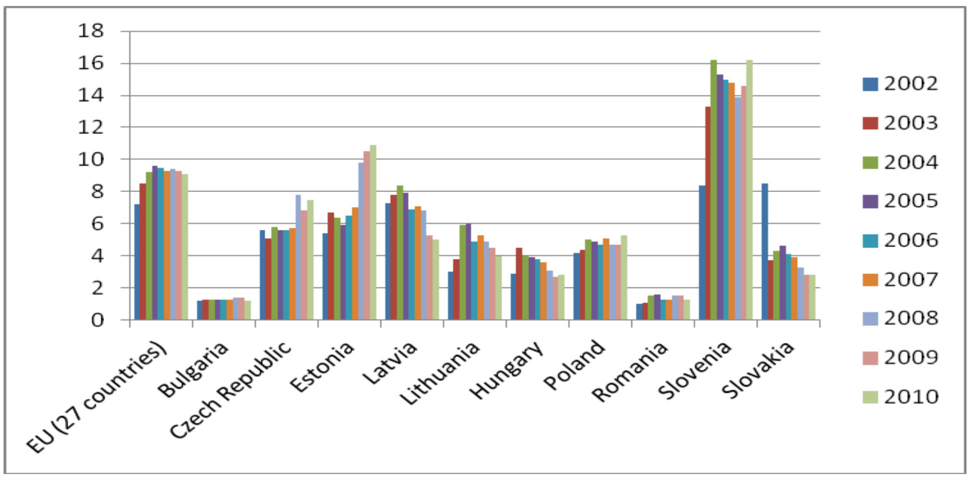


Fig.II.28. Percentage of the adult population aged 25 to 64 participating in education and training

There are significant differences among EEE countries from the point of view of life-long learning, Bulgaria and Romania having the lowest values for this indicator.

Few Arab countries have developed lifelong learning. Education systems in most Arab countries only allow limited opportunities for individuals to obtain more skills and acquire more knowledge after completing their formal degree or beginning to work. Lifelong learning is only articulated among national objectives in a handful of countries. Even then, the term “lifelong learning” is defined within the framework of formal education, and is linked to adult illiteracy, teacher training, or continuous education in the form of e-learning

7. Incubation

A modern “business incubator” is a combination of physical space and facilities, entrepreneurial ideas, and administrative and management support, all joined to nurture new companies in the critical early stages of development. More specifically, a typical business incubator is a building (or part of a building) in which space is provided for entrepreneurs who are forming new companies (a "new-venture" type), or else is intended to be a real-estate venture which will increase the value of the building used. The building usually includes a central office in which common services needed by all companies are provided, both logistical services and management assistance. The building and support services may be provided by government, industry, or one or more universities. This description is relatively conservative in some ways, since the explosion of investment in Internet firms ("dot-coms") has led to use of the term to include venture capital and other investment companies which buy or underwrite such Business Incubators for EEE new businesses without necessarily providing physical space or logistic support. In earlier years these would be termed "incubators without walls."

7.1. Links between knowledge variables and development variables at the aggregate but also at the level of localities

Three key variables serve as proxies for each Knowledge Economy pillar: Economic Incentive and Institutional Regime, Education, Innovation, and Information & Communications Technology (ICT).

Knowledge Index (KI) is the simple average of the normalized country scores on the key variables in three pillars – education, innovation and ICT. Knowledge Economy Index (KEI) measures performance on all four pillars.

The scorecards demonstrate comparative performance - the variables are normalized on a scale from 0 to 10 relevant to four possible comparison groups, all countries, region and income groups.

Table II.3: Knowledge Economy variables for EEE region

Country	KEI	KI	Economic Incentive Regime	Innovation	Education	ICT
Estonia	**8.40**	**8.26**	**8.81**	**7.75**	**8.60**	**8.44**
Czech Republic	**8.14**	**8.00**	**8.53**	**7.90**	**8.15**	**7.96**
Hungary	**8.02**	**7.93**	**8.28**	**8.15**	**8.42**	**7.23**
Slovenia	**8.01**	**7.91**	**8.31**	**8.50**	**7.42**	**7.80**
Lithuania	**7.80**	**7.68**	**8.15**	**6.82**	**8.64**	**7.59**
Slovak Republic	**7.64**	**7.46**	**8.17**	**7.30**	**7.42**	**7.68**
Latvia	**7.41**	**7.15**	**8.21**	**6.56**	**7.73**	**7.16**
Poland	**7.41**	**7.20**	**8.01**	**7.16**	**7.76**	**6.70**
Romania	**6.82**	**6.63**	**7.39**	**6.14**	**7.55**	**6.19**
Bulgaria	**6.80**	**6.61**	**7.35**	**6.94**	**6.25**	**6.66**

If a country performs worse over time on a certain normalized variable, this may be because it actually has lost ground in absolute terms, or improved slower than the comparative group.

Table II.4: Knowledge Economy Index Comparison Group: All, the most recently calculated with reference year 1995

Country	KEI		Economic Incentive and Institutional Regime		Innovation		Education		ICT	
	recent	1995	Recent	1995	recent	1995	recent	1995	recent	1995
Estonia	8.40	7.94	8.81	8.29	7.75	6.65	8.60	8.53	8.44	8.30
Czech Republic	8.14	7.77	8.53	8.07	7.90	7.15	8.15	8.13	7.96	7.73
Hungary	8.02	7.50	8.28	6.84	8.15	7.71	8.42	7.91	7.23	7.55
Lithuania	7.80	6.59	8.15	7.14	6.82	5.29	8.64	7.24	7.59	6.67
Latvia	7.41	6.51	8.21	7.29	6.56	4.56	7.73	7.06	7.16	7.15
Poland	7.41	6.85	8.01	6.23	7.16	6.22	7.76	7.86	6.70	7.10
Bulgaria	6.80	6.81	7.35	5.76	6.94	7.17	6.25	7.27	6.66	7.04

For the Arab countries, the most recent data about the Knowledge Economy Index shows the existence of a different pattern compared to the state of affairs in the EEE region.

Table II.5: Knowledge Economy variables for Arab region

Country	KEI	KI	Economic Incentive Regime	Innovation	Education	ICT
United Arab Emirates	6.94	7.09	6.5	6.6	5.8	8.88
Bahrain	6.9	6.98	6.69	4.61	6.78	9.54
Oman	6.14	5.87	6.96	5.88	5.23	6.49
Saudi Arabia	5.96	6.05	5.68	4.14	5.65	8.37
Qatar	5.84	5.5	6.87	6.42	3.41	6.65
Kuwait	5.33	5.15	5.86	5.22	3.7	6.53
Jordan	4.95	4.71	5.65	4.05	5.55	4.54
Tunisia	4.56	4.8	3.81	4.97	4.55	4.89
Lebanon	4.56	4.65	4.28	4.86	5.51	3.58
Algeria	3.79	4.28	2.33	3.54	5.27	4.04
Egypt, Arab Rep.	3.78	3.54	4.5	4.11	3.37	3.12
Morocco	3.61	3.25	4.66	3.67	2.07	4.02
Syrian Arab Republic	2.77	3.01	2.04	3.07	2.4	3.55
Yemen, Rep.	1.92	1.58	2.91	1.96	1.62	1.17

While in the EEE region the countries have almost the same performances in terms of knowledge economy indicators, in the Arab countries the degree of homogeneity is significantly lower.

Thus, a country like Israel is similar to Estonia, ranked on the first place in EEE region according to these indicators, while most of the Arab countries have very low values for knowledge economy variables.

One way to assess the relationship between the knowledge economy indicators and economic development is to build-up a panel data regression model, in order to explain real economic growth as a function of these knowledge related factors.
Also Granger causality or a VAR approach could be used in order to detect relevant causalities between the economic development and the key indicators related to knowledge economy.

IV. How local development is achieved in relation to knowledge in EEE countries?

The integration process of EEE countries into the European Union was long and complex, assuming the adoption of the European legislation (acquis communautaire) and the institutional development of a system compatible with that of the European Union member countries.
To enhance the knowledge-based growth in transition economies Orłowski (2000, p. 96) recommends the following solutions:

1. correct macroeconomic and structural policies (lowering the level of corporate taxes, more relaxed amortization of costs, increase the openness of the economy, effective privatization, strengthen restructuring and demonopolisation);
2. creation of competitive R&D market and increasing the efficiency of use of the research funds;
3. Reform of the education system (aimed at increasing the number of students, the quality of education and orienting the system to the market needs).

1. How knowledge is provided in localities and regions

Globalization and knowledge economy offer huge opportunities for localities and regions. Successful localities and regions will be those that identify the opportunities and use them for building new economies based on local strengths and adapted to changes.

National, regional and local policymakers need to work together, across boundaries, to ensure that all of them support the knowledge economy and benefit from its growth.

Local policymakers who are seeking to enable their localities or regions to adapt and to be innovative need to focus on both measurable policy instruments, such as transport and connectivity and intangible policy instruments such as skills, leadership, distinctiveness and collaboration.

There are two main reasons why cities and city-regions matter in the knowledge economy and in the globalised economy. First, because they offer productivity benefits, including access to markets and a variety of external economies of scale, including access to large and specialized labor pools (particularly of high skill workers). Cities and city-regions also offer proximity to other knowledge workers, enabling, tacit; knowledge to be shared; the knowledge that cannot be easily, codified and is best exchanged and developed through face-to-face contact and trust-based relationships. They offer a critical mass of firms, who interact through staff moves, networking and personal relationships. In other words, firms can benefit from spill-over effects from other firms' innovative activity. These spill-over effects are particularly important in the knowledge economy as they can significantly contribute to companies' ability to respond innovatively to changing markets. (DCLG, 2006; Hutton, 2007)

The second reason that cities and city-regions matter in the knowledge economy is *consumption benefits*: access to a rich variety of goods, services, cultural facilities and social opportunities. Research suggests that the benefits of living in a city or city-region may be particularly attractive for the most talented and entrepreneurial workers – in other words, the workers that drive the knowledge economy. This can in turn mean that knowledge workers gain access to a range of employment options, giving them the incentives to develop specialized skills. Clustering consumption services together also supports further innovation, as well as enabling providers to better understand their markets. (Cheshire, 2006; Glaeser, Kolko & Saiz, 2001; Hutton, 2007)

All localities and regions can assess their strengths and weaknesses to see their possibilities to become a knowledge-driven economy and to identify other assets that may have more potential for growth in the changing economy. Having these principles in mind, nine key drivers of success for cities in the knowledge economy were developed by Work Foundation in 2006 with the intention to demonstrate the different areas which policymakers need to focus on to create and sustain successful knowledge cities:

- *Investing in the physical knowledge city*: commercial and residential accommodation, public buildings, infrastructure, public space;
- *Building on what's there*: recognizing historic strengths and building on them where possible;
- *Diverse specialization*: a reputation for excellence in a limited number of industries (but definitely more than one industry);
- *High skill organizations*: organizations with high skill occupations and workers;
- A vibrant education sector: including schools, universities implanted in the community and the economy;
- *A distinctive "knowledge city" offer*: having something that complements nearby cities but is distinctive from them;
- *Leveraging strong connectivity* within and outside the city-region;
- *Strong leadership around a knowledge city* "vision", supported by networks and partnerships;
- *Investing in communities*: to deal with social exclusion and to invest in the most disadvantaged communities such that to ensure that the fruits of growth are equitably shared.

Hutton (2007) had a more detailed understanding of specific issues helping to generate an understanding of how the different policy instruments work together. He identifies four soft policy instruments very important for cities seeking to respond to the changing economy (Hutton, 2007):

- Skills: cities need to invest in skills appropriate to their key sectors, and can benefit from the innovation associated with higher skills as well as the spin-off benefits of education institutions;
- Leadership: if cities are to change direction, they need strong leadership to work with key stakeholders and generate a sense of shared purpose;

- Distinctiveness: successful cities are those that have a particular identity that helps them attract businesses, skilled workers, visitors and students. Often this may involve strengths in the creative and cultural sectors, which can in turn impact on economic success;
- Collaboration: Different cities have different strengths, but frequently these are complementary and working together can enhance the offer that both cities can make to businesses and to workers, for example a large city could find it easier to employ workers if a nearby city offers a high „quality of place" offer where they can live with their families. Collaboration may be particularly important for cities where the core industry has declined.

Previous research experience has shown that local development could have an important contribution on *innovative development* when successful experiences are followed by nearby towns or micro-regions. Essential is also the consensus on the importance of knowledge for social innovation, social change and development in general.

Speaking about the circulation of knowledge through interaction among many heterogeneous social actors, proximity – territorial and cultural – becomes a relevant factor.

Much of the work focusing on regional innovative capacity reveals the impact of geographical concentration upon learning. Learning is understood as the capability of developing new routines, skills and social practices in economic activity and not only (Lundvall&Johnson, 1994). *Tacit knowledge* can only be revealed through practice in a particular context and transmitted through social networks (Schmidt & Hunter, 1993). It is more common in emerging economies. Therefore, geographical proximity and, above all, social interaction play a key role for the diffusion of knowledge and, consequently, for innovation.

Cassiolato and Lastres (2003) and Maciel (1999, 2002) among others, have shown that "thinking locally" may be a fruitful strategy to understand the possibilities of development in "the South". In fact, the processes of articulation and interaction among the various political forces and different social factors involved seem to be more effective and more viable when they occur from the bottom up – from municipalities to the region, from the region to the country, etc.

A dynamic education sector, from schools to higher education, enables a city to support businesses to innovate in response to changing demand, as well as to adapt the cultural and leisure offer to the students demand. Even though the whole education sector matters to knowledge intensity and sustainability, universities and higher education institutions are particularly important for knowledge intensive cities and regions. Example: Prague, Budapest, Warsaw, Sibiu, Bucharest, etc.
Universities are more likely to be located in cities. The high participation rates in higher education make them an attractive location for businesses because of the proximity by sources of highly skilled labor and innovation.

However a strong higher education sector in a city or region will not drive automatically growth in a city. The education sector must be linked closely with the community and the local economy, to understand its needs and how it is changing such that to obtain a powerful knowledge economy through their educational sector. Universities aim to increase their international profile in research and cities need to recognize this. At the same time, cities and universities may have common objectives about developing strong links between research and businesses and improving knowledge transfer within the city itself. Universities also have a role in the social inclusion agenda in the cities in which they are located: for some this means working with the education sector in the city to provide opportunities for lifelong learning for working and non-working residents; for others it is about knowledge transfer to the public, private and voluntary sectors in areas related to tackling deprivation and worklessness (Hutton, 2007). Moreover, once students are in a local area there is also a likelihood that they will stay in that local labor market; further increasing the human capital of an area and helping that place to respond to demand for more highly skilled workers (Cheshire & Magrini, 2002).
Chatterton and Goddard (2000) argue that the main contribution of a university to regional development comes through universities' capacities to manage processes regionally. The framework they propose focuses on the processes which link together all of the components within the university and the region into a learning system.

The OECD (2008) review follows a common structure in order to ensure comparability across regions/city regions in different countries, investigating mainly qualitatively: the contribution of higher educational institution's research to regional innovation, the role of teaching and learning in the development of human capital and skills, the contribution of higher educational institutions to social, cultural and environmental development, their role in building regional capacity to act in an increasingly competitive global economy. Case studies from EEE are available in the Annex 4 (Appendices).

2. The distribution of information in EEE countries

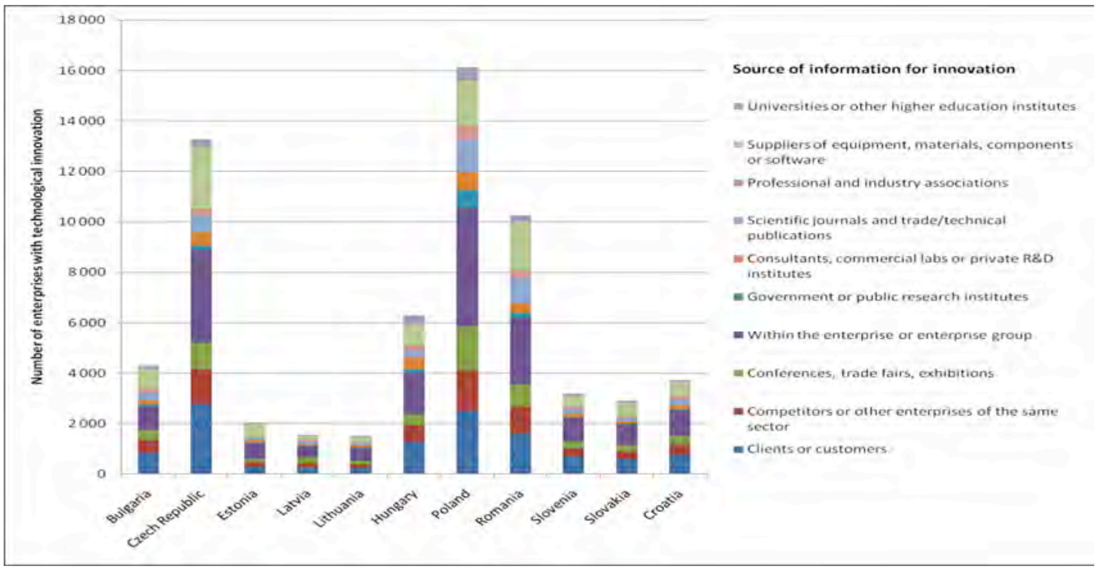


Fig.II.29

2.1. How diffusion operates in EEE countries

At the global level sustainable growth is not just about knowledge creation but also about its diffusion.

Everett Rogers (1995) defines diffusion as the process by which an innovation is communicated through certain channels over time among the members of a social system.

The influence of old members of EU on EEE countries during their transition process has been very strong especially on the enterprise level. Martin (1999) said that: Western companies have a major influence on the development of EEE enterprises. They represent the major source of innovation. New technologies, new methods of production and new products are transferred to the region by multinational corporations, both by internal transfer and through their influence on suppliers and customers in the region.

Some studies pointed out the difficulties encountered during the diffusion and transfer of knowledge from Western to Eastern EU countries due to cultural barriers. The transition process from a centrally planned economy to a market economy, involved not only privatization laws, economic policy measures according to market economy principles but also a deep change in the people relations, in the attitudes towards work and business transactions, in customer behaviors, life styles and value orientations.

Even if there are very few studies on diffusion with regard to EEE enterprises, the most important fact derived from them (Malone&Kirk, 2000; Warhurst, 2000; Mikl-Horke, 2004) is that actually in EEE countries has been transfer, but little spread. The spread starts with the early adopters of innovation and the rate of adoption rises progressively among the population (Granovetter 1978). Diffusion of management principles seems to be restricted to mostly foreign companies or joint ventures. There are barriers to the spreading of knowledge because of competitive reasons and there are probably also obstacles deriving from cultural and psychological facts.

The knowledge and innovation diffusion is happened through communication, power relations, informal networks and economic interests. In EEE society's foreign investors and business partners are transmitters and promoters of management innovations and handle considerable power. The likelihood of gaining access to innovations increases with the number of networks in which an organization is involved. Whitley et al. (1996) showed on Hungary case, studying ten large enterprises, that the network relations that have survived from socialist times are mostly informal relations. Informal personalized contacts play a great role in the EEE countries partly because of the persistence of socialist cultural elements, partly because of the weakness of institutional and relational structures of the new system. Very often the informal relations between the people involved are more important for the diffusion of innovations than the formal contractual ones. Ignorance of these capacities often leads to misunderstandings by foreign partners and hence to ineffective change interventions (Mikl-Horke, 2004). Case studies from EEE region are available in the Annex 5 (Appendicies).

2.2. What roles are played by schools and research centers

Politicians, especially in Europe, recently give an increased attention on how knowledge produced within universities and public research centers can be efficiently transferred and used by corporations for commercial purposes. University patents are often seen as a possible source of commercial technology. In particular university patents, jointly with exclusive licensing, could create the right incentives to develop products and could be a source of extra funds for universities and research centers. Bacchiocchi and Montobbio (2009) have drawn a picture of the diffusion of knowledge from university and public research patents in Europe. By using EPO patent data of four large European countries, US and Japan they have shown that, in the period 1978–1998, knowledge incorporated in university and PRO patents is more highly cited than knowledge embedded in corporate patents. Their result is mainly guided by university patents in the US and in the Chemical, Drugs & Medical, and Mechanical sectors. In Europe they do not find evidence that suggests that university and PRO patents have a higher quality. Their results suggest that the quality of European university patents is not higher than the quality of company patents.

Academic research institutions are acting as the main knowledge generators in contemporary society. Faculty members are engaged in three roles - teaching, research, and public service. The primary purpose of university scientists is recognition within the scientific community, which emanates from publications in top-tier journals, presentations at prestigious conferences, and governmental research grants (Siegel et al. 2003). Industry oriented research has greater potential for commercial applications than does academic research that is conducted more for the purpose of the advancement of the knowledge frontier (Siegel et al. 2004).

Sachwald (2008) and Sachwald & Chassagneux (2007) identify three types of R&D units: the local development units (LDC), the global research laboratory (GRL) and the global rationalization center (GRC). LDC correspond to the traditional motive of support to production for locating R&D activities abroad, their location being driven by the geographical distribution of production sites. In all sectors LDC are the most numerous (59%) and are present particularly in large markets. However, EEE countries attract some LDCs in pharmaceuticals, software and electrical engineering sectors. GRL are home base augmenting R&D units and their output generates applications for different countries. They are less numerous (23%) and most of them are located in high wage countries. EEE countries only host a GRL in pharmaceuticals. GRC are in charge of research and development tasks that can be separated and plugged back into the innovation process of the multinational. They are typically in charge of back-office tasks, such as specific studies, tests or software writing. These research units appeared as a result of the increasing pressure on the cost of R&D and the cost efficiency ratio is thus the main determinant of their location. Therefore EEE countries attract a relatively larger share of the GDCs mainly in automobile equipment, electrical and electronic equipment and software. GDCs represent 18% of the total number of R&D units. The attraction of GDCs depends both on the strengthening of technological and scientific capabilities in emerging countries, but also on the broader business environment, as in the case of FDI in general.

Chang & Yang (2008) carried out a survey on 229 academic patent inventors in Taiwan. Their study reveals a possible trade-off relation between research commercialization, knowledge production and diffusion as long as faculty members need to rely on external funds. Academic research commercialization makes the faculty members to construct their research agenda more basic- and applied-orientation integrated. The high entrepreneurial commitment tends to confine the disclosure of faculty members' research results. Case studies from EEE region are available in the Annex 6 (Appendicies).

3. Empirical study

Some US empirical studies (Jaffe 1989,…) have suggested that knowledge generated at universities spills over into the local industrial sector, leading to higher innovative outputs than would otherwise be the case.

The importance of a region as a unit of analysis for innovation and as an important level at which strategic innovation policy and support is appropriate is suggested by the social and interactive nature of innovation process itself (Feldman 1994, Audretsch&Feldman 1996, Acs 2000, …).

While information can be readily be transmitted over long distances, transmitting knowledge which is often tacit and sticky, necessitates face to face interaction and frequent and repeated contacts (Roper, 2005).

3.1. The model

In order to analyze how knowledge has determined economic growth in EEE countries we have used the aggregate production function of an economy (Chen and Dahlman, 2004).

$$Y = AF(K,L) \qquad (1)$$

where

- Y is the level of aggregate output
- K is the level of the capital stock
- L is the size of the labor force
- A is total factor productivity (a measure of the current level of technology)

An explicit form of equation (1) is that of the Cobb Douglas specification,

$$Y = A\,K^{\alpha}\,L^{\beta} \qquad (2)$$

where

- α is the elasticity of output to capital
- β is the elasticity of output to labor

From equation 2, applying the logarithm we obtain:

$$ln(Y) = \ln(A)+\alpha\, ln(K)+\beta\, ln(L) \qquad (3)$$

The key determinants of total factor productivity have been the subject of a long debate between economists. Nowadays, in the context of knowledge based economy, that total factor productivity could be seen as being affected mostly by the knowledge variables: aggregate level of knowledge or education level, innovation, ICT and economic and institutional regime.

Therefore the equation 3 could be seen as:

$$ln(Y) = \gamma\, ln(Knowledge) +\alpha\, ln(K)+\beta\, ln(L) + ct \qquad (4)$$

The econometric model for panel data could be written:

$$ln(Y_{it}) = \gamma\, ln(Knowledge_{it}) +\alpha\, ln(K_{it})+\beta\, ln(L_{it}) + ct +\eta_i + \delta_t + \varepsilon_{it} \qquad (5)$$

where:

- η_i - the unobserved effect of country: it captures the impact of unobserved variables constants in time for a given country but which varies between countries
- δ_t - the unobserved effect of time: it captures the impact of unobserved variables which have the same effect on all countries for a given period of time, but which varies in time
- ε_{it} - the unobserved effect of time and country: it captures the impact of unobserved variables which varies both in time and space (between countries)

3.2. Variables and Data

Moving the countries in transition toward knowledge economy is an important step for them for building competitive economies and development. As long as most of Arab countries have already embraced some of Knowledge Economy principles, we would like to see how the different aspects of knowledge economy exert positive effect on economic growth by using the example of EEE countries.

One of the essential conditions for creating, disseminating and using knowledge is the existence of a skilled population. This will have as result the increase of total productivity and therefore of the economic growth. Therefore in our analysis we will take into consideration the aggregate variable corresponding to the first pillar from the Knowledge Index, which is Education Index (ED).

Economic theory (Chen and Dahlman, 2004; Solow, 1957; Romer, 1986, 1990b) indicates that technical progress is a major source of productivity growth and an effective innovation system is the key for such technical advancement. There have been a number of studies that show that innovation or the generation of technical knowledge has substantial positive effects on economic growth or productivity growth (Lederman and Maloney, 2003; Guellec and van Pottelsberghe, 2001). Currently, the majority of technical knowledge is produced in the developed countries: more than 70 percent of patenting and production of scientific and technical papers are accredited to researchers in industrialized countries. Therefore, a key element of a developing country's innovation strategy is to find the best ways to tap into the growing global knowledge base and to decide where and how to deploy its domestic R&D capability (Chen and Dahlman, 2004). In our analysis we will take into consideration the aggregate variable corresponding to the second pillar from the Knowledge Index, which is Innovation Index (INN).

Information and Communications Technologies (ICTs) are the spine of the knowledge economy. Over the past decade, there has been a series of studies that show that both ICT production and ICT usage have contributed to economic growth (Pilat and Lee, 2001; Jorgenson and Stiroh, 2000). One of the most obvious benefits associated with ICT usage is the increased flow of information and knowledge. As long as developed countries are the main producers of innovations and technical knowledge, ICTs allow information to be transmitted relatively inexpensively and efficiently (in terms of cost) toward developing countries. Therefore, in our analysis we will take into consideration the aggregate variable corresponding to the third pillar from the Knowledge Index, which is ICTs Index (ICT).

The economic and institutional regime of an economy needs to be such that economic agents have incentives for the efficient use and creation of knowledge, and thus should have well-grounded and transparent macroeconomic, competition and regulatory policies. Many developing countries still have corrupt governments and legal systems enough developed for supporting the basic rules of commerce and protecting the intellectual property rights. Finally, in our analysis we will take into consideration the aggregate variable corresponding to the forth pillar from the Knowledge Index, which is Economic and institutional regime Index (EIR).

We have estimated the models by using regression method for panel data and World Bank database. The cross sections were EEE countries and the time sections were 1955, 2000, 2005 and 2008. All models use the production function with the dependent variable, the GDP per capita (constant 2000 US$) and Gross Capital Formation (K) and Total Labor Force (L) as independent variables from the Cobb Douglas function.

The first model assumes that the total productivity factor is determined by the four indexes corresponding to the four pillars of a knowledge economy: EIR, INN, ED and ICT.

Model 1: $ln(Y_{it}) = \gamma_1\, ln(EIR_{it})+\gamma_2\, ln(ED_{it})+\gamma_3\, ln(INN_{it})+\gamma_4\, ln(ICT_{it})+\alpha\, ln(K_{it})+\beta\, ln(L_{it})+ct+\eta_i+\delta_t+\varepsilon_{it}$

The second model assumes that the total productivity factor is determined by the Knowledge Economy Index (KEI).

Model 2: $ln(Y_{it}) = \gamma\, ln(KEI_{it}) + \alpha\, ln(K_{it})+\beta\, ln(L_{it}) + ct +\eta_i + \delta_t + \varepsilon_{it}$

The third one assumes that the total productivity factor is determined by the Knowledge Index (KI), which takes into consideration only three pillars: education, innovation and ICT.

Model 3: $ln(Y_{it}) = \gamma\, ln(KI_{it}) + \alpha\, ln(K_{it}) + \beta\, ln(L_{it}) + ct + \eta_i + \delta_t + \varepsilon_{it}$

3.3. Results

In order to decide which estimates for the previous models are the most appropriate for our data, we have tested if the models have or do not have fixed effects by using F test. All the F values are high, and therefore the null hypothesis (of no fixed effects) is rejected at a significance level of 0.01. Therefore, the best estimates are obtained if we consider that the models have fixed effects.

R square calculated for all models with fixed effects is more than 0.99. Therefore the models are very good. If we look at the coefficients we observe that in all models the coefficients of capital (K) are significant with a significance level of at least 0.01 and the coefficients of labor (L) are significant with a significance level of 0.1 for model 1 and 3 and non-significant for model 2.

If we look at coefficients of knowledge variables we observe some interesting results. First of all, Information and Communication Technology Index has a positive and significant effect (at 0.05 level of significance) on GDP per capita (Table II.6, Fig.II.30). It we look at the variables which compose the ICT index, we can conclude that the increase in the number of computers, phones and internet users contributes to the increase of economic growth. Generally, the ICT index decreased from 1995 to 2000 or 2005 and then restarted to increase until 2008.

Secondly, Economic and Institutional Regime Index has a negative and significant effect (at 0.05 level of significance) on GDP per capita (Table II.6). This conclusion is interesting as long as it is known that countries with governmental institutions working well and with low corruption have high values of GDP per capita. But by analyzing Fig.II.31 we observe that in some countries during the periods of high economic growth, the index of Economic and institutional regime decreased (Slovenia 2005-2008, Poland 2005-2008, etc.). If we consider only the relationship between the two variables without taking into consideration the individual effects of time and of space, we would say that there is a linear and positive relationship between the two variables. So, GDP per capita increases with the increase of Economic and institutional regime.

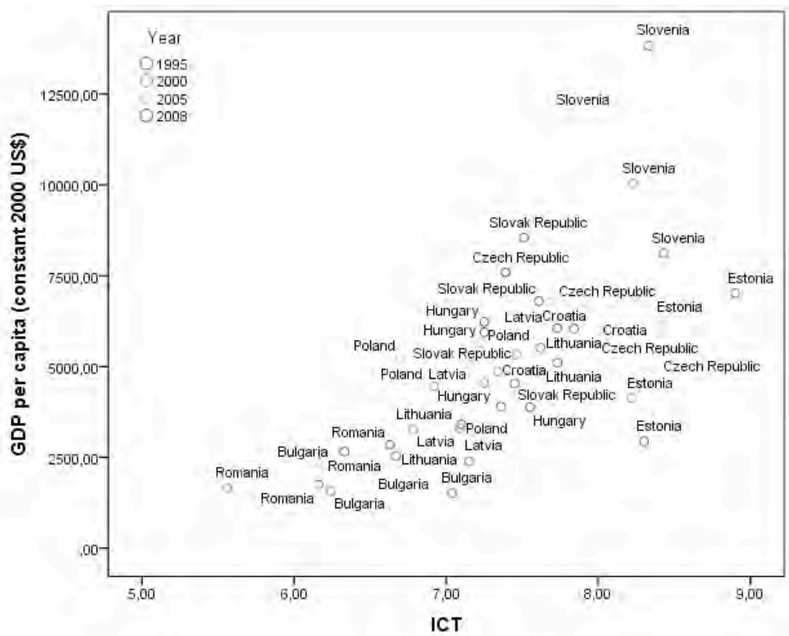


Fig. II.30 –The relationship between GDP per capita and ICT

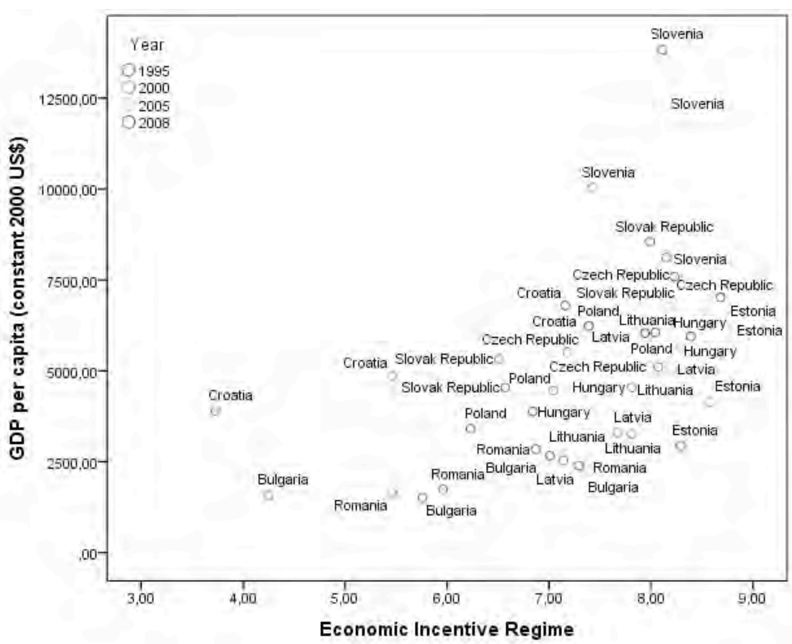


Fig. II.31 –The relationship between GDP per capita and Economic incentive regime

Thirdly, Education level of the workforce index has a positive but non-significant effect (at 0.1 level of significance) on GDP (Table II.6). By analyzing also the figure II.32 we could say that in many EEE countries during the last 10 years the level of education decreased, if we take into consideration the Education level of the workforce index. This means that some of the variables:

total number of schooling years or the secondary and tertiary enrolments contributes decreased in some periods of the last two decades.

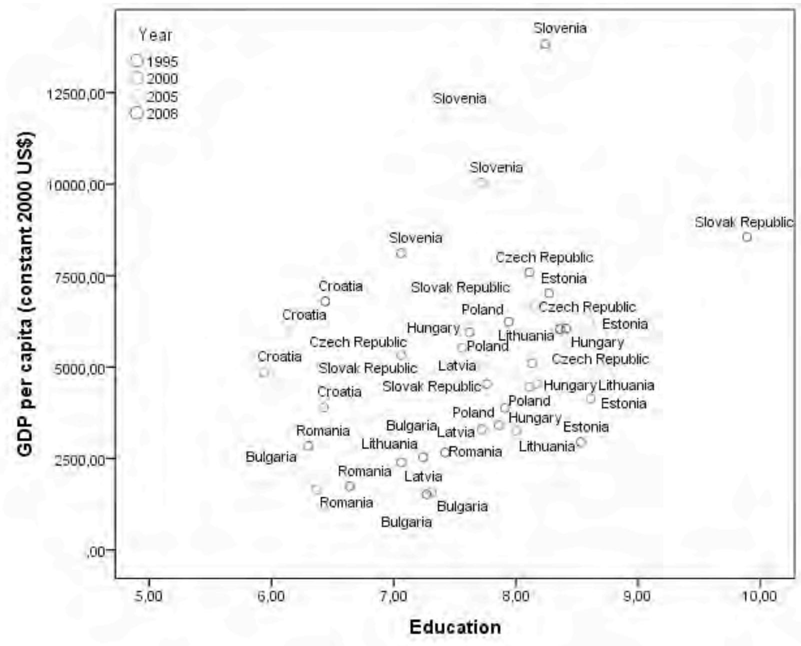


Fig. II.32 –The relationship between GDP per capita and Education

Fourthly, Innovation index has a positive and significant effect (at 0.1 level of significance) on GDP (Table II.6). Therefore, an increase in Royalty and License Fees Payments and Receipts, in Patent Applications or Scientific and Technical Journal Articles will have a positive effect on economic growth. This effect could be observed both in time and between countries (Fig.II.33). The countries with high levels of Innovation index have high levels of GDP per capita and also this index increased during the economic growth periods.

By analyzing the effect of time on GDP per capita, we could say that it had a positive effect (all coefficients are negative and significant with a level of significance of 0.01 if we take as year of reference 2008 – Table II.6). The highest increase in GDP per capita was observed in 2005 compared to 2000, the period of accession or pre-accession for the EEE countries.

Moreover, the country effects are also significant with at least 0.05 level of significance (Table II.6). This means that the effect of all KEI indexes on GDP per capita depends on the country.

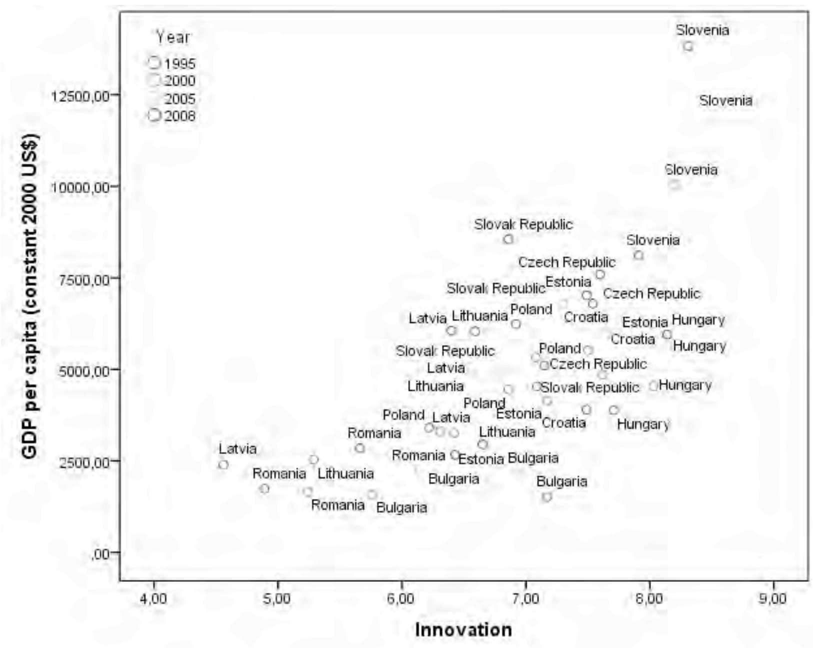


Fig. II.33 –The relationship between GDP per capita and Innovation

Table II.6 – Panel data estimates for the models describing the level of national aggregate output (GDP per capita) in relation with knowledge economy

Variables	Model 1		Model 2		Model 3	
	Estimates	Standard Error	Estimates	Standard Error	Estimates	Standard Error
Knowledge Economy Index – ln(KEI)	-	-	0.243^{NS}	0.334	-	-
Knowledge Index – ln(KI)	-	-	-	-	0.710***	0.265
Economic and institutional regime – ln(EIR)	-0.170**	0.083	-	-	-	-
Level of innovation – ln(INN)	0.244*	0.151	-	-	-	-
Education level of the workforce/population – ln(ED)	0.145^{NS}	0.124	-	-	-	-
Information and communications technologies - ln(ICT)	0.544**	0.238	-	-	-	-
Gross capital formation – ln(K)	0.317***	0.044	0.348***	0.054	0.318***	0.048
Total labour force – ln(L)	0.384*	0.236	0.325^{NS}	0.290	0.404*	0.251
Cross sections						
Bulgaria	-1.917***	0.286	-1.915***	0.353	-1.957***	0.312
Croatia	-0.919***	0.166	-0.870***	0.196	-0.886***	0.176
Czech Republic	-1.512***	0.398	-1.492***	0.495	-1.570***	0.432

Estonia	-0.295**	0.118	-0.298**	0.140	-0.301**	0.126
Hungary	-1.509***	0.344	-1.495***	0.429	-1.574***	0.374
Latvia	-0.621***	0.061	-0.695***	0.066	-0.664***	0.060
Lithuania	-0.857***	0.115	-0.907***	0.144	-0.911***	0.125
Poland	-2.426***	0.685	-2.397***	0.850	-2.519***	0.745
Romania	-2.517***	0.549	-0.569***	0.678	-2.611***	0.598
Slovakia	-1.006***	0.226	-0.999***	0.280	-1.020***	0.247
Slovenia	Ref	Ref	Ref	Ref	Ref	Ref
Time sections						
1995	-0.28***	0.047	-0.244***	0.058	-0.263***	0.052
2000	-0.203***	0.036	-0.185***	0.044	-0.196***	0.039
2005	-0.064***	0.026	-0.071**	0.031	-0.078***	0.027
2008	Ref	Ref	Ref	Ref	Ref	Ref
Intercept	-4.632NS	3.727	3.414NS	4.622	-4.803NS	4.003
R^2	0.9959		0.9927		0.9941	
N	44		44		44	
F test for no fixed effects	29.67***		22.22***		26.95***	

Notes: 1. All the results are obtained by using SAS software.
2. * Significance level at 0.1; ** Significance level at 0.05; *** Significance level at 0.01; NS – not significant at 0.1
3. The dependent variable is *ln (GDP per capita, constant 2000 US$)*.

The study of EEE countries shows that education, research, innovation and enterprise creation constitute the major drivers of growth and development both globally and locally. These same variables are pursued in part III to look at the impacts of these same variables besides others related to the types of natural resources mobilized in the Arab countries.

V. Knowledge and Local Development in Arab Economies

The intuitive idea behind this chapter is that knowledge driven development is unevenly distributed among locations in the same country. Furthermore, there are central regions and locations at the periphery. These latter locations are not served in the same way as knowledge driven opportunities are occurring in the central regions. Also, centralized decisions in most developing economies in opposition to local decisions are often not in favor of knowledge development and its access in most remote locations. Besides that, the on-going economic and business interests as shown in different locations are not all the time, encouraging further access to new knowledge sources. The available infrastructure does not often allow access and use of new knowledge based opportunities.

These observations are mostly supported by available literature on local development and spatial distribution of new knowledge sources among regions and communities. This leads to fragmented access to new knowledge sources and to uneven access to the benefits of the new opportunities that can accelerate local development. Emigration of skilled labor from lagging regions and localities is among the consequences of these trends. The political economy of localities can also exaggerate this process and could lead sometimes to impossibility of access to new opportunities and jobs that could be made available locally.

The above features do characterize the Arab economies. Most of Middle Eastern economies have their population concentrated in few rural locations with major urban agglomerations. In North African countries, almost a third to half of the population is in rural areas with growing urban segments. Agriculture and rural activities are still occupying a large share of North African economies. Furthermore, these economies have been operating under economic development models that are based mostly on agriculture and mining that are centrally directed. At the exception of some regions, these economies have been concentrating their economic and service activities in few zones. Universities and research centers are mainly concentrated around the most important urban agglomerations and even when they exist locally, they are not linking their activities to the future needs of their neighborhoods.

This chapter is consequently devoted to showing the major trends that characterize the state of local development in relation to knowledge in the Arab economies. After a literature review, a section discusses the method and data used before introducing the major evidence of the Arab economies in relation to production, use and diffusion of knowledge. Comparisons with the situation of the EEE economies are provided to strengthen the discussion of the above results.

1. Previous contributions

This review focuses on the major dimensions that relate to the objectives of this section of the report. These include the status of centralization and decentralization in the Arab region besides the links with local development through knowledge industries.

Tosun and Yilmaz (2010) suggest that the Arab countries are among the most centralized economies in the World. Besides that, the higher levels of urbanization in the Golf economies with a concentration in few agglomerations could impose further centralization. But, North African countries with agricultural and rural activities occupying an important share of the respective GDPs, centralization is known to be the rule even though major decentralization initiatives have been under way. Belghazi (2010) has also referred to this limited decentralization and shown that only few functions have been devoted to localities and regions. To this author, the major decisions are kept at the central level.

Bogaert (2011) has been elucidating the idea that is now being very common in the Arab countries with the dispatching of public power by the creation of relatively short lived agencies and institutions that will enhance some areas in a given country. The example of the Bouregreg Valley in Rabat-Salé, Morocco, is used to show how there is a need to first give exclusive power to the public sector (Ministry of Interior and a local community) over the territory of a mega urban project including real estate and commercial areas. This led to the the creation of an agency exclusive to this project with authority over the land and its construction. Bogaert's paper shows how this causes the project to smoothen the investor-project relationship, and allows a faster breakdown and dispatching of roles for the different private investors. This has reduced the roles of local institutions related to the urban areas concerned to avoid conflicts and smooth en the realization of the project.

Salim, Kabir, and AlMawali's paper (2011) is a study on the Arab countries of the region of the gulf and how their trading is influenced by the Gulf Cooperation Council (GCC). The research uses regression to test with different variables like distance, sharing borders… etc, to see if the GCC has affected the international trade of its members with other regions of the globe. The models showed several correlation problems due to the data, which was affected by several countries. The data, however, was very meaningful as it was data relevant from the imports and exports of the concerned countries from 1980 to 2008, collected from the IMF's Direction of Trade Statistics After modeling; results have shown that the GCC has indeed helped greatly in the enhancement of trade of the countries of the Arab Gulf. However, analysis of the coefficients also shows that intra-regional trade (trade amongst the countries of the GCC) still has great unexploited potential.

Throughout Eraydin's paper (2011), the issue is about two major problems. First, the attempt is to ensure that there is a lack of precision when claiming that the changes in the city region of

Istanbul are due to global adaptation and competitiveness, and second the neo-liberalism constraints, and therefore the negative economic consequences which enhanced major policy changes. Socio-economical change occurred in the 1980's because of the globalization will of Turkey, which reduced the "production" jobs and focused more on real estate. In the 1990's, new regulation measures took place to allow social groups to find their equilibrium, and managed to compensate for the bad effects of the unfair deployment of interests. In enforcing the new policies, low demand was made to the local that wasn't good because the interested weren't involved in solving the situation. The problem that has occurred is that, throughout the surfacing of major problems, many short term solutions have been found and implemented, which have created an overlapping and mixed type of ruling of the policies, where cooperation is tough amongst the different policy makers.

The research of Eric Chaney (2012) has been done with the help of a regression using as a dependant variable democracy per continent, with many categorical variables such as Muslim or not, Arab league member or not, to show that democracy deficit in the Arab countries is not due to factors such as Islam historic or palestinian-israelo conflicts. Rather, the research and therefore the findings show, to their own manner, how it is due to the fact that Islamic institutions have continuously affected the democratic political concept since the pre-modern era. The question that is brought up is that of the Arab Spring: Will it eventually be the catalyst to the dawn of a democratic era in the Arab World? The author claims that due to the lack of data, it is not concluable. However, this same data may help to say that the countries that have had great revolutions like Egypt and Yemen may not reach easily democracy as Tunisia due to the lateness of awareness of the population. This being said, though the constraint to change to democracy is seen to be deeply rooted in history, it is not necessarily the consequence of religious beliefs. The end of this paper claims, however, that the findings throughout the research may be statistically wrong if there is any political shift in the regions stated above, no reference to the model must then be made.

Temel, Tansel, and Albersen (1999), in their study show a modeling of the provincial regional productivity of sixty seven provinces throughout Turkey, in order to show the differences in tasks of the workers and the extent to which the locals are employed. The researchers used a Markov chain model to find out the latter, and to eventually be able to do a projection to the year 2000. The data used was from 1975 to 1990, and the assumptions were that the economic relations of the regions were to stay unchanged from this period onwards. It shows that, though there is great ability of movement of workers between provinces, there is a difference amongst the latter with respect to education, and therefore types of jobs available in these regions (educated therefore more intellectual jobs rather than poorer regions where physical labor is more demanded). Industrialized provinces (those of physical labor) profit from this because of the population growth in the surroundings, making neighboring provinces also profit from it. However, human resource development must be enhanced by Universities in order to make the labor force become more homogenous throughout the country, therefore sharing the labor force and also the welfare throughout the nation.

In Sudan, the sudden rush for urbanization has seemed to be a very bad influence for the nation's economy, where the newly industrialized and commercialized cities have been attracting a major portion of the nation's economy. However, this is not necessarily a bad consequence. This is typically what the El Bushra's essay (1985) is debating, which respect to the regional depressed rural areas, to which attention is to be given. Indeed, the reason why having over populated urban areas is an asset is that, because the need is clearly to enhance all different regions of the country, the workforce of the urban area may be of great help. The main goal of this study is to show the importance of finding solutions to specific regions of the country, by major industrial enhancement through the distribution of technology equipment in the sense of help in agricultural labor. This will enhance a balanced economic growth, to allow for a correlated growth of the country as a whole. The program must therefore include industrialization of both rural and urban areas, in order to avoid an imbalance of population for both of the latter, and allow the right proportions to work accordingly in view of a goal leading to economic growth of the nation as a whole.

Babiker (2007) has brought up the issues of poverty and has thought of several ideas that may affect the latter issues, including all economic situations and transitions through which a nation or a region may go through, from all the good to the bad ones such as economic and financial crisis. He has used the (most appropriate) computable general equilibrium model (CGE model) in order to assess the effect of several factors on poverty in countries, such as the effect of international organizations' actions on third world countries. His assessment was done using the model, nevertheless including several modifications to the model, hypothesizing that the latter were to be done for better representation of the reality by the CGE. In conclusion, it shows how the public policies of the Arab countries have affected poverty, which will help in assessing how the latter will occur with possibly occurring new policies, and how these will affect poverty in periods up to 2015.

Al-Khouri's papers (2010), discuss how the differences in populations of the GCC have different aspects of live, but are seen as a unique community of the Arab gulf. This society is seen as being at the same time a single group, and as different subgroups connected to one same ideology, that of oil as an economy, Arabic as a language, traditional dress code as a cultural identity. The conclusions of this research show that, though globalization and modernization have helped these countries open up to the world of today, and therefore allow growth and open mindedness in all aspects of live, their culture is still today endangered because of the difficulty the region as a whole faces to find an equilibrium between their traditional, cultural, and religious standards, and that of the western, modern world, with which they cooperate and share interests. The GCC governments have helped in structuring their population equilibrium through different standards, but the research shows that national and regional identity management systems may greatly help the respective governments in shaping or restructuring the minds of their populations, without decreasing the production and sustainability of the welfare being produced actually (Population growth and modernization).

Al_ Othman' study (2012) takes the case of Jordan as a country that has put in its most important goals that of human development. Indeed, the country has put into place several mechanisms of human development to decrease all indicators of low Human development. After the achievement of its goals, Jordan has witnessed several high indicators of the latter such as low infantile mortality, higher life expectancy and literacy. However, the country has done this with the negatively correlated flaws of international debt (money loaned from western countries for the fulfillment of these projects), high dependency on foreign aid, mainly Britain, and low, if not any, focus on economic growth and social improvement. It has raised issues of corruption and other internal problems which have led to Jordan in being in a crucial situation: that of being under the dependency of the core countries, and therefore, if they are attacked, may be a cause to the consequence of either the creation of new issues, or may enhance the reverse process of the pro-activeness of the state with respect to the former issues on human development.

Ducruet, Mohamed-Cherif, and Cherfaoui (2011), in their paper explore the new trend of the creation of multilayered hubs at strategic locations by focusing on the city of Tangier, and more specifically, The Tangier Med project. Lately, many countries and cities started giving a huge importance to hub strategies that integrate logistical, free-zone, and urban functions, which demonstrates the significance of material flows in both local and regional development. The case of Tangier with its mega project Tangier Med aspires to take benefit of economies of scale for large containerships regionally and at the same time attract value-added and skills at both the local and national level throughout the creation of industrial and logistics parks. To the author, three main characteristics define the Tangier Med project which consists of competitiveness, territorial balance, and local development. The tangier Med project contributes significantly to the country's development both internally and externally. At external level, it counters effectively to regional competition from other hubs in the Euro-Mediterranean region, while internally; it has a significant socio-economic impact that is measured by the job creation as well as the current diversification of the local and regional economy.

The most recent contributions are those by Driouchi & Zouag (2011a and 2011b). These are largely used for both underlying the previous relevant investigations but also for the first part of the empirical results that follow.

2. Empirical Assessments

2.1. Overall Assessment of the role of knowledge on local development

After establishing the countries included in each of the three sets, regression analyses are performed. The dependent variable is the Human Development Index (HDI) and the independent variable is the number of universities per region. Another independent variable can be the number of universities per population of age 18. The results of these analyses are summarized in tables II.7 and II.8. The results of the regressions show that the human development of economies is slightly explained by the number of universities in the given countries where all the data is in a logarithmic form.

Table II.7: Regression analyses results (source: Driouchi & Zouag, 2011)

Countries	Equation	R^2	Obs.
Developed	$\ln(HDI2010) = -\underset{(-13.226)}{0.2407} + \underset{(4.0121)}{0.0174} * \ln(NumOfUniversities)$	0.2678	46
Developing	$\ln(HDI2010) = -\underset{(-14.335)}{0.858} + \underset{(3.9468)}{0.082} * \ln(NumOfUniversities)$	0.1462	93
Emerging	$\ln(HDI2010) = -\underset{(-2.134)}{0.2917} - \underset{(-0.6665)}{0.0166} * \ln(NumOfUniversities)$	0.0255	19

The portion explained by the number of universities demonstrates that an increase in that number for developed countries leads to the slow increase of the human development factor by approximately 0.02%. At the same time, an increase in the number of universities leads to a slow increase in the human development effect on developing countries. Emerging economies have statistically insignificant results related to the effect of the number of universities on the human development effect of the country.

Table II.8: Regression analyses results (continued) (source: Driouchi & Zouag, 2011)

Countries	Equation	R^2	Obs.
Developed	$\ln(HDI2010) = -\underset{(-14.74)}{0.161} + \underset{(1.803)}{0.023} * \ln(UnivPerPop18)$	0.069	46
Developing	$\ln(HDI2010) = -\underset{(-2.796)}{0.124} + \underset{(13.49)}{0.203} * \ln(UnivPerPop18)$	0.667	93
Emerging	$\ln(HDI2010) = -\underset{(-4.769)}{0.203} + \underset{(4.705)}{0.1} * \ln(UnivPerPop18)$	0.566	19

From table II.8, another factor can explain the level of human development. It is the number of universities per population aged 18 that can significantly affects the 2010 human development index in developing and emerging markets. This means that an increase in the number of universities per population of 18 years old leads to slightly increasing rise (0.203%) in HDI while it contributes to a 0.1 % increase of HDI for emerging economies. The relationship for developed countries is found to be statistically insignificant.

Table II.9: Regression analyses with KEI data (source: Driouchi & Zouag, 2011)

Countries	**Equation**	**R^2**	**Obs.**
Developed	$\ln(KEI2009) = \underset{(36.48)}{1.99} + \underset{(2.823)}{0.033} * \ln(NumOfUniv) + \underset{(2.925)}{0.085} * \ln(UnivPerPop18)$	0.3244	44
Developing	$\ln(KEI2009) = \underset{(17.49)}{2.11} - \underset{(-1.214)}{0.029} * \ln(NumOfUniv) + \underset{(13.642)}{0.362} * \ln(UnivPerPop18)$	0.7633	76
Emerging	$\ln(KEI2009) = \underset{(7.04)}{2.02} - \underset{(-1.353)}{0.071} * \ln(NumOfUniv)$	0.0972	19
Emerging	$\ln(KEI2009) = \underset{(18.15)}{1.97} + \underset{(3.426)}{0.186} * \ln(UnivPerPop18)$	0.4084	19

When using the KEI as an independent variable and the number of universities as well as the number of universities per population aged 18 as dependent variables, the following tables and analyses result (Table II.9).

The results listed in table II.9 shows that for developed countries, both the number of universities and the number of universities per population aged 18 significantly impact the level of KEI in a positive way. In their logarithmic form, an increase in the number of universities by 1% can lead to the increase of KEI level by 0.033% and an increase in the number of universities per population aged 18 by 1% can lead to the increase in the KEI level by 0.085%. For developing countries, the increase in the number of universities does not significantly impact the KEI level. However, the number of universities per population aged 18 does positively influence the level of KEI. An increase in the number of universities per population of age 18 leads to the increase of the KEI level by 0.362%. In the case of emerging economies, the analyses show that an increase in the number of universities per population of age 18 of 1% can lead to the increase in the KEI level by 0.186%. However, the increase in the number of universities does not have a significant impact on the KEI level (table II.9).

2.2. Empirical Assessment for Arab and EEE economies

The method used here is identical to the one pursued for the other countries. The data used and the variables mobilized are respectively outlined below.

Arab Countries

The data related to each variable are introduced in table…. The variables are defined as:

Universities refer to the number of universities in a given country

Population refers to the youngest segments of the population aged 15 to 18

Regions refers to the number of regions per country

Univ/pop indicates the number of university per 1000 population in the age indicated above

U/regions is related to the average number of universities per region

KEI is the knowledge economy of the country

KEI per region is the division of KEI by the number of regions (each in logarithms)

HDI is the human development per country

HDI per region is the division of HDI by the number of regions (each in log)

Developed	Num. Univ.	Pop18	Univ pop 18	Regions	U reg	KEI 2012	HDI 2011
Algeria	46	2839	0.016	48	0.958333	3.78	0.698
Bahrain	14	55	0.255	5	2.8	6.9	0.806
Egypt	57	6916	0.008	29	1.965517	3.78	0.644
Jordan	37	609	0.061	12	3.083333	4.95	0.698
Kuwait	10	185	0.054	6	1.666667	5.33	0.760

Lebanon	39	346	0.113	6	6.5	4.56	0.739
Libya	10	500	0.020	22	0.454545	3.3	0.760
Mauritania	2	328	0.006	12	0.166667	1.65	0.453
Morocco	32	2744	0.012	16	2	3.61	0.582
Oman	21	253	0.083	11	1.909091	6.14	0.705
Palestine	27	300	0.090	2	13.5	4	0.641
Qatar	4	49	0.082	10	0.4	5.84	0.831
Saudi	43	2372	0.018	13	3.307692	5.96	0.770
Sudan	38	4241	0.009	15	2.533333	1.48	0.408
Tunisia	37	776	0.048	24	1.541667	4.56	0.698
Turkey	143	6185	0.023	81	1.765432	5.16	0.699
UAE	36	231	0.156	7	5.142857	6.94	0.846
Yemen	22	2709	0.008	21	1.047619	1.92	0.462

The results of the regression are underlined in table

Regression related to Arab Countries:

	Constant	Universities	Pop 18	Regions	Univ/Pop18	U/regions	R^2
KEI	0.930 (7.197)	0.445 (4.870)	-0.398 (-5.122)	0.181 (1.627)			0.706
	0.979 (9.872)			0.214 (2.226)	0.412 (5.682)		0.698
KEI per region	1.682 (7.258)		-0.290 (-2.082)	-0.298 (-1.075)		0.546 (3.336)	0.807
	1.682 (7.258)	0.546 (3.336)	-0.290 (-2.082)	-0.844 (-4.225)			0.807
HDI	-0.009 (-0.134)	0.172 (3.785)	-0.188 (-4.843)	0.115 (2.079)			0.649
	0.052 (0.835)				0.149 (4.054)	-0.033 (-0.816)	0.549
	-0.025 (-0.504)			0.105 (2.209)	0.183 (5.095)		0.645
HDI per region	-0.200 (-1.984)	0.123 (1.730)	-0.211 (-3.486)	0.402 (4.633)			0.617

The above regressions show that both KEI and HDI are statistically significantly sensitive to the number of universities and to the youngest segments of the population. The values per region include also significant levels of responses to the number of regions. While the number of universities affects positively KEI and HDI, the effect of the population is negative.

EEE countries

	Num. Univ.	Pop18	Univ/Pop18 (000)	Num.Regions	KEI 2012	HDI 2011
Albania	24	506	0.05	12	4.53	0.739
Armenia	12	400	0.03	11	5.08	0.716
Belarus	55	939	0.06	7	5.59	0.756
Bosnia and Herzegovina	37	439	0.08	3	5.12	0.733
Bulgaria	60	634	0.09	28	6.80	0.771
Croatia	54	450	0.12	21	7.29	0.796
Czech Republic	70	922	0.08	14	8.14	0.865
Estonia	35	120	0.29	15	8.40	0.835
Georgia	39	518	0.08	9	5.19	0.733
Hungary	75	989	0.08	43	8.02	0.816
Latvia	63	197	0.32	33	7.41	0.805
Lithuania	48	366	0.13	10	7.80	0.810
Macedonia	20	249	0.08	84	5.65	0.728
moldova	26	475	0.05	35	4.920	0.649
Poland	433	3,914	0.11	16	7.41	0.813
Romania	116	2,022	0.06	42	6.82	0.781
Slovakia	33	569	0.06	8	7.64	0.834
Slovenia	32	172	0.19	193	8.01	0.884
Ukraine	125	4,254	0.03	27	5.73	0.729

Regressions related to EEE countries:

	Constant	Universities	Pop 18	Regions	Univ/Pop18	U/regions	Rsquare
KEI	0.809 (6.583)	0.264 (3.806)	-0.175 (-3.046)	0.032 (0.833)			0.535
	0.861 (8.244)	0.089 (1.947)			0.186 (3.353)		0.514
KEI /region	1.644 (6.971)	0.196 (1.471)	-0.202 (-1.830)	-0.557 (-7.565)			0.792
HDI	-0.090 (-1.738)	0.088 (3.009)	-0.063 (-2.579)	0.004 (0.219			0.402
HDI/ Region	-0.240 (-3.416)	0.068 (1.701)	-0.032 (-0.240)	0.091 (4.147)			0.613

Comparisons between Arab and EEE countries: the outcomes of the Chow test show higher performance of EEE countries relative to Arab economies. The results are in the following table.

3. The Moroccan case

Morocco has been engaged in large investment projects that have impacts on regional development. Such projects concern besides Casablanca and Rabat, the regions of Tangiers, Meknès, Fès, Oujda and Marrakesh among others. While some projects focus on port and industrial development, others are centered on food industries, information technologies and tourism (Driouchi & Kadiri, 2010). The Green agricultural plan has also a pillar with very high regional and local development where the promotion of territorial labels is clearly well initiated (Driouchi & Kadiri, 2010).

Besides that, Morocco has adopted a new charter for communal development since 2009 (Mokhliss, 2010). Besides that, a clearer engagement towards regionally centered development is in process.

Dependent variable	Independent variables	SSRtotal	SSRarab	SSReee	Chow test
KEI	Reg, Univ, Pop	0.336	0.204	0.066	27.330
KEI/Region	Reg, Univ, Pop	1.047	0.656	0.242	29.977
HDI	Reg, Univ, Pop	0.082	0.051	0.012	29.047
	Univ/Pop, Reg	0.085	0.051	0.013	26.500
HDI/Region	Reg, Univ, Pop	0.242	0.124	0.022	39.726

These two frameworks are likely to be driving local development with an important role to be devoted to regional universities. Currently, Morocco has 16 public universities located in Casablanca, Rabat, Fès, Meknès, Oujda, Beni-Mellal, Settat, Tetouan, Tangiers, Ifrane and others. Morocco has also public and private schools that focus on engineering, telecommunication and commerce. Some of these schools are being expanding over series of regions. But the regional effects of these knowledge centers on local development are not often observable as universities are only recognized for their education functions. Regional and local universities are rarely mobilized as sources of knowledge and expertise for local development. Most of the time, tacit knowledge sustains local traditional development implying the emigration of newly trained skills with outward looking universities and schools. Contribution to local development may appear to be inferior relative to national and international orientations. These trends are partially confirmed by data related to registration of patents and related intellectual property rights for the period 2004-2010. These data show that out of at least 16 universities, only 11 (most of them are in regions) have deposited 40 patents in 2010 while only 11 patents concerned 4 universities in 2009 and only 1 patent by 1 university in 2008. At the same time, the total of patents has known small annual increase during the period 2004-2010. The same pattern is expressed at the levels of trademarks and design and models. The data about enterprise creation from table II.10 suggest that as the number of universities increases, the number of university deposits are likely to rise.

Table II.10: OMPIC intellectual property rights protection data 2004-2010

Patent registrations	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	151	135	178	150	178	140	104
Foreign	856	794	833	782	732	520	457
Total	1007	929	1011	932	910	660	561
Trademark Registration	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	5521	5678	4630	5020	5642	4966	4163
Foreign	1572	1269	1558	1502	1703	1429	1239
Total	7093	6947	6188	6522	7345	6395	5402
Design and models	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
National	990	864	759	696	723	646	448
Foreign	97	61	70	69	77	51	4
Total	1087	925	829	765	800	697	486
Moral person	**2010**	**2009**	**2008**	**2007**	**2006**	**2005**	**2004**
Intention of Creation (Enterprise)	46120	45181	45590	43663	33139	23492	20375
Creation of Enterprises	24560	23810	23552	25833	18703	13480	11360
	2010	**2009**	**2008**				
University Deposits	40	11	1				
Number of universities	11	4	1				

Source: Annual reports, OMPIC, Morocco

Besides the availability of universities in series of regions in Morocco, there is also Investment Centers (CRI) located in each region. Furthermore, Morocco has also developed agencies for the promotion of small and medium businesses besides the promotion of employment. But, these institutions besides the schools and the universities have not all the time focused on local needs and regional development. They are still often nationally and outward operated. Two major links seem to be missing. They include the lack of incentives for universities and schools to focus on local development and the absence of mechanisms that can help transform research ideas into development projects and enterprises. These links might be related to the limited demand for specific local development. The current trend of regionalization might be an important source for the enhancement of demand for specific local projects, for the valuation of local economic and

social niches besides the provision of further inspiration for patent development and enterprise creation.
The Moroccan experience in terms of enterprise creation mainly goes through regional institutions aiming at developing new niches. Enterprise creators can submit their requests either to the regional investment centers (RIC) or directly to other institutions to initiate the creation of enterprises. There is a RIC for each of the 16 regions of Morocco. Each RIC gathers all the processes and administration that is needed for the authorization of the enterprise. But, even under this high level of integration, the number of enterprises created within the RIC and outside is still limited.

The preceding description shows that there is room for more local development and enterprise creation as long as there are schools and universities focusing on the knowledge needs for their immediate neighborhoods.

VI. Urbanization Trends in Arab and Knowledge Based Economies

This section looks at how knowledge economy has been shaping the cities of the Arab countries and how urbanization has been progressing in these economies. This is to answer the question of global and local development in relation to the advancement of knowledge with comparisons with EEE economies. The assumption is that the proximity with EU is providing a comparative advantage to EEE economies that are progressing quicker than Arab countries even if these latter countries are benefitting from demographic factors and partially from oil resources.
As per the Istanbul Knowledge Cities Declaration (2008), the knowledge city in the Arab region is considered to be a public project where material and immaterial means are to be injected in order to promote planning and management of cities. These efforts include the development of knowledge infrastructure and equipment needed to support production and use of knowledge to the benefit of residents of these cities. Earlier authors contributed to the clarification of the concept and also the content of a knowledge city (Yigitcanlar, 2005). These efforts have been promoted also later through emphasizing the existence of demographic trends and pressures that strengthen urban divides among cities, countries and regions (UN-Habitat, 2011). This latter study shows that high, middle and low income countries exhibit respectively 78, 48 and 32

percent urban population and that there are regional variations where Arab shows 57 % in comparison with Latin America (78 %), Europe and Central Asia (64 %) and the Euro Area (73 %). The lowest rates are in East Asia (43 %), South Asia (29 %) and Sub-Saharan Africa (36 %). This implies that the Arab region has an intermediate position with regard to urbanization. But there are large variations among countries in this region.

Lower urbanization rate leads to lower access to urban services and besides lower provision of education, health and environmental amenities (UN-Habitat, 2011). Land availability besides land regulations and other real estate matters can be important constraints (Zimmerman, 2011) to urbanization but the major limits reside in the disequilibrium between urban services and demographic pressure. Acces to knowledge can be among the barriers that can expand or limit urbanization and access to goods and services.

It has been widely shown that competitiveness is currently and in the future driven, by the mobilization of different forms and contents of knowledge that are produced and developed locally and elsewhere. It is also well known that both formal and tacit knowledge are important drivers of the positioning of goods and services in local and export markets besides other needs of the population (food, housing, culture, art...). It is also pervasive that Information and Communication Technologies (ICTs) constitute only one dimension to knowledge and that knowledge includes also other innovations and instruments (culture, education, and outcomes of applied research...). Furthermore, most sources of production, use and diffusion of formal knowledge are located in universities and research centers besides tacit and formal knowledge owned by individuals and groups in different locations. Those sources are most of the time located in, and near agglomerations and cities where there are important consumption markets and potential for enlargement of local and global innovations. The spatial spillovers that are likely to occur besides other sources of tacit knowledge are captured under the spatial components of this model.

This section is devoted to showing how cities in general and particularly in the Arab World can develop means that can create the appropriate incentives devoted to the creation and diffusion of information that generates further competition among regions and among cities. This can underline the existence of differentiated products and services. The focal point of this set of means reside in creating a framework that assesses continuously the state of knowledge attained by different cities. Most of the information provided in this section is from Driouchi (2005) and Driouchi (2008).

1. Previous work

Urbanization is the social process whereby cities grow and societies become more urban. In the absence of detailed measures related to the knowledge of different sources of urbanization (immigration, creation of new cities, expansion of existing cities, natural urban population growth), the most popular measure of urbanization is the ratio of urban to total population.

Knowledge refers to different formal and informal cognitive assets and flows that are produced, used and stored in the economic activities. It includes both tacit and formal knowledge. Tacit and informal knowledge are hard to include in such a study. It is recognized though that some of their components are crucial for urban development. They mainly include artistic and cultural innovations that are critical to the pursuit of development. As clearly stated by Ernest and Lundvall, 1997), tacit knowledge is as important as codified knowledge. The authors also indicate that codified knowledge such as information technologies cannot be substituted to human abilities and creativity. While this is well underlined, this study focuses only on the use of an aggregate measure of knowledge that does not include tacit knowledge and human artistic and cultural capabilities. The most important available aggregate measure that provides the level of knowledge attained in each economy is the Knowledge Economy Index (KEI) and its components as they are provided by the World Bank. An important component of the KEI is the level of Information and Communication Technologies (ICT).

Competitiveness refers to the comparative advantages of economies. Once more, this index does not include qualitative elements such as those related to tacit knowledge. It is recognized though that the mobilization of tacit knowledge can enhance the competitiveness of countries (Ernest & Lundvall, 1997).

In this study, competitiveness is measured by the Index of Competitiveness Growth as provided by the World Economic Forum. It defines competitiveness as "that collection of factors, policies and institutions which determine the level of productivity of a country and that, therefore, determine the level of prosperity that can be attained by an economy".

Several studies have looked at both the importance of urbanization, knowledge and their relations in promoting knowledge-based development (OECD 1999; Lundvall, 2002, 2004; Maskell & Kebir, 2005; Maskell et al., 2005). These studies reveal how clusters are important for the diffusion and use of knowledge. Maskell and colleagues illustrate the merit of accounting for series of qualitative and quantitative variables and instruments that relate to the role of clusters in driving urban development. The role of temporary clusters as expressed through trade fairs, exhibitions, conventions and conferences is well stressed and local firms can benefit from the knowledge flows generated by these activities. Permanent clusters as represented by interactions between existing homogenous firms are also permanent sources of knowledge that could enhance knowledge-based urban development. The authors also emphasized the role of localized learning in relation to regional economic specialization and competitiveness. Lundvall (2002, 2004), on the other hand, insisted on the role of universities and the importance of the learning processes as they are accelerated under the new economy.

Anuja Adhar Utz (Development Outreach, World Bank) recognizes that knowledge driven development has recently emerged as an important engine of growth and poverty alleviation. He presents how Brazil, China, and India highly benefited from the knowledge production process (India with annual revenue of US$8.26 billion during 2000-01 from software, China with large innovative projects and Brazil with aeronautics, tropical agriculture and biotechnology). These examples show that knowledge economy is in no way purely confined to ICT's. But, information matters in shaping urban space and places (Guillain & Horiot, 1999). This statement has both theoretical and empirical foundations. Guillain and Horiot's (1999) study provides consistent and realistic explanations for the agglomeration of information, using activities including producer services and R&D.

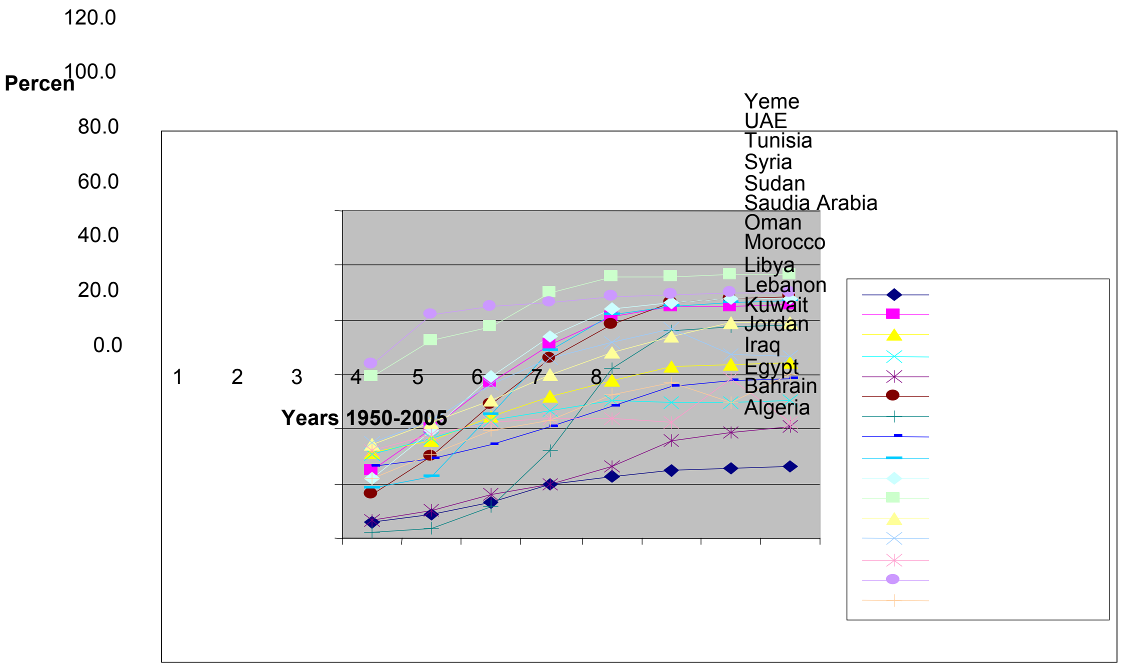
Yigitcanlar (2005) placed emphasis on knowledge as a major determinant for the economic growth and development of the 21st century cities. He also underlined the basic role of city administration in the development of the urban areas through entrepreneurial and competitive knowledge. Furthermore, Driouchi (2005) explains that the insertion of a country in the knowledge economy is a result of its capacity to use the knowledge in local and regional urban development. This insertion can also be ensured by the capacity of any area (region, city, village...) to maintain or develop specific activities based on knowledge (R&D, industrial, district, local productive systems, innovating areas, learning territories, and regional system).

Badaruddin et al. (2005) showed that the importance of ICT's in development of management facilities. This may help decision makers with providing geographically-referenced data for better decisions especially on urban areas. Furthermore, the growth of a city is mainly driven by the development of new tertiary activities such as financial and producer services, R&D and business administration (Guillain, 1999). These activities are based on human capital, knowledge and high-tech capital that are highly information dependent. Consequently, information and knowledge are becoming the most important drivers of the development of cities. On the other hand, Guillain (1999) considers that the concentration of these activities in cities appears "paradoxical in the era of information". This is mainly because of the scale economies to be achieved through distant networks. The access of cities to both local and global knowledge can definitely enhance the level of services provided to their inhabitants. Also, several studies focusing on knowledge have underlined important deficits that have characterized the developing economies, thus implying limitations in the levels of urban services that are provided by cities in developing economies. El-Kenz (2003) linked the low performance of the 132 universities with the production and diffusion of knowledge in the Arab countries. The knowledge production in the Arab cities needs to go in hand with major social transformations and thus be embedded within the urban development processes (Piran, 2005).

2. Assessment of Urbanization and Knowledge in Arab Countries

Urbanization in the Arab World has been growing over the period 1950 to 2011. Two major trends have been observed throughout this period. The first one is related to oil exporting countries where the urbanization process changed drastically during the period. Kuwait, Saudi Arabia, United Arab Emirates, Oman, Bahrain and Qatar experienced changes from 60 to almost 100 % (Kuwait) with important jumps from low urbanization in 1950 to more than 80 % in 2011. The urbanization rate in Oman changed from below 10 % to around 90 %. Jordan showed a regular increasing trend from 35 % in 1950 to 80 % in 2011. Syria pursued also a regular trend but at a lower rate of change compared to Jordan. The second type of trend is exhibited by North African countries (including Libya and Egypt). In this case, the moves were from around 30 % in 1950 to 50-60 % in 2011 as shown in figure II.34

Figure II.34: Urbanization rates 1950-2005 in selected Arab Countries



The role of economic factors and mainly the level and the changes that have taken place in total Gross Domestic Product (GDP), Agricultural GDP (AGGDP) and Industrial GDP (INDGDP) besides their respective variances (VarAGGDP and VarINDGDP) have been tested. The results (Driouchi, 2003) for the Arab World showed the strong explanatory power of the industrial GDP and its variance throughout years 1997, 1998, 1999 and 2000 (Table II.11).

Table II.11: Regression results for Middle East and North Africa (Arab World) (source: Driouchi, 2003)

Arab countries	R^2	N	Cst	AGGDP	INDGDP	Var AGGDP	Var INDGDP
1997	0.77	12	20.59 (tstat= 0.92)	-8.42 (tstat=-1.24)	15.24 (tstat= 2.00)	-0.59 (tstat=-0.30)	-2.14 (tstat= -0.76)
1998	0.87	12	2.68 (tstat= 0.16)	-1.25 (tstat= -0.25)	16.50 (tstat= 3.57)	-3.02 (tstat= -2.14)	-5.64 (tstat= -1.87)
1999	0.91	12	10.53 (tstat=0.76)	-3.09 (tstat= -1.03)	16.50 (tstat= 4.07)	-1.85 (tstat= -1.69)	-6.55 (tstat= -2.56)
2000	0.88	12	1.30 (tstat= 0.08)	-3.45 (tstat=-0.97)	20.08 (tstat= 4.04)	-2.38 (tstat= -1.58)	-7.17 (tstat= -2.19)

In comparison with other countries and regions, for the same period, urbanization appeared to have been driven positively by industrialization but negatively by agriculture (Table II.12).

Table II.12: Comparisons with other regions (source: Driouchi, 2008)

	R^2	N	Cst	AGGDP	INDGDP	Var AGGDP	Var INDGDP
Aggregate 1997-2000	0.58	106	20.11 (tstat=2.42)	-11.56 (tstat=-5.75)	15.94 (tstat= 6.31)	-0.27 (tstat= -0.30)	-1.59 (tstat=-1.25)
Arab Economies 1997-2000	0.88	12	1.30 (tstat= 0.08)	-3.45 (tstat=-0.97)	20.08 (tstat= 4.04)	-2.38 (tstat= -1.58)	-7.17 (tstat= -2.19)

EU 1997-2000	0.72	14	41.51 (tstat= 1.72)	-16.20 (tstat= -3.29)	13.61 (tstat= 1.91)	3.18 (tstat= 1.90)	-1.27 (tstat= -0.27)
Developing 1997-2000	0.48	82	15.66 (tstat= 1.66)	-11.59 (tstat= -4.63)	17.49 (tstat= 5.93)	-0.36 (tstat= -0.32)	-2.05 (tstat= -1.38)
Asian 1997-2000	0.78	12	-49.12 (tstat= -0.66)	1.90 (tstat= 0.13)	22.00 (tstat= 1.70)	-9.54 (tstat=-1.34)	-2.16 (tstat= -0.35)
Latin America 1997-2000	0.56	20	31.59 (tstat= 1.48)	-13.20 (tstat= -2.08)	17.58 (tstat= 2.88)	2.41 (tstat= 1.18)	-2.79 (tstat= -1.04)
Africa 1997-2000	0.50	23	25.81 (tstat= 2.80)	-11.46 (tstat= -2.88)	14.53 (tstat= 4.02)	0.97 (tstat= 0.59)	-0.43 (tstat= -0.30)
Developed 1997-1998	0.35	24	49.97 (tstat= 2.92)	-7.69 (tstat= -3.17)	7.34 (tstat= 2.46)	-0.55 (tstat=-0.69)	0.44 (tstat= 0.34)
1999-2000	0.28	24	54.70 (tstat= 3.73)	-8.83 (tstat= -2.44)	6.79 (tstat= 1.85)	-0.52 (tstat= -0.42)	0.83 (tstat= 0.46)
OECD 1997	0.55	27	27.88 (tstat= 2.54)	-14.10 (tstat= -4.15)	13.68 (tstat= 4.24)	-1.34 (tstat= -1.48)	-0.36 (tstat= -0.38)
1998-2000	0.22	27	49.31 (tstat= 2.69)	-3.84 (tstat= -1.05)	8.20 (tstat= 1.58)	0.85 (tstat= 0.71)	-2.16 (tstat= -0.91)

The role of cities in the process of development appears to be obvious from the above analyzes. Previous studies have confirmed this role. With a total population of more than 200 million and an average rate of urbanization above 60 percent, the Arab World occupies the second position among developing economies, after Latin America (M.Kharoufi, 2000). The same author distinguishes also between oil exporting countries that have limited agricultural base where the urbanization rate is above 70 percent and the other Arab countries that have larger agricultural endowments but limited or no oil resources. The high urban growth in the Arab World has induced further social investigations since 1970 with focus on economic, social and cultural urban topics (M.Kharoufi, 2000). Arab cities have been considered as areas of accelerated social transformations in the Arab World (M. Hafedh Sethom, 2000). This study points out the varieties of development of different types of Arab countries in relation to the types of urbanization. Low urbanization (10 to 25 %) for countries with large agricultural base with the persistence of traditional social practices and limited modernization is represented by countries such as Sudan and Yemen. Moderate urbanization (42-59%) is represented by Morocco, Algeria, Tunisia, Egypt and Syria where large agricultural practices and heavy traditions still operate. Saudi Arabia and Golf states with Jordan and Iraq have an urbanization rate that has been driven mainly directly or indirectly by the discovery of oil (66 to 94 %).

This part of the study has shown so far, the major link that exists between urban development (cities) and the overall growth and prosperity expected for each Arab economy. It has indicated the role of cities in driving the development process.

3. Evidence about the importance of knowledge, benchmarks and comparisons for Arab cities

Several studies focusing on knowledge have underlined several important deficits that have characterized the Arab World. Ali El-Kenz (2003) insisted on the low performance of the 132 Arab universities in relation to the production and diffusion of knowledge for development. The Arab World has important deficits in the areas production, use and diffusion of knowledge. Some important reasons rely on the limited budgets (0.2 to 0.7 % of GDP) allocated to research and development (R&D) and the reduced number of students pursuing scientific and engineering studies (5 % of total students). This is expressed in the number of patented innovations (less than 500 against 16228 for South Korea). The educational process based on memorization is also another reason for the overall deficit. The report on human development in the Arab World has emphasized series of facts about the state of knowledge in the region. The report emphasizes five pillars that could enhance the development of knowledge society in the Arab World. They are climate of freedom, quality education, and promotion of R&D, a production that is knowledge driven and the promotion of cultural values. These remedies are responses to series of deficits observed across the countries of the Arab World. These deficits are present in education, research, information technologies and others besides the limited involvement of women and illiteracy.

Table II.13: KEI and its components in some selected Arab countries (Driouchi & Djeflat, 2004)

Variables	*Morocco*	*Algeria*	*Tunisia*	*Egypt*	*Jordan*	*Syria*
GDP growth (%)	***3.2***	***3.8***	***4.6***	***4.3***	***3.9***	***1.7***
HDI	***0.62***	***0.7***	***0.75***	***0.65***	***0.75***	***0.71***
Economic Incentives						
Tariff and nontariff barriers	2	2	2	4	4	4
Property rights	0.02	-0.54	-0.02	-0.45	0.1	-0.97
Regulation	0.11	-0.54	0.27	0.09	0.33	-0.41
Innovation						
Researchers in R&D	0	0	331.47	492.82	1976	29.33
% of manufactured trade in GDP	13.67	5.41	25.06	18.33	43.04	3.8
Technical articles in scientific journals per millions of people	0.03	0	0	0.09	0.56	0
Education						
Adult literacy rate(age 15 and more)	50.73	68.86	73.17	56.2	90.9	82.89
Secondary enrolment	40.92	71.62	79.1	85.34	86.35	44.59

Tertiary enrolment	10.03	15.11	22.78	36.68	30.52	5.71
Information Infrastructure						
Telephones per 1000 (mainlines + mobile)	283.9	114.9	309.8	211.8	355.4	146.7
Computers per 1,000 people	19.9	7.7	40.5	21.9	37.5	19.4
Internet hosts per 10,000 people	265.57	159.78	637.01	393.31	833.91	129.1
Knowledge Economy Index	3.08	2.25	3.72	3.84	5.17	2.2

4. The Importance of the Knowledge to the Arab World Cities

Every city in the Arab World has its own characteristics. These include human resources, history, natural endowments, culture, infrastructure, schools, universities, enterprises and other public and private amenities. Cities in the same country are also assumed to be well differentiated. The problem is how one can distinguish between cities inside and outside the same country? How one can value differentiation as a source of wealth and prosperity in each city across the Arab World? How one can measure the levels of differentiation in order to promote development and therefore further competition?

The urbanization' increase has been also observed in developing countries. Oil exporting countries such as Kuwait, Saudi Arabia, United Arab Emirates (UAE), Oman, Bahrain and Qatar experienced important changes from 60 to almost 100 percent. Kuwait expressed an important jump from reduced urbanization in 1960 to around 96 percent in 2004. The urbanization rate in Oman changed from below 20 percent in 1975 to around 80 percent in 2004. Jordan showed a regular increasing trend from 50 percent in 1960 to around 80 percent in 2004. Syria pursued also a regular trend (with a YUT equal to 0.32) but at a lower rate of change compared to Jordan.

The second type of trend is exhibited by North African countries (including Libya and Egypt). In these cases, the moves were from around 30 percent in 1960 to 85 percent in 2004 for Libya, around 60 percent for Morocco and Algeria in 2004 (Fig.II.35).

Figure II.35- Arab countries: Evolution of urbanization rate 1960-2004 (source of raw data: World Bank computerized Database already used in Driouchi (2008)).

Low urbanization (less than 30% in 2004) for countries with large agricultural base with the persistence of traditional social practices and limited modernization is represented by countries such as Sudan and Yemen. Moderate urbanization (42-59%) is represented by countries of North Africa where large agricultural practices and heavy traditions still operate. Saudi Arabia and Golf states with Jordan and Iraq have an urbanization rate that has been driven mainly directly or indirectly by the discovery of oil (66 to 94 %).

Relationships between urbanization knowledge and competitiveness

Knowing that urbanization is also driven by population growth, different attempts are made below to see how knowledge, competitiveness and some of their components can be related to urbanization. The following regressions show the relationships between the urbanization rates in 2003 and 2004. They all indicate how knowledge and its components besides the growth of the population can be significant explanatory variables. These regressions are only valid for developing countries.

The relationships between competitiveness and knowledge (Driouchi, 2008) are statistically significant. They demonstrate that progress in knowledge leads to further advancement in competitiveness and thus creates better conditions for growth and development of each economy. Given the low performance of developing countries on the overall knowledge index and its components, larger opportunities exist for developing economies if knowledge is expanded. But since the major sources of knowledge are located in cities, advancements on this component imply higher chances for better urbanization. This is confirmed by the relationships estimated between urbanization and competitiveness (Driouchi, 2008).

As urbanization and competitiveness can be positively related with positive relationships maintained with the knowledge components, it is easily acceptable to claim that developing economies have important leverages included within the knowledge set. This implies that the promotion of education, research and innovation does promote competitiveness and generates urbanization that is supposed to be of better quality.

Urbanization is associated with population increase and urban expansions. Cities in developing economies appear to be lagging behind, in creation of better living conditions, because of the limitations observed on the creation, use and diffusion of knowledge. The analysis conducted in this chapter has shown the existence of possibilities for a better promotion of urban livelihoods through the acceleration of education, research and innovation. While this is possible with the existence of schools, research centers and industries in developing cities, difficulties reside in the absence of monitoring as an important part of enhanced governance of the knowledge process.

Urban executives and all city stakeholders in developing economies are invited to accelerate the processes of knowledge production, use and diffusion. They are also invited to monitor the progress and advancement of the knowledge components in each of the cities in every developing economy. While this monitoring exercise can directly be useful for urban planning and for promoting different industries of goods and services in different urban locations, it is also useful for the enhancement of the decisions related to universities, schools and research centers. Other effects related to the monitoring effort can also be viewed beyond the limits of the city and its region. They are more global because they can help with the overall situation of each country in relation to knowledge and competitiveness. The implementation of such features will require the creation of units that can initiate and monitor data collection and standardized analyzes for the promotion of the information needed for the characterization of the state of knowledge at least every year. The development of observatories of urban knowledge can be an important step in pushing further promotion of education, research, innovation and enterprise creation. These observatories can then get into larger cooperation with other cities in a given country but also worldwide. These networks of observatories can be in charge of contributing to standardization and exchange of instruments for the promotion and development of specific and global urban projects. These projects cover in general transportation infrastructure, the equipments for the provision of different types of utilities but have to cover more and more projects related to cultural heritage and local artistic endowments and enterprises.

At the same time, this can help with the creation of better living conditions in each city through using the outcomes of applied research and discoveries. Moreover, the expected growth of urbanization in the future leads to considering advanced knowledge that relates to the changes taking place in cities. The inclusion of the urban population segments that are in the peripheries of cities becomes a crucial task since it requires also the monitoring and anticipation of the growth of cities with the necessary needs of the populations. Urbanization with a humane component is the one that creates prosperity for all without implicit exclusion. These new tasks are to be embedded within the new urban planning and municipal policies and their implied managerial requirements.

Another positive impact resides in the fact that these conditions create opportunities for the promotion of tacit knowledge that is pervasive and occupies large shares in most traditional production and trading activities in developing economies. The identification, formalization and codification of part of this tacit knowledge are likely to contribute to product and service differentiation locally, at the regional levels and for export markets.

The above benefits are likely to be enhanced throughout the development of the knowledge monitoring systems in different urban locations. It is implicit that the system of city governance should be capable of following the new flows of knowledge that are needed in every step of the urban development process. This places a large burden on voters that should require and set

precise and innovative development programs with the appropriate means for their monitoring and evaluation.
The urbanization trend expressed in the Arab world shows the existence of new opportunities for the positive role of knowledge as driver of knowledge-based development. This role is likely to be expressed through the supply and use of knowledge for the benefit for the urban communities and the overall economies. The enhancement of level of knowledge use in cities is directly related to the level of enhancement of competitiveness of each city and its economy. Pursuing decentratlization policies is likely to mobilize the urban potential for larger access and attainment of higher benefits from local development.

The analysis conducted in this section has shown the existence of possibilities for a better promotion of urban livelihoods through the acceleration of adoption rates in each of the knowledge economy components such as education, research and information infrastructure. But, these processes have to be monitored by urban executives and all city stakeholders in developing economies. These continuously feed the processes of knowledge production, use and diffusion.

This monitoring exercise can directly be useful for urban planning and for promoting industries of goods and services in urban locations. This promotion is directly related to the enhancement of competitiveness that translates into increases in both direct foreign and domestic investments. It is also useful for the enhancement of the decisions related to universities, schools and research centers that benefit from larger incentives in promoting knowledge and contributing to higher competitiveness. Other effects related to the monitoring effort can also be viewed beyond the limits of the city and its region. They are more global because they can help with the overall position of each country in relation to knowledge and competitiveness.

With the growth of urbanization and with enhancement of knowledge, competitiveness is likely to be enhanced as they are major spillovers taking place between cities and their regions. North African economies (from Morocco in the West to Egyptin the East) besides Jordan, Syria, Lebanon, Mauritania, Yemen and Sudan have consequently more gains to realize as they are still under lower levels of urbanization in comparison with other Middle Eastern countries.

The above descriptions and analyzes have shown that there are promising avenues for further promoting the knowledge economy in the Arab world. This is well underlined when looking at both the global economies but also to localities and regions. But, how the major sectors of each of these economies have been responding to the knowledge economy omponents? This question is considered in the following third par of this report.

Part III: Knowledge Economy & Sectors

This part analyzes how the knowledge economy has been impacting different sectors of the Arab economies. This includes education with emphasis on its internationalization, the trends pursued in production and trade, in intellectual property rights and on the unemployment issue. It also focuses on the energy sector and the role played by Information and Communication Technologies (ICTs).

I. Skilled Labor & Internationalization of Education

This is analyzed from both mobility of students and movments of internationalization of universities in the Arab world.

1. Mobility of students to foreign developed countries

Commander, Kangasniemi and Winters (2004), emphasize that early models found that emigration of skilled labor would be harmful through the impact on wages, employment, and fiscal costs. They also showed that more recent literature has argued that a beneficial “brain gain” takes place under the effects of educational externalities. Marchiori, Shen and Docquier (2010) indicate that the movement of highly skilled human capital from developing to developed countries can have many positive effects. Brain drain improves human capital through ex-ante motivations to be highly educated, creates positive externality on total factor productivity by helping technology diffusion from the receiving countries, decreases information risks and triggers more foreign direct investment inflows (Marchiori et al., 2010).

However, the empirical findings of Beine, Docquier and Özden (2009) suggest that education-based selection rules are likely to have moderate impact. De la Croix and Docquier (2010) explore the complementarities between highly skilled emigration and poverty in developing countries through a model with human-capital accumulation, highly skilled migration and productivity. Their results show that two countries sharing the same characteristics can exhibit different impacts on poverty. Camacho (2010) uses a model with an economy composed of two sectors and two regions while allowing for skilled migration. The solution path attained converges to a steady state that exhibits a distribution of skills between regions but with no evidence of symmetry. The new steady state obtained depends on technology, fixed costs, knowledge spillovers and transportation costs.

Lodigiani (2009) provides stylized facts on the magnitude and skill composition of migration and explores the main findings on "brain drain". It focuses also on diaspora networks and on the major channels that foster economic development in source countries of emigration. Docquier and Rapoport (2009) contribute further to the literature through adding three case studies on the African medical brain drain, the exodus of European researchers to the United States, and the contribution of the Indian diaspora to the rise of the IT sector in India. The three cases are related to the "very upper tail of the skill and education distribution". Their effects on the source countries exhibit mixed results. These mixed types of results are also found in Beine, Docquier and Rapoport (2009).

The most recent empirical studies conducted under the Consortium for Applied Research on International Migration (CARIM) show that the North African countries with some other Arab economies are major sources of emigration to the rest of the world. For Morocco (Khachani, 2010), the emigration of highly-skilled labor has become significant. The paper indicates also that while emigration brings a net socio-economic gain at the individual level, it represents a loss from the macroeconomic perspective for the country of origin. Belguendouz (2010) recognizes also the extent of skilled labor expatriates from the experiences and policies devoted to create incentives to reverse the emigration trend. The study on Tunisia by Belhaj Zekri (2010) identifies the preliminary success of skilled Tunisians entering the Gulf countries labor markets. The study recognizes also the domestic difficulties in job markets and thus the emigration of skilled labor in Tunisia, even under new policies for retention and return.

Studies by Nassar (2010) insist on the role of education received by the skilled migrants in relation to the transfers in the case of Egypt. Migration benefits the country in terms of receiving education and medical services that result from migrants' remittances. Sika (2010) finds that highly skilled emigration patterns from Egypt, to the OECD and the Gulf, contribute positively to the development process of Egypt. But, Ghoneim (2010) views that the deteriorating Egyptian education system producing less qualified labor lead to increasing emigration as a result of excess labor supply.

Through series of surveys, Khawaja (2010) identifies further waves for skilled emigration from Palestine. The emigration of skilled labor is also recognized to be pervasive in Libya (Maghur, 2010). Algeria is also suffering from the emigration of skilled labor (Bouklia, 2010 and Labdelaoui, 2010). Olwan (2010) attributes highly skilled labor migration to the prevailing economic and social conditions in Jordan. The same trend is expressed by Syria (Marzouk, 2010 and Yazji Yakoub, 2010).

But, the new economics of skilled labor has identified potential gains that could benefit the source economy as emigration of skills can induce further quantitative and qualitative domestic training and graduation from domestic higher education systems. The overall net effects of the emigration and the domestic training and graduation is translated into a net effect that can be either "brain drain" or "brain gain" depending on the situation of each economy. This new type of literature has emerged following the contributions of Mountford (1997), Vidal (1998), Beine et al. (2003), Stark et al. (2005), Duc Thanh (2004) and M. Schiff (2005), among others.

Open economies with immigration are attractive since wages of skilled workers are higher than those prevailing in the source countries. According to Beine & al (2002), the human capital migration can be globally beneficial to the country of origin when the brain effect dominates the drain effect for the country of emigration. Stark et al., 2005 point to the fact that the prospect of migration may result in the formation of a socially desirable level of human capital. The expected higher returns to human capital in the destination country influence the decisions about the acquisition of skills in the country of origin (Stark, 2005).

But, most of the above contributions consider that those that emigrate possess already a skill or talent that can be considered in the emigration decision. Most of the literature recognizes that students constitute a large share in the emigration patterns. They will get the skills after emigration while they may stay in the country of destination or may return to their country of origin. Movements of students have been encouraged under financial incentives from destination or source countries but they have been accelerated under the development of trade in services where education is becoming an important area of exchanges.

1.1. Empirical Investigations

The number of foreign students in different developed economies has been increasing over the period 2000-2009. A large share of these students is in OECD countries.

	Algeria				
Countries of Destination	2005	2006	2007	2008	2009
Belgium	328	323	227	240	318
Canada	0	1932	2499	2769.57	3766.35
France	22228	21641	20125	18780	19171
Germany	473.68	446.64	428.95	350.82	354.82
Italy	84	84	123	119	134
Spain	199	98	249	314	485
Switzerland	474	395	352	264	244
United Kingdom	1306	1159	1202	898	756
United States	149.35	136.68	148.2	179.19	169.17
Total Students in OECD	25395.03	26365.32	25476.15	24066.58	25586.34

On the basis of OECD data, it appears that the Algerians students in tertiary education go basically to France with respectively 22228, 21641, 20125, 18780, 19171 in 2005, 2006, 2007, 2008, 2009 but this flow of students is decreasing in the five years contrary to Canada, where the number of Algerian students is increasing from 0 students in 2005 to 3766.35 in 2009, with 1932 in 2006 2499 in 2007 and 2769.57 in 2008. The United Kingdom comes in the third rank of destination countries with 1306 in 2005, 1202 in 2007 and 756 in 2009; the flow of students to this destination is decreasing as well. Spain is in the fourth place in 2009 with a total number of students' equivalent to 485, students flow to this destination was fluctuating from 2005 to 2009; total number was 199 in 2005, 98 in 2006, 249 in 2007, 314 in 2008. Germany comes after Spain in 2009 with 354.82 students, but it was before it till 2008; Algerian student in Germany were 473.68 in 2005, 446.64 in 2006, 428.95 in 2007 and 350.82 in 2008. In the sixth rank comes Belgium with a total number of 318 in 2009 more of this number was noted in Switzerland in 2007 the total number of Algerian in the country was 352; but Belgium was more attractive to Algerian students because this number has been increased in the time, 328 in 2005, 323 in 2006, 227 in 2007, 240 in 2008. On the other hand, student flow in Switzerland was decreasing approximately by the half; it was 474 in 2005, 395 in 2006, 352 in 2007, 264 in 2008, and 244 in 2009. The USA destination was in the 8eme place 2009 with 169.17 students, the flow to this destination is increasing; it was 149.35 in 2005, 136.68 in 2006, 148.2 in 2007, and 179.19 in 2008. Italy is well a destination of Algerian students they were 84 students in 2005, 84 in 2006, 123 in 2007, 119 in 2008 and 134 in 2009. The total number of Algerian students looking forward studying abroad still growing up in the time it was 25395.03 in 2005, 26365.32 in 2006, 25476.15 in 2007, 24066.58 in 2008, 25586.34 in 2009.

	Bahrain				
Countries of Destination	2005	2006	2007	2008	2009
Australia	183	210	256	253	234
Canada	0	210	213	209.2	207.73
Ireland	23	23	18	34	128
New Zealand	32	36.94	58.26	102.66	152.6
United Kingdom	1849	1858	1812	1865	1870
United States	393.76	386.24	400.66	394.42	423.91
Total Students In OECD	2581.76	2794.18	2835.92	2954.28	3122.24

The total students coming from Bahrain to OECD Countries was 2581.76 in 2005 to attain 3122.24 students in 2009. The main destination of these students is the United Kingdom with 1870 in 2009, besides 1849 students in 2005, followed by the USA destination with a total number equivalent to 423.91 in 2009, and 393.76 in 2005. In the third place of preferred destinations of Bahraini’s students is Australia with 234 students in 2009 and 183 students in 2005, then Canada in the fourth rank with a total number of 207 in 2009 and 210 in 2006. New Zealand and Ireland are as well targeted by these students, New Zealand with the fifth and Ireland with the sixth places respectively capturing a total student’s number of 152 and 128 in 2009 and 32, and 23 in 2005.

	Egypt				
Countries of Destination	2005	2006	2007	2008	2009
Australia	85	109	121	149	160

Austria	94	98	107	138	178
Belgium	73	72	65	54	131
Canada	0	1404	1539	2127.45	2863.3
France	886	926	862	1032	1190
Germany	2157	1909	1940	2104	2342
Greece	40	123	166	168	0
Italy	170	216	305	392	469
Japan	234	216	250	288	312
Spain	72	79	100	81	170
Sweden	44	38	33	99	151
Switzerland	131	127	163	163	203
United Kingdom	1761	2079	2715	3059	3210
United States	1643.99	1562.56	1700.79	1767.89	1883.53
Total Students In OECD	7619.99	9181.56	10298.79	11904.15	13628.92

The Egyptian students in tertiary education choosing the OECD countries as a destinations are in a number of 13628 in 2009 and 7619 in 2005. The main destinations of the Egyptian students are the United Kingdom and Canada; in 2009 the total number of students going to these countries respectively is 3210 and 2863 in 2009 comparing to 2079 and 1404 students in 2006. Other destinations are as well targeted, basically Germany and the USA with a total number of 2342 and 1883 in 2009 comparing to 2157 and 1643.99 in 2005. France comes in the fifth rank with an increasing flow; 1190 students in 2009 and 886 in 2005. Egyptian students choose other destinations such as Italy, Japan and Switzerland with respective flow equivalent to 469, 312 and 203 in 2009 comparing to this flow in 2005 with 170, 234 and 131. Austria and Spain are as well attracting Egyptian's students; the total number of students in 2009 was 178 and 170 and in 2005 was 94 for Austria and 72 for Spain.

	Iraq				
Countries of Destination	2005	2006	2007	2008	2009
Australia	40	30	30	72	118
Canada	0	387	447	548.46	574.43
Denmark	171	220	238	228	258
France	199	192	202	197	200
Germany	811	897	989	888	936
Norway	190	219	232	189	185

Sweden	408	311	228	239	410
Turkey	209	236	246	267	293
United Kingdom	1193	1429	1677	2084	2336
United States	148.31	196.74	267.79	307.32	353.1
Total Students In OECD	3912.31	4694.74	5257.79	5753.17	6410.12

Iraqi students in OEACD are raising, they were 6410 in 2009 and 3912 in 2005. The United Kingdom represents the main destination for these students with a total number in 2009 and 2005. Germany, Canada, Sweden and United States are targeted after the UK with an increasing flow; 936 in 2009 811 in 2005 for Germany, 574 in 2009 and 387 in 2005 for Canada, 410 in 2009 and 408 in 2005 for Sweden and 353 in 2009 and 148 in 2005 for the USA. Turkey, Denmark and France are as well destinations for Iraqi's students with a respective flow of 293, 258 and 200 in 2009 and 209, 171 and 199 in 2005. Norway and Australia they come in the ninth and the rank of destination with a total number of 185 students for Norway and 118 for Australia in 2009 and 190 and 40 respectively in 2005.

	Jordan				
Countries of Destination	2005	2006	2007	2008	2009
Australia	240	233	269	271	322
Canada	0	1092	1182	1300.76	1341.05
France	229	199	209	201	186
Germany	1524.77	1467.73	1358.55	1164.73	1296.58
Greece	65	242	237	229	0
Italy	144	146	159	0	144
Spain	52	96	106	99	124
Sweden	44	41	43	80	114
Turkey	167	166	185	202	171
United Kingdom	2736	2859	3232	2771	2871
United States	1832	1794.51	1764.16	1800.92	2188.44
Total Students In OECD	7346.77	8655.24	9067.69	8452.41	9166.18

Jordanian students are in a number of 9166 in 2009 and 7346 in 2005 in the OECD countries. The major destinations chosen by these students are United Kingdom, United States, Canada and Germany; where the total number was respectively 2871, 2188, 1341 and 1296 in 2009 however in 2006 it was respectively as well 2859, 1794, 1092 and 1467. Australia is attracting as well a part of the total number of Jordanian's students; they were 322 in 2009 and 240 in 2005, Greece is another European destination with a total number in 2006 equivalent to 229 students and 242 in 2006. In the mean time Jordanian students are targeting other countries such as France, Turkey, Italy, Spain and Sweden they were respectively in 2009 as follow: 186, 171, 144, 124 and 114, in other had in 2005 they were: 229, 167, 144, 52 and 44.

	Kuwait				
Countries of Destination	2005	2006	2007	2008	2009
Australia	147	191	232	240	264
Canada	0	381	420	525.87	496.55
Ireland	244	254	229	304	350
Slovak Republic	45	48	87	827	509
United Kingdom	1691	1865	2279	2472	3010
United States	1796.49	1763.45	1669.1	1824.95	1997.62
Total Students In OECD	4152.49	4701.45	5122.1	6391.62	6831.09

The Kuwaiti's students are present in OECD countries for higher education with a total number of 6831 in 2009 and 4152 in 2005. Main destinations of these students are United Kingdom, United States, Slovak Republic and Canada with a total number in 2009 for each country respectively equivalent to 3010, 1997, 509 and 496 besides 1865, 1763, 48 and 381 students in 2006. Far countries are as well targeted destinations such as Ireland and Australia where the Kuwaiti's students are represented with a total number of students of 350 in 2009 and 244 in 2005 for Ireland and 264 in 2009 and 147 in 2005 for Australia.

	Lebanon				
Countries of Destination	2005	2006	2007	2008	2009
Australia	225	228	247	264	251
Belgium	154	120	117	135	184
Canada	0	2865	2523	2394.23	2654.71
France	4695	5083	5391	5609	5254
Germany	1630.28	1816.47	1955.11	1939.85	2076.58
Italy	590	626	649	702	783
Spain	68	63	75	70	104

Sweden	38	51	59	105	120
Switzerland	189	204	222	278	310
United Kingdom	1335	1415	1530	1299	1250
United States	2130.72	2019.22	1892.94	1808.93	1793.04
Total Students In OECD	11360	14844.69	14996.71	14971.42	15042.81

International students from Lebanon available in OECD are reaching the number of 15042 in 2009 and 11360 in 2005. Most attractive destinations for these students are France, Canada, Germany, United States and United Kingdom where the number of total students in each country is respectively equivalent to 5254, 2654, 2076, 1793 and 1250 in 2009 however in 2006 they were as follow: 5083, 2865, 1816, 2019 and 1415. After the previous countries come other destinations such as Italy, Switzerland and Australia the respective flow of Lebanese's students in these host countries in 2009 is 783, 310 and 251, and in 2005 was 590, 189 and 225. Belgium, Sweden and Spain, are as well an attractive European countries for the Lebanese's students where the total number achieve respectively in 2009 184, 120 and 104 students and by 2005 they were 154, 38 and 68.

	Libya				
Countries of Destination	2005	2006	2007	2008	2009
Australia	54	57	64	76	114
Canada	0	411	411	648.77	567.33
France	246	223	228	235	245
Germany	496	539	479	411	407
United Kingdom	2837	2711	3667	3578	4613
United States	40.73	39.34	95.05	155.16	656.04
Total Students In OECD	4359.73	4520.34	5405.05	5549.93	6995.37

Libyan's students looking for studying abroad mainly in OECD countries achieved in 2009 a total number of students equivalent to 6995 and was 4359 in 2005. The first destination of these students is United Kingdom with a flow of 4613 students in 2009 and 2837 in 2005. Other basic destinations for Libyan's students are United States where the number of students was 656 in 2009 and 40 in 2005, Canada; where the number of students was 567 in 2009 and 411 in 2006, and Germany was attracting a number of students of 407 in 2009 and 496 in 2005. France and Australia are as well receiving Libyan's students with a flow respectively equivalent to 245 and 114 in 2009, this flow was in 2005 equivalent to 246 and 54.

	Mauritania				
Countries of Destination	2005	2006	2007	2008	2009
Canada	0	141	123	104.24	179.66
France	978	1079	1128	1119	1222
Germany	404	427	409	356	340
Total Students In OECD	1639.57	1957.23	1914.41	1850.3	2012.69

Students coming from Mauritania to OECD countries for tertiary education were in a total of 2012 in 2009 and were 1639 in 2005. The first destination for these students remain France with a flow of 1222 in 2009 and in 2005 was equivalent to 978, the second destination is Germany; where the total number of students was 340 in 2009 and it was 404 in 2005. The third destination for the Mauritanian's students is Canada with a flow equivalent to 179 students in 2009 and 141 in 2005.

	Morocco				
Countries of Destination	2005	2006	2007	2008	2009
Belgium	3687	3086	1783	1671	1813
Canada	0	5166	5421	5173.72	6067.32
France	29859	29299	27684	26998	27051
Germany	12785.54	13211.25	12463.99	10616.99	10396.51
Italy	776	813	1017	1207	1398
Netherlands	1448	1206	994	1178	1028
Spain	6064	6326	7110	7266	9167
Switzerland	857	773	715	659	669
United Kingdom	489	513	541	558	628
United States	1640.86	1555.31	1228.57	1133.21	1149.79
Total Students In OECD	57916.4	62275.56	59262.56	56825.92	59777.44

Moroccan students available in OECD countries for tertiary education are in a total number of 59777 in 2009 and they were in 2005 equivalent to 57916. Basic destinations for Moroccan's students are France and Germany with a total number of students in 2009 respectively equivalent to 27051 and 10396, where they were 29859 and 12785 in 2005. After these principals destinations comes other ones such as Spain and Canada; the repartition of students was as follow 29859 in 2009 and 6326 in 2006 students in Spain and for Canada they were equivalent to 12785 in 2009 and 5166 in 2006. More countries are attracting Moroccan's students mainly Belgium, Italy, Netherlands and United States, the flow of students in these countries is achieving respectively 1813, 1398, 1028 and 1149 in 2009 and in 2005 they were in a total number of 3687, 776, 1448 and 1640. Other destinations are as well targeted by the Moroccan's students; this is the case of Switzerland and United Kingdom; where the flow of students is reaching respectively 669 and 628 in 2009 besides 857 and 489 in 2005.

	Oman				
Countries of Destination	2005	2006	2007	2008	2009
Australia	479	491	559	522	546
Canada	0	300	279	347.75	315.14
New Zealand	98.74	201.6	245.28	306.14	313.46
United Kingdom	2200	2151	2512	3397	2352
United States	369.74	348.96	259.61	361.38	266.54
Total Students In OECD	3350.48	3633.56	4001.89	5074.27	3958.14

The Omani's students are choosing as well the OECD countries as destinations for the tertiary education; the total number of students noticed was 3958 in 2009 3350 in 2005. The main destination of Omani's students is United Kingdom with a total numbers of student's equivalent to 2352 in 2009 and 2200 in 2005, followed by Australia, where the flow of students was 546 and in 2005 it was 479. Other destinations are targeted by these students, such as Canada, New Zealand and United States with a respectively flow reaching a total of 315, 313 and 266 in 2009, this total was in 2006 as follow 300, 201 and 348.

	Qatar				
Countries of Destination	2005	2006	2007	2008	2009
Australia	149	169	167	122	117
Canada	0	132	141	113.16	110.36
United Kingdom	906	896	1078	1283	1737
United States	302.89	263.01	302.54	345.36	455.39

Total Students In OECD	1463.89	1554.01	1814.54	1994.52	2507.75

Students coming from Qatar to OECD destination for tertiary education are reaching a number of students of 2507 in 2009 and they were 1463 in 2005. The basic destination of Qatari's students is United Kingdom, where the number of students was of 1737 in 2009 and 906 in 2005, followed by the United States with a flow of students' equivalent to 455 in 2009 and 302 in 2005. The third and forth rank of destinations are obtained by Australia and Canada with respective total number of students of 117 and 110 in 2009 besides 169 and 132 students in 2006.

	Saudi Arabia				
Countries of Destination	2005	2006	2007	2008	2009
Australia	439	782	1244	1929	3676
Canada	0	1734	1602	2140.55	2587.24
France	127	100	208	263	403
Germany	145	172	189	184	238
Hungary	4	5	8	15	102
Ireland	24	23	21	56	118
New Zealand	106	163.76	213.72	334.56	739.2
Slovak Republic	28	24	36	94	170
United Kingdom	4525	5213	6265	7032	10280
United States	3169.97	3570.39	8060.36	9883.58	12452.97
Total Students In OECD	8740.97	11990.15	18062.08	22196.69	31180.41

Saudi Arabia export a good number of students to OECD Countries for tertiary education, they were 31180 in 2009 besides 8740 in 2005. Main Destination of Saudi's students are United Stated and United Kingdom, where the total number of students in these two countries is respectively as follow 12452 and 10280 in 2009 besides 3169 and 4525 in 2005. The third and fourth rank are kept by Australia and Canada; for Australia they were 3676 students in 2009 and 782 in 2006 , however they were 2587 in 2009 and 1734 in 2006 concerning Canada. New Zealand, France and Germany are as well targeted by the Saudi's students; the respective total number of students present in these countries was in 2009 equivalent to 739, 403 and 238, in 2005 they were 106, 127 and 145. The Saudi students are choosing as well Slovak Republic, Ireland and Hungary for studying where the total number was respectively as follow 170, 118 and 102 in 2009 and it was 28, 24 and 4 in 2005.

	Sudan				
Countries of Destination	2005	2006	2007	2008	2009
Canada	0	354	306	433.17	406.43
Germany	760	672	620	535	496
Sweden	44	63	60	98	137
United Kingdom	1224	1158	1252	1239	1288
United States	302.89	319.96	328.09	224.24	213.43
Total Students In OECD	2855.89	3091.96	3097.09	3050.4	3083.11

Students from Sudan choosing to study in OECD countries are representing a number of 3083 in 2009 and 2855 in 2005. The main destination of these students is United Kingdom with a number of 1288 in 2009 and 1224 in 2005. Other destinations are as well targeted they are Germany, Canada, United States and Sweden; where the total number migrating for study is equivalent respectively to 496, 406, 213 and 137, and for the year 2006 they were as follow 672, 354, 319 and 63.

	Syria				
Countries of Destination	2005	2006	2007	2008	2009
Canada	0	462	525	582.39	639.54
France	2323	2517	2618	2334	2252
Germany	2536.41	3130.55	3458.51	3548.6	3944.47
Greece	143	283	309	316	0
Italy	92	119	105	98	127
Spain	145	159	208	190	261
Turkey	291	279	264	260	291
United Kingdom	1119	1128	1340	1276	1292
United States	520.14	461.83	472.21	517.55	446.54
Total Students In OECD	7625.55	9018.38	9801.72	9657.54	9899.41

Syrian Students going to OECD countries for tertiary education were 9899 students in 2009 and 7625 in 2005. The main destination for them is Germany with total number of student's equivalent to 3944 in 2009 and 2536 in 2005; this destination is followed by France, the total number of students in this country was 2252 in 2009 and 2323 in 2005. United Kingdom comes in the third rank, where the flow achieved 1292 students in 2009 and 1119 in 2005. Far destinations are as well receiving Syrian's students such as Canada and United States with total number of student respectively in each country as follow 639 and 446 in 2009 and 462 and 461 in 2006. Greece represents as well a destination for these students, where the number of students in 2008 was 316 however it was 143 in 2005. Other destinations stay as a goal for Syrians' students they are; Turkey, Spain and Italy, the number of students interested in these destinations is increasing through the time 291 in 2009 and 291 in 2005 for turkey, 261 in 2009 and145 in 2005 for Spain, and 127 in 2009 and 92 in 2005 for Italy.

	Tunisia				
Countries of Destination	2005	2006	2007	2008	2009
Belgium	186	239	181	201	265
Canada	0	2316	2346	1890.48	2427.76
France	9750	10386	10533	10812	11177
Germany	3947.19	4649.25	5122.29	5171.51	5520.39
Italy	252	302	493	611	834
Spain	50	71	90	76	167
Switzerland	583	630	681	637	701
United Kingdom	160	169	219	213	220
United States	279.91	286.83	280.05	402.43	300.97
Total Students In OECD	15403.1	19242.08	20193.34	20269.42	21877.12

Tunisian's students are well available in OECD countries with the total number of 21877 in 2009 and 15403 in 2005. The main destination of Tunisian students is France where a number of 11177 students in 2009 and 9750 in 2005 is found, after this destination comes Germany and Canada this two countries received respectively in 2009; 5520 and 2427 students and in 2006 they received 4649 and 2316 students. Italy and Switzerland are as well attracting Tunisians' students, the total number students in these countries is respectively equivalent to 834 and 701 in

2009 and 252 and 583 in 2005. In the ninth and ten of destinations rank come Belgium and Spain with a flow of students achieving respectively 265 and 167 in 2009 and 186 and 50 in 2005.

	UAE				
Countries of Destination	2005	2006	2007	2008	2009
Australia	944	1002	1120	1184	1342
Canada	0	513	837	521.45	520.03
France	40	70	78	166	194
Germany	99	95	157	108	93
Ireland	134	85	132	176	242
United Kingdom	2693	3033	3220	3379	3889
United States	1209.49	1012.71	904.56	984.05	1197.98
Total Students In OECD	5266.49	5951.13	6604.44	6679.58	7676.79

Students coming from the UAE to OECD for tertiary education are representing a number of 7676 in 2009 and 266 in 2005. The main destination of Emirati's students is United Kingdom with the total number of student's equivalent to 3889 in 2009 and in 2005 it was 2693. Australia and United States are located in the second and third place as countries of destinations with the total number of students' equivalent respectively to 1342 and 1197 in 2009 and 944 and 1209 in 2005. Ireland and France are receiving each one a total number of 242 and 194 students in 2009 and 134 and 40 in 2005. Germany is a decreasing destination for Emirati's students the total number in 2009 was 93, in 2007 was 157 an in 2005 was 99.

	Yemen				
Countries of Destination	2005	2006	2007	2008	2009
Canada	0	201	195	318.12	324.1
Germany	432	540	676	787	946
United Kingdom	535	452	508	483	455
United States	248.58	254.73	253.48	233.24	244.9
Total Students In OECD	1446.58	1687.73	1850.48	2083.36	2281

The total number of students in OECD from Yemen was in 2009; 2281 persons and in 2005 they were 1446. Basic destinations of these students are Germany in the first rank with 946 in 2009 and 432 in 2005, in the second rank it is United Kingdom with 455 students in 2009 and 535 in

2005, followed by Canada in the third rank with 324 students in 2009 and 201 in 2006, and in the fourth rank it is United States with the total number of Yamani's students equivalent to 244 in 2009 and 248 in 2005.

Emigration Rates of Students from Arab and EEE countries' table is available in the Annex 7 (Appendices)

The above descriptive statistics are here completed with a regression model that investigates the main drivers of the mobility of students from Arab countries to foreign universities of developed economies. As developed in Driouchi et al. (2009) the analysis of the behavior of skilled labor may denote some degree of aversion towards risk that is not really taken into consideration by the literature on skilled labor migration.

Based on the data available on expenditures on education, GDP and relative wages (domestic versus foreign) in each country using world Bank data besides country risks as given by Euromonitor (June, 2012), emigration rates of students is used as dependent variable. The outputs show that relative wages are the most important drivers of the demand for studying abroad. These outputs are given in the following table where the R2 is 0.355 and 33 degrees of freedom.

Table III.1: Drivers of the mobility of students

	Coefficient	t-stat
Constant	8.991E-6	0.082
Log expenditures	-0.163	-0.958
Log relative wages	-0.661	-2.957
Log GDP	-0.054	-0.261
Log Risk	-0.126	-0.829

2. Internationalization of Higher Education and Positioning of Universities in Arab Countries

The trend of internationalization of higher studies concerns primarily advanced economies, but is recently evolving in developing nations. Countries in the Middle East and North Africa and also those in Eastern Europe have been largely concerned by the expansion of university activities from the developed nations. The actual relationship between the internationalization of higher studies and the development of knowledge economies enlightens the link between the internationalization of education as a main part of trade in services and the development of knowledge economy in different countries.

According to Altbach and Knight (2007), the main motivation behind the internationalization of education concerns a commercial advantage. The framework of the internationalization of higher education has been developed with the liberalization of economies, but primarily with the development of trade in services and the extension of privatization. The creation of international branch campuses, and cross border programs for internal students are the main initiatives undertaken.

According to C- Bert (2011), the number of international university campuses that are outside their country of origin amounts to 183 worldwide. Almost half of them are located in the United States of America (USA). And the other half goes to Australia and the United Kingdom. The major importers of these services are countries from Asia and the Middle East. One third is located in the United Arab Emirates (UAE). Besides that, other countries concerned by trading higher educational services are Canada, Malaysia, Belgium, France, Italy, Mexico, the Netherlands, Russia, South Korea, and Switzerland.

Miller and Hanauer (2011) centers their study on the international higher education in the Middle Eastern region with the recent opening of branch and offshore academic institutions that foreign universities have established in the region. Nearly one third of the branch campuses present worldwide are located in the Arab region. The authors focused in their study on the reasons behind the rapid expansion of the international higher education systems in the Arab countries and examine different theories in this subject.

Mahani and Arman (2011), in their report, have studied the effects of globalization in many fields, including tertiary education. Indeed, the growing international competitiveness, the willingness to attain superior ranking among global universities and the chase toward creating cross-border institutions are factors that had a significant influence on tertiary education programs and universities. Many universities worldwide react to these challenges by seeking the internationalization of higher educational programs. Over the last decade, the United Arab of

Emirates was mainly an importer of this kind of trade. However, recently, it is striving to become a leader in educational hubs in the Middle Eastern region. For many years, the UAE was mainly concerned with making education available and accessible to all students and offering them quality programs; however, today the UAE is working hard to become a world-class educational hub by inviting outstanding universities to establish their branches in the country.

Kinser et al., (2010) study the growing presence of private higher education centers worldwide, but focusing on case studies of Bulgaria, Chile, Dubai, Mexico, Kenya, Thailand, and the United states. One chapter in this study entitled: "Private Higher Education in Dubai: Growing Local Versus Importing Local Campuses" gives a general idea of the largest importers of international branch universities. The other chapter "The Private Nature of Cross-Border Education" discusses the global issues related to the internationalization of higher education.

Lane and Kinser (2011) examine the phenomenon of the internationalization of higher education as a more complex depiction of privatization. This report studies the concept of privatization through international initiatives, and claims that the full understanding of the public and private form of international universities requires the consideration of the relationship with the home and host countries. The study is based on an analysis of how governments in Qatar and the Malaysian state of Sarawak use foreign educational programs to achieve government objectives.

According to Becker, R, F (2009), Qatar is among the very active importers of foreign education worldwide. At present, Qatar disposes of nine international campuses namely from the United States, Canada, and the Netherlands. Qatar's main intention behind the importing of foreign education is to promote the educational, economic and cultural development of its young population. Among the actions pursued by the nation as to promoting the international of higher education, one could mention the creation of the Qatar foundation in 1995. The main objective of this foundation is to improve the quality of life of its nation through promoting the creation and sharing of knowledge (Qatar Foundation, 2010). One important project of the foundation was the establishment of Education city that offers prominent academic programs from six American universities. As stated by a representative of the Qatar foundation, Qatar is more concerned with the importation of specific programs that go along with the special needs of its nation. Such projects aim to give the opportunity to Qatar's citizens to have access to outstanding international academic programs.

As for the United Arab Emirates, a recent study by Mahani and Arman (2011) looks at the contemporary trends in the internationalization of higher education and studies the relative outcomes of this issue in the UAE. In their study, Mahani and Arman argue that the United Arab Emirates is making considerable efforts to become a leading education center in the Middle Eastern region. To achieve its end, the UAE is not only providing its citizens with quality education, but is also welcoming well-regarded institutions to build their branches in the country. Regarding the future of the emirates, and according to the Abu Dhabi Council, the UAE educational system suffers from a lack of coordination that affects the quality of education given to students. (2010), in this sense, the government considered a reform strategy that will place an investment of $1.3 billion in the higher education by 2018. This reform is intended to enhance research and coordination between universities as a way to facilitate the access and integration of graduates in the current competitive job market.

The UAE made considerable efforts to improve of the quality of its higher educational system through creating proper public facilities, attracting qualified faculty members, offering outstanding programs and many other actions that contributed to building a regional and international standing. However, the UAE higher educational system faces challenges when it comes to gathering the necessary funding needed to satisfy the increasing number of enrolled students. To deal with the current challenges, the UAE needs to consider offering new programs and disposing of additional institutional space in order to be able to achieve its objectives of social and economic development of the nation.

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Another study by Huggens (2011) focuses on the importance of the growth of Knowledge-intensive business services. The study underlines the positive relationship between the growing economic focus on knowledge and the expansion and development of Knowledge Intensive business services (KIBS). According to the above author, the expansion of KIBS contributes to extending the limits of globalization mainly through the establishment of new spaces of knowledge flows.

A study in China, by Zhang and Sonobe (2011) about the development of science and technology parks draws the important conclusion that the negative outcome of congestion can highly offset the positive outcome of agglomeration economies within the STIPs. The paper also reveals the fact that the high-tech companies' productivity is highly linked with foreign direct investments and also the academic activities of national universities.

S.Wilkins' study aims to identify the major stakeholders that might take advantage of transnational higher education in the Arab Gulf states and also determines how those stakeholders are currently benefiting from it. It was concluded that transnational higher education is crucial to the economic, social, and cultural advances of the Arab Gulf States.
A number of efforts and reforms have been undertaken in the subject of the internationalization of education in Arab countries. As a matter of fact, Lightfoot underlines the important ICT related education improvements mainly in Bahrain, Jordan, and UAE. It is deducted that there is a significant positive relationship between a successful implementation of ICT and the "knowledge economy skills". However, the study concludes that there is still a strong need for institutional reforms to reach the policy ambition instead of focusing on technology as a mean toward progress.

J. Knight (2004), focuses on the important changes that the field of internationalization has known recently, especially in the area of education. He actually focused on one recent development, Education hub. Knight argued that this concept is being used by nations that are concerned with building a center of education that combines both local and international parties, including students, education universities, companies, knowledge industries, science and technology centers. It is argued that nations have different priorities, purposes and adopt different strategies to become a well-known center for higher education brilliance, expertise, and economy.

Many educational reforms have taken place since the internationalization of education. In fact, Lightfoot (2011) studies the development and implementation of ICT as a mean to enhance the quality of education offered to students. The relationship between ICT and the development of knowledge economy skills is clear in the course reform policies of three countries in the study. A number of reviewers have pointed out the fact that to be successful participants in the knowledge economy, many ICT reforms need to be adopted such as, the development of e-learning in and outside classes, and to assist students in developing ICT skills.

Tahar Abdessalem (2011) examines the case of Tunisia concerning the allocation of funding necessary to finance higher education. Over the years, Tunisia placed important investments to finance education, especially through public funding. Though, lately, Tunisia starts facing some challenges hindering the process. In fact, the number of student enrollment as well as the difficulty to gather the necessary budget represented a challenge for Tunisia. Thus, the need for a public policy is unquestionable in order to find ways to enhance quality of education, and at the same time minimizing related costs. This article studies the spending of Tunisia on higher education relative to its quality and effectiveness. Also, the paper looks at the challenges facing the financing and the strong need for education of a higher quality. Finally, the paper analyzes some approaches that will eventually support and increase financing, and studies some ways that will rise private funding.

Kabbani and Salloum's study (2011) discusses the issue that the outcomes of the efforts made by the Syrian government for the sake of enhancing both the access to education and equity over the past ten years. The article says that significant progress has been achieved in terms of enhancing access to superior education. In this context, the number of students enrolled in universities has doubled over the ten last years. Concerning equity, the gender gap in both student enrollment and achievement has vanished. Fahim and Sami (2011) claim that in order to overcome the potential challenges faced toward the financing of higher education, Egypt has no other alternative than to look for different ways to rise funding. This article identifies the means by which funds will be raised and making sure to keep fair access to education with good quality for people who cannot manage to pay for schooling. First, this paper evaluates the respective spending on higher education in Egypt, relative to its effectiveness. Then it moves to examine the consequences of demographic changes on the demand for quality education, and also on how the financing of higher education will be impacted by the private provision. Finally, the article proposes new strategies that will eventually solve the problem faced concerning the financing of higher education in Egypt.

Galal and Kanaan (2011) on financing higher education in the Arab region, consider the idea that higher education contributes significantly to the present knowledge economy. In fact, its contribution consists in offering skilled and competent employees to the labor market who will contribute to economic development. Thus, one could say that higher education is a measure of a country's development level. Placing high investments in higher education allows developing countries learn from the developed ones and have the opportunity to compete at the international level. In the present world, where innovation, globalization, and rivalry govern, the wealth as well as the opulence of nations is mostly determined by the quality and quantity of their human assets. That is to say, globalization will be benefiting only countries with competent talents.

Lightfoot (2011) claims that in 2010, the number of students enrolled in higher education programs, in the Arab region, has reached six million students, an increase of 66 percent over the last decade . Although the general growth rate is slowing, countries such as Syria and Morocco still faces an increasing demand for higher studies. The increase in the demand transformed higher education since it serves a wider cross-section of society. Despite the evolvement of the Arab region countries, the demand for university graduates is not increasing in the majority of countries. In fact, the supply does not cover all the fields and is instead concentrated in some restricted ones, such as Humanities and Social Sciences and in Engineering and Construction. In order to be able to meet the needs of a knowledge-based economy and also attain the objectives for economic advance, the necessity for a diversified set of tertiary studies is indisputable. A number of universities respond to this issue by offering some diversified programs including technical and professional studies.

It is also argued in the chapter that for nations whose tertiary education systems do not meet the high demand necessary for the economic development and progress, the internationalization of higher studies is a good opportunity that can positively influence their economies. This is achieved through the mutual exchange of concerned parties, including students, faculty, and also academic programs.

The most universal form of international mobility of tertiary education consists of partnerships between universities and institutes of higher education. This kind of joint ventures goes hand in hand with the mobility of both students and academic programs. Though, profit-making international institutes have a significant role in the Asia Pacific, and are now emerging in the Arab region, where they take the form of franchising. Currently, the Arab region disposes of forty branch campuses, representing a percentage of 35 percent of the overall campuses present worldwide.

Regarding student mobility, it has increased significantly over the last two decades. At present, more than three million students enrolled in higher studies continue their studies outside their home countries. As for the outbound mobility, students, when choosing the country in which they will pursue their studies, their decision is determined by a number of factors including the language of the host country, history, culture, perceived economic return, and immigration policy. Students from the Arab region often choose France. The latter hosts nearly 30% from them, followed by the US (11%) and the UK (9%).

The International student mobility has increased significantly over the past decades. Bessy (2007) discusses at first some empirical evidence on international student mobility to Germany which represents one of the most attended destination countries worldwide. Unlike previous researches attempting to explain the internationalization of higher studies as a form of international trade in educational services, Donata's article uses a different approach that analyzes student mobility as a form of migration. The results of the study demonstrate the importance of distance. It is argued that the importance of disposable income in the country of origin is not too big for students, and student flows are significantly lower in countries with political restrictions.

González et al. (2010) in their study on the determinants of international student mobility (2010), show that the Erasmus student migrations have attained a significant level of two million ever since 1987 especially with the expansion of the program to the Eastern Region. Later on, the student flows have had a hard time to follow the same rate. Within this framework, the article investigates the determinants of Erasmus student migration using a number of hypotheses resulting from the migration theory and gravity models. The results of the study suggest that the most important determinants consist of country size, cost of living, distance, educational background, university quality, the host country language and climate.

Kondakci (2011) examines student mobility using a two- dimensional framework in order to figure out the logic behind in-bound student migration in the specific case of Turkey. The outcomes of the study say that private rationales are the most significant for students in public universities of Turkey. On the contrary, economic and academic rationales are proved to be the most significant for students from Western and economically developed countries. The study proposes three approaches that would help to understand the position of the countries in the periphery in international student mobility. The first approach consists of the nature of cultural, political and historical proximity between the country of origin and the host country as a determinant of the in-flowing student mobility, for developing countries. The second one says that for developing countries, private rationales are showed to be more significant than public ones. Finally, the study says that regional hubs are starting to attract a number of students originating from other countries of the periphery.

Teichler (2009), in his article on the internationalization of higher studies defines "Internationalization" and "Globalization" as two different concepts with different meanings. The author suggests that student mobility is the most prominent component in Europe with ERASMUS program as the major system of provisional mobility. The author also evoked the "Bologna Process" as an initiative aiming to attract students from other parts of the world toward higher studies and to ease the intra-European mobility.

Mau and Büttner (2010) identify different forms of "bottom-up" transnational activities in the European region. First, the authors start by a depiction representing the infrastructure of transnational interconnection in Europe, both the networks of transport and communication, which are viewed as enabling factors of transnationalisation. The results of the research demonstrate the high and increasing degree of interactions across national borders, which are causing the present degree of pan-European connectivity in the daily life.

Narayan et al. (2005) look at the short-run and long-run factors behind the migration from Fiji to Australia in the period between 1972 and 2001. The results show that the prominent long-run determinants consist of the real wage differential and the political instability in Fiji. Conversely, in the short-run, lagged migration and political instability are proved to be the most prominent determinants.

Soon (2012), looks at the determinants of the country of destination from a sample of students in New Zealand universities in order to figure out the directions of emigration upon completion of studies. They actually consist of the initial return intention, family support, and length of stay in New Zealand, work experience, and level and discipline of study. Other factors mentioned are the work environment, the opportunities of applying the learned skills, the lifestyle, and the family binds.

A recent study by Hamilton et al. (2012) looks at the particular issue of natural sciences Doctoral attainment by foreign students at U.S. universities. The authors analyze the issue of highly-skilled migration through the sixty thousands foreign students with natural sciences doctorates in the period of 1980-2005. The results reveal that highly-skilled migration paradigms related to natural sciences doctoral studies at US universities become free from political control with the end of the Cold War, allowing U.S. universities to become the principal suppliers of miscellaneous and gifted doctoral students for the U.S. scientific labor force.
The universities that have been opening campuses in Arab countries are introduced in the Annex 8 (Appendicies)

This section has shown that both movements of students and of universities are developing in the Arab economies. This is a way of further opening these economies to internationalization of higher education.

But, in order to account for the development of the knowledge economy in the Arab economies, other conditions are needed. The following parts describe the issues related to intellectual property rights, employment, production and trade besides ICTs and energy with their relationhips to different components of the knowledge economy.

II. Intellectual Property Rights, Innovation and Knowledge Economy in Arab countries

Nowadays, access to knowledge economy as well as progress in this area is continuously assessed by the expansion of the Intellectual Property Rights (IPRs) in any economy. This shows how a country protects the rights to innovation through patents, copyrights, geographical indications, models, labels and other distinctive measures.

In practice, every economy has developed domestic institutions that are in charge of enforcing and monitoring IPRs.

1. Influence of domestic and other institutions on IPR development

David (1992) investigates the historical evolution of Intellectual Property Rights (IPR), and traces the present state of modern IPRs. The advancement in technologies and the importance of research and development made the product life shorter and made it very easy for engineers to copy innovative ideas from competitors. This drove companies to care more about ways to protect its innovations in all fields. The current spirit behind the concept of IPRs is more lucrative and utilitarian. It is based on defending rights of collecting money coming from innovative works. However, the historical sense of IPRs was that the innovators get credit for their work, but then everybody could benefit from the scientific or technological advancement.

Hatipoglu (2007) aims at building a theoretical framework that integrates the relationship between multinational companies (MNCs) and host governments. Hatipoglu (2007) builds up onto two hypotheses supporting the fact that governments' evasion from their commitments on IPR protection is greatly affected by the nature of their political system and their institutions that sort out the society's demands. Furthermore, Hatipoglu (2007) suggests that the conceptualization of knowledge production is subject to interest conflicts between the MNCs and the host government. Evidence from Hatipoglu (2007) asserts that domestic institutions and political systems are important components of foreign investors' evaluation of the government commitment to IPR protection. In fact, it is stated that MNCs are more likely to favor IPR protection commitments by countries that are less democratic and are initiating development, which is due to less economic growth and thus, less public pressure concerning consumption and satisfaction.

Sinha (2007) studied the influence of the World Trade Organization (WTO) on the "institutional development and policy responses" in India as an example of the level of international organizations' influence on the way the country internationalize. Policy makers and societal groups are under this influence going to either push towards more globalization in some domains or towards less globalization in others.

According to Sinha (2007), the rules and regimes of global trade have a great effect on states, bureaucratic politics, and political institutions. For example, the international organizations may influence the country towards more costs for international trade, and the domestic organizations may respond by influencing towards reducing those costs.

Globalization is composed of many aspects and dimensions; each of which influences the countries in a different manner. International trade streams and changes in international prices do not exhaust global pressures, yet they are interceded and refracted by international institutions. Usually, the consequences of global regulations might oppose the incentive forecasted by global markets (Sinha, 2007).

Aboites & Cimoli (2004) show that the analysis of, the Mexican innovation system and the industrial information, is crucial to setting up a new intellectual property right framework. They try to frame the IPRs system in Mexico through the analyses of patents considering various patents systems. Besides, the new IPR framework and the recent economic and industrial reforms in Mexico do not encourage the development of Mexican technologies. This point is especially relevant to trade liberalization because of the unfavorable mechanisms for the diffusion of innovation within the system. Hence, the use of patent as an instrument to analyze this new framework is inappropriate. Patents represent a weak motivation for local invention and dissemination of innovation as it is biased against local efforts of research and development. It is also argued that incentives to innovate and incentives to open trade create even greater adverse methods of innovation diffusion within the system (Aboites & Cimoli, 2004).

2. IPRs and Domestic Institutions per Country

The institutions and mechanisms related to the protection of intellectual property rights are described below with regard to national and international regulations and agreements. The situation in different countries is described below country by country.

Morocco

- ***Importance of IPRs:***

Intellectual Property Rights are important to Morocco since they protect and prevent from piracy, counterfeiting, and hence give more credibility and reliability to the country's trade conventions. Morocco has a membership with several trade conventions with the European Union and several single states that expect the protection of intellectual property as a guarantee for a smoother trade exchange that may not harm technology advancement in the concerned countries by means of piracy. Protecting IPRs helps linking inventions with trade, industrialization and cultural innovation. Also, it encourages Foreign Direct Investments since IPR is a pillar of trade conventions with many countries such as France. The French Senate stresses on the protection of Intellectual Property in Morocco as to encourage French investments. The Agadir Free Trade Agreement (Morocco, Tunisia, Jordan, Egypt, and USA) stresses also on the enforcement of stricter laws concerning IPRs in Morocco and every other Arab country.

- ***The importance of the links between research and production of new innovations:***

Although Morocco is one of the countries in Africa that allocate the largest percentage from their GDP to research, it only allocates 0.79% from its GDP. According to the WIPO, "Promoting, encouraging and rewarding efforts of creativity are the main reasons for establishing IPRs." In 1998, OMPI launched a Section for promoting inventions by matching those to industry in order to concretize them for the sake of development. Morocco has expressed its interest in this program.

Morocco has several research institutions:

The CNCPRS: this is a public institution that has a legal personality and financial independence. It was established on 5 August 1976 to develop, direct and coordinate research. Its powers are numerous and varied,

Institut Universitaire de Recherche Scientifique (IURS): originally set up in 1962 as Centre Universitaire de Recherche Scientifique (CURS), and then renamed in 1975. The Center's publications include some twenty makhtoutats on literary and historical subjects, these periodicals include the Revue de la Recherche Scientifique, Revue de Géographie du Maroc, Les Signes du Présent, Hisperis Tamuda, and Le Bulletin Économique et Social du Maroc,

Government agencies: Examples are the Institut National de la Recherche Agronomique (INRA) (national agronomic research institute), Bureau des Recherches et des Prospections Minières (BRPM) (mineral surveys and research bureau), and the Laboratoire Public d'Études et d'Essais (LPEE) (public research and testing laboratory),

Semi-public agencies: The most important is the Office Chérifien des Phosphates (OCP) (phosphate control board), which has its own phosphate research centre, known as CERPHOS.

Morocco's research sector has significant assets, including a human potential made up of qualified researchers and numerous, fairly well-equipped research centers. The sector is marked by the following characteristics: research is mostly carried out in institutions of higher education and in a few public boards and institutes. The private sector invests practically nothing in innovation. University research is mainly oriented towards training and the earning of degrees. In most such work, application of the results is not a concern. There is no system for evaluating research, even in research institutes. There is no structure for funding and managing research. The bodies supposedly responsible for coordination have neither hierarchical authority nor budgetary control and there is very little collaboration between the research and production sectors.

The BMDA (Bureau Marocain des Droits d'Auteurs) has an important role in dealing with IPRs in Morocco: Registering and managing Moroccan Intellectual Property Rights inside and outside the country and organizing awareness campaigns about IPRs are the main functions.

The partners in Trade (U.S. and E.U.) are imposing stricter enforcement of IPRs. According to U.S. Department of Commerce, about Free Trade Agreement with Morocco, "industry has expressed a high level of satisfaction with the IPR provisions of the Agreement. U.S. industry calls the Agreement's IPR chapter, "the most advanced IP chapter in any FTA negotiated so far" and "a precedential agreement for future FTAs." Morocco has agreed to protect IPR to a degree unseen in many other developing countries. Some of the highlights for enhanced copyright, trademark, and patent protection and enforcement".

Algeria

Computer and software piracy are the two most common forms of piracy in Algeria. Intellectual property rights are very important to the Algerian government since they prevent it from losing money in the form of taxes. In other words, "piracy deprives local governments of tax revenue, costs jobs throughout the technology supply chain and cripples the local, in-country software industry." Not only at a national level will IPRs be efficient, but also at an international level. Actually, since IPRs aim at reducing the level of piracy in Algeria, it will have a positive impact on other countries as well such as the US. With IPRs, the piracy rate will decrease which will stimulate the Algerian economy hence generating government revenue. IPRs are very important in the sense that they allow people to innovate effectively, which will in return facilitate many tasks including getting credit and reward for the work achieved. IPRs permit punishing people who steal others' work and participate greatly in creating jobs.

According to Rodrik (2000), people do not have the motivation to innovate and accumulate knowledge unless they possess ample control over the return to the assets that are thus produced or enhanced. The keyword here is "control" rather than "ownership". Formal intellectual property rights do not matter much if they do not confer control rights. For this reason, there is an institution that deals with IPRs which is called Abu-Ghazaleh Intellectual Property Bulletin (AGIP). The Algerian government adopted new laws in July 2003 for copyright and related rights, trademarks, patent and integrated circuits. Also, Algeria is a signatory of the Paris Industrial Property Convention on Copyrights, the Berne convention for the protection of literary and artistic works. Moreover, Algeria is a signatory of the Madrid Arrangement and Lisbon Agreement for the protection of appellations of origin and their international registration. As of May 2005, Algeria intended to ratify the 1996 WIPO Copyright Treaty (WCT) and the WIPO Performance and Phonograms Treaty (WPPT) during the course of 2005. Patents, copyrights, trademarks and integrated circuits are currently protected under 2003 laws, industrial designs and models under 1966 laws and appellations of origin under 1976 laws. The Government introduced a new order on July 15, 2002 (article 22 of the Customs Code) which seeks to stop the entry of counterfeit goods at ports and borders.

Regarding software piracy, there are also some actions that are undertaken by the Algerian government. To stop the use of non-licensed software within government and other public entities, the Prime Minister circulated a February 2005 directive to prevent government use of pirated software and initiated a formal software licensing process through procurement channels. The National Algerian Institute for Industrial Property (INAPI) administers patents, trademarks, integrated circuits, appellations of origin, design and industrial models, and geographical indicators. The National Copyright Office (ONDA) administers copyrights and related rights.

While the legal framework for IPRs has improved, the enforcement of these rules is still generally inadequate due to the lack of public knowledge about counterfeiting and a lack of training in the customs services and the judiciary. Few foreign firms have sought legal recourse, which would require establishing the patent, trademark, or copyright in Algeria before filing suit. As a result, counterfeiting is common, especially in cosmetics, automotive aftermarket products, computer hardware components and software, some consumer and food products and even medicine. In software, only an estimated 20% of users pay licensing fees. The Business Software Alliance estimates software piracy in Algeria to be 84% (2003 data). (For comparison, the BSA estimated software piracy in Morocco and Tunisia to be 73% and 82% respectively.) According to Algeria's ONDA, the piracy rate for music and video works on cassette is about 37%, and has been estimated to be 87% for CDs. Solid piracy statistics are difficult to gather.

Some results of the initiatives taken by the Algerian government were that in 2004, more than 10 informal marketplaces were replaced gradually by authorized public markets. The same year, 100 counterfeit claims were registered, half of which were brought before the courts. The anti-counterfeiting office within the Ministry of Commerce operates through seven regional offices. To reinforce inter-agency cooperation, the ONDA has prepared a draft decree proposing the creation of an inter-agency National Council on Counterfeiting and Piracy with representatives from Customs, Police, and the Ministries of Commerce, Interior, Justice, and Finance, among others.

The government of Algeria is working with U.S. firms in Algeria, the Business Software Alliance and the U.S. government to reduce the rate of counterfeiting in Algeria through seminars and specialized training programs for judges and customs officials. In 2004, a private "business protection group" led by major U.S. companies in Algeria and other foreign firms was created to fight counterfeiting. The government adopted a new directive in July 2003 to define the conditions of competition practices in the market and prohibit restrictive practices.

Created in 1995, the Competition Council continues to play a role in the regulatory system. Reporting to the Head of Government, the group makes proposals and recommendations, including provisions for sanctions, to maintain a competitive market system. The Council also regulates prices for some goods and services that are considered strategic (such as prices for bread), but otherwise allows prices to be freely determined by market forces. Energy prices will eventually be freely set by the market over a gradual period, beginning after the passage of the hydrocarbons reform in 2005. In other sectors, such as telecommunications, Algeria is moving toward a more transparent regulatory system. Regulation of the health sector, particularly pharmaceuticals, is not transparent.

Tunisia

- ***Importance of IPRs:***

The adoption of a strong legislation to protect IPRs in Tunisia is important, for it allows the country to engage in Trade Agreements with other countries. For example, the Free Trade Agreement between Tunisia and the EFTA States (Liechtenstein, Switzerland, Norway and Iceland.) stressed on the protection of Intellectual Property Rights as a pillar for the trade contract. A reliable legislation protecting IPRs and covering areas including patents, copyright, industrial designs, undisclosed information and geographical indications is an important criterion for investors.

Enforcing IPRs in Tunisia and the Maghreb in general would help the local economies and particularly Small to Medium Enterprises (SME) to benefit from new inventions. According to the Commercial Development Law Program CDLP initiated by the US Department of State in the Maghreb including Tunisia, Maghreb scientists and engineers are inventing a significant number of new products/technologies/processes with strong potential to aid the local economies. CLDP experts advised on how to assess commercial value and how to evolve a professional network of patent lawyers, technology brokers, and financiers who can help bring inventors to market. Trainers stressed the importance to local economies for IPR protections.

Research found that a good IPR (Patents and Copyrights) legislation is positively correlated with Foreign Direct Investments, imports, and GDP. Tunisian economy should benefit from a sound protection of IPRs that helps settling a reliable judiciary environment for the establishment of foreign investments as well as benefiting from the local inventions.

- ***The importance of the links between research and production of new innovations:***

Tunisia made huge investments in Higher Education since 1987. The number of students increased from 44,000 in 1987, 415,000 in 2007 with 11% of students majoring ICT. In 2008, more than 1.2% of the GDP is devoted to research with more than 20 institutions, 6 technological parks (4 more to come) and more than 150 laboratories, 500 research units. In total, there are 27000 researchers (16,500 equivalent full time researchers). Research enhancement in Tunisia is motivated by the concern to face globalization, competition in various domains such as textiles, olive production, as well as using new inventions to boost the Tunisian industry. Many problems are targeted like waste products: olive oil, chemical fertilizer out of phosphate which gives an added value to the local industry.

- ***The introduction to the area of new technologies:***

Tunisia is incorporating information technology in every aspect of its economy. Much like the rest of its macroeconomics policies, this ambitious project involves the restructuring of the sector, the reinforcement of the infrastructure and the introduction of new technologies to meet the growing demand for diversified communication services.

The Euro-Tunisian cooperation policy stresses the implementation of the guidelines on the information society in the 2002-2006 national development plan. It also expects the promotion of the use of new communication technologies by business, public administrations, citizens, and in the health and education sectors (e-business, e-government, e-health, e-learning).

- ***The importance of domestic institutions in managing different stages of these processes (research, production, innovation...):***

The different domestic institutions dealing with IPRs are the Organisme Tunisien de Protection des Droit d'Auteur (OTPDA), The ‘Institut de la Normalisation et de la Propriété Industrielle’ (INNORPI) that belongs to the ‘Ministère de la Culture et de la Sauvegarde du Patrimoine’. Copyright Tribunal and Industrial Property Tribunal are executive institutions to enforce the regulations. Besides, the ‘Faculté de Droit et des Sciences Politiques’ is the only educational organism teaching intellectual property rights law. Their importance in protecting IPRs is not only in its enforcement aspect, but also in organizing awareness campaigns about the intellectual property. For example, the INNORPI gives firms a guide of about 40 million rights of invention to prevent from conflicts. It also organizes reconciliation meetings to solve problems when an invention opposition occurs. These institutions coordinate and register research and give licenses for production.

- ***The role of partners in helping with the strengthening of domestic institutions (for IPR management):***

The partners in helping with the strengthening of domestic institutions for IPR management are mainly educational partners to disseminate and build awareness in universities and scientific research centers for industrial usage. The Euro-Tunisian action plan for cooperation expects disseminating research results to all potential users, develop a “patent culture” and set up intellectual property offices in technology parks and universities, including support for the introduction of a doctoral-level course in intellectual property law in the framework of the Agreement on Scientific and Technological Cooperation.

Egypt

The intellectual property system in Egypt is not a strong system compared to other countries as it is ranked 40 over 100. The legal regime regarding patents and trademarks is similar to that of England, and registered owners of intellectual property are provided with adequate protection. Egypt is a signatory of the Paris Convention of the Protection of Intellectual Property and the

Madrid Agreement regarding international registration of trademarks. Furthermore, Egypt is a member of the World Intellectual Property Organization (WIPO).

Though Egypt is a signatory of many of the international intellectual property conventions, intellectual property rights (IPR) protection was well below international standards until 2002. In 2002, Egypt took important steps to strengthen its IPR regime through improvements in its domestic legal framework and enforcement capabilities. In May 2002, Egypt passed a comprehensive IPR law to protect intellectual property and to attempt to bring the country into line with its obligations under the World Trade Organization Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). The law addresses IPR protection in areas such as patents, copyrights (with enhanced protection for sound and motion picture recordings and computer software), trademarks, geographical indications, plant varieties, industrial designs, and semiconductor chip layout design. With respect to certain violations, the law stipulates higher fines and prison sentences for convicted violators. Although the law has certain shortcomings, its passage demonstrated a marked improvement in Egypt's IPR regime, offering protection for the first time for several types of intellectual property. The Executive regulations dealing with patents, trademarks, and plant variety protection were issued in June 2003. Regulations protecting copyright and related rights were issued in June 2003[1].

A committee was formed at the Ministry of Commerce and Supply to draft a unified act to govern all elements of intellectual property. The new act is to include the existing laws concerning copyrights, models, industrial designs, patents of invention and trademarks. In addition, the act will extend protection period for industrial designs and models to a renewable period of ten years. It will also provide for substantive examination of the model, design or patent to ensure that it is novel and innovative. The proposed act sets severe penalties for intellectual rights infringement[2].

Egypt has the challenge of developing a dynamic and modern knowledge based society. This is shown inside the UNDP's Human Development Reports. The challenge also calls for concrete actions and initiatives to facilitate the production, accumulation, dissemination and use of

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[1] http://commercecan.ic.gc.ca/scdt/bizmap/interface2.nsf/vDownload/IMI_4577/$file/X_7810136.DOC
[2] http://www.infoprod.co.il/country/egypt2d.htm

knowledge in the region, notably through effective R&D and Innovation systems. This was further confirmed in the recent "Egypt Human Development Report" published in February 2006.

Universities constitute the main scientific research entities since research activities are carried out in public sector institutions. Egypt signed an agreement for scientific and technological cooperation with the European Union in June 2005. But one of the most limiting factors for innovation in this economy is the few direct links between research and industry. Few innovative practices exist in the industry with the absence of systematic support for innovation.

The European Union will provide support to the Egyptian authorities in order to help them meeting the "knowledge" challenge through the EC R&D Framework Programs. More support will be provided through the progressive integration of Egypt into the European Research Area (ERA). The government of Egypt jointly with the EC will establish an innovation fund that aims at the diffusion of innovation practices, through pilot actions, to the industrial production[3].

The scientific research and innovation in Egypt are complex systems where devoted resources are modest. The estimates show that less than 0.1% of GDP was allocated in 2003/2004 by the state budget to this sector. The public sector has recently begun to make efforts to develop innovation activities, but these are at an early stage. There are almost no links between R&D institutions and the industry which prevents innovation within enterprises. In May 2005, to overcome these deficiencies, Egypt adopted a strategic plan to create a knowledge based economy through science and research which includes six elements to support R&D and innovation: design of a national strategic plan, establishment of a science & technology fund, stimulating inventions and innovations, restructuring research institutes and centers, using Information and Communication Technologies (ICT) to maximize output and ensuring quality and performance appraisal.

The elements of the strategy are coherent and address the major weaknesses in the system. However, important resources and cultural constraints exist and the strategy does not contain a clear agenda. The government of Egypt considers that the future areas of priority for innovation

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[3] http://www.delegy.ec.europa.eu/en/EU_EGYPT_Cooperation/EC_Bilateral_Cooperation_new.asp

are ICTs, biotechnology, nanotechnology, health as well as renewable energy sources (in particular solar), water resources and space sciences.

Egypt has been active and dynamic in the ICTs area that is described as a 'stand out' sector, not typical of the general situation. The very limited number of R&D organizations with clear industry-driven approaches is confirmed by the unreliable situation of innovation, although this is receiving increasing attention. There is a weak entrepreneurial culture within R&D organizations, where careers are usually life-long. There is also weak demand from industry and business. Private R&D is very sparse and industry has few high technology representatives. The recent Government strategy for industrial development, designed by the Industrial Modernization Center for the 2025 horizon, has put Research and Innovation at the heart of its priorities.

However, quality, monitoring and evaluation culture in research institutions are almost inexistent which undermines the proper follow up and the efficiency of national research policies[4].

Lebanon

The Lebanese law defines the intellectual property rights as any other property rights. These rights are outlined in Article 27 of the Universal Declaration of Human Rights, which establishes the right to benefit from the protection of moral and material interests resulting from authorship of any scientific, literary, or artistic production. The Lebanese ministry of economy and trade has official Intellectual Property Right regulations which contain 132 articles dealing with those rights. Those regulations show how important intellectual property aspects are to Lebanon[5].

The country is aware of the fact that economic development in the world, in the past three decades, particularly in developing countries, has been directly linked to efforts exerted in science, technology and innovation. It is also well known that the role of national science and research institutions is to advise government and societies on the impact and repercussions of the rapid progress in the application of science and technology. Since its establishment in 1962, the National Council of Scientific Research in Lebanon has been the national institution entrusted, by law, to carry out this role, directly through its affiliated research centers, and indirectly

[4] http://www.eu-delegation.org.eg/en/EU_EGYPT_Cooperation/Innovationprojectfichefin-May-IL%204.pdf
[5] http://www.economy.gov.lb/MOET/English/Panel/Projects/Quality.htm

through the cooperation relationships that exist with academic and other scientific institutions. The effective application of technological innovation, in the most creative way, is the optimal path to establish production and services with a high value added within enterprises. Through such enterprises, it is possible to enhance Lebanon's export capability, reduce the huge national debt and the big discrepancy in the balance of trade.

Furthermore, the optimal application of Information Technology, and other technological applications, whether locally developed or imported, is crucial to the modernization of Lebanon's manufacturing sectors and the building of the services sectors on a reliable basis. The creative outcomes of research and development efforts, along with appropriate entrepreneurial incentives, will enhance Lebanese productivity, performance in export capability and the Lebanese growth rate.

The example of Asian and Latin American countries is a guide to Lebanon since these countries have similar potential and socio-economic conditions with Lebanon and they have been able in recently to realize progress in their economies, their industries and the quality of their manufactured products. This is a valid goal that can be objectively realized if the Lebanese government is convinced by the importance of supporting all efforts in science, technology and innovation and adopting the result of these efforts in national economic development plans[6].

As an example of the process of innovation in Lebanon, the Ministry of Economy and Trade has launched an automation campaign aimed at increasing productivity and effectiveness in a transparent public sector. This is realized under the framework of promotion for technological development and within the organization and modernization structures[7].

Some of the attempts made by the Lebanese government to achieve simplification and transparency strategies in the administrational laws concern:

a. Creating suitable legislation environment that positively stimulate investments in relation to antidumping, competition, and laws for protecting national products and intellectual properties,

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[6] http://www.cnrs.edu.lb/stip/PrefaceEn.pdf
[7] http://www.economy.gov.lb/MOET/English/Panel/AutomationAndEcommerce/

b. Encouraging medium and long term industrial investments supported by the state guarantee and financial facilities to promote foreign investments,
c. Strategy design to stimulate joint- venture projects between Lebanese and foreign enterprises,
d. Development of industrial areas providing competitive infrastructure facilities.

In order for the country to adopt more rules concerning the intellectual property rights, Lebanon is becoming member with many global partners such as the EU. Many training programs were organized by the United States Patent and Trademark Office (USPTO) which focused on training the judges and prosecutors about Intellectual Property Rights (IPR) enforcement. The trainings focused on IPR laws and cases from the Middle East and North Africa (Arab) region, international standards and obligations for IPR enforcement, judicial perspectives on IPR litigation, private sector perspectives on counterfeiting trends in the Arab Region, adjudicating and management of IPR litigation, digital/ copyright piracy, and damages and sentencing in IPR cases.[8]

Jordan

The protection of intellectual property rights (IPR) have always been of big concern to the Jordanian authorities. It can be considered as a necessary element in the cultural, social and economic development of the country. Since the piracy destroys the creative spirit of scientists, the Jordanian authorities have progressively protected IPRs in the country starting from the late seventies. The Jordanian National Library was given the responsibility of IPR protection in the country, by law, to fight piracy in all domains.

The three main tools in IPR protection process are patents, trademarks and copyrights. Patents protect diverse inventions such as industrial designs, manufacturing processes and high-tech products. A trademark identifies and distinguishes the source of the goods of one party from those of others. Copyrights make artists and creators benefit from the outcome of their work for a specified time period, after which the material is used by the public[9].

Jordan joined the World Trade Organization in 2000, and signed a free trade agreement with the USA in 2001. Following these collaborations, the Jordanian government had to modify its IPR

[8] http://www.alcc-research.com/activities/USAIDactivitiesLb.html
[9] http://www.greatwallip.com/cn/articles/why-protecting-ip-rights-matters.asp

legislation through strengthening intellectual property laws and providing more effective enforcement of these laws. Laws consistent with the WTO Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) now protect trade secrets, plant varieties, and semiconductor chip designs in Jordan. Registration of copyrights, patents, and trademarks is required. Copyrights are registered at the National Library and patents are registered with the Registrar of Patents and Trademarks, which are both part of Jordan's Ministry of Industry and Trade. Jordan has signed the Patent Cooperation Treaty and the protocol relating to the Madrid Agreement Concerning the Registration of Marks. Jordan also acceded to the World Intellectual Property Organization (WIPO) treaties on copyrights (WCT) and performances and phonographs (WPPT)[10].

The Jordanian pharmaceutical industry was one of the first industries benefiting from the FTA and the new IPR legislation. The improved intellectual property climate in this country enhanced the attractiveness if the Jordanian companies as business partners for international pharmaceutical companies as well as diversified the export markets. An example of this is the establishment of licensing relationships[11] with pharmaceutical companies in the US, Japan, Korea, Italy, Switzerland and the United Kingdom. Therefore, protecting IPRs is proved to be a good development tool because these new regulations benefit all the industry.

The IT industry has also largely benefited from the new IPRs legislation. The Jordan REACH Initiative represents a collaborative effort between Jordan’s IT industry and the government. This initiative resulted in a good performance over the last few years. An IT market growth was noticed since 1999 from \$60 to over \$300 million (2005), exports increased from \$10 to \$69 million and employment has greatly increased from 1,250 to over 9,000. The IT sector yearly growth in Jordan is estimated, by the Jordan Investment Board, between 15% and 30%[11].

From the above mentioned examples (pharmaceutical and IT industries), Jordan has clearly improved its IPR legislation. This improvement followed Jordan’s membership in the WTO and the signing of the FTA with the USA.

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[10] http://usinfo.state.gov/products/pubs/intelprp/jordan.htm

[11] http://www.iipi.org/Conferences/IP_Caucus_Jordan/Background.asp

Iraq

Intellectual Property Rights (IPRs) are not considered as an issues in Iraq because of the instability of the country in terms of economy and politics.

Concerning the protection of property rights in Iraq, the government is in the process of developing a new IPR law in line with the WTO Agreement on Trade Related Aspects of Intellectual Property Rights (TRIPS). However, the exact structure and related legislation of this law is still in the process of identification. IPR functions are currently spread across several ministries. The patent registry and industrial design registry remain a part of the Central Organization on Standards and Quality Control (COSQC), an agency of the Ministry of Planning and Development Cooperation. Copyrights are relevant to the Ministry of Culture, and trademarks are related to the Ministry of Industry and Minerals. The ability of the government to enforce IPR law is weak because of the current security environment. Moreover, Iraq is a member of several conventions and regional or bilateral arrangements. These include Paris Convention for the Protection of Industrial Property (1967 Act) ratified by Law No. 212 of 1975 and World Intellectual Property Organizations (WIPO) Convention. The country has also a membership with the Arab Agreement for the Protection of Copyrights ratified by Law No. 41 of 1985 and the Arab Intellectual Property Rights Treaty (Law No. 41 of 1985). Iraq It is a signatory of the WIPO Convention and the Paris Convention (Industrial Property) since January 1976.

The lack of clarity in writing laws led to a misunderstanding of the Iraqi new patent law. This latter does not prohibit Iraqi farmers from using or saving "traditional" seeds. It prohibits them from saving those seeds for re-use. Confidence in secure property rights, joined with flexibility of regulation, could encourage both Iraqi nationals and Iraqi expatriates to invest in high-priority telecommunications, electricity supply, water services, and transport facilities.

Saudi Arabia

Both nationals and foreigners' rights concerning intellectual property benefit from the protection of the Saudi law. Actually, intellectual property rights are also indirectly protected by the provisions of the Regulations for Combating of Commercial Fraud. This, indeed, allows the Saudi authorities to impose numerous sanctions for the production of counterfeit products or unlicensed copies of products. There are many forms of sanctions such as "*inter alia*, seizure and destruction of such products, imposing monetary fined up to SR 100,000 for violation of the provisions of the regulations" (IPR Middle-East, 2007). Regarding book Piracy, Saudi Arabia's publishing market is in great deal affected by piracy. There are many illegally photocopied books, including textbooks, English language and teaching (ELT) materials, etc. that are still circulating in the Saudi Arabia's market. Moreover, evidence shows that pirate editions are being produced locally in Saudi Arabia and are even regulated by some universities, especially in the Central and Eastern Provinces. The Western Province was subject to improvements in 2003 thanks to the increased procurement near King Abdulaziz University of Jeddah (IPR Middle-East, 2007). The Saudi government should undertake some initiatives to regularize the procurement practices of books within all the universities so that students can be responsible academic citizens. Also, it should enforce actions against illegal offset printing as well as illegal photocopying to decrease piracy levels. Concerning the piracy of Software and Government Illegal Use of Software, the unlicensed use of software continues to be a problem in large, medium and small enterprises in Saudi Arabia. The Ministry of Information continued implementing its License Certification Program in 2003 that requires from businesses to demonstrate that they use only legal software. This latter is a requirement to obtain or keep their business licenses. However, despite these regulations, government entities continue to use illegal copies of software as a result of the complexity of the still-existing procurement procedures that limit the ability of IT divisions of government entities to buy software as needed. Inadequate allocation of resources for software acquisition and low prioritization for software purchases also make legalization difficult.

The Saudi Patent Regulations of 1989 established a patent registration system, covering any new article, methods of manufacture (including improvements in either of them) and product patents. In 1996, the Saudi Patent Office granted its first patents since its establishment in 1990. A patent may be granted to either Saudi or foreign citizens, including companies. Upon compliance with the registration formalities, the applicant receives a filing number and the filing date is secured. Patent cases are heard by an administrative commission which has legal competences and sits in the City of King Abdulaziz for Science and Technology. Decisions concerning patents may be contested by third parties within ninety days of the announcement that a patent has been granted.

Trademarks and service marks registration is governed by the Trademarks Regulation of 1984. Saudi Arabia follows the International Classification of goods and services, but is subject to various limitations (alcoholic goods). After being accepted for registration, a trademark/ service mark application is published in the Official Gazette. If no opposition is filed within three months, the owner would have an incontestable right to use the trademark/service mark for ten Hijri years starting from the application filing date. The Saudi law penalizes for unauthorized use of a registered trademark/ service mark, imitation applied on goods or with respect to services of the same class, storage, sale, exhibiting for sale or using the trademark/service mark in the course of unauthorized promotion (imposing fines and imprisonment). The Grievance Board and the Commerce Ministry and its branches are domestic institutions that control the infringement proceedings in relation to trademarks as well as different offences.

It is notable that the United States has continued to press for the amendment of the Regulations to cover foreign copyrights as well. Saudi copyrights are generally protected for the life of the author plus fifty and twenty-five years with respect to books and sound and audio visual works respectively. As to computer software, while its protection seems explicit, the regulations do not specify the protection duration.

United Arab Emirates (UAE)

The United Arab Emirates have made the protection of intellectual property a priority in recent years. The UAE considered previous copyright, trademark, and patent laws and issued improved legislation in 2002 especially to protect U.S. intellectual property rights. The 2002 copyright law grants protections to authors of creative works and expands the categories of protected works to include computer programs, software, databases and other digital works. The UAE also revised its Trademark Law in 2002. The law provides that the owner of the registration shall enjoy exclusive rights to the use of the trademark as registered and can prevent others from using an identical or similar mark on similar, identical or related products and services in case it brings confusion among consumers. It remains unclear, however, how the UAE provides for the protection of geographical indications required by the WTO Agreement on Trade- Related Aspects of Intellectual Property Rights (TRIPS).

The UAE published the Patent Law in November 2002. It provides national treatment for intellectual property owners from other WTO Members, product and process patent protection, and enforcement of intellectual property rights using civil and criminal procedures and solutions.

The UAE is also considering legislation for data protection, privacy and other IP-related issues and has consolidated its Intellectual Property Rights offices into the Ministry of Economy.

The importance IPRs in the UAE is that it symbolizes the fundamentals towards economic development and prosperity, and thus it represents a main step in the modernization and democracy of the country.

The link between research and production is mainly education. Indeed, education is the major basis of research and production of innovation by transitivity. The problem of the United Arab Emirates is that it has an education system that is not effective and modern at all levels, primary, secondary, or higher education. It is acknowledged that scientific research is principally performed in educational organisation such as university laboratories and scientific educational institutions. It is important to mention that infrastructure alone cannot be very helpful to research and development without a good scientific community. So the importance of modernizing and improving the quality of education is a key factor in achieving research and production of innovation. Therefore the United Arab Emirates is in need of economic development policy meaning a good political control and policy development in favour of the educational system.

In the technological field, the United Arab Emirates is having admirable infrastructure for the IT technology. However, the prices for telecommunication remain very high. Moreover, the government censures and restricts the access of internet and it even prohibits the use of voice communication over internet in order to protect the existing monopolies in the telecommunication sector.

Managing and defending property rights are crucial for a country's prosperity. Therefore, the United Arab Emirates has joined multiple international organizations and signed many treaties in order to deal with Intellectual Property Rights and to manage research, production, and innovation in the country. The United Arab Emirates deploy many efforts to develop local institutions in order to deal with IPRs. These organizations work in preparing, filing, prosecution, obtaining Industrial property, trademarks, copyrights registrations, legal protection, neighbouring rights, patents and industrial design, licensing, franchising, and domain names. They also provide services for providing professional advice and assistance in the fields related to unfair competition and litigation.

The international partners play a very important role in boosting the image of the country vis-à-vis other countries. The representation of the participation of the United Arab Emirates in treaties is valuable. Moreover, the international organizations dealing with Property Rights provide a basis for the country in order to develop its own local organization.

Syria

- ***Importance of IPRs in Syria:***

The intellectual property rights were essentially recognized and accepted all over the world due to some very important reasons. Some of the reasons for accepting these rights consist of providing incentive to the individual for new creations, providing due recognition to the creators and inventors, ensuring material reward for intellectual property and ensuring the availability of the genuine and original products.

As the other countries studied, the importance of IPRs for Syria is related to the image and credibility of the country. The enforcement of Intellectual Property Rights is required to sign Trade Agreements with the European Union as well as attracting Foreign Direct Investments.

Syria shall follow the "highest international standards" including, not limited to, the TRIPS Agreement. Syria shall also accede to the Budapest Treaty and the UPOV Convention (1991). However, Syria may replace accession to UPOV with implementation of an "adequate and effective" system for protection of plant varieties.

- ***The importance of the links between research and production of new innovations:***

These are some of the Research institutes and programs in Syria:

1. The Scientific Research Cooperation Program between Lebanon and the Syrian Arab Republic,
2. The Network of Syrian Scientists, Technologists and Innovators Abroad (NOSSTIA) is a nongovernmental organization grouping high-level expatriate Syrian scientists and innovators in all fields of technology. Founded in 2001, NOSSTIA is funded through membership fees, donations and activity sponsors,
3. The Higher Institute of Population Studies and Researches. The Damascus-based Institute enjoys the status of a body corporate, financially and administratively independent,
4. Albassel Center for Invention & Innovation.

The Syrian Patent Office (SPO) affiliated with the Ministry of Economy and Trade is the domestic institution that protects IPRs. It enforces the law related to IPRs. They do not have any strategy for managing different stages.

- ***The introduction of Syria to the area of new technologies:***

According to the government's commitment to benefit from the new technology in order to achieve socio-economic goals, it is important to mention the strategy of the Information and Communication Technologies in Syria. These latter set the following targets to be achieved by the year 2013: 30 lines of fixed and mobile telephone per 100 people; 20 sub-scribers internet penetration per 100 people; and of 30 computers per 100 people.

- ***The role of partners in helping with the strengthening of domestic institutions:***

Abu-Ghazaleh Intellectual Property (AGIP) is a partner of the Syrian SPO. It was established in Kuwait in 1972, under the name of T.M.P Agents when Intellectual Property (IP) protection was still in its early stages of development in the Arab region. However, since its launch, AGIP has consistently been at the forefront of efforts to improve the infrastructure of IP in the Arab world. It cooperates with Syrian Patent Office in protecting IPRs.

To this end, AGIP has worked in close coordination with Arab governments and multilateral organizations on introducing an efficient IP system that has brought up significant changes to the region.

With the new system, major multinational corporations have been given the confidence to expand to the region and plan major investments, as they are now assured that their investments are appropriately protected. In addition, the creative Arab individuals such as architects, artists, designers, scientists, musicians and writers are encouraged to render more creations, as their hard work is properly rewarded and their creations are effectively protected.

AGIP also assisted and supported governmental committees and officials charged with revising and drafting new laws and regulations for the enforcement of Intellectual Property Rights (IPRs) in several Arab countries such as, Bahrain, Lebanon, Yemen, Oman, Tunisia and the United Arab Emirates. AGIP has organized and sponsored, in coordination with WIPO, ASIP and WTO, relevant trainings for judiciary members and district attorneys in various Arab countries.

The regulation and enforcement of intellectual property rights falls under the purview of the Office of Property Protection of the Ministry of Supply and Internal Trade. However, enforcement is inconsistent. Various national authorities are involved with the implementation of

IP promotion and enforcement. Customs are to play a more important role with the new law as they were assigned the responsibility to respond to right holders' requests to monitor imports for suspected infringement. The Customs will have the authority to inspect containers, seize any suspected goods and give the parties concerned ten days to initiate proceedings. Also a special chamber will be set up at the Court of First Instance to examine cases related to intellectual property infringements, which shows the parallel involvement of the Ministry of Justice. IP-related initiatives are mostly launched and coordinated by the Ministry of Economy and Trade. Besides, the Syrian Patent and Trademark Office deals with applications and grants of trademarks and patents. Finally, the Ministry of Culture deals directly with copyrights-related issues.

Bahrain

The Intellectual Property Rights provisions call for the parties to ratify or accede to certain agreements on intellectual property rights, including the international Convention for the Protection of New Varieties of Plants, the Trademark Law Treaty, the Brussels Convention Relating to the Distribution of Programme-Carrying Satellite Signals (the "Brussels Convention"), the Protocol Relating to the Madrid Agreement concerning the International Registration of Marks, the Budapest Treaty on the International Recognition of the Deposit of Micro-organisms, the Patent Cooperation Treaty, the WIPO Copyright Treaty, the WIPO Performances and Phonograms Treaty.

Bahrain is a member of the WTO (World Trade Organization) since 1995. In 2005, Bahrain endorsed treaties such as the Patent Law Treaty (PLT) and Madrid Protocol. Recently in 2007, it has signed treaties to enforce its position such as Trademarks Law Treaty (TLT)[12].

In Bahrain, the task of property rights protection is delegated to the Directorate of Industrial Property under the supervision of the Ministry of Industry and Commerce[1]. With respect to Patent and Utility, a patent is approved for any invention if it is new and industrially applicable. Indeed, a patent is only granted if it is not disclosed to the public, if it involves creativity and innovation, and if it can be applied to any industry[13]. Likewise, patents are not approved for inventions or works whose exploitation might harm the environment or contradict with morality

[12] www.wipo.int/about-ip/en/ipworldwide/pdf/bh.pdf

[13] The legislative decree no. 1 of 2004 with respect to Patent and Utility.
www.commerce.gov.bh/.../0/LegislativedecreeNo1of2004withrespecttoPatentandUtilityModels.pdf

in the kingdom of Bahrain. Discoveries, scientific or mathematical methods, and biological processes are not protected as well. Similarly, therapeutic and surgical methods are not granted by a patent[13].

An industrial designs, according the "legislative decree no.6 of 2006, should be involving an innovative and creative step, be applicable in "industry and craft", and it should not be disclosed to the public either in Bahrain or elsewhere[14]. Like the case of the patent, an industrial design that does not respect the morality of the kingdom of Bahrain, or include national or religious symbols is not subject to protection[14].

The regulation of the registration of trademarks is described in the legislative decree no. 11 of 2006. Any violation of the rights the trademarks offer to their owner is subject to fines and imprisonment. The violation includes, for instance, an imitation of the trademark, or a trade in the products or services distinguished by the trademark. The severity of the punishment is decided by the court depending on the severity of the infringement[15].

The copyright for works prevents any third party from using the item under protection without the author(s) consent. To exploit the work, the author will provide a written document allowing reproducing or translating the intellectual property following articles 6 and 7 of the legislative decree n° 10[16]. Any violation of the author's rights is to be punished, and the author to be compensated. Violations include using, reproducing, selling, marketing, revealing or "facilitating the revealing" of the work[16]. The copyright provides protection of the works for the life of the author besides 70 years[17].

Bahraini authorities have been working hard to protect software and programs from piracy. According to the website orientplanet.com, the Ministry of Information has launched a campaign to raise people's awareness about the dangerous effects piracy has on the economy. Behind this movement, the government in Bahrain is trying to stress the importance of decreasing piracy

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[14] www.commerce.gov.bh/.../0/LegislativedecreeNo6of2006withrespecttoIndustrialDesigns.pdf

[15] www.commerce.gov.bh/.../0/LegislativedecreeNo11of2006withrespecttoTradeMarks.pdf

[16] www.wipo.int/clea/docs_new/pdf/en/bh/bh001en.pdf

[17] www.fta.gov.bh/Linkcounter.asp?rid=517&attached=IntellectProperty.pdf

rates and its role in encouraging investments in the IT and computer field. As a consequence for these efforts software piracy rates had decreased by 2 percent from 2004 to 2005[18].

Yemen

- ***IPRs in Yemen:***

In Yemen, the law that concerns intellectual property rights is law N°: 19 of 1994 that provides protection for patents, industrial designs, trademarks and copyright. However, an important criticism of the IPRs in Yemen is that the judiciary is subject to government pressure and corruption. Besides, contracts are weakly enforced. Also, foreigners may own property, but foreign firms must operate through Yemeni agents. It can be concluded that protection of intellectual property rights is inadequate in Yemen.

Without intellectual property protection, incentives to engage in certain types of creative activities would be weakened. But, there are high costs associated with intellectual property rights protection. Ideas are the most important input into research, and if intellectual property rights slow down the ability to use others' ideas, then scientific and technological progress will suffer[19].

The IPRs law in Yemen concerns patents, trademarks and copyrights. Patents are granted for a maximum term of 15 years from the filing date.

Yemen is not a member of the Paris Convention, although the law makes provision for grant of priority rights on a reciprocal basis. So far, however, no country seems to have established such reciprocal rights.

The two separate trademark laws previously in force in the Yemen Arab Republic (North Yemen) and in the People's Republic of Yemen (South Yemen) have been repealed. Under the transitional provisions, trademark applications filed and registrations obtained in either former North Yemen or former South Yemen will extend automatically to the whole of the Republic of Yemen, unless there is a disputed claim to ownership of a mark.

A copyright can be registered and this registration will protect the creative work against use by unauthorized third parties[20].

An intellectual property regime creates a temporary monopoly power, allowing owners to charge far higher prices than they could if there were competition. The reinforcement, however,

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[18] Bahrain Ministry of Information strengthens Intellectual Property Rights Campaign

[19] http://yementimes.com/article.shtml?i=869&p=culture&a=2

[20] http://www.ladas.com/BULLETINS/1995/1195Bulletin/Yemen_NewIPLaw.html

enhances the trust of foreign investors with Yemeni economy. The Ministry of Industry and Trade launched a new system of registering agencies, companies, and trade brands. The system is carried out in cooperation with UNDP and the Netherlands' government.

- ***Introducing new technologies***:

Much progress has been made in telecommunications in Yemen through the use of digital telephony, fiber optic cables (PDH and SDH), digital microwave systems and space telecommunication stations for national and international telecommunications, as well as submarine fiber cables for international communications. A reliable national and international telecommunication network has been established and put into operation in all the Republic's governorates, along with mobile and automatic telephony and the Internet. The machinery for introducing and marketing additional services, including Voicemail Prepaid Card, the Internet, DSL and intranet, and marketing ISDN was set up[21].

Qatar

Qatar is member of the World Trade Organization and the World Intellectual Property Organization (WIPO) but it is not a party to the Paris Convention for Protection of Intellectual Property. Protection of trade marks, copyright and patents are largely dependent on Qatar's own national laws and regulations.

The Trademarks Law in Qatar is No. 3 of 1978. It is known as "The Law of Trademarks and Commercial Indications" and provides for trademark registration and penalties for infringement. The Law allows the Ministry of Finance, Economy and Commerce to initiate action against trademark/ patent violators. The law also permits the Ministry to penalize those who describe products deceptively with respect to their nature, type, kind, essential properties, origin, and other related aspects such as weight and amount. However, in practice, protection of trademarks is afforded only by advertising a cautionary notice in Qatar's daily newspapers. The Patent Law in Qatar is governed by the 1978 "Law of Trademarks and Commercial Indications". As is the case with trademarks, protection is afforded by advertising a cautionary notice in local dailies.

The Copyright Law in Qatar is No. 25 of July 1995 concerning protection of intellectual property and copyrights. The law, which took effect from October 22, 1996, protects original literary and

[21] www.itu.int/ITU-D/ldc/documents/projects-2001/**yemen**.pdf

artistic works, including computer software, video and audio tapes and is enforced by a special agency called the "Bureau of Protecting the Intellectual Property and Copyrights", which has been set up within the Department of Censorship at the Ministry of Information and Culture. The law includes penalties for violation including fines ranging from QR 30,000 to QR 100,000 and/or imprisonment ranging from 6-12 months.

No rules or regulations are available for trade secrets in Qatar. However, for the settlement of Commercial Disputes, Qatar accepts binding international arbitration of investment disputes between the Government of Qatar and foreign investors. Qatar is not a member of the International Center for the Settlement of Investment Disputes (ICSID) known as the Washington Convention and is also not a signatory to the New York Convention of 1958 on the same subject. Resorting to arbitration to solve disputes can be more binding if clearly stipulated in contracts. Effective Qatari laws have provided sufficient means for enforcing property and contractual laws. However, this is a very long and time-consuming process.

It has been announced recently that the Government of the State of Qatar is likely to review the existing trade mark, copyright and other laws to make them stricter[22]. A new law relating to Trademarks, Commercial Data, Trade Names, Geographical Indications and Industrial Designs was issued in Qatar.

Microsoft recently announced the first community education, research and development projects that it will undertake at Qatar Science & Technology Park (QSTP) in Doha. The world's largest IT Company will work closely with university and government partners in Qatar to deliver many of the programs, which will bolster computing skills and capabilities in the country. Microsoft, which is already a tenant of QSTP, will invest around $4 million in six pioneering technology-related projects at the science park over the next year.

Kuwait

Although Kuwait's protection of intellectual property rights is not especially strict by international standards, the Kuwait government is currently considering new legislative measures in this field.

Concerning patents, law No. 4 of 1962 provides for the registration of patents and industrial models in Kuwait. Although the Patent Law was enacted in 1962, the Patent Office in Kuwait

[22] www.american.edu/carmel/SR3362A/LEGAL.HTML

was opened only in 1995, after a resolution adopted by the Gulf Cooperation Council (GCC) states calling for a unification of the patent registration systems of the member countries. The Kuwaiti government is presently preparing a draft law for the protection of patents to replace the current law discussed above. Trademarks and Service Marks in Kuwait follow the international classification of trademarks with a few exceptions (classes 32 and 33 relating to alcoholic beverages and pork). Following the filing of an application to register a trademark, the application is examined as to registration. The law allows an opposition to be filed by any interested party. Kuwait has no copyright law. As a result, there is extensive marketing of pirated software, cassettes, videotapes and unauthorized Arabic translation of foreign-language books. The Kuwaiti government is currently preparing a draft law for the protection of copyrights to be submitted to the national assembly.[23]

In the 2006 report, the U.S. Trade Representative was pleased to announce Kuwait progressed from the "Priority Watch List" to the "Watch List" due to significant improvements in its IPR regime, especially in the area of enforcement. The actions taken by both the Ministry of Education (program to combat book piracy) and the Ministry of Information (conduct raids on pirates and counterfeiters) were also recognized as significant achievements[24].

The Kuwait Information Technology Report has just been researched at source, and features latest-available data covering production, sales, imports and exports; 5-year industry forecasts through end-2012; company rankings and competitive landscapes for multinational and local manufacturers and suppliers; and analysis of latest industry developments, trends and regulatory changes. Kuwait Information Technology Report provides industry professionals and strategists, corporate analysts, Information Technology associations, government departments and regulatory bodies with independent forecasts and competitive intelligence on the Information Technology industry in Kuwait[25].

Production expansions were and still are pursued without adequate consideration of efficiency or quality, resulting in technical and economic inefficiencies. Inappropriate production technologies are adopted without considering the available soil and water resources. The lack of research and testing of technologies for adaptation in Kuwait weakens the farmers' productivity. When this latter is below international levels, this is attributed to gaps in technology adoption, unskilled

[23] http://www.infoprod.co.il/country/kuwait2d.htm
[24] http://kuwait.usembassy.gov/pr_05012006.html
[25] http://www.bharatbook.com/detail.asp?id=18623

labor force and inefficient management. Protected agriculture is expected to become an important agribusiness industry in Kuwait with greater impact on the national economy than was traditionally perceived. A priority area in the 20-year agricultural Master Plan was recently developed by the Kuwait Institute for Scientific Research (KISR). This Plan calls for careful evaluation and adoption of modern technologies. The Plan also calls for productivity enhancements of at least two-to-four-fold by 2015. These targets are easily attainable if greenhouse crop production is made efficient, productive and sustainable[26].

Oman

Oman is a member of various treaties, conventions and international bodies, for instance, Oman is an affiliate in the Nairobi treaty since 1986[27]. During the last decade, Oman has taken various actions to protect intellectual property rights in order to pull important investments from various parts of the world. In the nineteen's, Oman signed the WIPO convention (February 1997), the Paris convention for industrial property protection (1999), the Berne Convention for the protection of literary and artistic works (1999). Later in 2005, it has joined the WIPO Copyright Treaty (WCT) and WIPO Performances and Phonograms Treaty (WPPT). Recently in 2007, Oman joined the Madrid Protocol (International Registration of Marks), Budapest Treaty (Deposit of Micro-organisms), and the trademarks protection treaty (TLT). Besides the WIPO, Oman is part of the WTO treaty (TRIPS) since November 2000[27].

These efforts aim to improve the economic conditions in Oman and to encourage investors who would not be worried for their rights to be violated without punishments and compensations. Another point is that implementing intellectual property rights' protection would keep and maintain the Omani patrimony from illegal exploitation and abuse.

The Copyright law in Oman was issued by Royal Decree No.37/2000 in May 21st, 2000, and started to be effective on June 3rd, 2000[28]. Copyrights certificates offer protection to authors of literary, scientific, artistic and cultural works. On the other hand, law does not provide protection for daily news, publicly owned works, and official documents as well as their translation[28]. To

[26] http://www.icarda.cgiar.org/aprp/PDF/PAinAp_Kuwait.pdf

[27] Oman (OM) www.wipo.int/about-ip/en/ipworldwide/pdf/om.pdf

[28] Royal Decree No. 37/2000 Promulgating the Law on the Protection of Copyrights and Neighboring Rights http://www.wipo.int/clea/docs_new/en/om/om001en.html

prevent third parties from using the work without its author consent, the law allows the author to ask for seizures of the infringing copies of the work and what was used to make those copies and to "designate an official receiver for the work under conflict, who shall be responsible for the republication, presentation, manufacturing or making of copies of the work"[29].

According to the Omani law, an invention is patentable if it is new, innovative, applicable industrially and compatible with the public order, security and morals[30]. The punishments against violations of the patentee's rights vary between one to two years of imprisonment and/or fines not more than two thousand (Rial Omani). Besides, the court may decide to seize and destroy every item used to counterfeit the protected invention[31]. Everyone who imitates a protected industrial design or drawing sells or offers to sale a product containing the design, and anyone who uses the design or the drawing as his own is subject to punishment by the law. This punishment can be in the form of imprisonment not more than two years and/or a fine not more than two thousand Omani Rial.

According to article 1 of the Omani law on geographical indications issued by decree No. 40/2000, a geographical data or indication is protected in Oman. Violations of the protection offered by the law are subject of punishment of imprisonment (between 6 to 48 months) and fine (100 to 2,000 Omani Real)[32].

According to the Omani law, a trademark is also protected. After registering the trademark as described in the second chapter of the law, the owner is granted by various rights such as licensing any natural or juridical person. According to article 35 of the law on trademark, anyone who violates the trademark owner's rights is to be punished by imprisonment of, at most, a period of two years and a fine of two thousand Omani Riyals[33].

3. Overall Assessment

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[29] The Law for the Protection of Copyright and Neighboring Rights http://www.agip.com/country_service.aspx?country_key=90&service_key=C&SubService_Order=3&lang=en

[30] Sultanic Decree No. 82/2000, Promulgating the Patent Law http://www.agip.com/country_service.aspx?country_key=90&service_key=P&SubService_Order=3&lang=en

[31] Sultanic Decree No. 39/2000, The Law for Industrial Drawings and Designs http://www.agip.com/country_service.aspx?country_key=90&service_key=D&SubService_Order=2&lang=en

[32] Sultanic Decree No. 40/2000, The Law for Geographical data (Indications) http://www.agip.com/country_service.aspx?country_key=90&service_key=gi&SubService_Order=1&lang=en

[33] Sultanic Decree No. 38/2000, The law of Trademarks, Trade Data Undisclosed Trade Information and Protection from Unfair Competition.

To evaluate the efficiency of IPR protection, the internationally available data on piracy rates and economic losses will be needed as well as data on FDI, Exports, KEI, property rights indicator of the IEF and GDP index. Table III.2 provides a summary of the most significant results of the log linear regressions attained (Driouchi & Nada, 2009).

Table III.2: Regression results: Losses from piracy and IPRs in Arab countries

Relationships	**R²**	**Obs.**
$\text{Ln}(\text{Losses \$M, 2006}) = \underset{(0.15)}{0.02} + \underset{(25.99)}{1.01}\left[\text{Ln}(\text{Losses \$M, 2005})\right]$	0.98	14
$\text{Ln}(\text{Losses \$M, 2005}) = \underset{(1.33)}{0.33} + \underset{(14.98)}{0.98}\left[\text{Ln}(\text{Losses \$M, 2004})\right]$	0.95	14
$\text{Ln}(\text{Losses \$M, 2004}) = \underset{(1.03)}{0.17} + \underset{(22.27)}{0.99}\left[\text{Ln}(\text{Losses \$M, 2003})\right]$	0.98	14
$\text{Ln}(\text{Piracy Rate, 2006}) = -\underset{(-2.50)}{0.03} + \underset{(52.61)}{0.97}\left[\text{Ln}(\text{Piracy Rate, 2005})\right]$	0.99	14
$\text{Ln}(\text{Piracy Rate, 2005}) = -\underset{(-2.89)}{0.03} + \underset{(57.429)}{0.98}\left[\text{Ln}(\text{Piracy Rate, 2004})\right]$	0.99	14
$\text{Ln}(\text{Piracy Rate, 2004}) = -\underset{(-0.19)}{0.002} + \underset{(42.12)}{1.03}\left[\text{Ln}(\text{Piracy Rate, 2003})\right]$	0.99	14
$\text{Ln}(\text{Piracy Rate, 2005}) = \underset{(1.99)}{0.64} - \underset{(-3.64)}{0.76}\left[\text{Ln}(\text{KEI, 2004})\right]$	0.52	14
$\text{Ln}(\text{Piracy Rate, 2006}) = \underset{(2.03)}{0.73} - \underset{(-3.54)}{0.76}\left[\text{Ln}(\text{KEI, 2006})\right]$	0.51	14
$\text{Ln}(\text{Piracy Rate, 2004}) = -\underset{(-2.03)}{1.61}\left[\dfrac{\text{Ln}(\text{FDI, 2005})}{\text{Ln}(\text{Export Value Index, 2005})}\right]$	0.72	6
$\text{Ln}(\text{Property Rights, 2005}) = \underset{(25.47)}{3.55} - \underset{(-2.43)}{0.58}\left[\text{Ln}(\text{Piracy Rate, 2006})\right]$	0.33	14
$\text{Ln}(\text{Property Rights, 2004}) = \underset{(3.01)}{2.30} - \underset{(-3.69)}{0.73}\left[\text{Ln}(\text{Piracy Rate, 2005})\right]$	0.53	14
$\text{Ln}(\text{GDP Index, 2003}) = -\underset{(-6.42)}{0.82} - \underset{(-2.14)}{0.56}\left[\text{Ln}(\text{Piracy Rate, 2003})\right]$	0.31	12
$\text{Ln}(\text{Property Rights, 2006}) = \underset{(2.37)}{1.43} + \underset{(4.01)}{0.64}\left[\text{Ln}(\text{Freedom from Corruption, 2006})\right]$	0.57	14
$\text{Ln}(\text{Property Rights, 2005}) = \underset{(2.19)}{1.27} + \underset{(4.49)}{0.68}\left[\text{Ln}(\text{Freedom from Corruption, 2005})\right]$	0.63	14

To start with, the regressions relating the index of intellectual property rights as a component of the Index of Economic Freedom (IEF) published by the Heritage Foundation is definitely related to the software piracy rate as published by the Business Software Alliance (BSA, 2007). The estimated equations show how the sub-index is negatively related to the software piracy rate. The freedom from corruption which is another sub-index of the IEF is positively related to property rights and thus negatively related to the software piracy rate (Table III.2).

The other results show that software pirating (or intellectual property rights) has been and is still an issue in the region under study as far as economic losses are concerned (equations about losses). This is also confirmed by the piracy rates. But, the most important results are those related to the knowledge economy index (KEI) as having a depressing effect on the piracy rate. A one percent increase in KEI reduces the piracy rate by 0.76 percent. Furthermore and as expected the ratio of foreign direct investment to exports is negatively related to piracy rate, confirming that higher piracy rates do affect negatively the ratio of foreign direct investments and exports. The final result shows that GDP is negatively affected by piracy rates and therefore better protection of intellectual property rights are likely to contribute to the promotion of GDP in the countries under study.

In this Section, the domestic institutions that are directly in charge of IPRs have been promoting their functions to ensure their missions of protecting intellectual property rights and thus ensuring the contribution to MPC economies. The reforms undertaken in the region have further promoted market mechanisms but have contributed to further development of informal economies. These latter economies are those that often generate failure to protect intellectual property in all areas. These areas cover both old and new technologies but are pervasive in the works of arts, music and software besides other areas. This trend is generating direct and indirect losses that can lead to the elimination of domestic and foreign sources of services besides reduction of foreign direct investments and performance of each economy. This leads to the requirement of the strengthening of the functions of the domestic institutions that are dealing directly with intellectual property rights. But, the transversal nature of the impacts of non compliance is such that more institutions are invited to participate effectively to the effort. Furthermore, the intervention of all the players should also give priority to the inclusion of the informal industries such that they are part of the overall game. The solutions lie within the framework of formalization and inclusion of all players in order to provide win -win solutions to be identified and implemented. This effort requires also the collaboration of developed countries such as the European Union.

While IPRs need further international coordination, domestic mechanisms that can be strengthened by MPCs with the support of EU are likely to create new conditions for the development of both foreign direct investments and trade. The enforcement of the IPRs is likely to be beneficial to potential direct investors from the EU but also to franchisors willing to locate in each of the MPCs. As enterprise creation is highly consistent with market forces and also with the expansion of domestic economies of the MPCs, further formalization of enterprises is also among the target pursued. Besides that, the contribution of EU is also beneficial at the level of technological and managerial research for development. This can enhance the level of collaboration that is likely to produce more instruments for IP protection.

The approach of economic and social development through IPRs appears to be a promising dimension that leads to further and refined collaboration between North and South Mediterranean countries. This is related not only to setting of further rules but also to creating more market transparency with more market flexibilities at different levels (formalization, research, enterprise creation, franchising and trade).

III. Production, trade and Knowledge Economy

This section introduces respectively the issues related to production, trade concentration and diversification besides their relationships to innovation and knowledge. The link between innovation and the value added in diverse sectors of the overall Arab economies is then addressed and discussed.

1. Production

The Arab region has known a remarkable economic growth, with a growth in the creation of employment and the unemployment rate had decreased as emphasized in a report made by the World Bank. (2007)

Between 2004 and 2007, the Arab region had seen an economic growth as stated by the report, indicating that high oil revenues coupled with the recovery in Europe, the growing vitality of the private sector and increased investment have provided the impetus for another year of economic performance chip.

The document notes that the region recorded in 2006 one of its strongest growth rate since the 70s. This expansion has been attributed to the continued strong expansion of resource-rich countries and importers of labor and improved results of resource-poor countries, noting that real GDP grew by 6.3 pc in 2006, against 4.6 pc in first four years of the decade.

According to the report, the GDP per capita increased on average by 4.2pc in the region in 2006, which is the highest level recorded in at least 20 years.

However, not all the countries can benefit, from that incredible expansion since the latest data about poverty are not available. It has been shown from the report that the increasing investment from the private sector, national and foreign, makes that private sector the main source for new opportunities of employment in the region.
The private sector will pursue its activities in a growing integration in the global markets, which will promote the creation of new jobs, as stated in the report. It also indicates that the integration in the global markets will require an improvement in the educational system so that workers will be prepared to create a more competitive environment and establish mechanisms for social protection.
In general, the Arab region has the possibility to benefit from that economic boom to develop their reform programs. Authors of the report explain that the prospects for maintaining or increasing current growth rates in the coming years will depend on progress on the front of structural reforms "far irregular" and the growing private sector.
In contrast to the strong regional growth, industrial production, which had increased by 4.1 pc in 2005, was down 0.4 pc in 2006, mainly due to capacity constraints faced by the production of hydrocarbons, control of the record. He also noted that despite the decline in oil production and declining world oil prices, which reached a record $ 70 dollars per barrel in August 2006, revenues of oil exporting countries continued to increase. Hydrocarbon revenues have increased by more than $ 75 billion from the level reached in 2005 to $ 510 billion. Surplus funds of oil exporters and new investment opportunities in the region (some of which result from the ongoing reforms) have propelled the flow of foreign direct investment (FDI) to the record level of more than $ 24 billion in 2006, as stated in the report.
After the 2008 global economic crisis, the world cannot afford any uncertainty, and the lingering effects of that crisis continue to negatively impact some of the world's biggest economies.
According to the organization of the petroleum exporting countries (OPEC), despite the economic uncertainty, data show long term growth in energy consumption. In their World Oil Outlook, OPEC sees global energy demand increasing under all scenarios- with primary global energy demand to 2035 doubling in the Reference Case. Fossil fuels can be making up 82% of this by 2035, having fallen slightly from 87% today. This dominant growth is expected to be demand in non-OCED developing countries. In OPEC's Reference Case, the overall oil demand is going from 88 mb/d in 2011 to 93 mb/d by 2015- reaching around 110 mb/d by 2035.

One source of rising oil demand is growing domestic demand in the Arab region. Actually, some of the Arab countries have some of the fastest growing energy demand in the world. Domestic consumption of crude oil, which is primarily used for power and generating purposes, has increased in several countries. Obviously, these countries understand that with local energy consumption rising, they need to find ways to diversify and enlarge their energy supplies so that their oil exports are not negatively affected.

Some OPEC countries in Arab region are already exploring for more oil and gas. Others are raising some recent gas discoveries. However, if the problems of satisfying the domestic energy demand while keeping crude export levels if left without a solution that would seriously impact some Arab countries.

Descriptive Statistics:

The data represented in the table are extracted from UNCTAD database that shows how the production is progressing over the years in Arab countries. More precisely, it shows the data from 1970 to 2009, for the following countries: Algeria, Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libyan Arab Jamahiriya, Mauritania, Morocco, Palestinian occupied territories, Oman, Qatar, Saudi Arabia, Syria, Tunis, United Arab Emirates, Yemen, League of Arab states. It also shows how the production in each sector (agriculture, industry, production of electricity, gas, and water, transport, hotels and restoration, construction) is progressing over the years.

The data represent the GDPs of Arab countries over the years, the added values per sector, from which we can calculate the share of GDP for each country. In order to analyze the data, we have to describe it by using descriptive statistics such as the mean and the standard deviation. The mean will make it easier to have an overall view of all the variables for each country. The standard deviation will show how diversified the production is. A trend analysis should also be conducted to see how the dominant sectors of production are progressing over the years.

By using the means of GDPs of all the countries, we can see an overall progression through the years. But there is a decrease in some periods. There is a small decrease from 1970 to 1975, than an observable decline from 1980 until 1985.

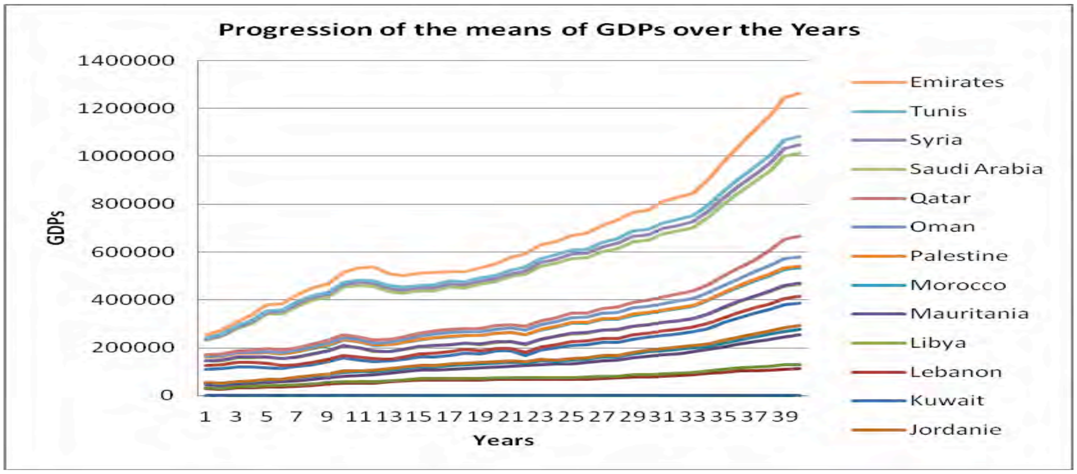


Fig. III.1

In order to study the production in each country, it is preferable to study the three dominant sectors per country. As shown from that exercise, for most countries, the main sectors are services, industry, and production of gas and electricity. There are only two countries that have different dominance. Morocco has agriculture as one of the dominant sectors, in addition to services and industry, and Lebanon has fabrication, services and industry as the main sectors.

After selecting the sectors, a trend analysis should be conducted for each country. However, since there are seventeen countries, it would not be practical to study all of them. The countries should be divided into categories to facilitate the analysis. Since there is a strong relationship between the production and the awareness of countries about Science and Technology, countries of the Arab region can be categorized based on that criterion.

As discussed earlier, there are three main categories of countries in the Arab region. The first category includes Algeria and Egypt (Fig.III.2, III.3), the second is formed of Morocco and Tunisia (Fig.III.4, III.5), and the last category is composed of Libya and Mauritania (Fig.III.6, III.7).

Trend Analysis

1st category: Algeria and Egypt

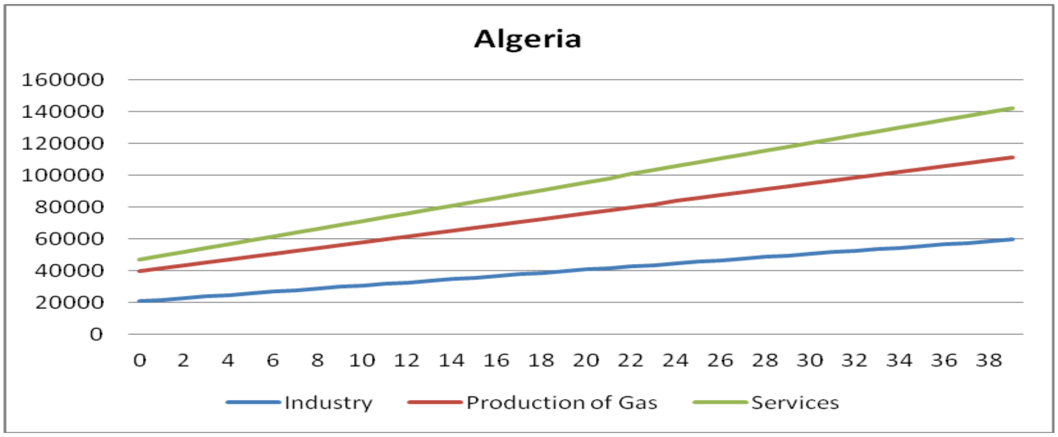


Fig.III.2

Equations for each sector, the respective coefficients are 991.75; 849.10 and 606.25 for industry, gas and services.

For Algeria, the behavior of the added value of its dominant sectors that are as shown in the graph Industry, Production of gas and services is increasing through the years from 1970 to 2009 for the three sectors. But the increase is different in each sector. Services are more ascending than the production of gas that has a higher expansion that the industry sector.

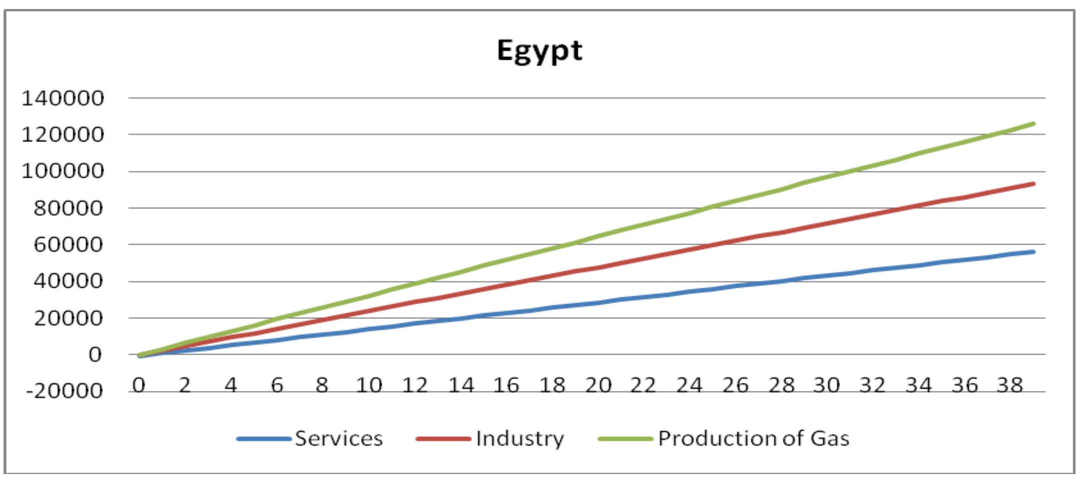


Fig.III.3

The trend coefficients for services, industry and gas are respectively 1456.42; 938.13 and 832.01.

For Egypt, the increase over the years of the added value of the three sectors (services, industry, and Production of Gas) starts from 0. The increase differs from one sector to another. The production of gas has a sharp ascendance that attains approximately $140000. Industry also has an observable increase that attains approximately $9000.

2^nd^ Category: Morocco and Tunisia

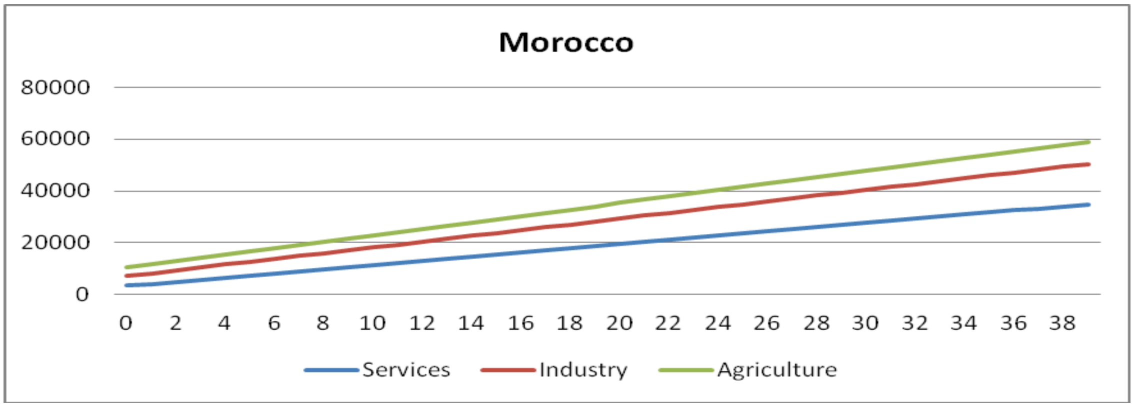


Fig.III.4

The estimated trends for services, industry and for agriculture are respectively 808.47; 303.13 and 130.77.

For Morocco, which is different than the other countries in term of the dominant sectors, has agriculture as a dominant sector of production. The three sectors have an increasing trend over the years. In agriculture, there is an increase in the added value from $10,000 to$ 60,000 in 40 years. The other two dominant sectors that are industry and services have also an increasing added value over the years.

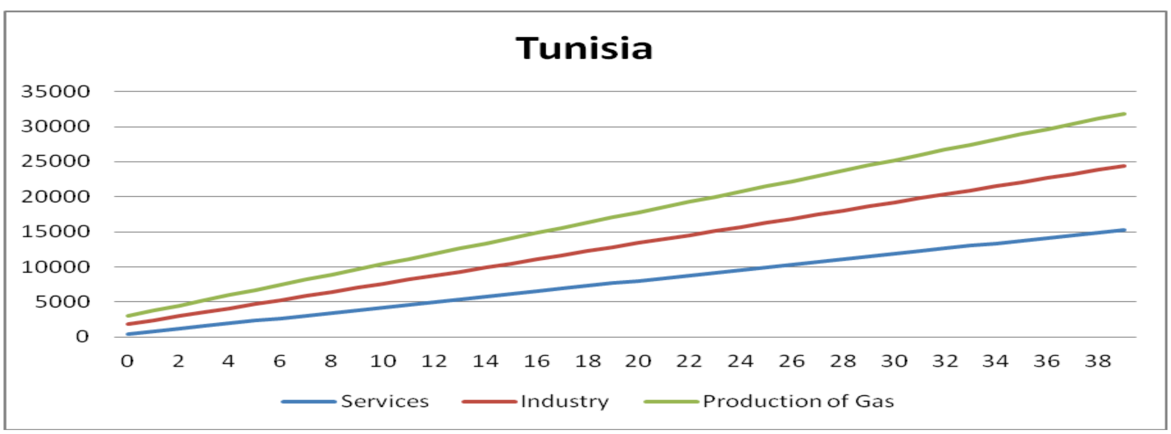


Fig.III.5

Similarly, the trends estimated for services, industry and gas are respectively 381.90; 198.14 and 160.15.

For Tunisia, there is also an increase in the added value of the three sectors over the years. The production of gas has a sharp increase that goes from $1,200 to approximately $32,500. The graph that represents the trend of industry over the years goes from $1,400 to approximately $25,000. The trend of services attains approximately $10,000.

Third category: Libya and Mauritania

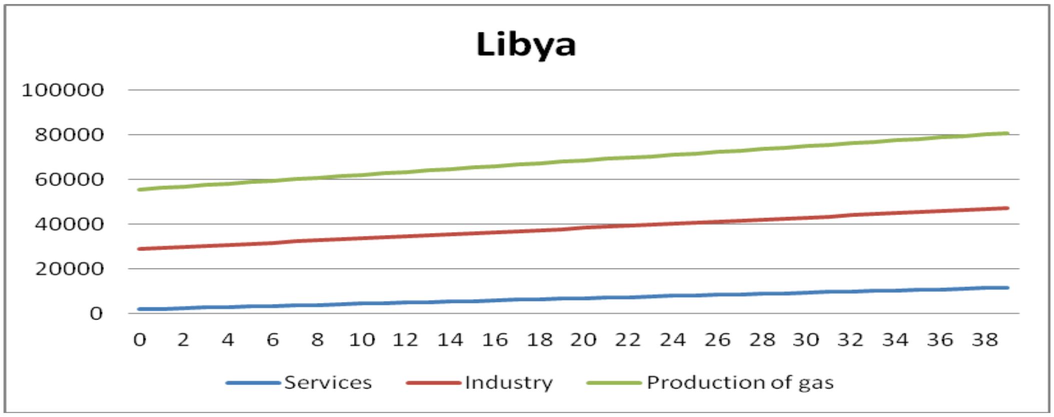


Fig.III.6

The respective coefficients for services, industry and gas are 248.30; 220.36 and 174.99.

For Libya, the increase in the added value of services over the years is not that big since it goes from $2,000 to $12,000 approximately. For the two other sectors, there is also an ascending trend over the years. For industry, it goes from $27,000 to approximately $39,000. We can say that the added value in the three sectors in Libya does not increase by the same rate over the years, and that services have the slowest increase.

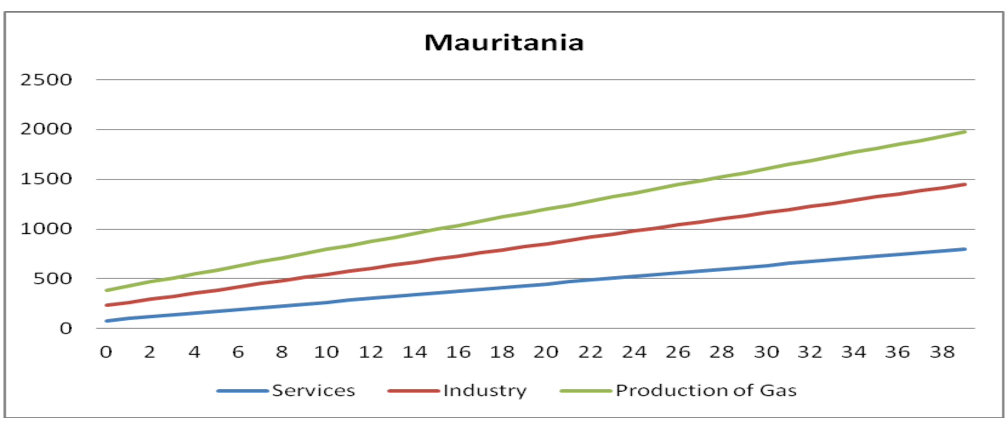


Fig.III.7

Mauritania has exhibited trend coefficients that are 18.47; 12.62 and 9.58 respectively for services, industry and gas.

For Mauritania, the added value in the three dominant sectors (industry, services, and production of gas) has an ascendant trend over the years, but the increase is smaller compared to other countries. For example in industry, the graph goes from \$153 to approximately \$1,500.

And if we take a global look to all the countries, we will see that the three main dominant sectors, which have the highest share of GDP, are industry, services, and production of gas. There are some exceptions such as Morocco that has agriculture as a dominant sector instead of the production of gas. There is also Lebanon that has fabrication as a dominant sector instead of the production of gas.

For all the countries, the trend of the added values of the dominant sectors is ascending over the 40 years.

2. Trends in Trade Concentration and Diversification

The tables below show respectively the major trends taking place respectively in trade concentration and diversification. When looking at concentration based on the number of commodities, the countries showing significant decreases are Egypt, Lebanon, Qatar, Tunisia, Yemen, Morocco, Oman and Syria. Jordan, Sudan and Kuwait are showing increasing trends with all the remaining countries having no trends over the study period. These results are shown in table (III.3)

Table III.3: Concentration

Country	Intercept	Coefficients	R^2
Algeria	0.529 (27.074)	0.005 (1.535)	0.207
Egypt	0.340 (10.187)	-0.015 (-2.682)	0.444
Jordan	0.133 (14.651)	0.003 (2.129)	0.335
Lebanon	0.117 (28.271)	-0.001 (-2.578)	0.424
Mauritania	0.510 (35.360)	-0.003 (-1.522)	0.204
Palestine	0.166 (15.312)	0.002 (1.117)	0.121
Qatar	0.601 (57.788)	-0.009 (-5.570)	0.775
Sudan	0.442 (10.308)	0.037 (5.107)	0.743
Tunisia	0.207 (74.984)	-0.005 (-10.794)	0.928
Yemen	0.865	-0.010	0.685

	(59.689)	(-4.431)	
Bahrain	0.410 (21.391)	-0.004 (-1.244)	0.146
Iraq	0.966 (161.118)	-0.0002 (-0.244)	0.006
Kuwait	0.608 (46.300)	0.010 (4.520)	0.694
Libya	0.804 (43.625)	0.001 (0.512)	0.028
Morocco	0.174 (40.124)	-0.001 (-2.633)	0.435
Oman	0.758 (24.197)	-0.022 (-4.200)	0.662
Saudi	0.713 (51.716)	0.003 (1.518)	0.203
Syria	0.629 (24.589)	-0.042 (-9.751)	0.913
UAE	0.499 (17.480)	-0.006 (-1.346)	0.167

When looking at trade diversification, Algeria, Egypt, Qatar, Tunisia, Yeman, Kuwait, Bahrain, Oman, Saudi Arabia, Syria and UAE exhibit a decreasing pattern. The other countries have a constant level of diversification. No country is showing increase in diversification. These results are shown in table (III.4)

Table III.4: Diversification:

Country	Intercept	Coefficients	R^2
Algeria	0.836 (118.794)	-0.005 (-4.792)	0.718
Egypt	0.699 (42.739)	-0.009 (-3.585)	0.588
Jordan	0.580 (32.505)	0.003 (1.079)	0.114
Lebanon	0.631 (92.808)	-0.001 (-1.001)	0.100
Mauritania	0.825 (51.054)	-0.003 (-1.169)	0.132
Palestine	0.603 (85.941)	0.002 (1.755)	0.254
Qatar	0.847 (110.151)	-0.006 (-5.211)	0.751
Sudan	0.824 (135.149)	-0.001 (-1.089)	0.116
Tunisia	0.661 (73.964)	-0.013 (-8.780)	0.895
Yemen	0.859 (212.839)	-0.009 (-13.247)	0.951
Bahrain	0.788 (122.718)	-0.009 (-8.521)	0.889
Iraq	0.817 (74.411)	0.002 (1.608)	0.223
Kuwait	0.850	-0.005	0.837

	(173.108)	(-6.818)	
Libya	0.821 (136.149)	-0.001 (-1.298)	0.157
Morocco	0.709 (62.165)	-0.003 (-1.664)	0.235
Oman	0.787 (64.143)	-0.008 (-3.878)	0.625
Saudi	0.833 (153.977)	-0.006 (-7.489)	0.861
Syria	0.786 (58.138)	-0.018 (-7.943)	0.875
UAE	0.662 (65.436)	-0.010 (-5.886)	0.793

But, the share of oil and gas in most of the Arab countries does still dominate in Arab countries. This share is represented in table (III.5)

This table (III.5) shows the share of oil and natural gas in the selected countries' total commodity exports. The shares indicate that, except for Oman in the last decade, none of the oil abundant countries of the region have managed to increase the share of their non-oil exports. More detailed analysis is undertaken in the section dealing with energy.

Table III.5: Share of oil and natural gas in total commodity exports

	Algeria	Egypt	Jordan	Kuwait	Morocco	Oman	S. Arabia	Tunisia
1991	96.90	53.48	0.02	80.36	2.51	87.40	92.87	14.32
1992	96.04	43.45	0.09	94.53	3.15	83.74	87.01	15.10
1993	95.76	49.07	0.02	95.07	2.66	78.90	91.08	11.46
1994	96.15	38.17	0.10	93.87	2.08	76.48	90.07	9.48
1995	95.08	35.83	0.03	94.67	2.20	78.59	86.76	8.47
1996	92.80	46.25		95.22	1.63	80.42	88.57	10.51
1997	97.17	44.32	0.04	95.05	1.94	76.39		9.07
1998	97.01	28.53	0.07	89.13	1.46	68.05	84.27	6.44
1999	97.14	36.03	0.03	90.64	2.70	76.93	88.53	7.16
2000	98.08	40.93	0.04	93.29	3.66	82.49	91.45	12.09
2001	97.61	39.02	0.04	92.04	4.22	80.49	86.09	9.24
2002	96.84	32.55	0.01	91.20	3.64	77.25	88.05	9.34
2003	98.04	42.14	0.24	91.54	2.59	76.82	88.23	9.99
2004	98.14	41.69	1.13	93.03	4.49	81.56	87.85	9.58
2005	98.40	50.71	0.17		5.05	84.38	89.47	12.93
2006	98.05	55.10	0.83	94.98	3.76	82.95	89.16	12.98
2007	98.38	51.41	0.68	94.45	3.81	79.66	88.10	16.19
2008	98.14	43.13	0.12	94.60	4.19	77.46	89.52	17.31
2009	98.31		0.27		3.28	67.64	84.61	13.63

Source: Dogruel & Tekce, 2011 based on COMTRADE data

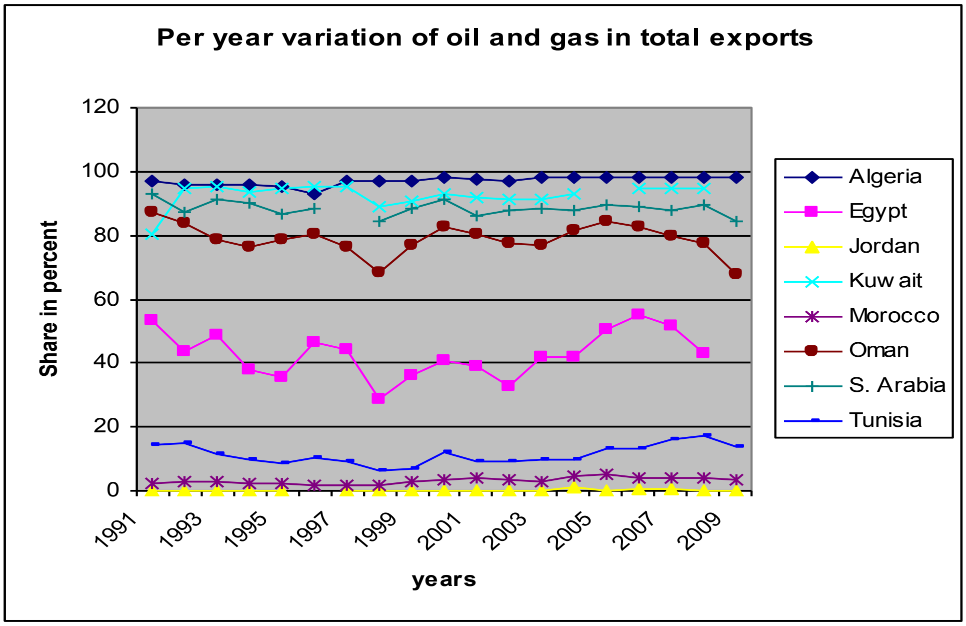


Fig : III.8

3. Knowledge Production in Arab countries

Compared to previous years, the Arab region has known an increase in its knowledge production from 1995. Although there is a lack of information about the outcomes of research and development in that region since there are no comprehensive statistics on specialized sectors or research topics, certain outputs can be measured by the amount of scientific publications, patents, and inventions.

For the scientific research, when the number of scientific publications per million people is taken into consideration, Arab countries fall into the category of advanced developing countries, since it published 26 research papers in 1995. It is more significant when compared with the other developing countries such as Brazil (42), China (11), and India (19). On the other hand, this production is still far from the production levels of developed countries, such as Netherlands (1,252), or Switzerland (1,878). The Arab world has noticed a substantial increase in the last three decades of the 20th century. There was a clear increase in the number of papers published by Arab scholars from 465 papers in 1967 to 7,000 in 1995, which is approximately an increase of 10% per year. However, that increase was not as significant as the increase in some other developing countries such as Korea, Brazil, or China. In order to make a comparison with those countries, the rate of increase in published scientific paper per million people can be useful. For example, the number of scientific paper per one million in China in 1995 was 11 times what it was in 1981. In South Korea, it was 24 times greater. But for Arab countries, it was only 2.4 times greater; i.e. increasing from 11 papers per one million people in 1981 to 26 papers in 1995. Even though there is that increase in the number of publications in Arab countries, most of the papers are specialized in applied fields such as medicine, health, and agriculture. For the publications in basic sciences such as physics, chemistry, astronomy, and mathematics, it did not exceed 10% of the total research. Therefore, the Arabic research activity is said to be far from innovative. There is no research in advanced fields, such as information technology and molecular biology. (Roshdy Rashed)

In order to measure the quality of research, there is an indicator that consists of calculating the number of references made to it. As indicated in the First Arab Human Development Report in 2002, “only one paper each in Egypt, Saudi Arabia, Kuwait, and Algeria in 1987 was quoted more than 40 times, while in the United States 10,481 papers were quoted more than 40 times and in Switzerland 523 papers.”

For the patents, which are also an indicator of measuring the knowledge production, in Arab countries, there is a weak research and development activity, which delay far behind of that of developed countries and other countries of the developing world as shown in the following table (III.6).

Table III.6: Number of patents registered in the United States from Arab and non-Arab countries from 1980 until 2000

Arab Countries		Non-Arab countries	
Bahrain	6	Korea	16,328
Egypt	77	Israel	7,652
Jordan	15	Chile	147
Kuwait	52		
Oman	5		
Saudi Arabia	171		
Syria	10		
Yemen	2		

Source: Djeflat (March 1999) and Bizri (April 2000)

In order to have a well developed research and development activity, Arab countries need to produce knowledge workers. Such as industries, national scientific research and development activities need to have highly qualified graduates and researchers with enquiring and trained people and highly skilled minds. According to some statistics, there is a sustained increase in the number of female students. Those statistics indicate that there are a small number of graduates who opted to specialize in basic sciences, engineering, medicine and other scientific subjects. There is also a lack of training for skilled people because training in Arab countries depends generally on the supply rather than the demand, and the focus is in the quantity, not the quality.

According to the Arab knowledge report 2009, Arab societies are in need to more nurturing institutions and some supportive policies to experience a significant increase in knowledge production and creation. It is stated in the report that Arab societies have to make political, cultural, and intellectual reforms in addition to reform of media and information technologies if they want to make the knowledge production stronger.

It is also said that for a clear increase in the knowledge production, there should be a strong link between knowledge and freedom. Knowledge can be defined by freedom in both its enlightenment and developmental aspects. In order to enhance knowledge performances, there should be a freedom of expression, thought, and political participation.

The Arab knowledge report also shows that Arab countries have made a reasonable progress with regard to most ICT axes, especially where infrastructure is concerned. There was an improvement in technological abilities and performances that surpasses that observed in any other region of the world in 2008. There are four Arab countries that are members of the Gulf Cooperation Council (GCC) that are part of the fifty countries that are the most ready to invest in this area. However, there is a limitation in regards to quantity and quality because performance varies from one Arab state to another. In the Arab world, the use of internet has noticeably proliferated in the last five years. However, the examination of the general Arab landscape shows that the digital divide remains. When conducting an investigation of Arab digital content, which is an indicator of investment and knowledge production activity in the Arab region, it has been shown that Arab countries and societies have fallen, according to most criteria if they are compared to other countries. The report explains how the Arabic knowledge will never pass an extremely low threshold if no steps are taken on various levels in the domain of technology policy and legislation, and if the issues related to Arabic language usage on the net are not settled.

3.1. Innovation in production in the Arab region

Arab countries, like the rest of the world and the Developing countries in particular, will soon face enhanced competition, vanishing trade barriers, more stringent intellectual property regimes and deeper concern for the environment, as said in a World Bank report. Movements in these areas are expected to make serious challenges for fragile components in the socio-economic systems of the region. Science and Technology policies and strategies are still inadequate even if policy-makers have taken the measures to a large extent of these challenges. However, those are essential prerequisites to attain viable Science and Technology capabilities and innovative capacity, where their role cannot be exaggerated.

There are of course some differences from one country of another in the Arab region, than it might seem as a result of resources endowment, history, political regimes etc. A more proactive role of the state would be involved aimed at promoting scientific and technological innovation, a well-established market-driven competition, and a more efficient market in allocating resources enhanced with the supply of more and better information.

As emphasized by the World Bank, " a Knowledge-Bases Economy (KBE) is defined as one where knowledge (codified and tacit) is created, acquired, transmitted, and used more effectively by enterprises, organizations, individuals and communities for greater economic and social development." One if the most important elements is an efficient innovation system, which means that several institutions and competencies have to interact to assimilate the growing stock of global knowledge, in order to adapt it to local needs and use it to create new knowledge and technologies.

3.2. Policies and strategies for National System of Innovation in the Arab region

The integrated approach to the National System of Innovation (NSI) was discovered by Lundvall (1985) and revised in the nineties for LDC. There are three main spheres that should be included in the NSI: The productive sphere, the training and education sphere, and the research sphere. There must be a co-ordination between those three components so that the system can work efficiently. Since the NSI composes a central component in the process of capacity building, its initial Nation-State base has to be expanded because of the necessary relationship it mobilizes with foreign entities. In order to overcome market failures and optimal uses of externalities, the market should regulates largely the interaction between the components of the system, social and political institutions and economic policies are the important factors that should be orchestrated by the State to have a homogeneous system.

Policy options

The National System of Innovation (NSI) mainly depends on the extent to which Science and technology is made and efficiently implemented. Research and Development ad innovation cannot rest on a vacuum. Since Arab countries are heterogeneous, they show different levels of awareness of the importance of Science and Technology for development. Some of them have managed to make a policy, often of an implicit nature. As a consequence, there are some components of the NSI. For instance, because training and education are found everywhere, Research and Development institutions start to rise in various fields such as health, agriculture, engineering in some countries but are absent in others.

There are three main categories of countries in the Arab region:

First category: Algeria and Egypt

Those countries have made serious attempts to include Science and Technology into their economic development and have now in their record some non-negligible experience. This experience seems to have started based on an S&T policy and NSI, which was explicitly, in the early seventies. After conducting a study by the Egyptian Ministry of Scientific Research, it has been found that there are several strengths of the Egyptian S&T systems: they have marvelous human resources with a large number of highly educated people and specialized personnel, a lot of R&D institutions in various disciplines, many examples of success especially in agricultural research. The main driving vectors of this policy includes: massive transfer of up to-date technologies from various advanced countries and substantial investments in education and training, and engagement in programs of scientific research.

Second category: Morocco, Tunisia, Jordan and Kuwait

This category is more oriented towards market-driven growth and the contribution of foreign capital to industrialization. Foreign firms were the ones who make decisions, at a time when the industrial base of the country was being laid down. Even though those countries have tried to make their policies in their own by developing local industries of small and medium size type, there weren't in charge of S&T policy and the level of awareness of the fundamental role of S&T in development. Consequently, the main component to set up the basis for NSI was missing.

Third category: Libya and Mauritania

Those countries do not have enough industrial bases and are small in terms of population and markets, so the S&T policy and its integration in the economic policy is not part of their priorities. Current infrastructure and potential are unlikely to provide the basis for an NSI.

Sector studies

Some studies of the most innovative companies in Tunisia in various sectors on a relatively small sample indicate that the most successful experiments were made by R&D departments in several operations: modification of the acquired technological products or process in order to improve their characteristics (80%), developing new products and commercializing them (80%), developing new products without commercialization (60%).

Arab Countries and Alternative Energy Sources

According to an article published in June 15, 2010 by Arabic knowledge Wharton, in 2009, Saudi Arabia turned on the largest water desalination facility in the world. With a price tag of $3.4 billion, the Jubail II desalination plant produces 800,000 cubic meters of water daily. It was made the 28th desalination facility operating in the country by the plant's opening. Its output is the lifeblood for Saudi Arabia: Fully 70% of the freshwater used by Saudis is generated by the desalination facilities.

But this desalination is costly. The Saudi government estimates that using all the desalination plants uses 1.5 million barrels of oil a day, because the process of turning seawater into tap water depends heavily on energy. Because of that, the oil-rich country is looking to another natural resource to fuel desalination: the desert sun. This is just one experiment in the region, where increased demand, rising oil prices and dwindling groundwater resources have made finding less costly and more efficient alternative energy sources a priority.

According to IDA, the International Desalination Association, the Middle East and Africa now account nearly half the world's global desalination capacity, with Saudi Arabia and UAE (the Unites Arab Emirates) alone counts for approximately 30% of installed capacity. There was a desalination boom in the Arab region that was fueled by growing water demand and the availability of cheap energy. Desalination is an energy-intensive process, with energy accounting for up to 50% of production costs. However, countries that do not have access to cheap energy found it expensive. For the hydrocarbon-rich nations in the Middle East, desalination has been the obvious way to address their lack of fresh water.

4. To what extent knowledge economy variables could have driven production?

Table III.7: Results

		Independent Variables								
Dependent Variable	Constant	INN	CONS	EDU	TRANS	SER	GAS	IND	AGR	R^2
GDP	1.554 (6.483)	0.168 (2.101)	0.857 (10.748)							0.876
AGR	0.743 (2.238)			-0.700 (-7.316)	1.020 (10.667)					0.839
IND	0.060 (0.625)			0.030 (1.311)		0.161 (4.291)	0.843 (23.912)			0.992
GAS	1.043 (1.554)	0.613 (3.961)							0.470 (3.033)	0.837
FAB	0.148 (0.289)	0.641 (5.009)							0.635 (4.961)	0.640
CONS	-0.034 (-0.080)	0.557 (4.952)							0.769 (6.801)	0.719
SER	0.430 (1.976)	0.415 (1.540)						0.489 (0.417)	0.466 (0.319)	0.930
TRANS	-1.046 (-3.349)	0.373 (3.966)						0.385 (3.883)	0.617 (7.153)	0.898

Variables: GDP: overall domestic product; AGR= agriculture value added; IND= Industry; GAS= Gas and oil; FAB= manufacturing; CON=Construction; SER=Services; TRANS=Transportation; INN=Innovation and EDU=Education.

Data Sources: UNCTAD, most recent data.

The above results (Table III.7) show that innovation has statistically significant effects on most sectors except for services and that education has a negative impact on agriculture. The other results show how positive interdependencies exist between sectors.

IV. Unemployment Persistence, Risks of Skill Obsolescence & Impacts on the Knowledge Economy in Arab Countries

This section is devoted to the issue of unemployment in relation to the development of knowledge economy in Arab countries. This aims at showing that unemployment is occurring even under further involvement of Arab countries in different components of knowledge economy. With high and persistent levels of unemployment, questions are addressed and include the effects of persistent lack of jobs with the risks of knowledge and skills obsolescence and the implied extra-costs.

This is organized in three subsections where the first one looks at the most important and significant publications on the unemployment issue in the Arab World. The second section is mainly based on the introduction of descriptive statistics to show the major trends governing unemployment. The last section discusses the risks of knowledge and skills obsolescence in relation to the persistence of high unemployment levels.

1. Unemployment and Challenges to Youth in Arab Countries

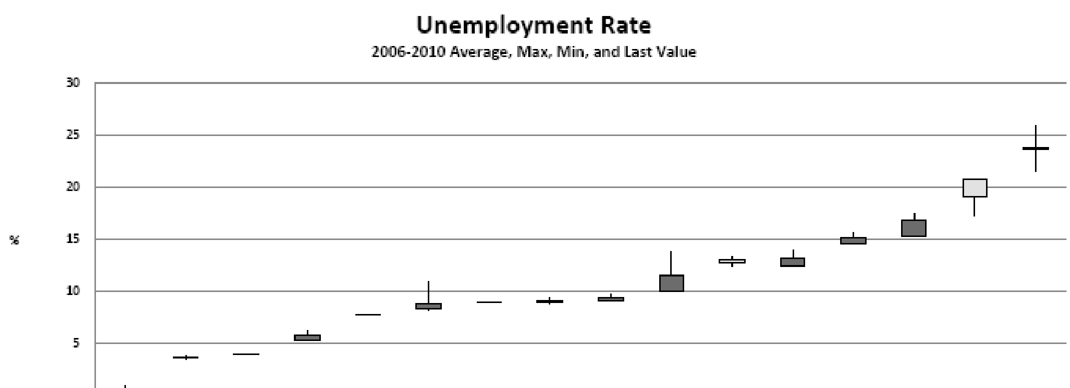
There is evidence that North African countries have been facing high rates of unemployment for their youth during the few past years. But this trend appears also for countries of the Middle East. In North Africa and the Middle East, the youth unemployment rate at 25 per cent, is the highest in the world according to series of publications (ILO, 2012). World Bank researchers are finding that the actual number of jobless people between the ages of 15 and 29 in the region could be much higher as many young people who are out of school and out of work are not reflected in the statistics.

Research has found that unemployment and underemployment are taking a toll on young people, often forcing them to wait years to obtain housing, get married and have children. As a consequence, young men between the ages of 25 and 29 in the region have the lowest marriage rates in the developing world at only 50 per cent (Table III.8, Fig III.9, and Fig.III.10).

Table III.8

Country	Youth Unemployment (Average 2006-2010)	Annual Pop. Growth (1980-2009)
Qatar	1.4	
UAE	12.1	
Algeria	23.7	2.13
Bahrain		2.84
Egypt	27.3	2.15
Jordan	28.1	3.60
Lebanon	22.1	
Libya		
Morocco	17.5	1.70
Saudi Arabia	30.8	3.40
Syria	19.1	3.08
Tunisia	28.8	1.60
Yemen		3.57

Source: Paper IEMed,(9), joint Series with EuroMesco. February 2012

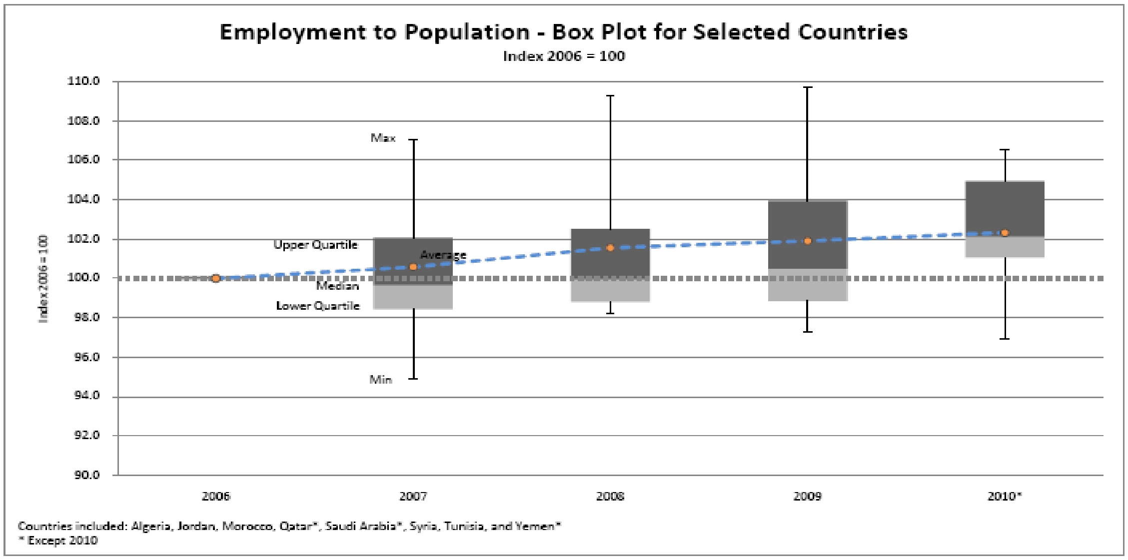


	Qatar	Bahrain	U.A. Emirates	Saudi Arabia	Kuwait	Syria	Lebanon	Egypt	Morocco	Algeria	Tunisia	Jordan	Yemen	Iraq	Sudan	West Bank and Gaza
Avg. 06-10	0.5	3.7	4.0	5.8	7.7	8.8	9.0	9.1	9.4	11.5	12.7	13.2	15.2	16.8	19.1	23.9
Max	0.9	3.8	4.0	6.3	7.7	10.9	9.0	9.4	9.7	13.8	13.3	14.0	15.7	17.5	20.7	26.0
Min	0.3	3.5	4.0	5.4	7.7	8.1	9.0	8.8	9.1	10.0	12.4	12.5	14.6	15.3	17.3	21.6
Latest Obs.	0.3	3.7	4.0	5.4	7.7	8.4	9.0	8.9	9.1	10.0	13.0	12.5	14.6	15.3	20.7	23.7

For Kuwait, Lebanon and U.A. Emirates only one observation is available. Official estimates for Sudan. For Kuwait, data refer only to Kuwaiti unemployment.

Source: ILO, Department of Statistics

Fig.III.9



Source: ILO, Department of Statistics

Fig.III.10

Table III.9: Selected Rates- Latest Data Available

	Latest Year	Labour Force Participation		Employment to Population		Paid to Total Employment		Unemployment		Youth Unemployment	
		Rate (%)	Var. (pp)	Rate (%)	Var. (pp)	Rate (%)	Var. (pp)	Rate (%)	Var. (pp)	Rate (%)	Var. (pp)
Algeria	2010	41.7	0.3	37.6	0.4	33.4	0.3	10.0	-0.2	21.5	0.2
Bahrain	2010							3.7	-0.1		
Egypt	2010[a]	50.3	1.2	42.5	1.5	59.1	-3.2	8.9	-0.5	24.8	-5.1
Iraq	2008[b]							15.3	n.a	43.5	n.a
Jordan	2010	39.5	-0.7	34.6	-0.4	83.5	0.1	12.5	-0.4	28.1	1.1
Kuwait	2008[c]							7.7	n.a		
Lebanon	2007	43.4	n.a	39.5	n.a			9.0	n.a	22.1	n.a
Morocco	2010[d]	49.6	-0.4	44.6	-0.2	44.4	0.5	9.1	-0.1	17.6	-0.3
Qatar	2009	87.7	0.3	87.4	0.3	99.6	0.1	0.3	0.0	1.2	n.a
Saudi Arabia	2009	49.9	-0.4	47.2	-0.5			5.4	-0.4	29.9	0.6
Sudan [e]	2008							20.7	1.3		
Syria	2010	43.7	0.7	42.0	0.9	62.7	0.9	8.4	0.2	18.3	-0.8
Tunisia	2010	46.9	0.4	40.8	0.4			13.0	-0.2	29.4	-1.5
UAE	2008	72.6	n.a	69.7	n.a	95.8	n.a	4.0	n.a	12.1	n.a
West Bank&Gaza	2010[f]	39.5	-2.0	29.8	-1.6	67.6	1.1	23.7	-0.8	40.2	5.1
Yemen	2009	42.2	-0.6	36.1	-0.4			14.6	-0.3		

Source: ILO, Department of Statistics

Notes:

a. Egypt: 2010 only data for unemployment. Rest of rates correspond to 2007
b. Iraq: Data for Youth Unemployment rate correspond to 2006
c. Kuwait: Data refer only to Kuwaiti unemployment
d. Morocco: Data for Unemployment to Population correspond to 2009
e. Sudan: Official Estimates
f .West Bank and Gaza: Data for Youth Unemployment rate correspond to 2008
n.a. Data from the immediately preceding year are not available for computation of annual variation

According to M. Zain (2011), the report, Education for Employment: Realizing Arab Youth Potential, sponsored by the International Finance Corporation (IFC) and Islamic Development Bank and conducted by McKinsey & Company, the Middle East suffers from the highest youth unemployment in the world, currently recorded at over 25%, with North Africa reporting approximately 24%. Female youth unemployment is even higher, exceeding 30% across the Arab world. The region's labor force youth participation rates are among the lowest globally, currently recorded at 35%, compared to the global average of 52%. In total, the economic loss due to youth unemployment exceeds USD 40 – 50 billion annually across the Arab World, equivalent to the GDP of countries like Tunisia or Lebanon.

Masood.A (2011) considers that the social and political turmoil in the Middle East and North Africa has given renewed urgency to the need to counter chronic joblessness, particularly among young people. Labor market data in the region are scarce, but available statistics covering six countries - Egypt, Jordan, Lebanon, Morocco, Syria, and Tunisia - indicate that average unemployment stood at 11% in 2008, barely below the average of the past two decades (12%) and the highest regional unemployment rate worldwide.

The problem is especially pronounced among the young and the educated. The share of young people among the unemployed in the six countries on average exceeds 40%, and even reaches around 60% in Egypt and Syria. At over 25%, the average youth unemployment rate is also the highest regional rate worldwide and, in Morocco and Tunisia, it stands at around 30%. Unexpectedly, unemployment in this region tends to increase with schooling, exceeding 15% for those with tertiary education [beyond high school] in Egypt, Jordan, and Tunisia.

Dhaka Mukhlis al-Khalidi (2011), focused on the process leading to high unemployment in the Arab economies. To the authors, the total population of 20 Arab countries (with the exception of the Palestinian territories) had increased from 218.2 million in 1990 to about 332 million in 2008, and to about 340 in 2009. The average population growth declined from 2.43% in the years 1990-2000 to 2.29% in the years 2000-2009. The large rate of population increase poses a challenge to economic and social growth because it consumes much of the annual growth in the economy, leaving only a small balance for investment.

Apart from determining population growth rates, demographers deal with two other issues -the distribution of population by age group as well as by urban/rural configuration. In terms of age

distribution, the rate of the age group below 15 has declined from 44.2% in 1975 to 41.3% in 1990 and then to 32.2% in 2008. By contrast, the ratio of the age group of 65 years and older has increased because of an improvement in the standard of living and health services.
At the same time, the rate of urban population has increased from 45.3% in 1970 to 68% in 2008. As a result, the active working population has increased from 35% in 1995 to 41.1% in 2008 or the equivalent of 136.4 million, an annual rate increase of 3.6% which is below the global rate because of the limited participation of women in the labor force.
Average unemployment in the Arab countries was estimated at 14.8% in 2009 which is higher than in other parts of the world. The number of the unemployed was about 14 million people in 2009, or about 7% of the entire international unemployed labor force. Unemployment in the Arab countries varies as it exceeded 15% in eight Arab countries with the highest in Djibouti at 50% and the lowest in Qatar at 0.3%. Within this range there are other related issues that include that the unemployment rate among females exceeds that among males and the rise of unemployment among youth (ages 15-24) to a frightening level registering no less than 30.9% in 14 Arab countries where data were available. In addition, the unemployment among those with university education is the highest with 56% in Saudi Arabia and 30.2% in Jordan. Also, the number of unemployed seeking work for the first time is also frightening as the number reached 98% in Libya in 2007 and 93% in Egypt, 80% in Kuwait (for citizens only) and 70% in Saudi Arabia in 2009. Besides these issues, the rate of the employed seeking work for longer than a year was also high at 69.5% in Morocco, 66.4% in Algeria and 64% in Kuwait but much lower in Saudi Arabia at 19%

Dhaka Mukhlis al-Khalidi (2011), emphasizes that the total population of 20 Arab countries (with the exception of the Palestinian territories) had increased from 218.2 million in 1990 to about 332 million in 2008, and to about 340 in 2009. The average population growth declined from 2.43% in the years 1990-2000 to 2.29% in the years 2000-2009. The large rate of population increase poses a challenge to economic and social growth because it consumes much of the annual growth in the economy, leaving only a small balance for investment. According to the above author, the average unemployment in the Arab countries was estimated at 14.8% in 2009 which is higher than in other parts of the world. The number of the unemployed was about 14 million people in 2009, or about 7% of the entire international unemployed labor force.

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Haririan et al. (2009) investigate the long term relationship between GDP growth and unemployment for selected Arab countries. As expected from the literature, a negative relationship is found to show how increasing GDP growth can lower unemployment in the Arab countries. However, in 2006, with 12.2 percent unemployment, the Arab world stood out as the region with the world's highest unemployment rate. The ILO observed that the Middle East and North Africa maintained the world's highest unemployment rates in 2007, at 11.8 and 10.9 percent, respectively. According to unofficial estimates, the unemployment rate may in fact be much higher. Nabli (2004) claimed that unemployment is actually likely to be much higher than reported data.

According to World Bank Report (World Bank, 2006) Morocco's low growth is the central challenge in the country's development agenda. In the 1960s, per capita economic growth in the Middle East and North Africa (Arab) region was among the highest in the world, averaging nearly 5 percent a year. After Saudi Arabia, Morocco's growth rate was the highest in the world. This edge was lost in the 1980s however; and by the 1990s, Morocco had become the worst-growth performer in the Arab region, averaging 2.5 percent. Recovery took place between 2000 and 2004. Following good agricultural seasons and important efforts in stabilization and structural reform, growth rates recovered to an average of about 4 percent. Nevertheless, these rates will still be insufficient to significantly reduce poverty and employment. Higher growth is critical to reduce unemployment. Labor force growth remains above 3 percent per year, and recorded unemployment stands at 11 percent. Reduction in unemployment will require sustained annual economic growth above the 5–6 percent range.
In the absence of such growth, poverty reduction will stall and sociopolitical tensions will increase. During the 1990s, reforms slowed and average annual growth declined to around 3 percent. After 2001, the pace of reform accelerated. Growth entered an expansive cycle, and unemployment declined. This is a clear improvement yet still insufficient to meet the population's expectations. If unemployment is not reduced, social crisis could result.

Morocco's growth is an enigma. There are good reasons why Morocco should be achieving high growth: a privileged geographic position as well as significant progress in price stability, public debt reduction, strengthening of the financial system, infrastructure improvement, educational reform, reinvigorated tourism, and privatization. The country is well regarded by international risk agencies, which recognize its political and social stability.

In light of these advantages and reforms, why does growth not accelerate? This study addresses this fundamental question. Morocco is not unique in this situation. Previous studies show that only 17 of 83 countries implementing similar liberalization processes between 1960 and 2000 experienced periods of ensuing rapid growth. These studies show that periods of rapid growth are linked to removal of actual constraints to growth rather than to the fact of reforms. Reforms are important, but rapid growth relies more fundamentally on properly identifying the binding constraints to growth. In similar vein, relying solely on ongoing reform and favorable external conditions would be a risky bet. For Morocco, additional efforts are needed.

Another study (World Bank, 2005?) identifies Morocco's binding constraints to growth. It applies an innovative procedure known as "growth diagnostic." This new approach is country specific, comprehensive in its assessment, and heterodox in the measures that it recommends.

It calls for activist policies for productive diversification and enhanced competitiveness of the economy. These selective reforms differ from "traditional" policy recommendations which give equal weight to simultaneously implement multiple reforms.

Applying this procedure, this report provides a central diagnostic. It finds that the

Moroccan economy suffers from a sluggish process of structural transformation for achieving higher growth, especially on exports that have to face unfavorable external shocks arising from competitors in the main markets for Moroccan exports. This process of so-called "productive diversification" requires Morocco to enhance its competitiveness and accelerate its transition from low to high value-added productive activities. International experience shows for strong economic performance, what is exported, not how much, is what matters most.

Four government failures are identified as binding constraints to growth: a rigid labor market; a burdensome tax regime that penalizes firms and creates obstacles to hiring skilled workers; a fixed exchange rate regime that has regained price stability but worked against international competitiveness in light of rigidities in the labor market; and an anti-export bias featuring high trade protectionism despite recent progress in tariff reductions and several Free Trade Agreements (FTAs).

In addition to these four binding constraints, three market failures are also responsible for low growth: first, information failures that incentive the violation of intellectual property rights and reduce the rates of return for investing in new productive activities; second, coordination failures between the public and private sectors; and third, training failures that place Morocco among countries with the least training offered by businesses, thereby discouraging competitiveness and innovation.

The Government and entrepreneurs are fully aware that Morocco needs a new growth strategy. The centerpiece of the Government agenda is the Emergence program, which was announced in December 2005. In addition, an Employment Initiative (EI) was announced in September 2005. Both decisions share the implicit vision of a new pact for growth and employment for Morocco. Both are highly positive steps in the right direction.

Complementary to such efforts and consistent with this focused approach, the CEM proposes a set of measures that would further encourage productive diversification and enhanced competitiveness. To create a leadership structure: Establish a coordination council headed by the highest-level authorities, including active participation by the private sector.

In regard to the short-term policy agenda: keep real minimum wages constant. Design and implement a neutral tax modernization reform mainly, reduced corporate income tax and IGR rates, and a simplified value-added tax. Move gradually toward a flexible exchange rate regime. Accelerate the reduction of tariff and nontariff barriers. To address potential market failures: Adopt a set of fiscal incentives to new productive activities—as transversal as possible and as sectoral as needed. Introduce a competitive, transparent, and accountable selection process for the new activities that would receive incentives. Strengthen property rights. Provide additional incentives for training by firms. To further encourage discipline and transparency: Extend the use of contracts program.

A report by the World Bank (2012) is prepared just prior to the Arab Spring. This anticipates the demands for social and economic inclusion articulated by Moroccan young people especially following February 2011. Since then, these demands have been amplified and reached a new level of urgency. This study adopts a mixed method approach combining an innovative quantitative instrument with qualitative and institutional analysis. The goal is to provide policy makers with a nuanced analysis of barriers to employment and active civic participation encountered by young people aged 15 to 29 years so as to tailor youth interventions more effectively. It identifies a wide range of recommendations available to support youth inclusive activities and policies, and a roadmap for integrated youth investments. Youth (aged 15 to 29) make up some 30 percent of Morocco's total population and 44 percent of the working age population (aged 15 to 64), but have been largely excluded from the sustained economic growth the country has experience in the last decade. Though the youth unemployment rate is high, averaging about 22 percent among males and 38 percent among females1, it only provides a partial picture of young people's exclusion from economic life.

L. Achy (2012) relates unemployment and job vulnerability to the economics of the rents that are prevailing in the Arab economies. The author considers that the few jobs created are precarious and related to low productivity sectors. To adjust their unemployment rates with the world average 20 million jobs are needed while keeping the current rate constant requires 13 million jobs. This necessitates a constant economic growth of at least 5 percent while the 20 million need an annual growth rate of 8 percent. This cannot be achieved under the on-going development model. This model is mainly based on the economics of rents, subsidies, fiscal favors and lack of transparency needs to be changed to a new model. This latter is merit based, transparent and without excessive rents.

A.Kadiri (2012), for more than a decade prior to the uprisings of 2011, the official unemployment rate in the Arab region was among the highest globally and around half the Arab population subsisted on less than two dollars a day. When unemployment is measured by imputing a minimum historically-determined level of subsistence into it, the effective unemployment rate would rise to nearly fifty percent. Armed with neoliberal ideology, the Western-backed comprador class squandered resources either by expropriating the working population or by surrendering them to capital at prices that were set by a global power structure from which working people in the Arab world were excluded. In this essay, I argue that the retention of resources and their redeployment within the national economy are indispensable conditions for development and job creation. Employment policies are best set subject to social efficiency criteria distinct from the salient neoclassical productivity ones. It is highly unlikely, in view of the sheer smallness to which industry and the productive economy have shrunk under neoliberalism, that it would be possible to reemploy the massive redundant labor force on the basis of expanding private-sector expansion and productivity gains. A criterion valuing and remunerating social work may be costly in the short term, but the social returns will reimburse initial expenses over the long term. Notwithstanding the reductionist nature of the neoclassical criterion of efficiency, equity, in an Arab context of war and oil, must precede any received criteria for efficiency. More egalitarian rent, land and resource distributions redressing the dispossession of the working population during the neoliberal age represent the necessary conditions for effective demand enhancement and a successful development strategy.

2. A Statistical Description of Unemployment Rates in the Arab World

2.1. Descriptive Statistics:

The data about unemployment rates have been collected from the World Bank Database. This data represents the unemployment rate for people with a certain level of education as a percentage of the overall unemployment rates in almost all the Arab countries: Algeria, Bahrain, Kuwait, Lebanon, Morocco, Oman, Qatar, Saudi Arabia, Syria, Tunisia, the United Arab Emirates, and West Bank and Gaza, from 1991 to 2011. It contains the unemployment rate for people who primary educated, which represents the first stage of compulsory education, or what we can call low skilled people. It also displays the unemployment rates for people who are secondary educated or with an intermediary education, which is in fact the stage that follow the primary education , and it represents the unemployment rate for people for tertiary educated or highly educated people, who have been to the university or college.

From the first look on the data, we can see that the trend of unemployment rates differ from a country to another.

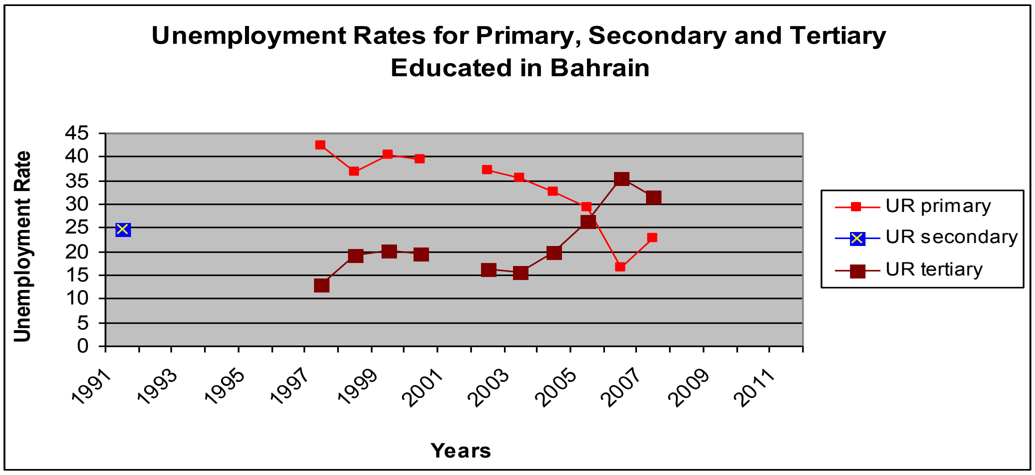


Fig. III.11

For instance, for Bahrain, the unemployment rates for both primary and tertiary educated change their trends around the years 1998 and 2006. In 1998, the unemployment rate for primary educated increases whereas it decreases for tertiary educated. The same thing happens in 2006. The decrease in the unemployment rate for the primary educated and the increase in the unemployment rate for the tertiary educated means that more low skilled are being hired in Bahrain, and less skilled people are being hired if we suppose that the tertiary educated people are the skilled ones. In 2005, the unemployment rate for tertiary educated people continues to increase until it exceeds the unemployment rate for primary educated. It starts decreasing in 2006, but it still continues to exceed the rate for primary educated (Fig. III.11).

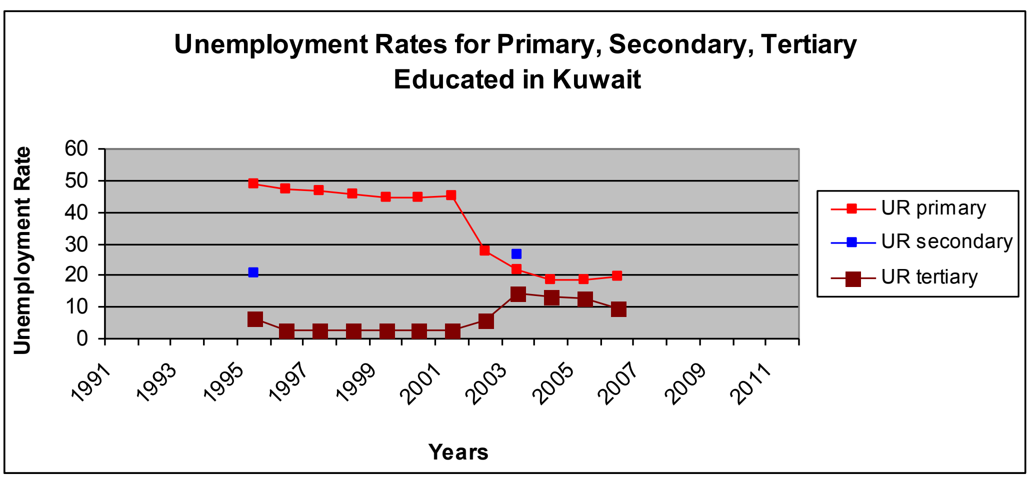


Fig.III.12

As for Kuwait, we can notice that there is a very wide gap between the unemployment rates for primary and tertiary educated people, where it reaches 50% for primary educated and does not exceed 10% for tertiary educated. We can also see from the line graph that in 2001, the unemployment rates for primary educated sharply decreases and continues to decrease with a slower rate in the upcoming years, while the rate start decreasing for the unemployment rates for the tertiary educated, until the two lines get very close and reach values between 10% and 20% (Fig.III.12)

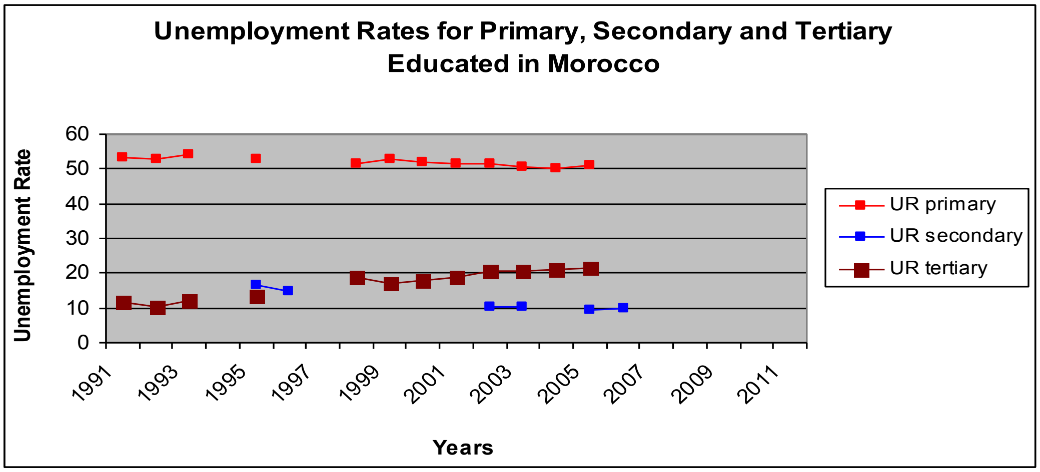
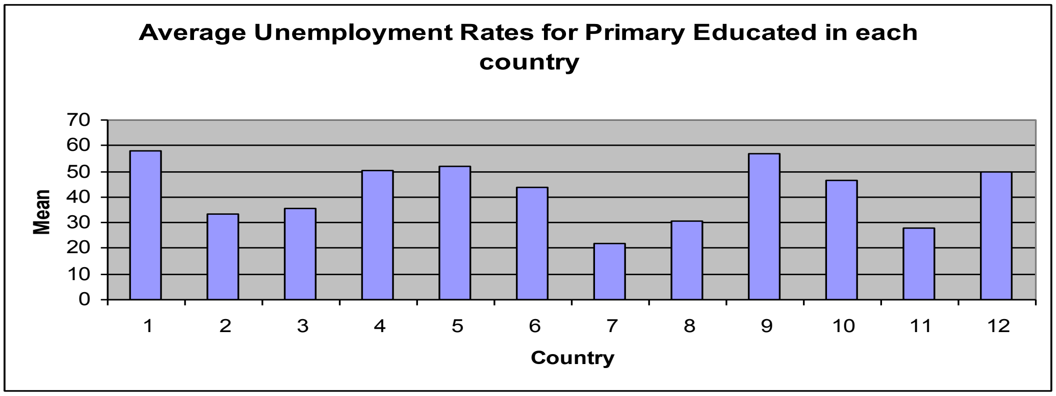


Fig.III.13

As for Morocco, we can notice that the same unemployment rates remained almost constant for the three levels of education, with a very small increase in the unemployment rates for the tertiary educated, and a very small decrease for secondary educated people. We can also notice the very wide gap between the unemployment rates, where the unemployment rate for the primary educated people exceeds 50% along the years, and where the unemployment rate for secondary educated people does not exceed 25%. And from 2003, we can also notice that the unemployment rate for tertiary educated starts exceeding the unemployment rate for secondary educated (Fig.III.13).

Examining all the countries data for the primary education reveals that Algeria has the highest mean in unemployment rates, and Qatar has the lowest one. We can also put the countries into two categories, the ones with means higher than the X bar for the whole population (42.18103%), which are Algeria, Lebanon, Morocco, Oman, Syria, Tunisia and the west Bank and Gaza, and the ones with means lower than the X bar which are Bahrain, Kuwait, Qatar, Saudi Arabia, and United Arab Emirates, and which represent the countries of GCC.



Notes: 1- Algeria ; 2- Bahrain; 3- Kuwait ; 4- Lebanon ; 5- Morocco ; 6- Oman; 7- Qatar; 8- Syria ; 9- Tunisia ; 10- United Arab Emirates; 11- West Bank and Gaza
Fig. III.14

As we draw the histograms of the average unemployment rates, the comparison between the countries gets clearer, we can for instance see that Algeria, Lebanon, Morocco, Syria, and west Bank and Gaza have the highest unemployment rates for primary educated, whereas Qatar, the United Arab Emirates and Saudi Arabia have the lowest unemployment rates (Fig. III.14)

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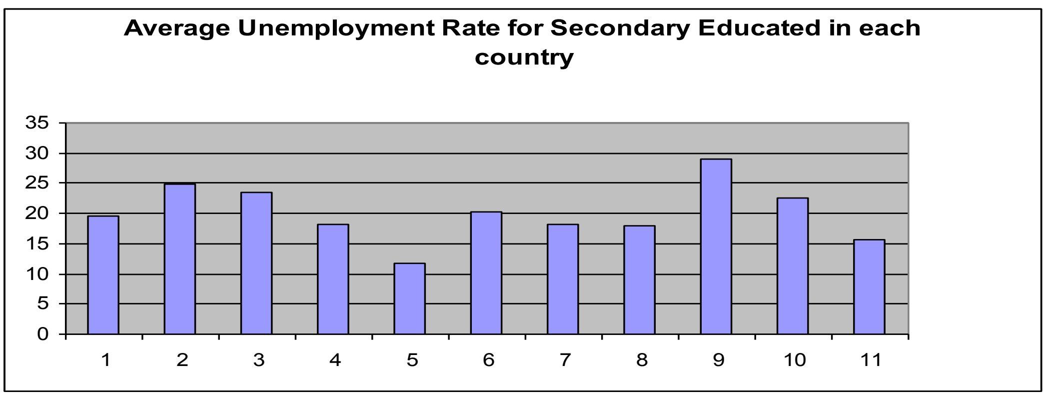
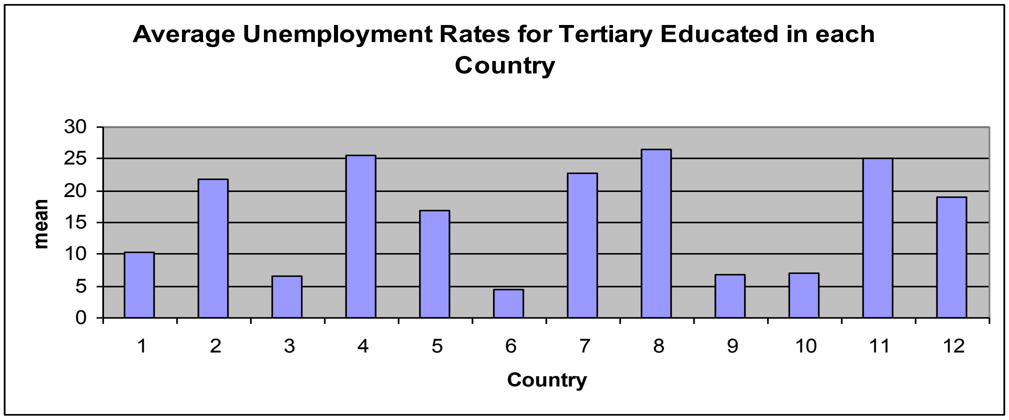


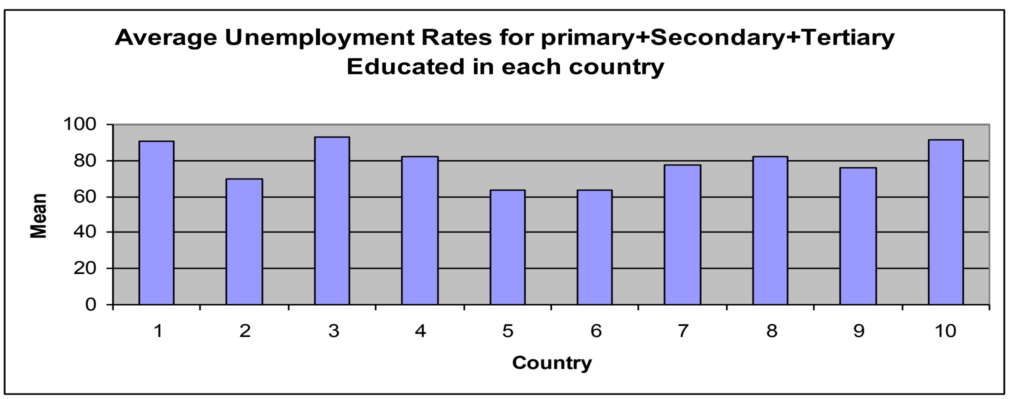
1-Algeria ; 2- Bahrain; 3- Kuwait ; 4- Lebanon ; 5- Morocco ; 6- Oman; 7- Qatar; 8- Syria ; 9- Tunisia ; 10- United Arab Emirates; 11- West Bank and Gaza
Fig. III.15

As for the unemployment rates for the secondary educated, and from the histogram, we can conclude that Tunisia has the highest unemployment rate, followed by Bahrain and Kuwait, and Morocco has the lowest unemployment rate followed by the West Bank and Gaza with an average unemployment rate of 15.65%. And this seems to be different from the results we have found from analyzing the first histogram that represents the average unemployment rate for primary educated, and from which we concluded that mainly, the countries of the Gulf Cooperation Council have the lowest unemployment rates (Fig. III.15).



1- Algeria ; 2- Bahrain; 3- Kuwait ; 4- Lebanon ; 5- Morocco ; 6- Oman; 7- Qatar; 8- Syria ; 9- Tunisia ; 10- United Arab Emirates; 11- West Bank and Gaza
Fig. III.16

As for the unemployment rates for tertiary educated, we can see from the histogram that there is a very wide discrepancy between the countries' unemployment rates. Here, the country with the highest unemployment rate is Saudi Arabia, followed by Lebanon and the United Arab Emirates, and the country with the lowest unemployment rate is Oman, followed by Kuwait and Syria (Fig. III.16).



1- Algeria ; 2- Bahrain; 3- Kuwait ; 4- Lebanon ; 5- Morocco ; 6- Oman; 7- Qatar; 8- Syria ; 9- Tunisia ; 10- United Arab Emirates; 11- West Bank and Gaza
Fig. III.17

And if we gather all the three unemployment rates, which will give us a measure of the unemployment rates of skilled people, and from the histogram above, we will find that Oman has the lowest rate, and Lebanon has the highest rate. And again we can split the countries into two categories, the ones that have a higher unemployment rate than 79.03% such as Algeria, Lebanon, Morocco, Syria, Tunisia, and the West Bank and Gaza, and the second category, of the countries which have a smaller unemployment rate than 79.03% such as Kuwait, Oman, Qatar, and the United Arab Emirates. And here again we can notice that the countries with relatively low unemployment rates of skilled people are the countries of the Gulf Cooperation Council (Fig. III.17).

For the unemployment rates for the primary educated, we can see that there is a low standard deviation, and hence a low variance for Algeria, Lebanon, Morocco, Qatar and Tunisia, which means that those countries have most of the data points centered on their respective means. The other countries have a relatively higher standard deviation (Bahrain, Kuwait, Saudi Arabia, Syria, the United Arab Emirates and the West Bank and Gaza), which means that their unemployment rates vary more than the other countries, and the data points are not really clustered around their respective means.

As for the unemployment rates for primary and secondary educated gathered, we can see that only one country have relatively high standard deviation, Kuwait. As for the rates for secondary and tertiary educated, two countries have relatively high standard deviations, Kuwait and the United Arab Emirates. And at last, for the unemployment rates for primary secondary and tertiary educated, those latter countries again are the ones that have relatively high standard deviations. But again, these are not really accurate measures, as the number of data per country that we have is really low, which make it hard for the standard deviation to be reliable.

2.2. Trend Analysis

The trends estimated below are increasing over the period 1990-2012. They concern the unemployment rates globally and by level of education for each Arab country. They are also increasing in relation to gender. The following respective tables address the estimated trends.

Table III. 10: The Dynamics of the Yearly Unemployment Rates (1990-2012)

Country	constant	coefficient	R^2	Observations
Algeria	-0.06 (-0.04)	0.99 (14.01)	0.90	23
Bahrain	0.08 (0.28)	0.96 (18.51)	0.94	23
Egypt	2.70 (2.46)	0.72 (5.98)	0.63	23
Morocco	1.32 (0.81)	0.88 (7.75)	0.74	23

Jordan	2.46 (1.44)	0.82 (7.36)	0.72	23
Tunisia	2.64 (1.75)	0.82 (7.89)	0.75	23
Syria	8.00 (4.20)	0.10 (0.49)	0.01	23
Yemen	1.40 (1.93)	0.92 (17.20)	0.93	23
Saudi	0.91 (1.27)	0.84 (6.36)	0.66	23
UAE	4.44 (2.35)	0.04 (0.20)	0.001	24
Qatar	0.02 (0.10)	0.94 (10.86)	0.85	23
Lebanon	1.24 (1.55)	0.87 (9.34)	0.80	24
Algeria, Morocco & Tunisia	0.43 (0.65)	0.96 (24.84)	0.90	69
Saudi, Qatar & Bahrain	0.41 (1.19)	0.92 (14.40)	0.82	47

Trends of unemployment by level of education

Table III. 11: Results of Primary Education's Regressions

Country	constant	coeff	R. squared	Obs
Algeria	-0.04 (-0.04)	0.10 (13.70)	0.91	20
Morocco	1.03 (1.20)	0.87 (7.91)	0.77	21
Tunisia	2.86 (6.64)	0.65 (11.56)	0.92	14
Algeria, Morocco &Tunisia	0.48 (2.04)	0.96 (42.29)	0.97	55
UAE	0.04 (0.87)	0.98 (18.02)	0.95	17
Kuwait	0.01 (1.41)	1.07 (13.68)	0.93	15
UAE & Bahrain	0.02 (2.27)	1.01 (76.03)	0.99	32

Table III. 12: Results of Secondary Regressions

Country	constant	coeff	R. squared	Obs
Algeria	-1.82 (-1.56)	1.09 (13.44)	0.95	11
Morocco	-0.69 (-1.11)	0.98 (13.65)	0.95	12
Tunisia	1.51 (0.99)	0.67 (1.81)	0.35	8

Algeria, Morocco &Tunisia	-0.18 (-0.65)	0.97 (35.51)	0.98	31

Table III. 13: Results of Secondary Female's Regressions

Country	constant	coeff	R. squared	Obs
Algeria	3.94 (0.61)	0.83 (2.61)	0.53	8
Morocco	1.19 (0.66)	0.88 (5.59)	0.74	13
Tunisia	0.47 (0.45)	1.02 (7.92)	0.91	8
UAE	4.50 (2.61)	0.85 (15.22)	0.95	15
Syria	0.32 (0.33)	1.04 (10.98)	0.93	11
Oman	-1.27 (-0.54)	1.05 (13.97)	0.95	12
Qatar	1.93 (0.87)	0.95 (12.01)	0.93	13
Kuwait	0.04 (0.03)	1.00 (10.36)	0.93	10
Algeria, Morocco &Tunisia	0.12 (0.28)	1.01 (32.69)	0.97	29

3. Unemployment Persistence and Risks of Skill Obsolescence

Researchers, policymakers, and people of many vocations and ideologies are genuinely concerned about the progress of Arab workers

A recent study by the World Bank last year stressed the need for Arab countries to have 100 million jobs by 2025, only to maintain the current unemployment levels and prevent them from increasing. The study also stated that the unemployment rates in the Arab countries ranged between 25% and 30% in 2011, and these figures are the highest in the world.

Clearly, youth unemployment rates (15-24) constitute the highest figures in comparison with other age groups (Arab report, 2009). Unemployment is highest among secondary graduates and those with 'mid-level' educations. Dhillon and Yousef (2009) show that the duration of unemployment for new graduates is long in Arab countries: 3 years in Morocco and 2.5 years in Egypt. How to reduce the risk of persistent unemployment is an important macro policy question. But also unemployment disproportionally affects women.

There are some social and human costs of unemployment. They include the loss of lifetime earnings, loss of human capital, adverse health outcomes, discouragement. Those become unemployed suffer a substantial decline in wages in the short and long run. Some scholars empirically document that these earning losses persist over time (see Von watcher, 2010). Furthermore, parents' unemployment can even affect health and education outcomes of their children. The costs of unemployment seem to be particularly large for certain groups, such as the youth and the long term unemployed (see von Watcher, 2010). Some scholars argue that the estimated increase in mortality due to unemployment can persist up to 20 years after the job loss and it can be associated with decreases in life expectancy. The duration of unemployment might be associated with higher risks of heart attacks and other stress related illnesses. High youth unemployment constitutes lost productivity to the economies of the region, with the opportunity costs associated with youth unemployment reaching almost 3% of GDP annually (Chaaban, 2008)

In addition, long-term unemployment involves important economic costs on everyone, not just the unemployed themselves. Elevated unemployment strains public finances because of both lost tax revenue and the payment of increased unemployment benefits and other income support to affected families. Some scholars argue that the longer the spell of unemployment, the more difficult it becomes for the worker to return to the employment (Heckman and Borjas, 1980). In overall, loss of skills reduces the economy's overall productive capacity in the long run.

College graduates from less prestigious universities or majors who have received less training or might be of lower abilities are at particular risk from early career interruptions. Nevertheless, the magnitude of these losses is unknown because of a lack of longitudinal data in Arab countries.

The data were obtained from the World Development indicators from the World Bank. The database consists of annual observations. The problem with the dataset is that there is only a small number of observations. Data is also available by gender and age in the World Development Indicators from the World Bank. In what follows, a simple description of the unemployment rates is presented.

Given the nature of data we have, there is no way to identify spells of employment or unemployment that may have occurred. It is clear, however, that all workers are vulnerable to future spells of non-employment. Table displays the evolution of unemployment rates over time for a sample of Arab countries. The average rate of unemployment over this period is. If unemployment is being reduced in these countries, it is essential to reduce the percentage of long term unemployed.

Potential solutions for long term unemployment

One of the potential solutions suggested in the formal literature is called reemployment bonuses. Workers, who have been unemployed for a long period of time, might have lost motivation or hope. Bonuses that pay workers for finding a new job might can reconnect long term unemployed workers to the labor force (see von Watcher, 2010).

Job search assistance has been shown to be efficient and cost effective in the United States and some European countries. This assistance is linked to the perception of unemployment benefits. Job career centers can provide training courses and individual career counseling.

Combination of these policies can be implemented simultaneously for further effectiveness. Nevertheless, these policies cannot be substitute of a rise in job creation. Other authors argue that by retraining workers in the skills that are demanded by firms (see Julen Esteban Petrel, 2002).

V. ICTs' Role in and Impact on Enhancing Social and Economic Performances in the Arab Region

Information and Communication Technology (ICT) refers to a technology that allows communication along with the electronic acquisition, processing and broadcast of information. ICTs have an impact on businesses in both developed and developing countries. New opportunities emerge from the use of ICTs such as the design and delivery of digital goods and margin and revenue increase by accessing foreign markets directly. In the pursuit of development, sectors interact and share knowledge and techniques. These interdependencies among sectors need to be coordinated in order to achieve better progress. For instance, the economic performance influences and is impacted by performances in health and education sectors. In addition, there are variations between countries and regions in benefiting from these interdependencies. Therefore, this paper focuses on the importance of coordinating ICTs to benefit from the variations by sector and by country and region (developed versus developing, especially Arab countries) in promoting development.

This collaboration has to do with the way ICTs can be helpful in education, health, social and economic performances and how they are used to coordinate interdependencies within and between these sectors. This paper explains how ICTs and related technologies have been means to improve the lives of people and compares between the era of limited ICTs access and the era of reduced digital divide and improved access to ICTs, including the enhancement of old functions and the creation of new ones such as e-commerce, e-health, e-education, e-tourism, e-finance and e-trade. Developed economies are assumed to benefit more from these ICTs than developing ones. It also seems that the Arab region has the potential of performing better.

1. Past contributions

Information and Communication Technology (ICT), through radio, television and print media, have been important in many developing countries. In recent years new ICTs, including Smart phones and Internet-associated applications have become accessible to larger populations worldwide. ICTs have been helping developing countries deal with different health, social and economic problems (Postnote, 2006). ICTs are assumed to have a potential role in eliminating extreme poverty, achieving universal compulsory education and gender equality and fighting against serious diseases, by enhancing information accessibility and allowing communication.

However, disparities between countries still exist and poor and rural populations often do not have access to new ICTs. According to Postnote (2006), OECD countries have the highest access to new ICTs, followed by South Asian and some African countries, including South Africa. Manochehri et al. (2012) stated that ICTs have an important impact on businesses in developed and developing countries in terms of productivity and economic growth. Burke (2010) reported the existence of important benefits from having websites, including the introduction of new customers and additional sales for firms. Other studies found that Arab countries still fall behind developed ones both in ICT spending (Nour, 2008) and in the lack of means needed to succeed in projects made to promote growth through IT transformation (El-Shenawy, 2010). In addition, Richardsson et al. (2006) identified five main areas of ICT applications to support enterprises and rural development, which include the economic development of products, community development, research and education, small and medium enterprises development and media networks. The effect of ICTs also differs inside regions. The diffusion of ICT in OECD countries currently differs considerably since some of them have invested more or have began investing in ICTs earlier than other countries (OECD, 2003). This investment refers to establishing the infrastructure or networks for the use of ICT and providing productive equipment and software to businesses (Richardsson et al., 2006). Galliano et al. (2008) found that there is a gap in the intensity of ICTs' usage between industrial French firms that are located in rural areas and those located in urban zones. The authors stated that two elements result from the geographic isolation that is the difficult access to information and the complicated mode of coordination with eternal partners, given their distance.

Piatkowski (2003) has already established the link between ICTs and company competitiveness. The author found that ICT platforms, including personal computers, mobiles and internet, provide more visibility to businesses, offer more information to small enterprises, allow enterprises to overcome trade barriers and facilitate financial transactions. The private sector was encouraged to invest in an ICT infrastructure and use ICTs as a means of competitive advantage to conduct business. This can take the form of commercially-driven connectivity, software, technology, e-commerce and online transactions (Clift, 2003).

Manochehri et al. (2012) established a positive link between ICT investments and labor productivity. They stated that the most important benefits of ICTs come from their effective use, especially in enterprises that are structured to use these technologies. The ICT revolution in the US has stimulated enterprise restructuring and has modified the terms of competition: US enterprises have become more efficient in getting value from their ICT activities, given that spending in the US has jumped to 5.4 % in 2010 according to Pettey and Tudor (2011).

It has been reported that investment in basic telecommunications in Africa resulted in a positive impact on economic, political and institutional development. Shirazi (2008) has also established a link between ICTs (the internet) and a rapid democratization in regions such as the Middle East. A recent example of such view has been witnessed recently through events such as the "Arab Spring" in Egypt, Libya, Syria, Tunisia, Yemen and other Middle Eastern countries.

Adewoye and Akanbi (2012) pointed out to problems that delay the development of the SMEs sector in Nigeria, including obsolete technologies and machineries, lack of access to modern technology, lack or limited access to information on raw materials, management support and technical advisory services, financial problems and poor economic condition. Some of these problems can be resolved by applying ICTs to bring about sustainable economic development. According to Richardsson et al. (2006), Nigerian companies can use ICTs in online services for information, monitoring and consultation and transaction and processing (e-commerce).

Rallet and Torre (2000) found that there are factors impacting the diffusion of ICT. These factors include coordination mechanisms in innovative and research activities and the geographical proximity of economic agents to develop innovation activities. It has been reported that geographical proximity is beneficial if the nature of the activities is characterized by tacit knowledge. Thus, the less tacit knowledge is (later stages of the development process), the less the need for physical proximity. In addition, it is argued that ICTs can increase the possibilities of remote coordination since they are a means of turning tacit knowledge into codified knowledge.

Ssewanyana and Busler (2007) reported that the adoption and use of ICTs have an impact on business processes, even though disparities between developed and developing countries do exist. Internet usage in the developed world was 8 times that of developing countries in 2004 (ITU, 2011). ICTs have transformed the way businesses are conducted by introducing the concept of 'Networked economy' that links businesses with suppliers, internal manufacturing processes, shippers and customers in real-time. From a Ugandan case study, the adoption and usage of ICTs by enterprises in developing countries are said to follow the same pattern as the developed ones and only differ in the level of usage and adoption.

2. Methodology and Data

To assess the impacts of ICTs on economic and social performance data, some indicators were gathered especially from the World DataBank database (The World Bank) and the International Telecommunications Union (ITU) database to try to link ICT variables with health, education and economic indicators. Linear regressions were conducted to identify links and relationships between these indicators. Only countries included in Arab region are considered in this study. These include Bahrain, Egypt, Iraq, Jordan, Kuwait, Lebanon, Libya, Morocco, Oman, Qatar, Syria, Tunisia, United Arab Emirates and Yemen.

Among the ICT indicators used, there is the number of internet users who are people with access to the worldwide network and the investment in telecoms with private participation (current US$) which is the value of telecom projects that have reached financial closure and directly or indirectly serve the public, including operation and management contracts with major capital expenditure, green-field projects and divestitures. There are also the ICT goods imports and exports, which include telecommunications, audio and video, computer and related equipment; electronic components; and other ICT goods where software is excluded. In addition, ICT service exports include computer and communications services (telecommunications and postal and courier services) and information services (computer data and news-related service transactions).

The health, education and economic data was respectively represented by the total health expenditure, the total life expectancy at birth, the adult total literacy rate (as % of people ages 15 and above), GDP (current $US) and GDP per Capita (current $US). The total health expenditure is the sum of public and private health expenditure. It covers the provision of health services (preventive and curative), family planning activities, nutrition activities, and emergency aid designated for health but does not include provision of water and sanitation. Life expectancy at birth is the number of years a newborn infant would live if prevailing patterns of mortality at the time of its birth were to stay the same throughout its life. The adult literacy rate is the percentage of people ages 15 and above who can, with understanding, read and write a short, simple statement on their everyday life. GDP at purchasers' prices is the sum of gross value added by all resident producers in the economy plus any product taxes and minus any subsidies not included in the value of the products. Data are in current US dollars. GDP per capita is gross domestic product divided by mid-year population.

The indicators used in this paper are listed in the appendix under their raw and natural logarithmic forms. The results of the regression analyses conducted are as follows:

a. Impact of Economic and social development on ICTs:

Equation	R^2	Obs.
$\ln(InternetUsers2010) = \underset{(-0.928)}{-5.295} + \underset{(3.557)}{0.807} * \ln(GDP2009)$	0.46	17
$\ln(InternetUsers2010) = \underset{(-1.432)}{-6.265} + \underset{(5.401)}{0.983} * \ln(GDP2009) - \underset{(-3.376)}{0.567} * \ln(HEPC2009)$	0.70	17
$\ln(InvInTelecoms2010) = \underset{(-0.874)}{-1.127} + \underset{(0.770)}{0.447} * \ln(HEPC2009) - \underset{(2.569)}{0.746} * \ln(GDP2009)$	0.59	10
$\ln(InvInTelecoms2010) = \underset{(0.189)}{1.633} + \underset{(2.126)}{0.727} * \ln(GDP_{PC}2009)$	0.39	9

b. Effects of ICTs on Economic and social development:

Equation	R^2	Obs.
$\ln(GDP2010) = \underset{(5.85)}{14.08} + \underset{(4.86)}{0.75} * \ln(InternetUsers2009)$	0.68	13
$\ln(HEPC2010) = \underset{(0.24)}{0.65} + \underset{(2.19)}{0.40} * \ln(InvestmentInTelecom2009) - \underset{(-1.22)}{0.22} * \ln(InternetUsers2009)$	0.45	9
$\ln(GDPperCapita2010) = \underset{(1.90)}{3.94} + \underset{(2.01)}{0.21} * \ln(InvestmentInTelecom2009)$	0.37	9
$\ln(GDP2010) = \underset{(4.28)}{9.67} + \underset{(7.01)}{0.79} * \ln(InvestmentInTelecom2009)$	0.88	9

3. Discussion

It has been indicated in the literature that the share of ICT in investment is a core indicator of ICT diffusion. From the first set of results above, it is observed that an increase in the economic performance, measured by GDP per Capita in the Arab region can lead to an increase in investment in telecommunications at a decreasing rate. Indeed, previous studies have shown that higher levels of ICT investments do not necessarily lead to better business performance than lower levels.

The results also show a positive relationship between economic performance (GDP) and the number of internet users. An increase in GDP can lead to an increase in the number of internet users but at a decreasing rate. However, an increase in health expenditures per capita by one

point of percentage can trigger a decrease in the natural logarithm of the number of internet users by 0.57 points.
Other indicators tested during the empirical analysis did not show any impact on the investment in ICT, number of internet users, ICT goods for import, ICT goods for export or ICT service exports. These include the total adult literacy of ages 15 and above and life expectancy at birth. In addition, health expenditures per capita, GDP, GDP per capita and total life expectancy at birth did not seem to affect the ICT goods imports, ICT goods exports and ICT service exports.
The second set of results studies the impact of ICTs on the economic and social developments. It is observed that an increase in internet users can lead to an increase in GDP at a decreasing rate. The same result appears when an increase in telecommunications investment occurs. In addition, a small increase in investment in telecommunications seems to lead to a slow increase in GDP per capita. The increase in telecommunications' by one percentage point leads to the increase in health expenditures per capita by 0.4 points of percentage. Further details are in tables in the Annex 9 (Appendices).

This section discusses ICTs' impact on businesses in North Africa and Middle Eastern countries. From the results, it appears that new economic and social opportunities emerge from the increased use of ICTs. At the same time, it seems that the enhanced economic and social development, notably in relation to health and GDP, leads to an improved use of information and communication technologies. A future development of this paper can be focused on the need to coordinate interdependencies among sectors in order to achieve better progress. Variations between countries and regions in benefiting from these interdependencies are also subjects to be discussed further. This paper focuses on proving the importance of ICTs in the economic and social developments as well as the effect of improved social and economic conditions on the usage of ICTs. These latter are helpful in education, health, social and economic performances. This paper provided some explanations on how ICTs and related technologies can be means to enhance the lives of people. Also, the paper demonstrates that the development of Arab countries' economic and social conditions can be explained by the improved usage of ICTs and related technologies. According to the results, these countries seem to have the potential to perform better.

VI. Energy: The Oil and Gas Sectors & The Green Economic Trends in the Arab World Economies

As most of the Arab countries produce and export a large share of oil and gas to world markets, it is important to focus on these sectors to find out about the economic effects on these economies. Also, with the development of non renewable energies and the major debates and actions undertaken to promote green economies, this dimension of the report aims at characterizing the main trends affecting both renewable and non renewable energy in the Arab countries. It further addresses the question related to the promotion of greener activities in this part of the world. Are green energy and environmental innovations likely to be adopted and developed in the context of traditional oil and gas producing and exporting economies or in economies that are not based on oil and gas?

The above objective is pursued in this part of the report. This is organized in two sections. The first one focuses on oil and gas. The last section concentrates on the relationships between renewable and exhaustible energy sources with the likely resulting trends in different Arab economies.

1. Economics of Oil and Gas in Arab Countries

This part introduces an overall description of the situation of oil and gas in each Arab country. This is followed by the analysis of the dynamic patterns of net revenues from these natural resources. The relationships between net revenues and prices are then introduced to show how oil and gas market indices drive revenues from these commodities.

1.1. Descriptive Analysis of oil and gas sectors

According to oil data published by the Energy Information Agency (EIA) in 2011, the daily global world oil production is 88.76 million barrels. The Middle East accounts for the largest share of production among all world regions through 31% contribution. North America accounts for 20%, Eurasia for 11%, Africa, Asia, and Oceania for 9%, and Central and South America, and Europe for 5%.

Knowledge about the crude oil produced in each country is fundamental to understanding the global oil market and how global events can impact it. The top 10 world oil producers in 2011 are in order: Saudi Arabia, United States, Russia, China, Iran, Canada, United Arab Emirates, Mexico, Brazil, and Kuwait. Besides the Arab countries listed above, Iraq, Libya, Algeria, Qatar, Oman, Egypt, Syria, Yemen, are other important oil producers and suppliers. In addition to the high production, the Arab world has important reserves in oil and natural gas that are among the largest in the world (Fig.III.18and Fig.III.19).

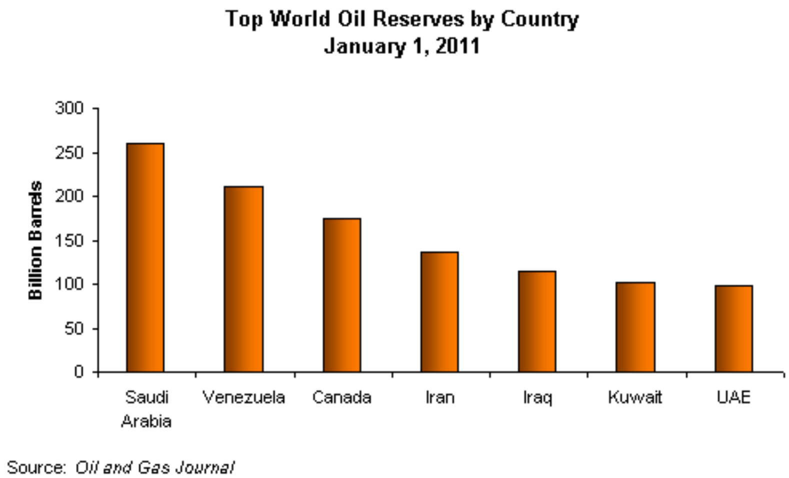


Fig.III.18: Top World Oil Reserves by Country, 2011

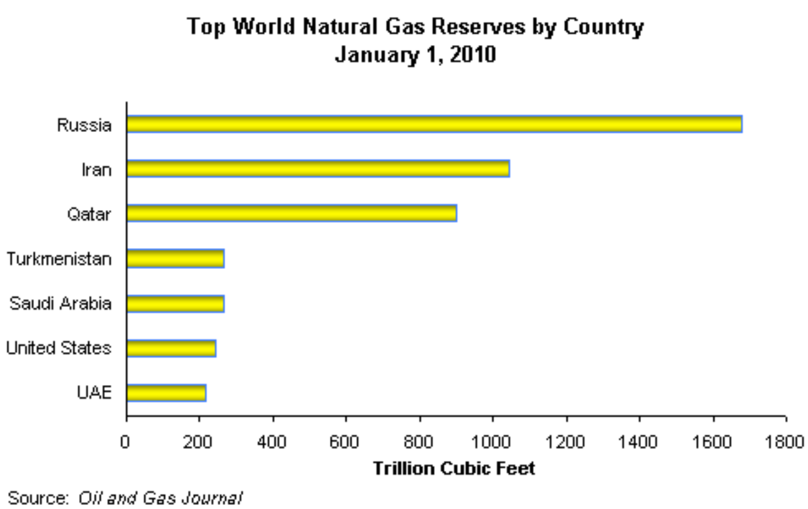


Fig.III.19: Top World Natural Gas Reserves by Country, 2010

Saudi Arabia is the largest producer and exporter of total petroleum liquids in 2010, and is the second largest crude oil producer in the world. It is an important member of OPEC and its first oil producer followed by Iran, Iraq, and Emirates as shown in the figure below (Fig.III.20):

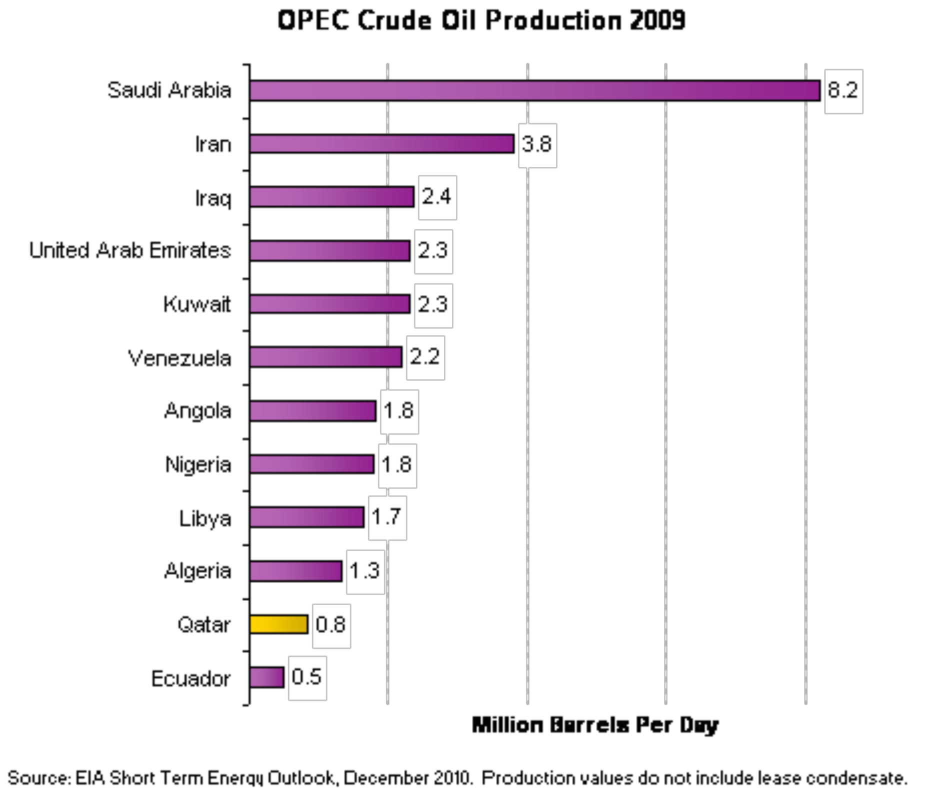


Fig.III.20: OPEC Crude Oil Production 2009

Oil revenues in Saudi Arabia account for 80 to 90% of the total revenues, for 40% of the GDP, and 90% of export earnings. Saudi Arabia is also the biggest consumer of petroleum in the Middle East. Up to 2008, the power needs for transportation, industry and domestic use were drawn from oil and natural gas at 56% and 44% respectively. Its oil consumption doubled from 2000 to 2009, and that is due to the growth of industrial sector, and the subsidization put on oil prices. Saudi Arabia has 20% of the world's proven oil reserves. It holds the world's largest oil field, the "Ghawar" field with 70 billion barrels of estimated remaining reserves. The Saudi Aramco, the national oil company, estimates that the average depletion for Saudi oil fields is 29%. As for the natural gas, the country has the fourth largest reserve in the world. However, most of this gas is of the associated type of gas, found in the same fields as crude oil or with petroleum deposits. In the past decade, natural gas exploration has been reconsidered as means for diversifying the sources of energy demand in order to free oil for export, and also for fueling the growing economy especially the petrochemical sector and for use in the water desalination. The exploration aims at finding fields of non-associated gas that is easy to develop.

United Arab Emirates is classified seventh in proven reserves in both oil and gas in the world. Although it has successfully worked on diversifying the economy until it has reduced the portion of oil and gas in GDP to 25%, it remains strongly dependent on oil and gas with a bigger emphasis on oil and increasing investment in natural gas projects. UAE exports oil to Asian markets, mainly Japan at 40% of its exports, South Korea, and Thailand. Most the electricity generated in UAE is based on natural gas of which UAE is a net importer, mainly from Qatar through the 2008 long term Liquefied Natural Gas (LNG) contract. The government then is pushing the gas exploration efforts forward in order to reduce the importation amount and cover the increasing demand on natural gas by an increasing population and an expanding economy. The development of the natural gas sector has been restrained by the high capital cost and the high sulfur content within the gas sources. Currently, UAE is looking into diversifying the sources of electricity generation by considering nuclear power and renewable sources of energy. In fact, the government has contracted in 2009 to build four nuclear reactors with a total capacity of 5.6 GW. Solar and geothermal projects are currently either on the phase of construction or planning to provide power for UAE and are part of Abu Dhabi's plan to make 7% of electricity generation from renewable by 2020. UAE is gaining reputation in the field of renewable, especially after the establishment of Masdar City, the first zero emission city in the world.

In Qatar, natural sources of oil and gas account for 85% of export earnings; 70% of revenues, and 50% of GDP. Qatar has the highest per capita income and the lowest unemployment among Arab countries. It is a large oil and gas producer with the third largest reserves in natural gas in the massive offshore North Field. It exports its oil to Asian economies, principally Japan. As for the natural gas, 70% of its exports are in the form of LNG destined to Japan, North Korea, and India at 57 % of total exports, to Belgium, UK, and Spain that accounts for 33%, and recently to UAE and Oman. Consumption in both oil and gas never out passes the production rates, which makes Qatar a net exporter of these two resources. 75% of energy consumption is from natural gas, the remaining 25% from oil. Besides being the world leading LNG exporter, Qatar is among the three countries in the world, besides South Africa and Malaysia, to have Gas-to Liquid (GTL) facilities to turn gas into fuel liquids such as diesel.

Iraq has the world's fourth largest petroleum reserves, however only a small fraction of it is developed. According to the Iraqi ministry, the production of oil was at 2,360 thousand bbl/ day in 2010 while the potential is at 13,225 thousand bbl/ day. Efforts are now directed towards bringing investment into the field of oil and gas after the years of war and sanctions have drift them away in order to reach its full production potential as well as modernizing and expanding the current oil infrastructure, reopening and rehabilitating the export pipelines that have been closed since the war. The economy is largely based on the oil sector that accounts for 90% of the government revenues and 80% of foreign exchange earnings, and two thirds of the GDP. The total energy consumption is based on oil at a 96% level. Most Iraqi oil exports are destined to China, India, and South Korea, the United States, and Europe, while gas exports remain controversial.

In Libya, hydrocarbon sector is the pillar of economy. It contributes to 95% of export earnings, 65% of GDP, and 80% of government revenue. It has the largest reserve of oil in Africa. Since sanctions on Libya were lifted in 2003, it has attracted foreign investment in exploration and production. As a result, the production has continuously but slowly increased over the past decade, and so have the oil exports. Currently, Libya exports over 72% of its oil to Europe namely Italy, Germany, France, Spain, Greece, and UK, and to China and the United States. Natural gas production and exports have substantially increased since the "Green stream" underwater pipeline was opened in 2004. It has increased from 200 billion cubic feet in 2003 to over 550 billion cubic feet in 2010, and the capacity is planned to increase further in the future for use in domestic power sector and LNG development.

Algeria, as all the discussed countries, has an economy that relies heavily on oil and gas. In fact, hydrocarbons contribute to 60% of budget revenues, 30% of GDP, and 95% of export earnings. An inert bureaucracy has constituted an impediment to attracting foreign and domestic investments in sectors outside the oil and gas sector, which has made the economic diversification a hard task to accomplish and unemployment to sustain. Besides crude oil production that is limited by OPEC quota, Algeria produces condensates and natural gas liquids as well. During the last few years, United States was the largest importer of Algerian crude oil, and then comes Europe in a second rank. In 2010, Algeria was the seventh largest exporter of LNG in the world, providing 7% of total LNG exports. Authorities' efforts since the last year has focused on corruption investigation among the operators in the oil and gas sector, investment incentives, and planning for additional LNG capacities.

For Egypt, hydrocarbons play a major role in the Egyptian economy. Tourism, manufacturing, and construction are also important elements to the economy. The Suez Canal and Suez-

Mediterranean (SUMED) Pipeline has made Egypt a strategic point for the world energy markets through which Persian Gulf oil and LNG is exported. Oil production has decreased since 1996 although new discoveries have been made and enhanced oil recovery techniques have been deployed. At the same time, the demand for oil has been increasing. Currently, the consumption is slightly higher than the production, which compels Egypt to import in order to cover the deficit. Egypt is an important provider of natural gas to Europe and Mediterranean region. It is constantly expanding its gas sector and promoting exploration and production. Half the energy demand in Egypt is assured by natural gas. In 2008, 5% of consumption came from hydroelectricity, and 0.3% from renewable. The rest was assured by oil. Projects are launched to increase the share of wind and solar energy such as a 140 MW solar installation that should be operational during this year, and a 5.66 GW wind energy to be installed over the five next years. Egypt is also developing nuclear power; a 1200 MW reactor is expected to operate by 2019 and three other nuclear plants are planned by 2025.

The tables below summarize the production of oil and Natural gas by Arab countries, and their exports, imports, and consumption in Natural gas.

Table III.14: Total Oil Supply in 2011 (Thousand Barrels per day)

Country	Production
Algeria	1884.148
Bahrain	47.43458
Egypt	706.0936
Iraq	2634.582
Jordan	0.08777
Kuwait	2681.894
Lebanon	0
Libya	495.621
Morocco	3.93794
Oman	888.9089
Qatar	1637.539
Saudi Arabia	11153.02
Sudan and South Sudan	436.269
Syria	330.8154
Tunisia	82.58438
United Arab Emirates	3096.343
Yemen	163.4243

Table.III.15: Natural Gas Overview in 2010 (in Billion Cubic Feet)

Country		Production	Imports	Exports	Consumption
Bahrain		432.60875	0	0	432.60875

Iraq		46.01545	0	0	45.9095
Jordan		7.7693	88.9938	0	96.7631
Kuwait		414.3509	31.43035	0	445.78125
Lebanon		0	0	0	0
Oman		957.0365	67.0985	405.76935	618.7188
Palestine		0	0	0	0
Qatar		4121.2605	0	3351.3935	769.867
Saudi Arabia		3095.7129	0	0	3095.7129
Syria		315.7161	24.36735	0	340.08345
United Arab Emirates		1810.9532	597.17665	270.15975	2137.9701
Yemen		220.3656	0	193.5262	26.8394
Africa		7376.52657	173.39665	3995.89225	3553.64251
Algeria		2988.00215	0	1970.22385	1017.7783

Data extract from Dogruel & Tekce, 2011: Trade Liberalization & Export Diversification in Selected Arab countries, Topics in Middle Eastern and African Economies, Vol 13, September 2011. Annex 10 (Appendices)

Table III.16: Share of oil and natural gas in total commodity exports

	Algeria	Egypt	Jordan	Kuwait	Morocco	Oman	S. Arabia	Tunisia
1991	96.90	53.48	0.02	80.36	2.51	87.40	92.87	14.32
1992	96.04	43.45	0.09	94.53	3.15	83.74	87.01	15.10
1993	95.76	49.07	0.02	95.07	2.66	78.90	91.08	11.46
1994	96.15	38.17	0.10	93.87	2.08	76.48	90.07	9.48
1995	95.08	35.83	0.03	94.67	2.20	78.59	86.76	8.47
1996	92.80	46.25		95.22	1.63	80.42	88.57	10.51
1997	97.17	44.32	0.04	95.05	1.94	76.39		9.07
1998	97.01	28.53	0.07	89.13	1.46	68.05	84.27	6.44
1999	97.14	36.03	0.03	90.64	2.70	76.93	88.53	7.16
2000	98.08	40.93	0.04	93.29	3.66	82.49	91.45	12.09
2001	97.61	39.02	0.04	92.04	4.22	80.49	86.09	9.24
2002	96.84	32.55	0.01	91.20	3.64	77.25	88.05	9.34
2003	98.04	42.14	0.24	91.54	2.59	76.82	88.23	9.99
2004	98.14	41.69	1.13	93.03	4.49	81.56	87.85	9.58
2005	98.40	50.71	0.17		5.05	84.38	89.47	12.93
2006	98.05	55.10	0.83	94.98	3.76	82.95	89.16	12.98
2007	98.38	51.41	0.68	94.45	3.81	79.66	88.10	16.19
2008	98.14	43.13	0.12	94.60	4.19	77.46	89.52	17.31
2009	98.31		0.27		3.28	67.64	84.61	13.63

Source: Dogruel & Tekce, 2011 based on COMTRADE data

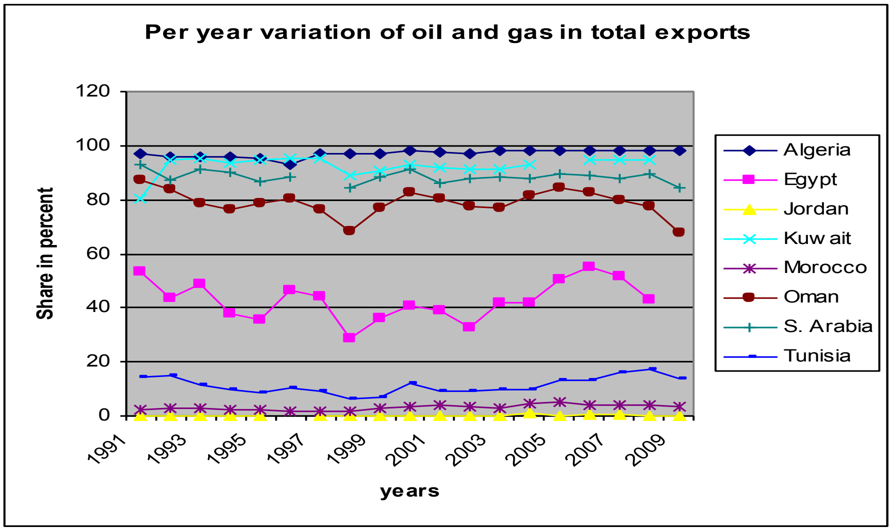


Fig.III.21

The Table (III.16) above shows the share of oil and natural gas in the selected countries' total commodity exports. The shares indicate that, except for Oman in the last decade, none of the oil abundant countries of the region have managed to increase the share of their non-oil exports.

1.2. Analysis of Oil and Gas Revenues per Arab country

Based on oil and gas rents or net revenues for the period 1971-2010, regression analysis is performed to determine the pattern governing these processes. The best models obtained show that in most of the countries, the statistically significant coefficients are those related the one lagged rent variable at the exception of Iraq. Also, the coefficients are most of the time lower than one except for Egypt and Libya where they are around one. This means that the rent series for oil in every country appear to be stationary in general. There is though the case of Yemen where the coefficient of the second lagged rent is also statistically significant. This means that more instability in oil rents has been observed. But this is not the case of all other Arab countries.

Table III.17: The Dynamic Process of Oil Rents

Country	Cst	Coef. Rt-1	Coef. Rt-2	R²
Algeria	3.403948	0.746037	0.032749	0.601761
(tstat)	1.909783	4.405703	0.194927	
Bahrain	9.792952	0.380411	0.135796	0.674435
(tstat)	4.671812	2.139495	1.002893	
Egypt	1.958001	1.064257	-0.21813	0.788032
(tstat)	1.703186	6.475296	-1.34048	
Iraq	-1.08058	0.443593	0.455159	0.751048

(tstat)	-0.02806	1.270458	0.865055	
Jordan	0.003454	0.905894	-0.58366	0.558515
(tstat)	2.497945	5.255468	-3.39932	
Kuwait	17.16019	0.652586	-0.00693	0.418059
(tstat)	2.322628	3.739681	-0.03949	
Libya	5.976755	1.051715	-0.19749	0.797601
(tstat)	1.266299	3.784344	-0.67648	
Morocco	0.001612	0.580242	0.259221	0.629061
(tstat)	1.100857	3.55235	1.577764	
Oman	8.256666	0.576811	0.217359	0.559306
(tstat)	1.511886	3.412828	1.298058	
Qatar	5.031336	0.802174	0.039118	0.680489
(tstat)	1.124128	4.604747	0.225866	
Saudi Ar.	12.18668	0.731304	-0.00112	0.532195
(tstat)	2.098643	4.30892	-0.00662	
Sudan	4.594598	0.697095	0.071589	0.749279
(tstat)	2.098056	2.290784	0.256124	
Syria	4.614056	0.720626	0.023409	0.619674
(tstat)	2.546302	4.312949	0.14727	
Tunisia	0.983658	0.894236	-0.04976	0.737298
(tstat)	1.510193	5.308184	-0.29604	
UAE	5.108619	0.725712	0.022961	0.597574
(tstat)	1.74835	4.061001	0.132341	
Yemen	20.92185	0.807225	-0.50941	0.471904
(tstat)	3.2356	3.759291	-2.31944	

While Bahrain, Iraq and Libya have not shown statistically significant coefficients for one lagged rent, the other countries have expressed coefficients that are less than one. This confirms the stationary of the gas rents.

Table III.18: The Dynamic Processes of Gas Rents for Arab countries 1971-2010

Country	**Cst**	**Coef. Rt-1**	**Coef. Rt-2**	**R²**
Algeria	1.207192	0.637002	0.238589	0.768291
(tstat)	1.564762	3.877817	1.479507	
Bahrain	1.971624	0.43622	0.305549	0.449798
(tstat)	1.465214	1.921179	1.204101	
Egypt	0.439317	0.82505	0.039444	0.745736
(tstat)	1.219889	4.874714	0.232846	
Iraq	-0.11705	0.563924	0.324896	0.462988
(tstat)	-0.18666	1.283942	0.522993	

Jordan	0.117099	0.516034	-0.00626	0.244858
(tstat)	1.856101	2.097025	-0.02691	
Kuwait	0.960479	0.422894	0.144464	0.270705
(tstat)	2.585382	2.417199	0.81929	
Libya	0.479209	0.616134	0.287502	0.761891
(tstat)	1.172707	1.978023	0.837641	
Morocco	0.002611	0.973636	-0.09214	0.788173
(tstat)	1.116366	5.782856	-0.54351	
Oman	0.605938	0.739963	0.194399	0.843213
(tstat)	1.194667	3.18119	0.788668	
Qatar	1.123673	0.539656	0.397961	0.799184
(tstat)	1.281931	2.840164	1.941492	
Saudi Ar.	0.241104	0.716393	0.210953	0.853585
(tstat)	1.531687	4.331212	1.275414	
Syria	0.20074	0.682182	0.231978	0.838902
(tstat)	1.293089	3.841906	1.325341	
Tunisia	0.093895	0.708712	0.183503	0.77976
(tstat)	1.540895	4.270463	1.113927	
UAE	0.78005	0.571856	0.190207	0.614606
(tstat)	2.228481	3.275745	1.145115	

Overall interpretation of results:

The above results are introduced in the following figure to show that most of the lines are closer to the 45 degree line with most slopes lower than one.

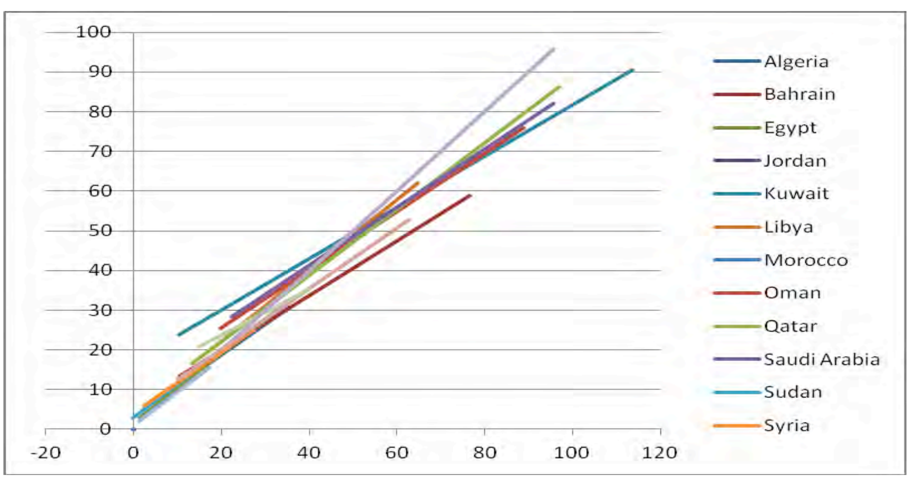


Fig. III.22

1.3. The relationships between oil and gas net revenues and prices

The estimated regressions show respectively the relationships between rents and prices of oil with respectively introducing instantaneous prices with their first and second lag in the first model, first lag and instantaneous price in the second model and only the instantaneous price in the third model. The fourth model is based on the first price lag while the fifth is based on the second lag only.

For Algeria, the first model appears to be statistically relevant with the coefficient of instantaneous price and that of the second lag of the price with R^2 of 0.41. All the other models are statistically non valid except for the third model with the instantaneous price.

For Bahrain, the first model appears to be statistically significant with the second lag of oil prices.

Egypt and Jordan did not show any statistically significant price effects.

Kuwait is showing that the first and second models are statistically valid with price effects expressed by instantaneous and second lag of oil prices.

Libya exhibits mainly the effects of instantaneous prices under first, second and third models with a high level of R^2. The detailed results are in the Annex 11 (Appendices)

No price effects are expressed in the case of Morocco and also for Tunisia. But, oil rents in Oman appear to be sensitive to both current and past prices as shown under the first and second models.

In Qatar, the effects of past prices are statistically significant as it be read from the first and second models.

Table III.19: Oil net revenues and prices

Country	Cst	Coe. Pt	Coe. Pt-1	Coe. Pt-2	R²
Morocco	0.012236	9.24E-06	-9.9E-06	-2E-05	0.025454
	(4.8169)	(0.2025)	(-0.1788)	(-0.3998)	
	0.012151	3.88E-06	-2.2E-05		0.020872
	(4.8590)	(0.0901)	(-0.4720)		
	0.011935	-1.4E-05			0.014637
	(4.9077)	(-0.7312)			
	0.012196		-1.8E-05		0.020644
	(5.0491)		(-0.8711)		
	0.012273			-2E-05	0.0241
	(5.2003)			(-0.9428)	

Oman	47.78995	0.150071	0.029575	-0.2796	0.272302
	(12.0463)	(2.3257)	(0.2796)	(-2.4031)	
	43.98709	0.139222	-0.16891		0.144949
	(11.3223)	(2.0253)	(-2.3942)		
	42.62688	-0.00574			0.000782
	(10.4099)	(-0.1654)			
	45.99004		-0.04306		0.041785
	(11.7322)		(-1.2354)		
	48.73234			-0.08128	0.093442
	(11.7100)			(-1.8993)	
Qatar	51.49413	0.123797	0.035029	-0.34859	0.288424
	(9.5126)	(1.4060)	(0.2427)	(-2.1957)	
	46.75295	0.11027	-0.21243		0.184461
	(8.9300)	(1.1903)	(-2.2344)		
	45.04227	-0.07204			0.064702
	(8.2395)	(-1.5560)			
	48.33938		-0.11275		0.150471
	(9.4911)		(-2.4898)		
	52.20479			-0.17237	0.220715
	(9.8053)			(-3.1484)	

For Saudi Arabia, current and past prices appear to be relevant as shown in the first, second and third models. Sudan has only the effects of current prices as in the first, second and third models. The same thing applies to Syria.

Table III.20

Country	Cst	Coe. Pt	Coe. Pt-1	Coe. Pt-2	R^2
Saudi Ar.	39.65866	0.270872	-0.05045	-0.20133	0.356164
	(10.2314)	(3.8905)	(-0.5979)	(-2.6798)	
	38.78366	0.216099	-0.17182		0.220175
	(9.2571)	(2.9932)	(-2.2256)		
	37.0799	0.073115			0.109811
	(8.5450)	(2.1073)			
	41.30766		0.033819		0.020545
	(9.1088)		(0.8689)		
	43.97963			0.005842	0.000581
	(9.8086)			(0.1446)	
Sudan	2.301488	0.102658	0.005217	-0.04138	0.816895
	(1.0866)	(4.3057)	(0.1997)	(-1.6360)	
	2.349079	0.086594	-0.01546		0.767883

	(1.0332)	(3.7126)	(-0.6300)		
	2.107634	0.074131			0.759508
	(0.9651)	(6.1561)			
	4.964573		0.061801		0.47702
	(1.5981)		(3.3083)		
	6.730205			0.053686	0.356974
	(2.0678)			(2.5810)	
Syria	15.37456	0.090962	-0.02489	-0.05828	0.235235
	(9.0710)	(2.9878)	(-0.6746)	(-1.7740)	
	15.12126	0.075107	-0.06002		0.164441
	(8.6907)	(2.5050)	(-1.8720)		
	14.5261	0.025159			0.080777
	(8.2108)	(1.7786)			
	15.9985		0.011451		0.014633
	(8.7666)		(0.7311)		
	16.7182			0.004061	0.001743
	(9.2988)			(0.2506)	

Only model one applies for the UAE with the effect of instantaneous prices. But, Yemen has also the effect of the second lagged price as shown under model 1.

Table III.21

Tunisia	5.969451	0.018769	-0.00436	-0.01626	0.024116
	(4.6151)	(0.8078)	(-0.1549)	(-0.6486)	
	5.898773	0.014345	-0.01417		0.012039
	(4.6151)	(0.6512)	(-0.6014)		
	5.758305	0.002556			0.001827
	(4.6235)	(0.2566)			
	6.066316		-0.00052		6.5E-05
	4.884618		-0.04838		
	6.257137			-0.0027	0.001683
	(5.1515)			(-0.2463)	
UAE	23.28026	0.120757	-0.04145	-0.10204	0.197663
	(7.3421)	(2.3835)	(-0.6729)	(-1.8490)	
	22.49471	0.093426	-0.10132		0.106222
	(6.8950)	(1.8568)	(-1.8625)		
	21.11328	0.011194			0.006206
	(6.4031)	(0.4470)			
	23.64015		-0.01268		0.00681
	(7.1121)		(-0.4684)		

	24.9521			-0.02687	0.028555
	(7.6917)			(-0.9698)	
Yemen	30.24502	0.12198	-0.01611	-0.12983	0.541367
	(12.2061)	(3.5035)	(-0.4103)	(-3.4399)	
	29.55732	0.075107	-0.08101		0.179553
	(9.2412)	(1.8102)	(-1.8168)		
	28.52411	0.008869			0.010281
	(8.5052)	(0.4202)			
	30.91482		-0.01009		0.01152
	(9.3371)		(-0.4451)		
	32.85943			-0.0279	0.082
	(10.4922)			(-1.2322)	

The above tables (III.19, III.20 & III.21) present the data of the regression analysis conducted on the oil rents in Arab countries on oil price in three different years: the same year t form which the oil rent value was taken designated as "Pt", the price index for the previous year t-1 designated as "Pt-1", and the price index for the prior year t-2 designated as "Pt-2". The table is organized by country. For each country, five different regression analyses are made depending on the combination of independent variables used. The first row in each country's table presents the coefficients of the multiple regression models using all three price indices Pt, Pt-1, and Pt-2. The second row presents coefficients of the multiple regression model using Pt and Pt-1 as variables. The third row presents the coefficients of the regression model using Pt only. The Fourth row presents the coefficients of the regression model on Pt-1 only. Finally, the fifth row presents the coefficients of the regression model on Pt-2 only. Under each coefficient, the corresponding t (stat) is mentioned in parentheses. The last column in the table presents the coefficient of multiple determination of the regression model R^2.

2. Description of the current status of renewable energies and nuclear energy in Arab countries

UNEP's reports about global trends in renewable energy investments make comparisons between the different world regions about this particular type of investment. Excluding the large-scale hydropower projects, the global investment in renewable energies (RE) went from 10 billion in 1998 to 38 billion in 2005, it reached over 50 billion in 2006, then 160 billion in 2009 to get to 211 billion in 2010 and finally at 257 billion in 2011. Countries of the Middle East and Africa combined contribute to the smallest share of the global investments through an investment number of 5.5 billion in 2011, which accounts for 2.1% of global investments.

The growth in Asia, although increased by 31% in 2010 on 2009 levels to reach a $4 billion, it was contributed to mainly by Pakistan, Thailand, and Taiwan and other countries outside the Arab countries. In Africa, growth achieved in 2010 was five times higher than in 2009 to reach $3.6 billion, and was the performances' results of Egypt and Kenya. In Egypt, the investment rose from $800 million to $1.3 billion. Smaller contributions were made by Zambia, Morocco which made an investment of $0.18 billion, Cape Verde, Libya by $0.15 billion, and Sudan with $0.10 billion

In 2011, investment growth decreased by 18% on 2010 in the Middle East and Africa to reach $5.5 billion while it continued to increase in the rest of the world except in the Americas. Arab countries contribution to Asia's total investments was insignificant. Achievements were higher in Indonesia, Singapore, and Pakistan among others. In the Middle East, UAE led the way with $837 million followed by Turkey. Morocco led both the Arab and the African countries with a $1.1 billion up from 0.18 billion in 2010. Other Arab African countries made only small investments that do not exceed$ 0.1 billion.

Small-scale projects account for 30% of the total renewable investment. It is however led by Germany, Italy, Japan, US, Australia, UK, France, Spain, Greece, and China. The investment from these countries sums to $69.5 billion over a $76 billion global investment in small-scale RE (UNEP, 2012). Once again, the Arab countries have a very limited presence.

The investment in corporate and government R&D renewable energy again scores the lowest numbers in the Middle East and Africa with an investment of $0.013 billion in 2011. For comparison sake, the world leaders in R&D investment register numbers like $2.3 in both US and Europe, $1.6 in China, $0.14 in Brazil, and $0.08 in India (UNEP, 2012).

The Arab region has a huge potential for renewable energy sources. It has an excellent solar irradiation thanks to its geographic positioning in what is named the "sun belt", which has the most of the energy-intensive sunlight on Earth (AFED, 2011). It also has in many of its areas wind speeds that are suitable for power generation. The average speeds were recorded to vary from 8 to 100 m/s in Egypt and Gulf of Suez, and from 5 to 7 m/s in Jordan (AFED, 2011). Other important sources include hydro energy, biomass, and geothermal. In general, the renewable energy sector and the green economy remain very limited. This is mainly due to the abundance of oil and gas sources and their low supply cost relative to the renewable sources of energy. Unless there is a national policy for the development of a green economy accompanied by government incentives and initiatives, the growth of this sector will remain limited in most of the Arab countries. In general, Arab countries can be classified into two categories: those which have come to the formulation of national policies and plans for the development of RE, and those which still haven't taken any significant steps towards RE development and for which RE does not constitute a priority for their leaders. In the latter category of Arab countries, RE development are only limited to small initiatives for universities or research departments.

Algeria plans to provide 7% of electricity needs from RE by 2020. It has successfully carried a project of the electrification of 18 southern villages using solar energy, and hybrid power station using both solar and natural gas sources. Other completed projects include mini PV stations of small capacities of generation connected to the grid and solar bath heaters. Projects underway shoot for bigger capacities and include a 150 MW hybrid solar/gas hybrid stations and a 10 MW hybrid wind/ diesel facility, in addition to the provision of solar water heaters for households and the industrial tertiary sector (Algerian ministry of energy and mines, 2007).

Tunisia: Electricity generation by RE is currently at 1% of total generation; however, the Tunisian government has the target of increasing this share to 11% by 2016, and 25% by 2030. Government efforts has been since oriented towards rural electrification and towards energy conservation and efficiency. Tunisia offers capital subsidies, grants, and rebates for energy efficiency projects and tax incentives for renewable energy. In solar energy, Tunisia has a total peak capacity of 255 KW for photovoltaic pumping applications and a total capacity of 2.15 GW from CSP technology is planned to start construction during the next year. In wind energy, Tunisia plans to increase its capacity from 114 MW to 692 MW by 2016

Libya targets a contribution of 10% from RE to the electricity supply by 2020. So far, Libya is currently planning for pilot projects in PV for a 1 MW capacity and in desalination. It also intends to use PV for water pumping used for irrigation.

Egypt is currently producing 5% of its electricity needs from hydroelectricity. According to the energy ministry this share is almost equal to the full hydroelectric potential of the Nil River. Egypt targets a 20% contribution to the electricity sector from RE by 2020. The share from the grid-connected wind power is 12%. Of the 12% capacity, the government plans to finance projects for the implementation of 3% of it and implement incentives for the private sector to contribute by the remaining 8% (NREA, 2012).To this purpose, Egypt plans the adoption the competitive bids approach at a first place, then the implementation of the feed-in-tariff system (NREA, 2012). Launched projects include a 140 MW integrated solar combined cycle (ISCC) power plant where the solar input accounts for 20 MW, and the rest of power is provided by natural gas (EIA, 2011), another 100 MW solar thermal project in Kom Ombo (UNEP, 2011), and a 220 MW wind installations in the Gulf of El Zeit region (UNEP, 2011) Egypt is also developing nuclear power; a 1200 MW reactor is expected to operate by 2019 and three other nuclear plants are planned by 2025 (EIA, 2011).

Currently in ***Jordan***, there are two wind farms of 320 KW and 1.2 MW capacities that date back to 1988 and 1996. Other uses of wind resources include stand-alone wind units for small applications. About 30% of households in Jordan use solar energy for water heating in addition to 184 KWp of PV origin used to provide power in remote areas. Jordan owns biogas facility that generates 5 MW from Municipal Solid Waste. The country is orienting its efforts towards RE development. In fact, Jordan’s national energy strategy targets 7% of energy demand from RE by 2015 and 10% by 2020. A Renewable Energy and Energy Efficiency Fund were established to support initiatives. The Renewable Energy Law passed recently aims at encouraging investment in the RE sector by eliminating the bidding approach; the companies with project ideas can instead negotiate with the Ministry. The law forces the national company of electricity (NEPC) to purchase power from RE projects and the local electricity providers to absorb the excess of electricity from small-scale and private RE projects by purchasing it at retail value (EBoom Policy, 2010).

Currently, ***UAE*** is looking into diversifying the sources of electricity generation by considering nuclear power and renewable sources of energy. The government has contracted in 2009 with the South Korean Electric Power Corporation to build four nuclear reactors with a total capacity of

5.6 GW. The first one of them is expected to come online in 2017 (AFED, 2011). Solar and geothermal projects are currently either on the phase of construction or planning to provide power for UAE and are part of Abu Dhabi's plan to make 7% of electricity generation from renewable by 2020 (EIA, 2011). Negotiations involving Masdar and Abu Dhabi companies are expected to lead to the construction of a 100 MW thermal solar project in Abu Dhabi. Masdar is also planning for a 100 MW PV plant in Abu Dhabi (AFED, 2011). UAE is gaining reputation in the field of renewable, especially after the establishment of Masdar City, the first zero emission city in the world.

In ***Saudi Arabia***, solar energy is still underdeveloped. PV installations provide a total of 3 MW power (AFED, 2011). Recently however, the king Abdullah Petroleum Studies and Research Center awarded the construction of a 3 MWp PV system, and Aramco awarded a 10 MWp shade mounted PV plant, the biggest one in the world (AFED, 2011).
Kuwait seems to be more interested in the nuclear energy. In fact, it established a 20 year cooperative deal with the French Atomic Energy Commission to develop this sector in the country. It is planning four nuclear power plants to become operational by 2022 (EIA, 2011). As for solar energy, Kuwait has made the feasibility study for the development of an integrated solar combined cycle (ISCC) power plant (AFED, 2011).

Morocco's RE plan looks more ambitious than in the rest of the Arab world. It aims to provide 42% of electricity demand from RE applications. It is mainly focusing on wind, solar, and hydropower resources. The government announced their 2 GW solar initiative and 2 GW wind initiative and plans to realize them in partnership with the private sector. Morocco has the largest PV installation in the Arab region with a total capacity of 16 MW that benefitted 160000 solar power home systems in 8% of rural households (AFED, 2011).

In other countries where RE is underdeveloped, a part of the electricity demand is provided by hydropower. The total hydroelectric capacity installed in the Arab world 10 683 MW (AFED, 2011). This type of power is present mainly in Iraq, Egypt, Syria, Morocco, and Sudan. However due to the increasing demand in electricity, the hydropower share is continuously decreasing.

Table (III.22) summarizes the wind and hydro capacities installed in Arab countries as reported in 2010.

Table III.22: Wind and Hydro Installed Capacities in Arab Countries in 2010

Country	Existing Wind Capacity (MW)	Existing Hydro Capacity (MW)
Algeria	0	228
Egypt	550	2800
Iraq	0	2513
Jordan	1.4	12
Kuwait	0	0
Lebanon	0	13
Libya	0	0
Morocco	255	1730
Sudan	0	1342
Syria	0	1151
Tunisia	160	66
UAE	0	0
Total	966.4	9855

Source: Solar Energy Conservation and Photoenergy Systems – Renewable Energy Potential in the Arab Region- Mohammed Mostafa El-Khayat.

The PV technology is present in almost all the countries as opposed to electricity generation from wind or biomass. Solar water heating is another common practice across the Arab Region. Besides the previously discussed solar projects and applications, there is also a study conducted by the Omani government to develop a 150 MW solar plant and another project to install a 20 MW grid-connected PV system in Bahrain (AFED, 2011). However solar applications remain of a limited capacity and are mainly installed in remote areas or for rural electrification purposes.

As part of the effort made in the Arab world to promote alternative sources of energy for power generation, many countries have engaged in international and regional initiatives namely DESERTEC, founded by a the European Union and let by Germany that aims at the generation of 550 GW of electric power in solar plants installed at different locations in North Africa and the region that extends from Turkey to Saudi Arabia. It expects to export the electricity in the form of direct current from the Arab world to Europe through undersea cables. A second initiative has been launched under the name of Mediterranean Solar Plan (MSP) and aims to establish a 20 GW power capacity to be generated from alternative sources on the Southern Mediterranean by 2020 along with the adequate electricity infrastructure to enable the interconnection with Europe. A different form of initiatives that emphasizes cooperation among

Arab countries has taken place. It includes the Arab Regional Strategy for Sustainable Consumption and Production which has undertaken the task of identifying the strategic objectives including policy making necessary to the transition towards a green and sustainable energy sector in the Arab world.

The current Arab energy policy can be seen in most countries leaning towards a more promotion to oil and gas than to RE ore other green energy measures. First, a heavy and untargeted government subsidization to oil and gas industry underlines the Arab policy that at the same time neglects to set specific targets, strategies, legal and institutional frameworks for the promotion of green energy; Algeria is the only country that has implemented a feed-in-tariff, and only nine countries have set and announced national targets for renewable energy development. The Arab policy is also characterized by the absence of national standards, testing, and certification schemes for the RE technologies installed. Moreover, the energy policy do not account for the external cost of fossil fuels caused by environmental degradation as hospitalization costs or loss in fisheries and agriculture. In fact, a study undertaken by the World Bank estimated this kind of losses to account for 4.8% of GDP in Egypt (1999), 3.7% in Morocco (2000), and 3.6% in Algeria (1998) (AFED, 2011).

3. Prospects of Green Energy and Green Economies in the Arab Countries

These prospects are based on the assessment of the relationhips of the Environmental Performance Index (EPI) and each of its components to the rents from oil and others. The data of EPI and its components are obtained from http://epi.yale.edu/. The variables used are respectively as defined below.

EPI: Environmental Performance Index
EH: Environmental Health
EV: Ecosystem Vitality
EHEH: Environmental Burden of Disease
EHAIR: Air (effect on human health)
EHWATER: Water (effect on human health)
EVAIR: Air (ecosystem effect)
EVWATER: Water resources (ecosystem effect)

EVBH: Biodiversity and Habitat
EVAG: Agriculture
EVFOREST: Forests
EVFISH: Fisheries
EVCLIMATE: Climate change and Energy

EPI scores vary widely across Arab countries and so do their trends over time. In 2010, Egypt scored the highest value for EPI (55.2) and Iraq the lowest one (25.3). Arab countries also vary in their amount of progress their EPI is showing over years as represented by the value of regression coefficients obtained. Egypt, Libya, and UAE are the most performing Arab countries. On the average, their EPI value is increasing by 0.569, 0.356, and 0.451 respectively every year. In a second position come Algeria, Jordan, Lebanon, Morocco, Oman, Qatar, and Yemen with positive regression coefficients that do not exceed 0.3 increases in EPI value per year. Iraq, Kuwait, and Saudi Arabia are the least performing as their EPI value show a decrease over the years by amounts that do not exceed 1 EPI score per year(-.018, -.162, -.115,).

EH and EV scores have different pattern of change over time as with EPI. A value increase appears in the EH score of Algeria, Egypt, Jordan, Lebanon, Libya, Mauritania, Morocco, Oman, Saudi Arabia, UAE, Yemen. Among those countries, only Iraq, Jordan, Libya, UAE, and Yemen along with Bahrain and Qatar that show an increase in the EV score as well, while Saudi Arabia, Oman, and Algeria show a decrease in their EV scores. EH however declines in Iraq and Kuwait. EH increases the fastest in Egypt and Algeria with coefficients of 1.857 and 1.288 EH score per year respectively, and EV increases the fastest in Bahrain with a pace of 1.69 EV score per year. For the rest of the countries, the increase or decrease in EH as well as EV scores per year is less than 1.

Within each of the two policy objectives EH and EV, the trend pattern for the sub-indicators differ across the countries and the sub-categories.

EHEH score increased over the years in all the Arab countries to the exception of Kuwait where it has decreased on the average by 0.1 per year. The Coefficients of determination obtained from the analysis reach 97% for most countries; they show indeed the strong correlation of EHEH scores and time. The most performing Arab countries in this sub-category register growth rates of 1.6, 1.56, and 1.41 and are respectively UAE, Oman, and Egypt. The rest of the countries mark growth rates that are less than 1. The Environmental Performance Index ranks UAE as the first country to score the highest value of EHEH improvement in the world during the past decade. Oman ranks 7th, Yemen, Morocco, and Egypt ranks 10th, 11th, and 12th respectively.

EHAIR, the second sub-category within EH shows a different picture about the environmental performance of Arab countries. A bigger variation exists across the countries; Lebanon, Bahrain, and Qatar have held their EHEH at its maximum (100) during the last decade, while Yemen displayed the lowest values among Arab countries of an EHAIR score of 34.7 in 2010. Among countries, Algeria, Egypt, Jordan, Libya, and Mauritania are the ones improving the air's effect on the human health within their territories to varying degrees. Libya and Tunisia could reach maximum score during the last years of the past decade. The rest of countries including Iraq, UAE, Kuwait, Oman, Saudi Arabia, Morocco, and Yemen have witnessed a fall in their EHAIR scores. In fact the first three countries in this category are ranked the three lowest countries in the world for their trend rank.

Variance of environmental performance across Arab countries is further stressed when analyzing data for EHWATER, the last sub-category within EH. Qatar has held its score at its maximum of 100 for the entire last decade. At the opposite end there exists Mauritania with a score of 8.1 in 2010, only increasing slightly from the 5.6 score in 2000. Sudan and Yemen also figure among the lowest scores' countries with scores of 11.3 and 16 respectively. In general, the EHWATER were kept almost constant over the year with minor improvement in few countries and more important growth in Egypt that went from 52.3 to 71.0 in 10 years.

While the average of European countries is around 61, most Arab countries are doing poorly in improving the effect of air on ecosystems which reflects on their EVAIR scores. The least performing country in this sub-category is Kuwait with a score of 9.8 in 2010. Algeria is the most performing Arab country with a score of 61 in 2010. It is also the one that is improving the fastest over time with a growth rate of 1.54 EVAIR score per year. Most other countries have positive growth rates lower than 1, while Kuwait and Sudan have regressed slightly.

As for EVWATER, while European countries' score swing around 37 on the average, Most Arab countries show far lower values that have been constant over the entire last decade. Bahrain for example scores 0, Lebanon 3.4, Qatar 9, Syria 7.6, Tunisia and Morocco 9.0. Countries with scores above 29.0 are Mauritania, Algeria, Oman and Sudan

While the same sample of European countries have succeeded in raising their score of EVBH from 65 to 77 during the ten year period studied, most Arab countries have kept theirs constant over almost the entire period. The exception to that is Bahrain which went from 1.3 in 2000 to 57.9 in 2003 and till 2010. Score vary from 0.6 in Syria to 99.0 in Saudi Arabia.

The same steadiness applies to EVAG with scores varying from 0.0 in Libya and Mauritania to scores above 60 for most of the other countries to 97.0 in Sudan while the average in European countries has improved to reach 46.6 in 2010.

As far as forestry is concerned, Arab countries are different in their EVFOREST scores and they way they change over time. Linear increase in the value of the score is noticed in Mauritania at a rate of 6.51 EVFOREST score per year and Sudan but important step back has been made in Saudi Arabia with a rate of 4.72 EVFOREST score per year. In a less important rate, Algeria and Tunisia are also regressing. The rest of the countries have held their scores elevated and constant over time.

The pattern of change in EVFISH score during the last decade was such that most Arab countries have witnessed a fall in their scores, some at important rates exceeding 1.5 EVFISH score per year like in Algeria, Lebanon, Sudan, and Syria, and reaching 2.6 per year in Egypt; others at a less important rate that do not exceed one and are in progressive order of their fall rate: Tunisia, Morocco, Kuwait, Yemen, UAE, and Bahrain. Libya seems to be the only country which have progressed over time and has reached in 2010 the highest score among the rest of the countries of 62.3.

Analysis of EVCLIMATE data show that Arab countries vary once again in both their scores' values and trend of change. In general, the rate of linear change, either positive or negative, does not exceed 1 for any of the countries. Countries which have been improving their scores are Bahrain, Jordan, Libya, Qatar, and Tunisia. Countries which have had a fall in their scores are Yemen, Syria, Sudan, Saudi Arabia, Oman, Egypt, and Algeria.

These trends are introduced in the tables, respectively for each country in the Annex 12 (Appendices).

3.1. Comparisons of models of green economy adoption

The objective of this test is to determine whether there exists a significant difference between the oil exporting and oil non-exporting Arab countries in terms of their environmental behavior.

This test allows determining whether there is a significant reduction in the residual sum of squares when we subdivide the pooled sample of countries into two categories depending on their oil export activity and run separate regressions. Annex 13 (Appendices).

The variables used to represent countries' oil activity are the oil consumption, and oil rents. The variables used to represent countries' environmental sustainability level are EPI indicators.

Multiple regressions are run for each of the EPI sub-variables on the two oil variables. The F statistic is calculated for each of the individual EPI variables. Results are shown in the table below where the test statistic values are displayed in the right-most column. The critical value of F against which these F values are going to be compared is:

$F(3,170) = 2.65$ (2.70) at 5% significance level

Or $F(3,170) = 3.88$ (3.98) at 1% significance level.

The non-exporting countries (group 1) taken in this analysis are: Jordan, Lebanon, Morocco, Egypt, and Tunisia. The exporting ones (group 2) are: UAE, Algeria, Iraq, Kuwait, Libya, Oman, Qatar, Saudi Arabia, Sudan, Syria, and Yemen.

The results' table shows values above the critical value for the following EPI indictors: EPI, EV, EVAIR, EVWATER, EVBH, EVAG, EVFISH, EVCLIMATE, SO2CAP, SO2GDP, WATUSEINV, PACOV, POPs, TCEEZ, CO2CAP, CO2KWH, and RENEW. We conclude from that the existence of a difference between the performance of the exporting and non-exporting countries of oil in terms of these particular environmental categories that the pooled regression do not adequately account for.

In general, the overall environmental performance is significantly different between the first and second group of countries. This does not mean that their performance is also different in all environmental sub-categories. In fact, the test results show a similarity between all countries in their performance in the Environmental Health policy objective and at the same time a significant difference between the two groups of countries in their performance in the other policy objective, Ecosystem vitality. A similarity is also found in all the analyzed in all variables of the policy categories and their sub-categories that belong to the Environmental Health policy objective, namely the Environmental burden of disease (EHEH), air pollution and water pollution on their effects on humans (EHAIR and EHWATER), which also includes, child mortality (CHMORT), indoor air pollution (INDOOR), and access to drinking water

(WATSUPINV). A significant difference however exists between the performance of the two groups of countries in all the analyzed policy categories of the Ecosystem Vitality policy objective and in almost all their sub-categories excluding marine protection (MPAEEZ) and CO2 emissions per GDP (CO2GDP). Difference in environmental performances concerns the following variables: air and water on their effects on ecosystems (EVAIR and EVWATER), biodiversity and habitat (EVBH), agriculture (EVAG), fisheries (EVFISH), climate change (EVCLIMATE), sulfur dioxide per capita and per GDP (SO2CAP and SO2GDP), change in water quantity (WATUSEINV), biome protection (PACOV), pesticide regulation (POPs), coastal shelf fishing pressure (TCEEZ), CO2 emissions per capita and per KWh (CO2CAP and CO2KWH), and renewable electricity (RENEW).

The above reviews of the sectoral trends characterizing Arab economies indicate both progress and weaknesses. These latters are related to limited economic diversification, to reduced promotion of higher education, constrainted access to IPRs and major use of traditional energy sources.

The last part of this book looks first, at major policy issues that are implied by the above identified sectoral, global and local constraints. It then addresses the economic and policy gains from the overall study.

Part IV Economic & Social Policies

As discussed above, the knowledge economy is assumed to be linked with both business development where private initiatives are the main drivers and an overall macroeconomic and social growth where governments play an important role. The impacts of the knowledge economy on businesses and economic policies are first reviewed. The last section is devoted the overall lessons learned globally and from the comparisons with EEE countries.

I. What Can Be Learnt from Doing Business by Arab Economies?

The way of doing business and mainly the starting of a business provides important indications about how enterprises are created. It seems that the context of Arab countries does show the prevalence of more public businesses and government related transactions in comparison with that of private businesses. As the growth of the number of enterprises indicates how market economy is promoted, it also indicates how private initiatives lead to enterprise creation.

This chapter uses the data from the World Bank databases with the objective of showing the major trends characterizing the initiation of businesses in Arab economies at the level of countries and globally with comparisons with Eastern European Economies (EEE). The major characteristics as well as the comparisons are major means to underline the existence of market incentives for the expansion of private initiatives in individual countries and for the overall economy of the Arab World.

The chapter is composed of a literature review and a section based on data analysis. This latter is used to discuss the trends taking place in Arab economies.

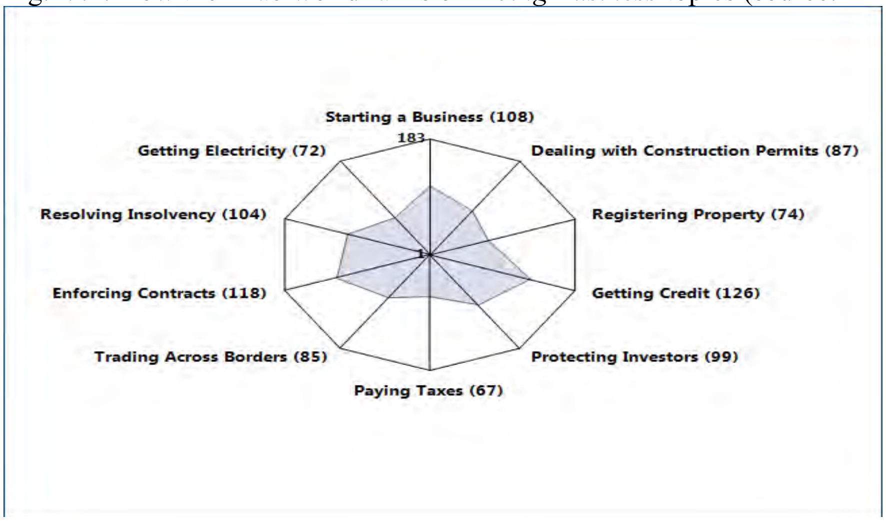
1. Previous contributions

Most of the existing economic literature focuses on the general economic conditions for business development and on the overall entrepreneurship in Arab countries. Only few contributions are found to be based on the characterization of doing business at the microeconomic level.

In practice, the creation of new enterprises goes through series of steps that relate to the different stages needed for launching a business. This can be crucial in case of largely fragmented set of authorizing agencies.

According to Doing Business (2012) when governments make registration easy, more entrepreneurs start businesses in the formal sector creating thus, more jobs and generating more revenue for the government. As Doing Business measures the ease of starting a business in an economy by recording all procedures that are officially required in practice by an entrepreneur to start up and formally operate an industrial or commercial business and the time and cost required to complete these procedures. It also records the paid-in minimum capital that companies must deposit before registration (or within 3 months). The ranking on the ease of starting a business is the simple average of the percentile rankings on the 4 component indicators: procedures, time, cost and paid-in minimum capital requirement.

Fig.IV.1: How the Arab world ranks on *Doing Business* topics (source: DB, 2012, page 7)



The most important contribution in this area is provided by Qianwei and Guangnan (2007). In this paper, the authors investigate how the fragmentation of licensing rights affect the occurrence of the tragedy of anti-commons in the enterprise licensing procedures.. It is also shown that the impacts of the tragedy of the anti-commons are more emphasized with the high extent of fragmentation. This situation alters the evolution of the entrepreneurial initiatives in China because it creates considerable challenges for the victims of the anti-commons (e.g., enterprises).

Dethier and al, (2010) survey the recent literature which examines the impact of the business climate on productivity and growth in developing countries using enterprise surveys. Various infrastructure, finance, security, competition, and regulation variables have been shown to have a significant impact on enterprise performance.

Scharff (2006) in condemning the anticommons found that economic development of land may be suboptimal where multiple parties have the legal right to exclude use of the property in question.

But some authors referred to the links between bureaucraty, corruption and economic performance before the pioneering works on anticommons. These include Quah (1982). This author focused on some examples such as import-export licenses and the underassessment of income tax.

The empirical evidence introduced here concern respectively the general trends taking place in both technological and institutional innovations and related economic policies pursued by series of developing countries. While economies should develop further awareness about the negative effects of anti-commons and related tragedies, they are invited to the strengthening of the knowledge base and the economic foundations that sustain different policy shifts and reforms, especially when accounting for access to promising technologies.

The pervasiveness of anti-commons appears at different levels in developing economies and is not often perceived outside the existing legal frameworks. With the expansion of urbanization and the increase of the number of buildings where individuals and households own apartments in different floors, individualistic incentives show often the blockages taking place in the access to new technologies and services (i.e: Internet) and in the maintenance and repair of different facilities. This concerns the common areas, the overall environment besides some useful facilities (elevator, utilities besides others).

2. Empirical Analysis

Doing Business as a source of data:

"Doing Business Report" is an annual report issued by The World Bank Group (2010). As of 2010, the report has input from 183 countries and 8000 lawyers, government officials, agencies and professional. DBR is ranking countries using the Ease of Doing Business Index. A country ranked in the top would have better laws and regulation for creating a business and high investors' protection. This index is based on 9 main sub-indexes each measuring a topic or step in enterprise creation using indicators such as the time, costs and procedures required to accomplish a step. Those can be listed as follow: starting a business, dealing with construction permit, registering property, getting credit, protecting investors, paying taxes, trading across borders, enforcing a contract, and closing a business. The first three topics deal with the creation of enterprises and will be used as data. The description of those topics and variables included will be in the next section.

3. Characterization of the on-going Business Climate & the Economic Environment for Arab Enterprises

There are several indices that are produced by different international organizations that help identify the aggregate behavior of businesses, the macroeconomics and the sectors environments in each economy. Selected indices are introduced before looking at all of them as aggregates as groups, description of these indices are in the Annex 14 (Appendicies).

The list of indices and the corresponding abbreviations used in the empirical analysis undertaken below are:

Business Disclosure Index (BDI)

Intellectual Property Protection (IPP)

Intensity of Local Competition (ILC)

Rigidity of Employment Index (REI)

Soundness of Banks (SB)

Corporate Ethics Index (CEI)

Corporate Governance Index (CGI)

Corporate Illegal Corruption Index Component (CICI)

Corporate Legal Corruption Index (CLCI)

Public Sector Ethics Index

Economic Freedom Index (EFI)

Bertelsmann Transformation Index (Management index)

Bertelsmann Transformation Index (Status Index)

Contract Intensive Money (CIM)

Global Peace Index (GPI)

Government Effectiveness (GE)

The Silatech Index: Access Index Scores

The Silatech Index: Mindset Index Scores

Regulatory Quality (RQI)

3.1. The positioning of Arab businesses relative to all indices

Table IV.1

	BDI	IPP	ILC	REI	SBI	CEI	EFI	BMI	BSI	CIM	GPI	SIG	SMSS	RQI	GEI
Algeria	6	2.5	4.2	41	3.9	39.35	56.9	3.88	4.72	0.763	2.277	44	69	-0.94	-0.59
Bahrain	8	4.9	5.3	10	6.4	59.58	76.3	4.66	6.01	0.955	1.956	53	69	0.78	0.62
Egypt	8	3.6	4.6	27	4.7	44.81	59	4.15	4.88	0.856	1.784	22	55	-0.14	-0.3
Iraq	4			24				2.54	3.28	0.499	3.406	26	45	-1.04	-1.26
Jordan	5	4.6	5.6	24	5.8	63.18	66.1	4.81	5.12	0.86	1.948	35	65	0.36	0.28
Kuwait	7	3.6	5.1	0	6.2		67.7	3.94	5.2	0.968	1.693	66	77	0.2	0.21
Lebanon	9			25			59.5	4.57	6.16	0.979	2.639	24	60	-0.07	-0.67
Mauritania	5			39			52	5.94	4.46		2.389	32	65	-0.66	-0.9
Morocco	6	3.3	4.6	63	5.2	37.47	59.2	4.6	4.65	0.821	1.861	38	63	-0.01	-0.11
Oman	8	4.9	4.7	13	5.4		67.7	4.77	5.3	0.917	1.561			0.66	0.65
Palestine	6			31								28	52	-0.12	-0.87
Qatar	5	5.1	5.1	13	6.2		69			0.962	1.394	67	83	0.62	1.13
Saudi Arabia	9	4.5	5.2	13	5.7		64.1	3.81	4.36	0.912	2.216	59	70	0.22	-0.09
Sudan	0			36				2.88	3	0.705	3.125	41	66	-1.25	-1.32
Syria	6	3.8	5.1	20	5		49.4	2.47	3.39	0.703	2.274	34	66	-1.07	-0.61
Tunisia	0	4.4	5.4	40	5.3	57.2	58.9	4.75	5.37	0.864	1.678	49	68	0.1	0.41
UAE	4	5.2	5.6	7	6.2	72.99	67.3	5.04	5.23	0.945	1.739	68	79	0.56	0.93
Yemen	6			24			54.4	3.97	3.91		2.573	19	53	-0.6	-1.12

Based on the above variables (Table IV.1), three groups of Arab countries can be identified. The first one includes Qatar, UAE, Oman, Bahrain and Kuwait. The second includes Lebanon, Jordan, Palestine and Syria. The last one includes Algeria, Morocco, Tunisia, Egypt, Mauritania, Sudan and Yemen. While all groups are setting policies of economic openness and better market and economy governance, the last group appears to have deficiencies in most of the indices. The first group is in better position but is still constrained by the existence of market imperfections. The second group is an intermediate position where improvements are needed on both market and public mechanisms. The following diagrams show the positioning of different Arab countries with respect to all the variables in relation to subsets of the indices used in this descriptive analysis (figures IV.3, IV.4, IV.5 and IV.6).

Fig.IV.2: Positioning with All Variables

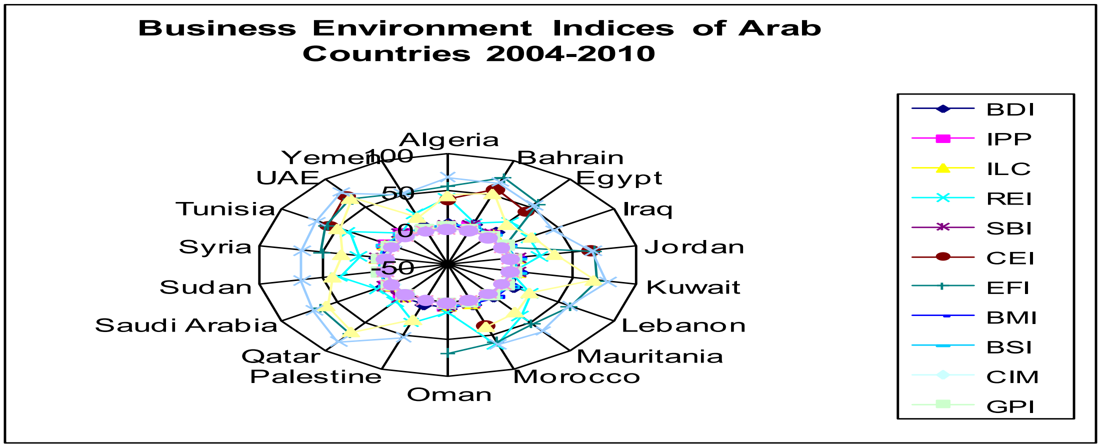


Fig.IV.3: Positioning with Variables scoring from 1 to 100

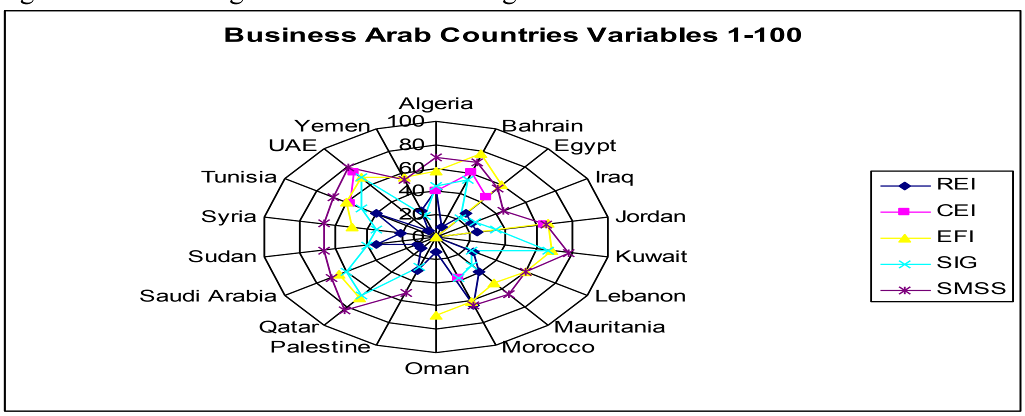


Fig.IV.4: Positioning with Variables scoring from 1 to 10

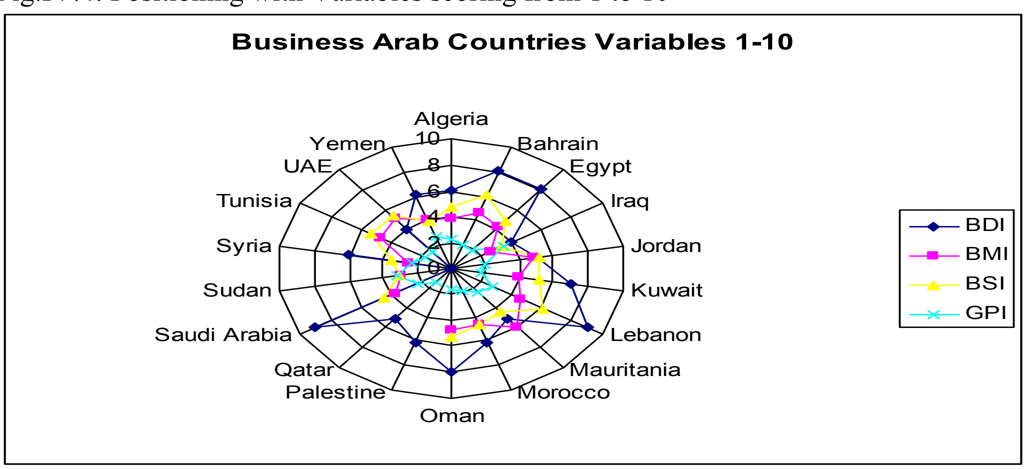


Fig.IV. 5: Positioning with Variables scoring from 1 to 7

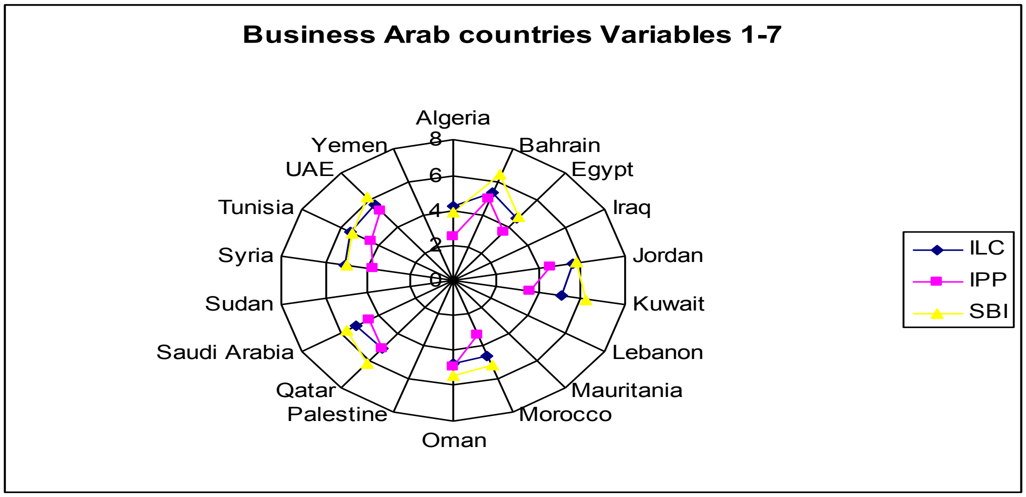
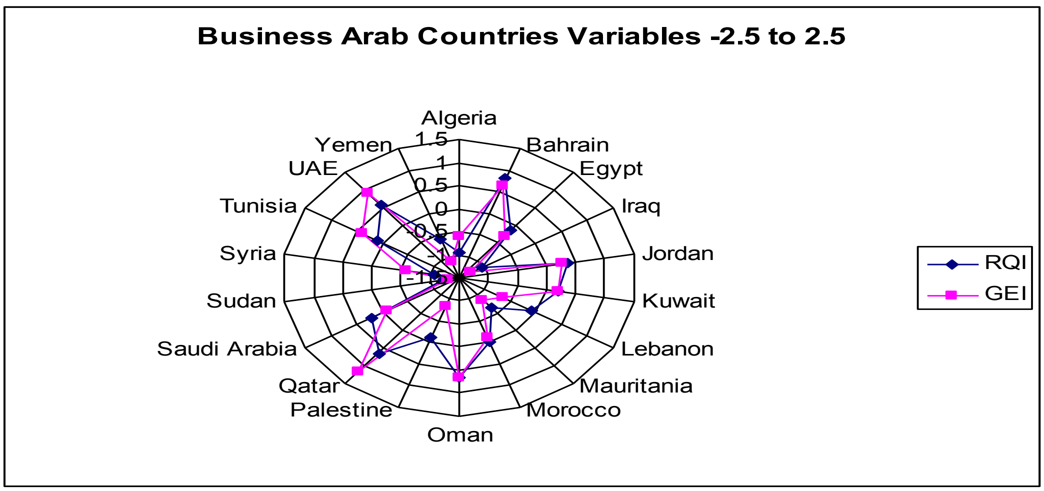


Fig.IV.6: Positioning with Variables scoring from -2.5 to 2.5



4. Using Business data

4.1. Variables and data

Table IV.2: Comparing means of variables between Arab and EEE countries

Variables	*Arab Countries*			*EEE Countries*			*T stat*
	Mean	SD	Observations	Mean	SD	Observations	
ST	30.10	24.821	136	28.89	19.172	109	0.4304
SP	9.38	2.888	136	8.74	3.309	109	1.5911
ECT	642.10	136.280	134	450.39	164.117	108	9.7327
ECP	44.48	5.713	134	34.76	6.339	108	12.3881
RPP	5.78	2.992	122	6.51	1.953	97	-2.1745
RPT	39.80	36.188	122	98.37	149.456	97	-3.7727

Variable Definitions:

SC: the cost of starting a business. (% of income per capita).

Etp: Enforcing contracts time per procedure.

Stp: Time needed to start a business per procedure pertaining to the business.

RpovT: Registering property procedures per unit of time.

RIRR: Resolving Insolvency- the Recovery rate (cent recovered per dollar loaned).

PIESSI: Index assessing the ease of shareholder suits. (0-10).

GCPBC: % of adults getting credits- public bureau coverage.

GCPRC: % of adults getting credits: public registry coverage.

GCDI: Index informing on depth of credit. (0-6).

The means and standard deviations of the variables are introduced in table 1.

While the required time (ST) and the number of procedures (SP) exhibit no statistically significant differences between Arab and EEE countries, the time of enforcing contracts as well as the related procedures appear to be higher in Arab countries. The time and procedures for registering property do show lower levels in Arab countries. But the costs of starting a business are overall larger in the Arab countries as shown in tables IV.2 and IV.3.

Table IV.3: Descriptive statistics of the variables included in the regression

Variables	Arab Countries		EEE Countries		Total	
	Mean	**Std**	**Mean**	**Std**	**Mean**	**Std**
SC	1.2160	0.6771	0.79901	0.4245	1.0291	0.6130
ETP	1.6550	0.19347	1.6560	0.2045	1.6555	0.1981
STP	1.3821	0.27834	1.4616	0.2995	1.4178	0.2902
RIRR	1.2245	0.5595	1.3502	0.4173	1.2808	0.5038
PIESSI	0.430	0.2615	0.5778	0.3125	0.496	0.2943
GCPBC	0.328	0.4760	0.5738	0.6931	0.442	0.5922
GCPRC	0.211	0.5377	0.4702	0.6526	0.325	0.6046
GCDI	0.351	0.2391	0.4682	0.2683	0.406	0.2576
RpovT	0.5933	0.25502	0.6108	0.2580	0.6011	0.2560

5. Results of Analyzes

5.1. Descriptive analysis

The table IV.2 shows that the Arab Countries exhibit the highest costs for starting a business, as shown by the corresponding t-statistics.

Table IV.4: Comparisons of means of variables between Arab and EEE countries

Variables	**Arab Countries**			**EEE Countries**			**t -**Stat
	Mean	SD	N° Observations	Mean	SD	N° Observations	
SC	1.2160	0.6771	144	0.79901	0.4245	117	6.0669
ETP	1.6550	0.19347	144	1.6560	0.2045	117	-0.0402
STP	1.3821	0.27834	144	1.4616	0.2995	117	-2.2009
RIRR	1.2245	0.5595	144	1.3502	0.4173	117	-2.0771
PIESSI	0.430	0.2615	144	0.5778	0.3125	117	-4.0842
GCPBC	0.328	0.4760	144	0.5738	0.6931	117	-3.2616
GCPRC	0.211	0.5377	144	0.4702	0.6526	117	-3.4490
GCDI	0.351	0.2391	143	0.4682	0.2683	117	3.6786
RpovT	0.5933	0.25502	143	0.6108	0.2580	117	-0.5469

5.2. Regression Analysis

The Table below introduces the outcomes of the regression of the cost of starting business on the other variables.

The outcomes of the regressions for the sets of Arab, EEE and total countries (Arab+EEE) show elasticity's that are statistically significant for most of the explanatory variables introduced. Another statistical result relates to the statistically significant differences between the three models (Arab, EEE and all) using the Chow-F test that is around 20.52. This means that each regression can be interpreted separately as it exhibits coefficients that are different for the same variable. According to the results, the regression of the Arab countries shows coefficients that are higher than those of the EEE.

The cost of starting a business or creating and enterprise in the Arab countries appears to be more sensitive to ETP (2.592) (number of procedures to enforce business contracts). This same explanatory variable shows the highest level of response over all the countries (2.301) but the level of response of this same variable is not statistically significant for EEE economies (0.433).

Table IV.5: Outcomes of the regressions of starting business costs.

Independent Variables	**Arab Countries**	**EEE Countries**	**Total**
Constant	-3.155 (-10.014)	-0.108 (-0.334)	-2.399 (-8.619)
ETP	2.592 (10.539)	0.433 (*) (1.818)	2.301 (11.545)
TP	0.589 (4.660)	0.280 (2.547)	0.389 (3.980)
RIRR	**-0.599** **(-7.796)**	**0.394** **(3.471)**	-0.510 (-7.376)

PIESSI	-0.468 (-3.235)	-0.349 (-2.954)	-0.338 (-3.039)
GCPBC	-0.585 (-7.183)	0.052 (nss) (1.014)	-0.285 (-5.155)
GCPRC	-0.293 (-4.571)	-.215 (-3.643)	-0.245 (-4.677)
GCDI	**0.577** **(2.749)**	**-0.477** **(-2.677)**	0.096 (nss) (0.577)
RpovT	0.429 (3.408)	-0.410 (-2.985)	0.100 (0.896)
R Square	0.791	0.561	.584
Fstat	62.981	17.124	43.908
VIF	Less than 4	Less than 4	Less than 3
Chow Test	20.52238		

Comparisons are available in the Annex15 (Appendicies).

6. Discussion

In relation to labor markets and unemployment of skilled and unskilled labor, the question is that limited enterprise creation is not consistent with level of unemployment. But it is assumed that constraints to enterprise creation, leads to limited creation of enterprises. Example of enterprise Created in Tunisia is in the Annex 16 (Appendicies).

The indices and the “doing business data” have had a promising role in characterizing both the business environment and the creation of enterprises in Arab countries with comparions with EEE economies. The attained descriptive and regression result confirm that Arab countries need to attain highest level of business performance at both the environment and enterprise creation levels. EEE countries appear globally to have highest performances but Arab countries such as those of the Gulf are ensuring promising conditions for the development of enterprises. But these performances need to be sustained. The global economic and political conditions may inhibit the efforts that have been undertaken so far.

The following sections are devoted to showing how at the level of governance and economic policies, important adjustments are necessary to ensure the functionality of the chain starting with R&D and innovation to sustainable enterprise creation and market development.

II. Rents from Natural Resources and Relations to Knowledge Economy in the Arab Countries

Arab countries have been discovering only few new opportunities that are directly or indirectly related to their dominant and traditional economic and business activities. Outside, mining, real-estate, tourism, commerce and agriculture and logistics, only few opportunities have been discovered during the last years. As some of these countries are already facing the post-oil era in relation to the trends taking place in mining and in oil and gas industries, with future possibilities of exhaustion of oil in gas reserves, diversification of economic activities has been emerging in some of these economies. But, the creation of new portfolios has not been expanded outside the traditional spectrum of economic activities. Besides that, the roles of Governments and of public sovereign funds are still playing an important role both domestically and internationally implying that rents from natural resources are still promising sources for economic development. How rents are driving the development path in relation to adhesion of most world countries to the gains from the new economy? How knowledge variables have been related to rents obtained from natural resources? Do natural resources constitute a curse or a favoring factor of development?

The above questions are addressed in this chapter in order to investigate the development directions taking place in the economies of the Arab countries. After a literature review looking at the rents from natural resources and their links with development, an empirical framework, with the data used is introduced. This empirical framework is used in a third section to investigation the links between rents and knowledge variables.

This chapter addresses mainly the question of rents from natural resources and their links to knowledge economic indices in order to investigate the likely impacts of rents on the overall economies of the Arab countries.

After a literature review about different previous findings on the issue of links between rents and development, an empirical emphasis is placed on the likely links between subsets of knowledge variables and those related to rents.

1. Previous contributions:

Rents related to exhaustible and renewable natural resources have been largely discussed in both economic theory and in empirical applications. The changes taking place in both domestic and international markets have been also emphasizing the roles of rents on different economies but also in the implications of rents on the political economies. As Arab countries are important producers and exporters of natural resources mainly those related to mining, series of papers have been raising different issues related to the effects of rents. These papers range from those asking questions about the opportunity of having exhaustible resources to those that suggest means for better using of the revenues from mining activities. As growth and development require further access to knowledge, and as the link between knowledge and development has been shown to be obvious, the present literature reviews mainly the relationship between oil resources and economic performance.

Ebeke and Ombga (2011) discuss oil rents and allocation of talents in relation to the quality of governance in a sample of 69 developing economies. The authors conclude that good governance leads to orient talents towards productive activities while lower quality governance may induce human resource allocation to rent-seeking.

Alan Gelb and Sina Grasmann (2009) consider options for absorbing resource rents from oil production. They focus on saving abroad and domestic spending in relation to price volatility and the tradeoffs of alternatives for using the rents. They conclude that some countries have been more successful in dealing with the available options.

Elbadawi & Gelb (2010) through an extensive review of the literature on the oil curse and economic diversification, emphasize issues characterizing the development of the Arab world. They find that the curse is real but could be transformed with sound economic and institutional policies. Avenues for further diversification in the Arab economies are also introduced.

Luciani (2008) focuses on the limits of rents from oil extraction. The view developed by this author appears to be more balanced between the miracles of “oil” and the other economic and social variables. The case of the economies of Arab region is well developed to show that "oil" is not the only explanatory issue. Other authors such as Sturm et al. (2009) deal the fiscal policy challenges in oil exporting countries.

El Anshary (2011) focuses on the "curse" outcome in oil based economies as related to market shocks such as those of 1970 and 2000s but the author considers that the magnitude depends also on the composition of public spending and the use of the generated oil rents.

Farzanegan and Schneider (2009) show that higher oil rents are not all the time harmful for economic growth and focus on the importance on institutional mechanisms in ensuring better resource allocation. They focus on the role of rent seeking effort levels in affecting oil rents and then the economic growth in Iran.

Paltseva and Roine (2011) deal with the issue of resource curse while indicating that key economic policies can transform resource rents into engine of development.

Gauthier and Zeufack (2009) discuss the case of oil in Cameroon with oil discoveries in 1977 and the negative implications on growth and development over years. The authors analyze the oil rents captured by the country and assess the factors related to the aggregate savings and spending. They find that a sizeable share of rents has been obtained from international companies (67 %) but only 39 % of the revenues is transferred to the public budget over the period 1977-2006. The authors suggest then a better governance to better transform curses from oil rents to social benefits and development, in the case of Cameroun.

The case of Cameroun can be contrasted with the case of oil-abundant economy where oil rents have been generating high economic growth and lower inequality (Mehlum and Torvik, 2008).

In an early paper by Sachs and Warner (1997), natural resource abundance is related to economic growth. The authors observe that economies with a high ratio of natural resources to GDP in 1970 tend to grow slowly during the period 1970-1990. Additional evidence is then discussed to understand the negative relationship between resource abundance and economic growth.

Cappelen and Mjoset (2009) describe the changes and the improvements in Norwegian economy from 1950-1970 to the current era. The authors noticed the attainment of higher per capita income and the high level of human development. They attribute that to the petroleum sector but mainly to the policies and types of governance pursued in comparison with other natural resource abundant economies.

Cotet and Tsui (2010) study the effects of oil rents on development based on a world panel dataset focusing on oil discoveries and extractions. They first test the hypothesis of the negative relationship between oil endowment and economic performance to find little robust evidence about that. But, they emphasize the positive link between oil abundance and population growth that negatively affects economic growth. But, health improvements are found to be more in oil rich countries relative to those with no oil implying that the presence of oil can be a source of blessing to the economy.

Hartzok (2004) looks at the dividends from oil resource rents with focus on Alaska, Norway and Nigeria. According to the author, citizens of Alaska have been receiving payments from an oil rent trust fund since 1982. In Norway, the population is provided with social services with investments in an oil rent fund. But, Nigeria has been in the process of setting similar fund. The paper focuses on the oil rent institutions and their optimal use to support the needs of the population. The cases of Alaska, Norway and Nigeria are addressed to support the arguments developed by the author.

El-Katiri et al. (2011) analyze the oil rent distribution in Kuwait. They say that different countries have adopted strategies for using the oil rents to cover the needs of the population. To the author the best practice is provided by Norway where oil and gas represent 27 % of GDP (2008) and 50 % of exports. The receipts of the oil fund are distributed transparently to the current population while accounting also for future generations. Such a model is suggested for Kuwait by the authors.

Kurtz and Brooks (2011) discuss the oil curse within the framework of globalization and human capital growth. In this context, the resource curse becomes a developmental opportunity. This paper introduces the roles of domestic human capital in ensuring technological advancement, absorption and progress of new economies and sectors that can be linked or not to the oil economy. These trends are further amplified by globalization and international markets where major gains are captured by human capital and then by the virtuous spiral of economic growth and development.

Gurses (2009) attempts testing hypotheses related to the resource-curse from oil and democratization. The attained results show the existence of a positive relationship between oil wealth and democratization.

Di John (2011) attempts a critical survey of theory and evidence about the resource curse. The author looks at the literature on Dutch disease, “rentier state” and rent seeking versions of the resource curse. Important shortcomings of these approaches are found. To the author, there is a threshold below which the risk of curse can be higher and above which better economic performance is achieved.

Carneiro (2007) looks at the development challenges facing resource-rich economies with focus on oil exporting countries. The author introduces the “paradox of plenty” to refer to the likely negative externalities that may be related to natural resources. Series of macroeconomic policies are suggested to overcome any negative effect related to the abundance of natural resources.

Bretschger and Valente (2011) discuss how international trade can help ensure through the increase of competitiveness not only the material sides of natural resource producing economies but also their immediate natural and international environments. The economic adjustment processes are consequently as important as the long run equilibria.

Tsui (2010) considers variations in the timing and size of oil discoveries to identify the impact of oil wealth on democracy. The findings show that discovering 100 billion barrels of oil reduces the country’s level of democracy to 20 percentage points below in three decades. This effect is found to be larger for oilfields with higher-quality oil and lower costs of discovery and extraction. But lower accuracy of the estimates is assessed when oil abundance is measured by oil discovery per capita.

The findings of Davis and Tilton (2005) suggest series of various policies for different countries possessing rich mineral deposits. The positive relationship between natural resources and development has often been questioned on empirical evidence that is not all the time appropriate.

Developing countries need more development and natural resources can be important assets in this process.

Brooks and Kurtz (2012) conclude their paper by saying that "oil wealth is not necessarily a curse, and may even be a "blessing" with respect to democratic development". These findings are based on 1960-2009 data used to determine that regime-resource endogeneity and intra-regional diffusion have major effects on political regime outcomes.

In a more recent paper, Mohadess (2012) uses an econometric modeling framework for world oil supplies to assess the terminal price and time of resource depletion. The model is then adjusted backward to account for current stocks and flows as well as for current prices. The time of resource depletion can be used to predict the levels of rents related to the elimination of the exhaustible resource. This model is useful for the understanding the flows of rents that can be generated between the present and the terminal time.

In a recent book devoted to show how petroleum wealth shapes the development of Nations by Ross (2012), the question of oil curse is again discussed. The author confirms that countries that are rich in petroleum have less democracy, less economic stability, and more frequent civil wars than countries without oil. The oil curse is mainly due to the upheaval of the 1970s, when oil prices soared and governments across the developing world seized control of their countries' oil industries. Before nationalization, the oil-rich countries looked much like the rest of the world; today, they are 50 percent more likely to be ruled by autocrats--and twice as likely to descend into civil war--than countries without oil.

The above set of publications shows the interests that have been expressed all over the last years to the relationship between oil rents, economic performance and development. Besides the authors that emphasize the curse effect, more insist on the positive effects under the conditionality of further transparency in allocating the revenues generated for natural resources.

2. Methods and Data

The major issue discussed here relates to the significance of rents. In the sense of World Bank data, rents are measured as percentages of GDP in each country. As such, the total rents from natural resources include those from exhaustible resources (oil, gas and coal) and that from a renewable resource that is forestry. Rents account for the difference between valuations at world prices and domestic production costs (World Bank, 2011). For oil and gas, the related rents are consequently the difference between the value of crude oil at world prices and the total costs of its production. Similarly, the forestry rents are measured by the flow of forest products valued at both world prices and domestic costs of its production. The same definition applies for coal rents and then for the total rents from natural resources. As reported above, the estimates of different types of rents are based on sources and methods described in "The Changing Wealth of Nations: Measuring Sustainable Development in the New Millennium" (World Bank, 2011).

Economic rents do exist with natural exhaustible and renewable resources. They can be collected by a government as royalties or extraction fees in the case of minerals and oil and gas. Series of economists have recognized that economic rents are "excess returns" above "normal levels" that take place in competitive markets. More specifically, it is a return in excess of the resource owner's opportunity cost.

Based on World Bank datasets (World Bank, 2011), rents are considered to be originating from oil and gas, coal extraction and forestry activities. As they are representing the excess returns between their valuation at international world prices and their domestic production costs, each value is composed of both quantity and price effects. In order to investigation the likely trends taking place in each economy, the quantity effect is first described through variables represented by the percent area of land covered by forests and the total energy produced in oil equivalent (World Bank, 2011). These preliminary investigations are introduced under the following descriptive analysis.

3. Descriptive Analysis

Table IV.6

Forests as % total land area					
Country	1990	1995	2000	2005	2010
Arab World	7.0395	7.0395	6.5603	6.5202	6.4806
World	32.0414	32.0414	31.4105	31.2205	31.1049
Algeria	0.6999	0.6999	0.6630	0.6449	0.6264
Bahrain	0.2899	0.2899	0.6479	0.6486	1.3158
Egypt	0.0442	0.0442	0.0593	0.0673	0.0703
Iraq	1.8383	1.8383	1.8703	1.8863	1.8995
Jordan	1.1106	1.1106	1.1106	1.1106	1.1039

Kuwait	0.1684	0.1684	0.2806	0.3367	0.3367
Lebanon	12.8055	12.8055	12.8055	13.3920	13.3920
Libya	0.1233	0.1233	0.1233	0.1233	0.1233
Mauritania	0.4026	0.4026	0.3076	0.2590	0.2348
Morocco	11.3130	11.3130	11.2413	11.3847	11.4968
Oman	0.0065	0.0065	0.0065	0.0065	0.0065
Qatar	0.0000	0.0000	0.0000	0.0000	0.0000
Saudi Arabia	0.4545	0.4545	0.4545	0.4545	0.4545
Sudan	32.1469	32.1469	29.6679	29.5539	29.4398
Syria	2.0242	2.0242	2.3506	2.5113	2.6739
Tunisia	4.1388	4.1388	5.3875	5.9475	6.4753
United Arab Emirates	2.9306	2.9306	3.7081	3.7321	3.7919
Yemen	1.0398	1.0398	1.0398	1.0398	1.0398

During the period 1990-2010, forests as a homogenous product have represented around 7 % of total land in the overall Arab countries. The lowest shares are those of Qatar, Oman, Kuwait, Egypt, Bahrain, Mauritania and Libya. The highest proportions are for Sudan, Lebanon and Morocco. The other countries such as Yemen, UAE, Syria, Tunisia and Iraq occupy intermediate positions. This implies that most of the Middle Eastern countries have low levels of forest resources while those of North Africa exhibit higher levels. But, it should be noticed that Sudan has the best percentage of forest land that is almost equivalent to the world distribution.

Regarding the production of energy as in oil equivalent, the shares of each country in world production and in the Arab World do provide indications about the quantities produced between 1971 and 2009.

Trends in total rents from natural resources

A decreasing trend would mean that the country is likely to be diversifying its economy while an increasing trend would show that more pressure is placed only on total natural resources. Algeria, Sudan, Syria, and Libya show increasing trends in total rents from natural resources. Oman, Qatar, Tunisia, the United Arab of Emirates, and Bahrain exhibit decreasing trends implying that diversification is likely to be pursued in these economies. Egypt, Jordan, Kuwait, Mauritania, Morocco, Saudi Arabia, and Yemen show stagnating trends in total rents from natural resources meaning that no major changes have been taking place in either in resource expansion or in diversification. The negative trends in total natural resource rents are though in favor of knowledge enhancement while positive trends do show social costs "paid to the knowledge economy". Any improvement in knowledge indices can be then related to other variables that are not included in this framework (Table IV.7).

Table IV.7: Trends in Total Rents as Percent of GDP (Source of Raw data: World Bank databases)

Country	Intercept	Trend	R^2
Algeria	13.7726 (4.8673)	4.8673 (3.2122)	0.2135
Egypt	13.6776 (4.8417)	0.0359 (0.2882)	0.0021
Jordan	0.5203 (1.0732)	0.0115 (0.5378)	0.0075
Kuwait	57.8131 (10.8939)	-0.3541 (-1.5120)	0.0567
Mauritania	10.1469 (4.7114)	0.1861 (1.9582)	0.0916
Morocco	2.9534 (4.1912)	-0.0550 (-1.7710)	0.0762
Oman	54.1377 (13.7739)	-0.4106 (-2.3673)	0.1285
Qatar	63.7910 (14.8946)	-0.8039 (-4.2537)	0.3225
Saudi	49.9980 (10.1233)	-0.2158 (-0.9904)	0.0251
Sudan	-3.7543 (-2.4859)	0.4980 (7.4729)	0.5950
Syria	5.6234 (3.4479)	0.6001 (8.3382)	0.6465
Tunisia	9.8502 (7.3406)	-0.1468 (-2.4798)	0.1392
UAE	65.1689 (17.3926)	-1.1614 (-7.0242)	0.5649
Yemen	26.9224 (8.4888)	0.3756 (1.3161)	0.0877
Libya	18.1439 (4.2292)	2.3013 (5.9613)	0.6637
Bahrain	47.9820 (10.0476)	-0.9852 (-3.4841)	0.3024
Lebanon	0.0339 (8.7964)	-0.0017 (-5.6009)	0.6106

When looking at the decomposition of total rents, the trends related to forestry rents appear to vary from one country to the other. Of course, countries without forest rents are not included in the analysis and only those exhibiting rents are considered. The trends in forestry rents in

Algeria, Egypt, Mauritania, Morocco, Jordan, and Tunisia are all decreasing while they are stagnating in Sudan and Syria (Table IV.8).

Table IV.8: Trends in Forestry Rents

Country	Intercept	Trend	R^2
Algeria	0.2068 (9.8728)	-0.0022 (-2.4128)	0.1328
Egypt	0.6441 (27.6176)	-0.0127 (-12.3602)	0.8008
Mauritania	1.0426 (25.6964)	-0.0059 (-3.3166)	0.2244
Morocco	0.6666 (21.5089)	-0.0161 (-11.7903)	0.7853
Jordan	0.0402 (12.6049)	-0.0004 (-2.9414)	0.1854
Sudan	1.7591 (8.2443)	-0.0083 (-0.8901)	0.0204
Syria	0.0148 (4.3972)	-2.19365E-05 (-0.1474)	0.0005
Tunisia	0.3121 (21.1239)	-0.0044 (-6.8620)	0.5534

Time trends in Oil Rents

All Arab countries are considered in the trend analysis of rents from gas and oil as they all have data on rents from oil and gas. While some appear to be lowering these rents, others have had increasing trends with also countries having stagnating rents. Iraq, Syria, Libya, and Sudan show increasing trends in oil rents. Morocco, Oman, Qatar, Tunisia, the United Arab of Emirates, Bahrain, and Jordan exhibit decreasing trends. The trends in oil rents in Algeria, Egypt, Kuwait, Saudi and Yemen are all shown to be stagnating. These results indicate that the negative trends are consistent with either depletion of stocks or with the diversification strategy. Positive trends do mainly are consistent with either new discoveries of oil and gas or with reduction of other activities.

Table IV.9: Time trends in Oil Rents

Country	Intercept	Trend	R^2
Algeria	14.8439 (6.3151)	-0.0429 (-0.4137)	0.0044
Egypt	14.8406 (5.6044)	-0.1668 (-1.4280)	0.0509
Iraq	23.5914 (3.7924)	1.7572 (6.4011)	0.5188
Kuwait	56.2508 (10.7815)	-0.3770 (-1.6374)	0.0659
Morocco	0.0185	-0.0004	0.3290

	(8.4824)	(-4.3168)	
Oman	57.1422 (17.1008)	-0.7429 (-5.0380)	0.4004
Qatar	64.6162 (17.3756)	-1.2955 (-7.8942)	0.6212
Saudi	50.2773 (10.3215)	-0.3222 (-1.4990)	0.0558
Syria	6.5554 (4.0856)	0.4841 (6.8376)	0.5516
Tunisia	8.8256 (7.0188)	-0.1505 (-2.7127)	0.1622
UAE	59.4558 (15.6604)	-1.1291 (-6.7394)	0.5444
Libya	19.5358 (4.8269)	1.6504 (5.0027)	0.5558
Sudan	-5.3082 (-3.2105)	1.2631 (9.3724)	0.8145
Bahrain	41.7038 (10.1859)	-1.0763 (-4.4395)	0.4131
Jordan	0.02182 (10.0773)	-0.0008 (-6.4938)	0.6009
Yemen	26.8893 (8.4443)	0.3730 (1.3018)	0.0860

4. Regression Analysis: Effects of rents on knowledge variables

Table IV.10: Overall World Sample

Dependent Variable	Constant	AVG 2000	ICT	R²	N° Observations
EDU	0.028 (.658)	-0.042 (-1.980)	0.913 (15.492)	0.761	95
INN	0.294 (10.314)	-0.043 (-3.019)	0.620 (15.553)	0.772	95
EIR	0.341 (5.098)	-0.106 (-3.196)	0.483 (5.169)	0.364	95
KI	0.149 (7.669)	-.028 (-2.942)	0.796 (29.308)	0.918	95
KEI	.222 (10.179)	-0.043 (-3.932)	0.697 (22.888)	0.878	95

In the overall sample of 95 countries, the relationships between each knowledge variable selected as independent variable, a high level of linearity is established (as shown by R^2 that is between 0.364 and 0.918). The explanatory variables that show statistically significant (1% level) effects (except EDU that is significant at 5 % level) on each of the knowledge variables, are the average rate of total rents as percent of GDP over the period 2000-2009 (AVG 2000) and ICT that also exhibits statistically significant effects. The above results show that knowledge variables are highly sensitive to the average rate of rents and to ICT. While the effects of ICT are all positive and good drivers of the other knowledge variables, the effects of rents are all negative. This implies that any increase (decrease) in rents decreases (increases) the related knowledge variable.

As they are limited observations in the group of Arab countries (16), the explanatory variables used that appear to provide good responses are the average rents of 1970 (AVG70) (1970-1979), the average of 1990 (AVG90) (1990-1999) and the average of rents over 2000-2009 (AVG2000). Other variables such as AVG80 and ICT as shown in the overall model were tried and eliminated for reasons of multicollinearity. Under this framework that appears to be statistically relevant with R^2 between 0.207 and 0.833, the AVG 90 variable does not exhibit statistically significant effects. But, AVG2000 and AVG70 do show statistically significant results for the variables EIR12 (Economic Incentive Regime), KI12, KEI12, EDU09, INN09, EIR09 and KI09 and KEI09. The level of significance is 5 % for KI12, EDU09 and KI09. It is 1 % for the other variables (EIR12, KEI12, INN09, EIR09 and KEI09. In some cases, both effects of AVG2000 and AVG70 are observed.

While the effects of the average rents for the period 2000-2009 are negative, the effects of the average rents over the period 1970-1979 are positive. This means that over the period 2000-2009, the increase in rent decreases the related knowledge variables. But, the net effects: EIR12 (-0.835 and 0.806), for KEI12 (-0.494 and 0.439), for KI12 (-0.433 and 0.358), for INN09 (-0.347 and 0.316), for EIR09 (-.830 and 0.860), and for KEI09 (-0.412 and 0.371) could be negative. This implies that the net effect of average rents is negatively related to most knowledge variables as represented by the above components.

Table IV.11: Arab Countries

Dependent Variable	**Constant**	**AVG 90**	**AVG2000**	**AVG70**	**R²**	**N° Observations**
ICT 12	0.605 (6.705)	-0.011 (-0.045)	-0.269 (-1.204)	0.337 (1.631)	0.239	16
EDU12	0.588 (5.658)	0.211 (0.454)	-0.644 (.028)	0.430 (0.096)	0.364	16
INN12	0.617 (10.782)	0.143 (0.359)	-0.507 (.004)	0.378 (.014)	0.557	16

EIR12	0.603 (10.914)	0.063 (0.437)	-0.835 (-6.104)	0.806 (6.373)	0.821	16
KI12	0.613 (8.252)	0.097 (0.499)	-0.433 (-2.350)	0.358 (2.102)	0.372	16
KEI12	0.615 (9.561)	0.080 (0.473)	-0.494 (-3.105)	0.439 (2.983)	0.523	16
ICT09	0.684 (9.618)	0.065 (0.347)	-0.275 (-1.563)	0.226 (1.385)	0.207	16
EDU09	0.586 (6.533)	0.215 (0.912)	-0.496 (-2.234)	0.292 (1.424)	0.305	16
INN09	0.625 (13.247)	0.034 (0.273)	-0.347 (-2.965)	0.316 (2.921)	0.501	16
EIR09	0.600 (11.015)	-0.009 (-0.061)	-0.820 (-6.073)	0.860 (6.894)	0.833	16
KI09	0.639 (10.601)	0.086 (0.547)	-0.346 (-2.318)	0.269 (1.948)	0.351	16
KEI09	0.634 (11.846)	0.055 (0.394)	-0.412 (-3.112)	0.371 (3.031)	0.525	16

Is there a change in rent structure and what are the likely effects on knowledge variables?

Table IV.12

Dependent Variable	Constant	Diff	DiffSqu	R^2	Observations
KEI09	0.636 (16.845)	-.419 (-2.159)	0.044 (0.185)	.517	16
KI09	0.632 (16.997)	-0.302 (-2.652)	-	0.334	16
EIR09	0.657 (17.997)	-0.614 (-3.268)	-0.335 (-1.443)	.846	16
INN09	0.622 (21.549)	-0.329 (-3.724)	-	0.498	16
EDU09	0.557 (9.856)	-0.380 (-2.196)	-	0.256	16
ICT09	0.659 (14.218)	-0.545 (-2.286)	0.436 (1.483)	0.312	16
KEI12	0.620 (13.599)	-0.522 (-2.224)	0.086 (0.296)	0.510	16
KI12	0.618 (13.454)	-0.390 (-2.773	-	0.354	16
EIR12	0.647 (17.225)	-0.608 (-3.142)	-0.310 (-1.296)	0.83	16
INN12	0.601 (14.512)	-0.475 (-2.227)	0.060 (0.228)	0.525	16
EDU12	0.546 (8.378)	-0.522 (-2.620)	-	0.329	16

ICT12	0.630 (10.314)	-0.675 (-2.150)	0.538 (1.388)	0.287	16

Note : *Diff=Difference between log (%Rent in GDP, Average 2000-2009) and log (% Rent in GDP, Average 1970-1997) and *DiffSqu=Diff squared.

The above regression results (Table IV.12) show that all indices and sub-indices related to knowledge economic index are negatively related to the explanatory variable representing the rate of rents in GDP per country. The indices used as independent variables in these regressions account for the difference between the average of the logarithmic values over the years 2000-2009 of the percent rent in GDP per country and the logarithmic values over the years 1970-1979 of the percent rate in GDP per country. It also includes the squared value of this index. But, in these regressions, the coefficients related to the squared values of the index appear to be statistically non significant.

These results show that the overall KEI of 2009 and of 2012 have respective coefficients of -0.419 and -0.522 while the related KI for the same years exhibit responses of -0.302 and -0.390 respectively for 2009 and 2012. Similarly, when INN09, INN12 are the dependent variables, the respective effects are -0.329 and -0.475. EDU09 and EDU12 exhibit also responses that are -0.380 and -0.522. The levels of responses of ICT09, ICT12, EIR09 and EIR12 are given as -0.545, -0.675, -0.674 and -0.608.

The results show how the rate of rent in GDP per country does influence the level of knowledge attainment as this is measured by knowledge economy and knowledge indices besides the sub-components of the KEI. Otherwise, larger dependency on oil, gas and forestry rents as included in the World Bank data lowers the levels of knowledge attainment in case of positive values of the independent variable. Countries with lower rents might have higher levels in the knowledge attainment indices in case of positive values of the independent variable. These coefficients can be interpreted as effects of rents on knowledge gains or losses for countries. Those with higher levels of rents do have higher costs in the knowledge sphere while lower costs are expressed by countries with lower dependency on oil, gas and forests. Countries such as Lebanon, Morocco, Tunisia, Bahrain, UAE, Qatar, Kuwait, Oman and Saudi Arabia are having extra-benefits in the area of knowledge from the rent economy. Jordan, Egypt, Mauritania, Sudan, Syria, Yemen and Algeria are those countries that pay knowledge tribute to their rent based economy. In the sense of the selected index for rent representation, the 2000/1970 ratio when less than one implies a negative value in logarithms while positive values are ensured under the values of the ratio that are higher than one. This might mean that the concerned countries have lowered their dependency on rents in the economy when the original ratio representing the average rent in percent of GDP if the value for the years 2000 is lower than the one that prevailed in 1970's. This is a sign of diversification and less dependency on oil, gas and forests. Newer discoveries of new natural resources may show figures where the 2000 rent is higher than that of 1970.

Rents from natural resources have appeared to be constraing the promotion of knowledge economy under the on-going economic and social policies. This is shown to be clearly expressed by Oil exporting countries as accompanying financial and institutional frameworks are still needed to transform the rents into incentives for futher development of the knwoeldge economy. Rents as percent of GDP (source WB), Annex 17 (appendicies).

This means that at this stage, there are imperfections that need to be addressed. These imperfections in knowledge introduction are discussed in the following section.

III. Imperfect Knowledge: The Likely Factors behind Imperfect Development of Knowledge Economy in the Arab Countries

In relation to the different indicators of knowledge economy, some Arab countries appear to be exhibiting higher values while others are still having modest performance. Furthermore, different reports have been discussing series of initiatives devoted to the promotion of different dimensions of knowledge economy in variety of Arab countries. But, almost all of these countries have been recently exhibiting economic performances that are not consistent with the penetration of knowledge components. They all show high levels of unemployment including for skilled labor and they all show limited creation of new enterprises.

This section is devoted to showing that there are imperfections in these economies that prevent from the attainment of the performances expected. These imperfections are also related to the way the knowledge economy is introduced, monitored and governed.

Different authors have been looking at these imperfections. These include those that relate that to the social and economic imperfections that exist already in these economies. Others focus on the existence of rents and other economic distortions that prevent from looking at alternative and innovative means to pursue with the economy. Others insist on the role of culture and societal organization in pursuing further use of the knowledge economy.

This variety of approaches is first reviewed before attempts to introduce series of quantitative means devoted to showing the extent of imperfections of the knowledge economy in the Arab countries.

1. Previous contributions

According to Farzanegan (2012) attributes the limited creation of enterprises in Arab countries to the negative economic effects of the excessive rents from natural resources. To the author, resource-rich countries of the Middle East and North Africa have the highest youth unemployment rate in the world while other parts of the world are experiencing an increasing trend in the creation of new enterprises as a potential solution to unemployment. But, the Arab region has the lowest records in new business establishments. Growth theory highlights the importance of entrepreneurship. In the Solow model (1956) growth comes from new and larger plants (economies of scale), while in the Romer model (1990), it comes from new and growing firms (knowledge spillovers). The above author uses series of publications such as that of Acs et al. (2009) who show how knowledge spillovers following research and development spending create opportunities for entrepreneurs. Other authors cited include those that focus on the new firms as an indicator of entrepreneurship and of higher economic growth and productivity (Hause and Du Rietz, 1984; Black and Strahan, 2002; Djankov et al., 2002; and Klapper et al., 2007). The development of new enterprises lead also to higher employment (Birch, 1979, 1987), more technological innovations (Acs and Audretsch, 1990), and higher levels of education (Dias and McDermott, 2006).

According to ILO (2011), the youth unemployment rate for males and females in this region was 22 and 39 percent respectively, while the average world figure was 13 percent. These unemployed could be a source of economic growth in the case of more business friendly policies for the private sector. The following table compares the rate of firms' entry density in the Arab region with other regions. It shows that the Arab countries have the lowest rate of entry of new firms in the world (Fig.IV.7).

Average 2004 -2009	MENA	EAP	LA	SSA	OECD	World
New business density (new registrations per 1,000 people ages 15-64)	0.66	1.35	2.28	1.13	5.03	3.25
GDP per capita (constant 2000 US$)	1836	1590	4481	592	28206	5827
Domestic credit to private sector (% of GDP)	32.33	101.20	32.81	62.41	160.33	133.04
Cost of business start-up procedures (% of GNI per capita)	67.35	47.47	53.99	195.63	6.88	74.39
Procedures to register property (number)	6.98	5.29	6.88	6.58	5.04	6.11
Procedures to enforce a contract (number)	42.40	37.28	39.08	39.37	31.83	37.97
Oil rents (% of GDP)	25.43	2.77	5.87	11.72	0.57	2.57
Lack of Corruption	-0.18	-0.02	0.10	-0.63	1.41	-0.02
Regulatory Quality	-0.22	-0.10	0.11	-0.74	1.36	-0.003

Note: EAP (East Asia & Pacific), LA (Latin America *and the* Caribbean), SSA (Sub-Saharan Africa).
Source: WDI (2012).

Fig.IV.7

According to the above author, the literature on the resource curse shows that natural resource of wealth may reduce economic growth and thus investments and employment (Frankel, 2010 and Van der Ploeg, 2011). Some authors relate the curse to the Dutch disease where high oil prices increase the effective exchange rate leading to appreciation of the domestic currency. This increases the price of non-oil exports (Corden and neary, 1982; Corden, 1984; van Wijenbergen, 1984; Torvik, 2001). Others relate the problem to the neglect of human capital. When countries invest less in education leading to lower economic growth in the long run, natural resources become a curse (Gylfason, 2001).

Other authors relate that to the nature and quality of institutions (Robinson et al., 2006). Others focus on the rent seeking behavior and the attractiveness of the natural resource sectors (Torvik, 2002).

The examination by Farzanegan (2012) of resource rents in relation with entrepreneurship activities shows that shows that point source resources (such as oil and coal) have a statistically negative effect on entrepreneurship.

L.Achy (2012) relates unemployment and job vulnerability to the economics of the rents that are prevailing in the Arab economies. The author considers that the few jobs created are precarious and related to low productivity sectors. To adjust their unemployment rates with the world average 20 million jobs are needed while keeping the current rate constant requires 13 million jobs. This necessitates a constant economic growth of at least 5 percent while the 20 million need an annual growth rate of 8 percent. This cannot be achieved under the on-going development model. This model is mainly based on the economics of rents, subsidies, fiscal favors and lack of transparency needs to be changed to a new model. This latter is merit based, transparent and without excessive rents.

Schwalje (2012) argues that the Arab countries are pursing knowledge-based economic development based on flawed practices as initiated by international firms and domestic organizations including governments. To this author, the importation of the knowledge economy concept to the Arab region has been accompanied by an emphasis on the welfare of individuals. These are tied directly to their success in gaining and maintaining higher qualifications and skills. These could be sold in the labor market to match high wage employment opportunities expected to be generated by emerging high skill, knowledge-based industries. However, the high wage, high skills jobs associated with knowledge-based industries have not materialized in the region and are increasingly subject to competition from the emergence of low wage, high skill workers in other developing countries. The failure of Arab economies to deliver on the livelihood generating promises of knowledge-based development has caused economic impediments.

This same author and in another paper (Schwalje, 20011) shows the low match between the skills of public sector employees and the work roles they perform particularly at lower administrative levels. The author cites Al-Yahya (2008) who introduces the evidence that formal educational qualifications are frequently not related to current jobs and a high number of public sector employees who believe their current jobs require low levels of their perceived skills and capabilities. Citing deficiencies in soft skills like communication, teamwork, analytical skills, and innovative thinking, a recent survey of the private sector also found that 46% of regional CEOs do not believe that education and training systems in the Arab World prepare students for the workplace.

In addition, the author insists on the impacts on skills formation and claims that vocational training could have a negative reputation regionally. This may force students to study abroad which perpetuates the brain drain of talented students.

At the higher education level, low levels of professorial titles and lack of tenure systems fail to incentivize professors to engage in academia full time (Choueiri 2008). Additionally, the use of Arabic, English, and French in education and training systems has consequences at several levels including cultural identity; research productivity and locally produced knowledge; and in terms of facilitating ambitious scholars to seek higher qualifications outside the region.

The Arab world suffers also from a weak innovation systems in which R&D spending is significantly lower than in the developed world with very little private sector funding (United Nations Educational 2010). Regulatory frameworks do not protect intellectual property leading to low level of patents and stifling private R&D expenditure. There is weak government policy making in research and innovation

Furthermore, the research function has gradually been marginalized in Arab universities. University research centers are few and do not have access to critical resources (United Nations Educational 2003).

In many countries in the Arab World, firms have anecdotally expressed a serious concern that they face internal employee skills deficiencies that limit performance, a phenomenon that has been labeled as a "skills gap." Given the regional human capital challenges described thus far, it would be reasonable to hypothesize that skills gaps are likely widespread in many countries in the Arab region in the private sector

The data from the Arab CEO survey suggests that Arab countries, particularly the Gulf countries, are amongst the top of the ranking in terms of facing the highest prevalence of skills gaps globally

Also the Arab human capital investments meant to support knowledge-based development over the last decade have been marginally successful. The burden of making up for inadequate pre-employment skills formation shifts attention from the formal education system as provider of knowledge and skills towards the role of firm training in eliminating skills gaps

In addition, the number of employers providing formal training to permanent employees is comparatively low: Algeria (29%), Egypt (12%), Jordan (24%), Lebanon (68%), Mauritania (24%), Morocco (20%), Oman (20%), Syria (21%), and Palestine (27%)

In this perspective, Arab countries are pressured to reinforce their education and training systems in order to create lifelong learning and employment opportunities. A number of Arab countries have already launched strategies and action plans in this regard especially when facing several education and training persistent challenges.

Qatar has launched in 2011 a new education and training strategy aiming at the following objectives: quality, equity, inclusiveness, portability, and mobility. The country has even developed new frameworks and processes to effectively manage the new resources allocated to the education and training sectors along with the improvement of the reforms' implementation, policy making, as well as monitoring progress to go in line with the country's development strategies (Schwalje, 2012).

Besides the above explanations, the nature of the central power in relation to market forces have also been described as imposing constraints on economic and social reforms in Arab countries. In a paper by M.Dabrowski (2012) and for the period 1950s to 1970s, the author claims that the so-called Arab socialism has some analogies to the model of previous communist countries. The author considers that some Arab countries had imitated the Soviet experience of central planning, especially with respect to investment processes driven by political considerations and import-substitution industrialization strategies. For oil-producing countries, such as Algeria, Libya, Iraq, they had the capacity to pursue such policies (the political military and economic support of the Soviet bloc also played an important role here). Some other countries that had regional conflicts, allocated a large share of their public expenditure to military and security programs.

But, the author considers that by the early 1980s (Egypt) and 1990s (Algeria and Tunisia), there has been a start to depart from administrative dirigisme in the economic sphere, usually with the active engagement of the MIF and World Bank. This process is driven by external factors (fall of oil prices in the mid-A980s, the collapse of the Soviet bloc, economic reforms in China, India, and other developing countries and domestic policy needs (combating macroeconomic instability and the desire to avoid political unrest.) In 2000s, Libya and Syria for example that are the most statist and closed countries, started to pursue more flexible economic policies and limited market reforms.

Now that the Arab and Soviet-type socialisms are not similar, the experience of the post-communist transition of 1990s cannot be copied by Arab countries. Even though there are some similarities in some economic problems, the solutions cannot be found following the same paths. For example, most Arab countries have to eliminate direct and indirect subsidies to domestic food and energy products in order to reduce excessive budget deficits (which threaten their macroeconomic stability), eliminate market distortions and, sometimes, market shortages. And they must replace subsidies with targeted social assistance to those who really need support. Without a doubt, these are difficult reforms that involve great political and social risk.

This is also the case for external economic relations. The economies of Arab countries must undoubtedly become more open among themselves and with the wider world. But there was a lot of progresses made in this sphere in the last 15 years. Most of the Arab countries are now members of the WTO. They concluded free trade agreements among themselves, with the European Union, and some of them also with the United States.

There are also some differences in the privatization policies since there is less to privatize in Arab countries compared to the post-communist countries in the early 1990s. The first reason is that nationalization in Arab countries never went as far as it did in the Soviet bloc countries. Secondly, a large part of public ownership included the oil and gas industries' assets, which will not be part of privatization for political reasons. Thirdly, there are a lot of Arab countries that already started privatizing several years ago. Furthermore, they must now avoid the revolutionary temptation to reconsider some of the past privatization deals considered unfair by the wild public. Finally, there will be some differences in privatization methods. Arab countries have working capital markets and enjoy access to international financial markets. Hence, they can privatize for money, to strategic investors or through initial public offerings (IPOS).

All in all, the democratization may prompt economic reform. It all depends on the ability of young democracies to generate a stable government. The Arab countries must use the political window of opportunity while it is still open and not shelve difficult decisions for the future. So these countries have to learn from those past experiences how to deal with the timing and speed of reforms. Finally, they should learn about the dangers of smoldering ethnic and sectarian conflicts.

Besides the above authors and explanations, others have been mainly looking at the likely effects of cultural variables on economic changes and on the adoption of the components of the knowledge economy. The contributions of G.Holfstede have been substantial in characterizing variety of behaviors throughout series of countries. The likely relationships between the indices provided by the latter author are used to empirically test for the links between these indices and those of the knowledge economy. A case study about the management information system (MIS) component of the knowledge is also introduced to show that there are imperfections in the adoption of the knowledge economy in Arab countries.

2. Empirical Analysis: Holfstede Indices and Knowledge Economy

This empirical part of the study looks at the positioning of Arab countries in relation to Hofstede dimensions and attempts to investigate the links between these dimensions and knowledge and human development variables.

2.1. A descriptive Analysis

According to Holfstede, the values that distinguished countries from each other could be grouped statistically into five clusters that are: Power Distance (PDI), Individualism versus Collectivism (IDV), Masculinity versus Femininity (MAS), Uncertainty Avoidance (UAI) and Long Term Orientation (LTO).

Power Distance (PDI): This measures the extent to which the less powerful members of organizations and institutions (like the family) accept and expect that power is distributed unequally. This represents inequality (more versus less), but defined from below, not from above. It suggests that a society's level of inequality is endorsed by the followers as much as by the leaders.

Individualism (IDV): Individualism is the one side versus its opposite, collectivism, that is the degree to which individuals are integrated into groups. On the individualist side we find societies in which the ties between individuals are loose: everyone is expected to look after him/herself and his/her immediate family. On the collectivist side, we find societies in which people from birth onwards are integrated into strong, cohesive in-groups, often extended families (with uncles, aunts and grandparents) which continue protecting them in exchange for unquestioning loyalty.

Masculinity (MAS): Masculinity versus femininity refers to the distribution of roles between the genders which is another fundamental issue for any society to which a range of solutions are found. The IBM studies revealed that (a) women's values differ less among societies than men's values; (b) men's values from one country to another contain a dimension from very assertive and competitive and maximally different from women's values on the one side, to modest and caring and similar to women's values on the other. The assertive pole has been called 'masculine' and the modest, caring pole 'feminine'.

Uncertainty Avoidance (UAV): Uncertainty avoidance deals with a society's tolerance for uncertainty and ambiguity. It indicates to what extent a culture programs its members to feel either uncomfortable or comfortable in unstructured situations. Unstructured situations are novel, unknown, surprising, and different from usual. Uncertainty avoiding cultures try to minimize the possibility of such situations by strict laws and rules, safety and security measures, and on the philosophical and religious level by a belief in absolute Truth; 'there can only be one Truth and we have it'.

Long-Term Orientation (LTO) is the fifth dimension of Hofstede which was added after the original four to try to distinguish the difference in thinking between the East and West.

The values that are shown for Arab countries are introduced in the following table (IV.13). The values are relatively high for PDI, lower for IDV and higher for MAS and UAI. These say that in comparison with other countries, the recognition of inequality, the dominance of males and the avoidance of risk are major features in most of Arab countries.

Table IV.13: Values attained by Arab countries in Geert Hofstede dimensions

Country	PDI	IDV	MAS	UAI	LTO
UAE	90	25	50	80	
Kuwait	90	25	40	80	
Egypt	70	25	45	80	
Iraq	95	30	70	85	30
Lebanon	75	40	65	50	
Morocco	70	25	53	68	
Saudi Arabia	95	25	60	80	
Arab world	80	38	52	68	

The following section attempts to show how the above variables are related to the knowledge economy as represented by KEI and to the human development index (HDI).

2.2. Regression Analysis

As shown in the following table (IV.14), only IDV and UAI appear to be related to KEI.

Table IV.14: Regressions of KEI on four Holfstede indices (all countries)

	PDI	IDV	MAS	UAI	R^2
KEI	-0.184 (-1.734)	0.628 (5.958)	-0.085 (-1.034)	0.191 (2.341)	.546
HDI	-0.151 (-1.245)	0.540 (4.477)	-0.029 (-0.309)	0.239 (2.562)	.405

These same variables appear also to be driving HDI. But when taking all the countries, PDI appears to have a negative effect on KEI only. This leads to testing if higher PDI countries are similar or different from low PDI, knowing that Arab countries are in the first category. This is confirmed by the Chow test that is computed after having the required regressions. This says that PDI has a negative effect for low PDI countries and a positive effect for high PDI economies. The outcomes are introduced in the following successive tables.

Table IV.15: Regression Results: High and Low PDI countries combined

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	4.115 (3.517)	-0.020 (-1.734)	-0.063 (5.958)	-0.011 (-1.034)	0.019 (2.341)	.546
HDI	0.597	-0.001	0.003	0.000	0.001	.405

	(7.261)	(-1.245)	(4.477)	(-0.309)	(2.562)	

Table IV.16: Regression Results: High PDI countries

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	-1.568 (-0.658)	0.033 (1.276)	0.069 (3.248)	-0.002 (-0.094)	0.029 (1.961)	.362
HDI	0.201 (1.154)	0.003 (1.356)	0.003 (2.116)	0.001 (0.424)	0.002 (2.163)	.288

Table IV.17: Regression Results: Low PDI countries

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	5.150 (4.449)	-.048 (-2.970)	.056 (5.601)	-.016 (-1.702)	.034 (3.363)	.639
HDI	.680 (8.395)	-.003 (-2.776)	.003 (4.206)	-.001 (-1.020)	.002 (3.380)	.530

Table IV.18: Chow test to compare high PDI and Low PDI countries

KEI	**SSR**	**K**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
Comb.	189.539	5	77	142.535	47.004	65	2.1928	9.4008	4.287 (**)
high PDI countries	95.543	5	37						
Low PDI countries	46.992	5	38						

Table IV.19

HDI	**SSR**	**K**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
Comb.	0.935	5	77	0.74	0.195	65	0.0114	0.039	3.426 (**)
high PDI countries	0.51	5	37						
Low PDI countries	0.23	5	38						

Fstat (5,65) =2.36 for 0.05
Fstat (5,65) = betw. 3.34 and 3.29 for 0.01

As we need to compare Arab countries to EEE economies and even with limited number of observations, a Chow test is computed for these groups of countries. The regression results for both KEI and HDI show positive and statistically significant effects for PDI and IDV with negative effects for MAS and UAI at the level of the combined sample.

Regression Results (Arab and EEE countries)

Table IV.20: MENA and EEE countries combined

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	-2.856 (-.967)	.102 (2.968)	.164 (4.644)	-.084 (-2.914)	-.002 (-.094)	.680
HDI	.262 (1.676)	.007 (3.811)	.009 (4.776)	-.005 (-3.451)	-.001 (-.668)	.676

But, at the level of Arab countries only the effect of PDI is observed. No affect appears for the group of EEE countries.

Table IV.21: Arab countries

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	-9.507 (-1.365)	.089 (2.247)	.097 (1.310)	.014 (.203)	.054 (1.077)	.807
HDI	-.170 (-.358)	.008 (2.927)	.009 (1.738)	-.001 (-.324)	.001 (.352)	.835

Table IV.22: EEE countries

	Cst	PDI	IDV	MAS	UAI	R^2
KEI	4.067 (.928)	.072 (1.497)	.106 (1.967)	-.068 (-1.846)	-.040 (-1.544)	.628
HDI	.580 (1.986)	.004 (1.328)	.006 (1.538)	-.004 (-1.477)	-.002 (-.993)	.429

The Chow test shows that the two groups of countries show statistically similar patterns with regard to Hofstede variables and their relations to KEI and HDI.

Table IV.23: Chow test to compare Arab and EEE countries

KEI	**SSR**	**K**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
Comb.	11.087	5	15	4.997	6.09	5	0.9994	1.218	1.219
Arab economies	1.626	5	6						
EEE	3.371	5	9						

Table IV.24

HDI	**SSR**	**K**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
Comb.	0.031	5	15	0.023	0.008	5	0.0046	0.0016	0.348
Arab economies	0.008	5	6						
EEE	0.015	5	9						

Fstat (5,5) = 5.05 for 0.05

Other authors more engaged in behavioral economics, appear to be providing more microeconomic frameworks for experimenting with attitudes towards different parameters including those related to knowledge economy. These contributions appear also to be promising for the Arab countries. Further research is consequently needed in the area of behavioral economics for these countries.

3. **Adoption of MIS by Arab countries**

J.M.Twati (2006) in his thesis on Societal and Organizational Culture and the Adoption of Management Information Systems (MIS) develops very interesting conclusions that relate to the imperfect adoption of MIS in Arab countries. Information System (IS) refers to a field of research governed by the development of the areas of computing, communication, as well as Internet-related technologies. One cannot deny the role Information Systems play in modifying the way societies and organizations are operating. Consequently, in the context of a globalized world, IS are a crucial element to the success of societies and organizations. On the other hand, Management Information Systems (MIS) is a discipline that has been derived from the development of the IT/IS and computer-based technology; and refers to an ordered collection of people, activities, software, hardware, and database in additions to methods used to provide managers with adequate information.

Due to the increasing importance of MIS, more and more organizations and governments are investing huge sums of money to adopt, implement and integrate information systems within their daily activities and operations.

The research paper at hand points to the importance of organizational and societal culture in making the implementation and integration of MIS within a given entity either a success of a failure in the Arab region.

With the large engagements of Arab countries in the knowledge economy, many objective signals show that there are imperfections in the adoption of different dimensions of knowledge. While oil and gas exporting countries have been investing in further infrastructure to accelerate access to different knowledge components, non oil and gas exporting countries have even more imperfections. North African countries stand as lower performers in the knowledge area as they have limited resources to be devoted to every component. The high performance shown by GCC economies could be easily reduced in the medium term if accompanying measures are not undertaken.

These imperfections are mainly related to interdependent components that include the limitation in diversification from rent based economies and the related on-going political economy.

The following sections are devoted to how governance can lead to the progressive reduction of these imperfections through series of macroeconomic and political instruments.

IV. Knowledge Governance and Economic Growth in Arab Countries

We examine the effect of knowledge governance on medium term growth using cross-country data over 2000-2010 for a sample of 22 Arab and African countries. From an analytical point of view, knowledge governance encompasses intellectual property rights system. Using as benchmark, the software industry, our findings suggest that poor knowledge governance reduces economic growth over the medium term but the relationship is non-linear – the rate of decrease in economic growth diminishes with poor knowledge governance. Policy implications are discussed.

The World Development Report 1998/1999 (World Bank, (1998, pp. 6-8) argues that knowledge has become the crucial factor for development, as it has become for the global economy with its implications for R&D expenditure. The creation of knowledge is expanding rapidly. Three categories of knowledge have been defined: scientific knowledge; technological knowledge and entrepreneurial knowledge. Technological knowledge includes implicit and explicit blueprints in the form of inventions. This type of knowledge is more associated with firms, and universities.

This relates to the characteristics of knowledge described as the degree to which it is rivalrous and excludable (Arrow, 1962). A purely rivalrous good has the property that its use by one economic agent precludes its use by another. Excludability relates to both technology and legal systems and thus to the possibilities of inventors to appropriate the returns of their inventions.

That is the economic rationale for policy makers to provide a legal system is to avoid an underinvestment in the production of knowledge (Arrow, 1962).

A good is excludable if the owner can prevent others from using it. Technological knowledge may be perceived as a non-rivalrous, but partially excludable good due to legislation on intellectual property rights (IPRs), i.e. patenting and copyrights. Its non-rivalrous character stems from that technological knowledge is inherently different from other economic goods. Once the costs of creating it have been incurred, it may be used repeatedly at no additional cost. The marginal cost of reproducing it is zero. The IPR system is designated to increase the incentives of firms or individuals to generate new technological knowledge and introduce technological innovations.

In this paper, we analyze the impact of knowledge governance on economic growth. For that purpose, we use a cross sectional dataset for 25 countries. This paper aims to be a very preliminary effort to contribute to a better understanding of the intellectual property policies from an evolutionary developmental perspective. As such, it seeks to build a more coherent framework within which the discussions of both institution building and policy design for development can proceed. Following Burlamanqui (2010), we will label it a "Knowledge Governance" approach and suggest that from a public policy/public interest perspective, and within an evolutionary framework, it is a better way to address the problems concerning the production, appropriability and diffusion of knowledge.

Knowledge governance is a multidimensional concept and a very broad term. From analytical perspective, it encompasses intellectual property rules. Intellectual property rights are a necessary institution for the enhancement of the social capability to generate new technological knowledge. That is to guarantee the access to knowledge. Notice that this knowledge governance is also one of the components in the KEI developed by the World Bank: the economic incentive regime. This component includes as an important aspect the IPRs protection regime.

Without an adequate IPRs protection, creators will have little confidence in appropriating their returns. Poor knowledge governance might also influence the incentives to innovate. Further, weak IPRs systems might also signal weaker formal institutions, and thus affecting economic growth. Thus, the link between knowledge governance and economic growth is a key question that deserves further consideration.

1. Knowledge Governance in Arab countries

In general, little attention has been paid to Intellectual Property Rights (IPRs) regulation in the Arab region (see, El-Said, 2005). Property rights protection and institutions are highly underdeveloped within the Arab Region. As one would expect, the experience of Arab countries with IPRs protection is not homogenous and it differs a lot across countries. We can distinguish two main groups: a small group of countries with active involvement in IP issues at international level, and another one with a more limited participation in the IPRs protection at international level. It is important to note that some of the Arab countries are not even members of the World Trade Organization (WTO). Table (IV.25) displays the current status of the Arab states in relation to the IPRs protection at international level.

Table IV.25: Status of Arab countries on Intellectual Property Rights (IPRs)

Country	WTO Member	TRIPS Agreement	Paris Convention	WCT
Morocco	Yes	Yes (1995)	(1917)	(1995)
Bahrain	Yes	(1995)	(1997)	No
Botswana	Yes		(1998)	No
Cameroon	Yes		(1964)	No
Kenya	Yes		(1965)	Yes (1996)
Mauritius	Yes		(1976)	No
Lebanon	No	No	(1924)	No
Nigeria	Yes		(1963)	Yes (1997)
Qatar	Yes	No	(2000)	(1976)
Oman	Yes	(2000)	(1999)	No
Senegal	Yes		(1963)	Yes (1997)
Jordan	Yes	(2000)	(1972)	(1972)
South Africa	Yes		(1947)	Yes (1997)
Zambia	Yes		(1965)	No
Algeria	No	No	(1966)	No
Egypt	Yes	(1995)	(1951)	No
Tunisia	Yes	(1995)	(1984)	(1995)
U.A.E	Yes	(1996)	(1996)	(1996)

Kuwait	Yes	(1995)	No	(1998)

Source: World Intellectual Property Organization (WIPO). WIPO Lex

Notes: WTO: World Trade Organization; WCT: WIPO Cooperation Treaty; WIPO: World Intellectual Property Organization.

Most Arab countries have enacted new copyright laws and have signed international bilateral agreements. Nowadays, copyright laws are still under work. For instance, software piracy rates still remain at unacceptable levels in Arab region. Following Shandlen et al. (2005), rather than focusing on inputs, we focus on outputs. That is the actual amount of enforcement delivered. There might be a divergence between institutional (theoretical modification of the law) and factual implementation of intellectual property rights (henceforth, IPR) laws has recently become more critical and apparent. In the absence of enforcement and hence adequate punishment, IPRs reforms tend to fall short of their proclaimed goals, leading at the end to inefficient IPRs institutions.

From a legal perspective, we have reviewed the existing national copyright laws and international agreements. Table (IV.26) shows the countries in which copyright protection is mentioned in the Constitution.

Table IV.26: Copyright laws in Constitution

Country	**Copyright in Constitution**
Bostwana	No
Cameroon	No
Morocco	No
Kenya	No
Mauritius	No
Nigeria	No
Senegal	No
Bahrain	No
South Africa	No
Lebanon	No
Zambia	No
Qatar	Yes
Oman	No
Jordan	No

Algeria	Yes
Egypt	No
Saudi Arabia	Yes
Tunisia	No
U.A.E	No
Kuwait	No

Source: World Intellectual Property WIPO. WIPO Lex

Our argument is that measures of output are a rough predictor of the output of IPP. Thus, output measures seem to be more relevant to capture the enforcement of IPRs. In the current study, we use a proxy variable for IPRs protection, software piracy rates provided by the Business Software Alliance (BSA). Software piracy is one of the most widespread and fastest growing forms of Intellectual Property Right (IPR) violation (see for instance, Gantz and Rochester, 2005; Traphagan and Griffith (1998).

Following El Bialy et al (2010), we can assume that software piracy can be used as a proxy for IPRs violations of other information goods[34]. There are many empirical studies using IPRs as an input and they provide evidence that the stronger IPRs promote economic growth. Indeed, one could also argue that software piracy rates can be viewed as an unauthorized transfer of technology (Goel and Nelson, 2009).

1.2. Hypothesis and model

Our argument is that measures of output are a rough predictor of the output of IPP. Thus, output measures seem to be more relevant to capture the enforcement of IPRs. In the current study, we use a proxy variable for IPRs protection, software piracy rates provided by the Business Software Alliance (BSA). Software piracy is one of the most widespread and fastest growing forms of Intellectual Property Right (IPR) violation (see for instance, Gantz and Rochester, 2005; Traphagan and Griffith (1998). Following El Bialy et al. (2010), we can assume that software piracy can be used as a proxy for IPRs violations of other information goods. There are many empirical studies using IPRs as an input and they provide evidence that the stronger IPRs promote economic growth. Indeed, one could also argue that software piracy rates can be viewed

[34] See Varian (1998).

as an unauthorized transfer of technology (Goel and Nelson, 2009). There are many empirical studies using IPRs as an input and they provide evidence that the stronger IPRs promote economic growth.

Weak enforcement of IPRs might influence economic growth via its impact on aproprpiability of intellectual property rights and related risks of loss of investment, its effect on productivity, and its signal for low quality institutions (for instance, Ding and Liu, 2009). The main hypothesized effect of all these influences is to lower economic growth, although there is scant evidence on the nature and magnitude. Furthermore, the presence of weak IPRs protection might signal greater profit risk and this might hamper economic growth. If IPRs are not adequately protected, or investors run a high risk of being defrauded of their legitimate profits, the incentives to invest or generate knowledge are hindered.

HYPOTHESIS 1: Stronger knowledge governance is positively correlated with economic growth in Arab countries.

HYPOTHESIS 2: The relationship between knowledge governance and economic growth might be non-linear. We want to test the existence of a Kutznets curve for Arab countries.

MODEL AND DATA

The theoretical framework is borrowed from Goel and Ram (1994) and Goel et al. (2008). The main idea is to consider an aggregate production function with only two inputs, capital stock (K) and labour (L) to derive an economic growth equation.

$$GDP = h(K, L) \qquad (1)$$

After totally differentiating, and rearranging terms, we can rewrite the basic growth equation

$$(dGDP/GDP) = (\partial GDP/\partial K)(K/GDP)(dK/K) + [(\partial GDP/\partial L)(L/GDP)](dL/L) \qquad (2)$$

In equation (2), ($dGDP/GDP$) and (dL/L) are, respectively, the rates of growth in (real) per capita *GDP* and labor (*GDPgr* and *LABgr*, respectively, in (3) below). We can also add up other variables to the equation (2). Human capital or labor quality (*LIT*) and income are added to (2). Initial per capita GDP should be included in the regression equation to capture trends towards convergence. Based on the above theoretical background, the estimated growth relations take the following general form:

$$GDPgr_i = f(GDI_i, LABgr_i, LIT_i, Knowledge\ Governance_i, GDPpc_i,) \qquad (3)$$

$$i = 1,2,3,..$$

The focus here will be on equation (3) which will be estimated using Ordinary Least Squares (OLS). The dependent variable is the rates of growth in real per capita GDP (GDPgr). Knowledge governance is proxied by piracy rates provided by the Business Software Alliance, (BSA, 2007), (see Business Software Alliance (2009) for measurement details)[35]. BSA is an industry group; nevertheless its data on software piracy, is the best cross-country measure currently available, albeit subject to some inherent upward bias. Table 1 shows the piracy rates of different Arab countries. For instance Egypt has low piracy rates when compared to the rates in other Arab countries. For example, Algeria, and Lebanon have higher piracy rates. This fact calls towards a tougher policy of copyright enforcement. For instance, only Lebanon, Syria, Algeria, Saudi Arabia, and Qatar are not yet signed the TRIPs agreement. It is clear that Arab countries will increasingly become more attractive investment targets as TRIPS regulation begin to be enforced. An important question to be answered is to investigate the potential effectiveness of the TRIPS agreement. This is beyond the scope of this paper. The idea behind is that the TRIPs agreement has been a useful way to strengthen domestic protection of IPRs.

The data include annual cross-country observations for sixty five countries for the years 2000-20010 (some countries dropped out of the analysis due to missing data). To overcome anomalies with year-to-year swings in data, we estimate cross-sectional models with variables averaged (annually) over the 2000-20010 period. Thus, the study may be viewed as estimating medium-term growth.

Table IV.27: Average Piracy Rates (2000-2010)

Country	Average Piracy rate (%)
Algeria	83.6

[35] The BSA data primarily measure the piracy of commercial software. We are unaware of any publicly available cross-national data on end-user software piracy. See Png (2008) for a discussion about the reliability of piracy data. Also, see Traphagan and Griffith (1998).

Bahrain	63.5
Egypt	60.4
Jordan	62.4
Kuwait	67.1
Lebanon	74.7
Morocco	65.6
Oman	66.1
Qatar	62.1
Saudi Arabia	52.4
Tunisia	77.4
United Arab Emirates	36.4
Yemen	89.5
Average	**63.3**
Std. Dev	**15.7**

Source: The Business Software Alliance (BSA). Several reports. Own construction

In our sample period, the average growth rate of per capita GDP was 4.4 percent, while the average software piracy rate was 68 percent. The correlation between the two primary variables of interest, PIRACY and GDPgr was a modest 0.37. Details about the variable definitions, data sources and summary statistics are provided in Table 1. The Appendix provides a correlation matrix showing the basic correlations between key variables used in this study. The results section follows.

2. Empirical results

Table 4 displays the main results from different models. All the estimations were carried out by using STATA v.12. Model (1) can be viewed as the baseline model. The overall fit of all models in Table 4 is decent as evidenced by the statistically significant F-value and an R^2 that is at least 0.52. As a general test of the specification of the estimated relation, a RESET test was conducted. The corresponding results (reported at the bottom of Table IV.28).

The results reveal that consistently with the literature GDI has a positive impact on growth. GDI leads to greater economic growth. Human capital apparently enhances economic growth. Greater piracy might also enhance economic growth, although this relationship might be non-linear. In column (2), we observe a non-linear relationship between knowledge governance and economic growth in Arab and African countries. The coefficients on our proxy variable for knowledge governance are statistically significant.

Table IV.28: Knowledge governance and Economic growth. Dependent variable: GDP growth

VARIABLES	Model (1)	Model (2)	Model (3)	Model (4)
GDI	0.104	0.062	0.095	0.054
	(0.080)	(0.059)	(0.075)	(0.054)
Labgr	-0.331**	-0.335***	-0.508***	-0.502***
	(0.123)	(0.105)	(0.135)	(0.108)
Literacy	0.036*	0.028*	0.020	0.014
	(0.019)	(0.014)	(0.022)	(0.017)
Piracy	0.029	0.328**	0.036	0.331**
	(0.020)	(0.122)	(0.021)	(0.122)
Piracy^2		-0.002**		-0.002**
		(0.001)		(0.001)
Initial GDP			0.000	0.000*
			(0.000)	(0.000)
Constant	-3.638	-10.625**	-2.726	-9.670**
	(3.534)	(4.390)	(3.603)	(4.395)
F- value				
Observations	22	22	22	22
R-squared	0.519	0.673	0.559	0.709
Reset test (p-value of F test)				

*Notes: Variable definitions are provided in Table 1. All equations included a constant term. However, corresponding results are not reported to conserve space. The figures in parentheses are robust t-statistics from OLS regressions. * and ** denote statistical significance at the 10% level and at 5%, respectively.*

One could also argue that there is a two way relationship between knowledge governance and economic growth. In this sense, nations can be force to spend more resources in combating piracy. On the other hand, potential pirates might also have more resources to undertake illegal activities in richer countries. Future research should also allow for simultaneity between knowledge governance and economic growth by employing a two-stage least squares (2SLS) approach. At this respect, Banerjee et al. (2005) and Goel and Nelson (2009) might also provide guidance regarding the choice of valid instruments.

Using data from a large sample of countries and employing a fairly standard growth model, this research examines the effect of knowledge governance on medium term growth. There are various, direct and indirect means through which knowledge governance proxied by software piracy can affect economic growth. The present research contributes to the empirical literature by examining the impact of knowledge governance on economic growth. Further details are in the Annex 18 (Appendicies).

The answer to the question posted in the title of the paper is yes – knowledge governance influences economic growth. As expected, poor knowledge governance lowers economic growth. Further, the negative growth effects of knowledge governance are found to be especially pronounced in the case of low income nations. Investment and education increase growth, while there was little support for the convergence hypothesis. Other things being the same, growth was lower in low income countries - suggesting the presence of some minimum income threshold in order for nations to get on growth trajectory.

The above results lead to considering further issues that include the importance of formal institutions in relation to the knwoeldge economy.

V. The Impact of Formal Institutions on Knowledge Economy

This section analyzes the impact of formal institutions on economic knowledge and its related variables. In particular, the role of various governance indicators is examined. For that purpose, we use the Kauffman, Kray and Mastruzzi governance indicators. This study also employs the variables identified under the World Bank's four knowledge economy index (KEI) components which include the economic environment, innovation, education, and information infrastructure. For that purpose, we estimate panel data models for 22 Arab and African countries over the years 1996-2010. The results show that institutional quality plays an important role in the relative performance of Arab and African countries in building up the knowledge economy. Policy implications are also discussed.

The main idea is that in the process of creation and diffusion of knowledge depends on appropriate governance policies that are the outcome of good governance. Therefore; it is important to identify the institutional factors that promote the diffusion of knowledge. On this way, we can create a secure access to the new technologies developed by technology leaders.

The Arab states have remained weak and without any remarkable change in terms of institutional performance. The governance indicators did not change much in the last ten years. The effect of this poor institutional performance on the development and the main components of the knowledge society is not a secret (Arab Report, 2011);

The institutional framework is crucial as it might guarantee an adequate flow of knowledge between scientific research and technological applications, as well as a good information flow between users and researchers. Thus, governments play a key role; as the creation of knowledge cannot be leave to the market mechanism. As we know the market for knowledge is characterized by market imperfections.

Following the main idea is that good governance attracts FDI inflows and domestic investment and this contributes to the development of the knowledge economy infrastructure. According to the World Bank, one of the key pillars in the knowledge economy is a favorable institutional framework. In this paper, we deviate from previous research that does not incorporate all dimensions of government quality and provide an exhaustive assessment with seven institutional quality dynamics. Secondly, a substantial bulk of work in the literature is based on data collected between 1960 and 2001. By using much recent data, the paper provides an updated account of the nexus with more focused policy implications.

1. Institutions and FDI

The literature suggests that the main institutional impediment to FDI may not lie in its effect on the return of investing abroad but on the excess risk that it entails. Unlike trade, foreign investment is not only subject to a risk of predation and hold-up but also, and chiefly, to a risk of expropriation and nationalization. Harms and Ursprung (2002), focusing on democracy, argue that authoritative regimes are associated with a greater risk of policy reversals, due for example to the dictator's own whims, the need to raise public support through populist measures, or simply coups. Globerman and Shapiro (2002) also observe that various measures of governance quality are related to FDI inflows. Stern (2003), Bénassy- Queré, et al. (2005) are some recent examples in this research field. These works have shown that, especially in developing countries and emerging economies, the quality of institutions and of the regulatory system operating in the economy, has a significant impact over inward FDI.

Finally, Lambsdorff (2003) finds that the predictability of corruption has an impact on inward capital flows that is distinct from the impact of the level of corruption. Other authors find that defective institutions tend to be correlated with lower literacy rates, larger public investment in unproductive assets (Mauro, 1998), and lower expenditures devoted to the maintenance of past projects. Hence, by encouraging unproductive public investments that result in less efficient public facilities and a slower accumulation of human capital, defective institutions also indirectly hamper countries' attractiveness for foreign investment.

2. Governance in Arab Countries

Good governance would include and effective and efficient legal system that protects intellectual property rights, public institutions that are credible and honest, and government policies that favor free and open markets. Good governance is measured by several indicators. In this paper we use six governance indicators. In particular, Note that good governance indicators are not available for developing countries before 1996. The institutional quality governance indicators employed here are: the rule of law, regulation quality, corruption-control, government effectiveness, voice and accountability, political stability (or no violence), and democracy (Table IV.29).

Table IV.29: Average Governance Indicators in Arab countries (1996-2010)

Country	Average of Rule of Law	Average Regulation Quality	Average of Political stability	Average of Government Effectiveness	Average of Voice and Accountability	Average Control of Corruption
Algeria	-0,78893455	-0,7122877	-1,44133868	-0,66451305	-1,04268179	-0,63530697
Bahrain	0,60638449	0,76833987	-0,08984976	0,50221845	-0,82313355	0,3351015
Egypt	-0,02711022	-0,32806343	-0,59035112	-0,35251068	-1,03610378	-0,46453046
Jordan	0,36026962	0,24806912	-0,28850636	0,12145374	-0,59777677	0,17050885
Kuwait	0,60171929	0,2259226	0,30555479	0,06863596	-0,41279797	0,6943274

Lebanon	-0,4208629	-0,21463871	-1,16768498	-0,28462694	-0,40577663	-0,62499801
Libya	-0,85715901	-1,43194516	0,04464944	-1,04837214	-1,7870522	-0,92958657
Morocco	-0,02929891	-0,17353106	-0,37764633	-0,11549552	-0,6355504	-0,1368671
Oman	0,59995743	0,45599291	0,86999168	0,43112549	-0,85063887	0,43587834
Qatar	0,62765847	0,27447152	0,94517336	0,51753337	-0,70744149	0,81803273
Saudi Arabia	0,15368463	0,00908734	-0,31108863	-0,22388904	-1,57620164	-0,21724499
Tunisia	0,06426717	-0,00869308	0,13865218	0,45864286	-1,00947499	0,01364234
UAE	0,56471647	0,67985047	0,82859111	0,77652508	-0,78778162	0,789341
Average Arab						

Source: Own construction. World Bank.

Table (IV.29) displays the average governance indicators for 15 Arab countries. There is an enormous variation in Arab countries. Indeed, this gap varies for different governance components. In some Arab countries, corruption is a serious matter.

3. DATA

(a) The dependent variable

To date, efforts to measure knowledge have been undertaken at one of two levels: first, at the individual firm level; and, second, at the national systems level. Inevitably, because knowledge has informal and tacit aspects (as well as formal or codified forms), all such measurements involve proxies and indirect estimates where direct measurement is not possible. Firm level measurement arises out of business initiatives to manage knowledge and measure intangible assets. These efforts are operationalized at the micro or individual firm level and use a combination of accounting and non-financial indicators to measure stocks of intellectual or knowledge capital and flows of changes in knowledge stocks (OECD, 2002). The knowledge capacity of firms is proxied by means of instruments like balanced scorecards; intangible assets monitor, intellectual capital accounts, and stylized models of knowledge spillovers. (Sveiby, 1997; Lev, 2001; Boudreau, 2002). In addition to knowledge stocks and flows, knowledge enablers are measured as a way of identifying practices with the potential to change or maintain knowledge stocks and flows. These may include leadership, strategy, organizational partnerships, or talent. (Kermally, 2002).

At the macro level, economic models capture the generation of ideas and their association with wealth in the production function. Conceptually, the generic production function relates total product to labor, capital, and other inputs that combine to produce it. The deficiency of the basic Cobb-Douglas function in handling new innovations and endogenous technical change has since resulted in many refinements, dating back to the seminal work of Robert Solow (1957) and Moses Abramowitz (1956). The resulting literature, termed "growth accounting" attempts to disaggregate the residual in the standard production function by employing increasingly sophisticated econometric methods. Knowledge is seen as embodied in technical change (Solow 1957; Abramowitz 1956). A more recent development is the "knowledge production function" which postulates the generation of new knowledge to be dependent on R&D capital, labor and other inputs. Various measures of "new knowledge", including citation weighted patents as well as new product announcements have been used in these econometric models (see Griliches, 1990, 1992, for discussions of related efforts).

As noted previously, there have also been a variety of attempts by international bodies and countries to develop indices of science, technology or knowledge standing (see also discussion in Grupp and Mogee, 2004). For example, the UNDP's Technology Achievement Index (UNDP, 2001) is a comparative national macro-composite of indicators for technology creation (e.g. patents per capita), diffusion of new innovations (e.g. internet hosts per capita), diffusion of old innovations (e.g. telephones per capita), and human skills (e.g. mean years of schooling for people over 15 years). Similarly, the 2004 European Innovation Scoreboard employs 20 indicators, comprised of these four groups – human resources; the creation of new knowledge; the transmission and application of knowledge; and innovation, finance, output and markets – to develop composite indices of innovation performance for EU member states, the US, and Japan (Commission of the European Communities, 2004). The "creation of knowledge" indicators include public and business R&D/GDP and high tech patents/population. The "transmission and application of knowledge indicators" include proportion of small and mid-size enterprises

(SMEs) that report making innovations or collaborating in innovations, innovation expenditures/sales, and non-technical innovations by SMEs. The UNDP, EU, and other similar indices draw on already available data reported at the national level; national comparisons of standing are then made.

Our dependent variable is extracted from the World Bank. The knowledge index consists of four dimensions: An Economic Incentive and Institutional Regime, Educated and skilled workers, an Effective Innovation System and Modern and Adequate Information Infrastructure.

(b) Independent variables

Our major variable of interest is governance. Governance is multidimensional and of course a very broad term. Governance is defined here as the way in which policy makers are empowered to make decisions, the way in which policy decisions are implemented and formulated. To operationalize this concept we use a set of governance indicators that capture different aspects of governance. This indicator developed by the World Bank is based on several sources partly polls of experts, partly surveys of residents and entrepreneurs within a country (Kaufmann, Kraay, & Mastruzzi, 2006). The process by which those in authority are selected and replaced [Political Governance]: voice and accountability and political stability. The capacity of government to formulate & implement policies, and deliver services [Economic Governance]: regulatory quality and government effectiveness, and finally the respect of citizens and state for institutions that govern interactions among them [Institutional Governance]: rule of law and control of corruption.

Each indicator provides a subjective assessment of some aspect of a country's quality of governance. The indicators are normalized such that they range from around 2.5 to 2.5 and have a mean of zero and a standard deviation of one. Higher values signal better governance.

One of the advantages of using aggregate data is that aggregate indicators are more informative about broad concepts of governance. Individual data provides a noisy signal of broader concept of governance. Aggregate indicators also provide broader country coverage than individual indicators.

We will use each indicator in isolation since they measure different aspects of governance and it is interesting to see what aspect of governance; if any; might have an impact on knowledge. In addition; we use a general indicator of governance that is the average of the individual indicators six in the most of countries.

4. Method and empirical results

We are interested in empirically evaluating the impact of formal institutions on knowledge economy. One might also criticize the redundancy in the information provided for each component of the knowledge economy index. Each component could be correlated with each its components variables individually. For that reason, we use principal component analysis (PCA). The PCA is a common statistical technique that is used to reduce transform a larger set of correlated variables into a smaller set of uncorrelated variables, called principal components, that account for most of variation in the original data set.

Without going into more details about the PCA technique, as it can be seen from Table (IV.30), the first principal component (Comp1) accounts for approximately 65% of the variation in all four knowledge economy dimensions. The criteria applied to determine how many common factors to retain are taken from Kaiser (1974) and Jolliffe (2002). Kaiser recommends dropping factors with an eigenvalue smaller than one. Note also that the weights in the first principle component are almost equal across dimensions. This result indicates that a one principal component model is appropriate in our sample.

Table IV.30: Principal Component Analysis

KE dimensions		**Component Matrix(Loadings)**			**1st P.C**	**Eigen Value**	**Indexes**
Education	School enrolment	SEP	SES	SET			Educatex
		0.535	0.620	0.574	0.771	2.313	
Information & Infrastructure	ICTs	Internet	Mobile	Telephone			ICTex
		0.653	0.661	0.371	0.705	2.115	
Economic	Trade and Tariffs	Trade	Tariffs				Tradex
		-0.707	0.707		0.645	1.290	

Incentive	Credit & IR Spread	Private Credit	Interest rate spread			Creditex
		-0.707	0.707	0.679	1.358	
Innovation	Scientific Journals					
	FDI Inflows					

SEP: School Enrolment Primary. SES: School Enrolment Secondary. SET: School Enrolment Tertiary. PC: Principal Component. ICTs: Information and Communication Technologies. IR: Interest Rate.

We estimate pooled time-series cross-section (panel data) regressions. The yearly data extend to a maximum of 22 countries and cover the 1986-2010 periods. Since some of the data are not available for all countries or years, the panel data are unbalanced and the number of observations depends on the choice of explanatory variables. More details are available in the Annex 19 (Appendices).

Table IV.31: Effect of governance on education (with HAC standard errors)

	Dependent variable: Educatex					
Constant	0.883*	-0.737	1.030	-0.050	0.494	0.681
	(1.688)	(-0.640)	(1.905)	(-0.047)	(0.704)	(0.940)
Voice & Accountability	-0.483***	---	---	---	---	---
	(-3.272)					
Political Stability	---	-0.916***	---	---	---	---
		(-3.513)				
Government Effectiveness	---	---	-0.557*	---	---	---
			(-1.685)			
Regulation Quality	---	---	---	-0.408	---	---
				(-0.810)		
Rule of Law	---	---	---	---	-0.746***	---
					(-3.146)	
Control of Corruption	---	---	---	---	---	-0.810***
						(-2.770)
Trade	-0.000	0.034*	-0.001	0.012	0.007	0.006
	(-0.012)	(1.945)	(-0.279)	(0.530)	(1.414)	(1.188)
Population Growth	-1.434***	-1.259***	-1.438***	-1.131***	-1.514***	-1.532***
	(-6.434)	(-4.890)	(-5.162)	(-5.171)	(-6.275)	(-6.045)
Inflation	0.113***	0.036	0.084**	0.052	0.099***	0.098***
	(4.621)	(0.879)	(2.042)	(1.061)	(3.743)	(3.714)
Government Expenditure	0.141***	0.103***	0.139***	0.104***	0.154***	0.172***
	(6.256)	(6.218)	(3.960)	(6.401)	(7.151)	(7.022)
Financial depth	-0.350	-1.987	0.187	-0.315	-0.219	-0.696
	(-0.404)	(-1.642)	(0.209)	(-0.810)	(-0.340)	(-1.190)
Hausman test	100.44***	38.168***	65.609***	30.488***	54.009***	44.126***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sargan OIR	3.938	2.677	5.604	10.600*	4.427	3.675
	[0.558]	[0.749]	[0.346]	[0.059]	[0.489]	[0.597]
Adjusted R^2	0.584	0.640	0.536	0.645	0.568	0.542

Fisher	82.558***	65.541***	101.21***	111.44***	211.47***	261.43***
Observations	79	79	79	79	79	79
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

Table IV.32: Effect of governance on Information & Infrastructure (with HAC standard errors)

	Dependent variable: ICTex					
Constant	-15.490***	-7.799***	-20.86*	-6.874***	-22.708	-18.322*
	(-2.838)	(-3.457)	(-1.702)	(-3.874)	(-1.160)	(-1.692)
Voice & Accountability	-2.053*	---	---	---	---	---
	(-1.704)					
Political Stability	---	-1.309***	---	---	---	---
		(-2.643)				
Government Effectiveness	---	---	-4.695	---	---	---
			(-1.155)			
Regulation Quality	---	---	---	-2.352***	---	---
				(-2.929)		
Rule of Law	---	---	---	---	-5.246	---
					(-0.754)	
Control of Corruption	---	---	---	---	---	-3.436
						(-1.081)
Trade	-0.031*	-0.002	-0.019	0.026	0.026	-0.003
	(-1.793)	(-0.196)	(-0.808)	(1.146)	(0.371)	(-0.146)
Population Growth	-0.036	-0.512	-0.035	-0.593	0.260	0.373
	(-0.036)	(-1.260)	(-0.037)	(-1.617)	(0.145)	(0.330)
Inflation	0.282	0.107**	0.117	-0.009	0.048	0.066
	(1.639)	(2.084)	(0.556)	(-0.179)	(0.145)	(0.326)
Government Expenditure	0.095	-0.021	0.162*	-0.056	0.159	0.156**
	(1.535)	(-0.595)	(1.896)	(-1.339)	(1.186)	(2.004)
Economic Prosperity	-0.538	0.550	-0.478	0.627	-0.794	-0.762
	(-0.432)	(1.247)	(-0.379)	(1.523)	(-0.342)	(-0.556)
Domestic Investment	-0.034	-0.019	-0.135	0.009	-0.113	-0.015
	(-0.240)	(-0.202)	(-0.428)	(0.102)	(-0.235)	(-0.057)
Financial Size	16.857**	5.752**	22.447	3.934	22.095	18.292
	(2.096)	(2.509)	(1.212)	(1.615)	(0.835)	(1.108)
Financial Efficiency	4.736*	1.492**	8.114	-0.695	7.193	5.135
	(-1.704)	(2.229)	(1.445)	(-1.023)	(0.957)	(1.337)
Hausman test	120.36***	55.345***	151.62***	42.352***	157.7***	136.71***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sargan OIR	1.359	8.875**	0.213	9.33***	0.068	0.414
	[0.506]	[0.011]	[0.898]	[0.009]	[0.966]	[0.812]
Adjusted R^2	0.090	0.063	0.096	0.116	0.054	0.080
Fisher	4.174***	11.687***	2.318**	9.410***	1.062	1.823*
Observations	139	139	139	139	139	139
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

Table IV.33: Effect of governance on First Economic Incentive (with HAC standard errors)

	Dependent variable: Tradex					
Constant	4.537***	5.380***	3.830	5.188***	3.944	4.303*
	(2.677)	(3.521)	(1.551)	(3.425)	(1.631)	(1.730)
Voice & Accountability	-0.710*	---	---	---	---	---
	(-1.855)					
Political Stability	---	-0.582	---	---	---	---
		(-1.427)				
Government Effectiveness	---	---	-1.166	---	---	---
			(-1.302)			
Regulation Quality	---	---	---	-0.690*	---	---
				(-1.833)		
Rule of Law	---	---	---	---	-1.032	---
					(-1.525)	
Control of Corruption	---	---	---	---	---	-0.906
						(-1.245)
Trade	---	---	---	---	---	---
Population Growth	0.318	0.047	0.175	-0.088	0.048	0.200
	(1.173)	(0.180)	(0.731)	(-0.308)	(0.208)	(0.875)
Inflation	-0.072	-0.103**	-0.129***	-0.114	-0.126***	-0.133***
	(-1.433)	(-2.385)	(-2.618)	(-2.552)	(-2.822)	(-2.858)
Government Expenditure	0.003	-0.061	-0.009	-0.067	-0.035	-0.016
	(0.059)	(-0.991)	(-0.210)	(-1.215)	(-0.883)	(-0.379)
Economic Prosperity	-0.486	0.005	-0.221	0.152	-0.005	-0.184
	(-1.091)	(0.014)	(-0.653)	(0.378)	(-0.016)	(-0.530)
Domestic Investment	0.051	0.053	0.002	0.051	-0.020	0.005
	(0.662)	(0.657)	(0.031)	(0.719)	(-0.217)	(0.058)
Financial Size	-4.075**	-4.972**	-2.466	-4.525*	-1.905	-2.621
	(-2.417)	(-1.997)	(-0.792)	(-1.910)	(-0.653)	(-0.801)
Financial Efficiency	-0.229	-1.504*	-0.042	-2.056***	-0.851	-0.829
	(-0.159)	(-1.886)	(-0.025)	(-2.872)	(-0.860)	(-0.728)
Hausman test	47.828***	75.876***	50.741***	64.734***	46.119***	71.148***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sargan OIR	1.295	0.937	1.947	0.830	0.343	0.515
	[0.730]	[0.816]	[0.583]	[0.842]	[0.951]	[0.915]
Adjusted R^2	0.085	0.158	0.204	0.164	0.311	0.204
Fisher	13.683***	11.514***	6.222***	13.196***	9.529***	11.258***
Observations	82	82	82	82	82	82
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

Table IV.34: Effect of governance on Second Economic Incentive (with HAC standard errors)

	Dependent variable: Creditex					
Constant	9.433**	5.036	8.464	4.127	2.966	6.506
	(2.153)	(1.781)	(1.310)	(1.427)	(1.216)	(1.596)
Voice & Accountability	1.293	---	---	---	---	---
	(1.532)					

Political Stability	---	0.576	---	---	---	---
		(1.515)				
Government Effectiveness	---	---	1.509	---	---	---
			(0.639)			
Regulation Quality	---	---	---	0.313	---	---
				(0.914)		
Rule of Law	---	---	---	---	-0.230	---
					(-0.317)	
Control of Corruption	---	---	---	---	---	0.742
						(0.622)
Population Growth	0.368	0.418	0.307	0.376*	0.186	0.277
	(1.480)	(1.622)	(0.973)	(1.677)	(0.829)	(1.123)
Inflation	-0.036	0.050	0.060	0.071	0.076	0.069
	(-0.302)	(0.591)	(0.484)	(0.870)	(1.097)	(0.650)
Government Expenditure	-0.062	-0.025	-0.083**	-0.041	-0.050**	-0.073**
	(-2.578)	(-0.676)	(-2.084)	(-1.126)	(-2.192)	(-2.407)
Economic Prosperity	0.026	-0.383	0.007	-0.294	-0.074	-0.056
	(0.122)	(-1.354)	(0.022)	(-1.223)	(-0.346)	(-0.244)
Domestic Investment	0.001	0.043	0.044	0.029	-0.014	0.012
	(0.012)	(0.442)	(0.237)	(0.265)	(-0.121)	(0.099)
Financial Size	-6.865	-3.991	-7.615	-3.511	-1.946	-5.408
	(-1.492)	(-1.253)	(-0.816)	(-1.128)	(-0.656)	(-0.942)
Financial Efficiency	-4.396***	-2.043**	-4.174	-1.489	-1.317	-2.840**
	(-2.733)	(-2.023)	(-1.384)	(-1.359)	(-1.252)	(-2.126)
Hausman test	238.74***	143.68***	101.37***	113.22***	54.186***	89.189***
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Sargan OIR	6.155	11.097**	6.755*	15.858***	25.963***	10.603**
	[0.104]	[0.011]	[0.080]	[0.001]	[0.000]	[0.014]
Adjusted R^2	0.302	0.306	0.172	0.300	0.396	0.232
Fisher	21.245***	6.265***	23.544***	17.405***	125.22***	14.145***
Observations	105	105	105	105	105	105
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

Table IV.35: Effect of governance on Technical & Scientific Journals (with HAC standard errors)

	Dependent variable: LogJournals					
Constant		0.600		1.958	-4.950	
		(0.424)		(1.214)	(-0.898)	
Voice & Accountability		---	---	---	---	---
Political Stability	---	-0.952***	---	---	---	---
		(-3.928)				
Government Effectiveness	---	---		---	---	---
Regulation Quality	---	---	---	-1.045***	---	---
				(-5.234)		
Rule of Law	---	---	---	---	-1.866	---
					(-1.358)	
Control of Corruption	---	---	---	---	---	

Population Growth		-0.087		-0.291**	0.067	
		(-0.470)		(-2.139)	(0.222)	
Inflation		-0.021		-0.075**	-0.003	
		(-0.543)		(-2.016)	(-0.026)	
Government Expenditure		0.008		0.012	0.080***	
		(0.504)		(0.731)	(2.578)	
Economic Prosperity		0.088		0.300	-0.341	
		(0.305)		(1.553)	(-0.840)	
Domestic Investment		-0.007		-0.021	0.0001	
		(-0.118)		(-0.444)	(0.001)	
Financial Size		0.446		-0.019	7.707	
		(0.286)		(-0.011)	(1.149)	
Financial Efficiency		1.233**		0.020	1.902	
		(2.440)		(0.063)	(1.403)	
Hausman test		143.89***		130.43***	115.82***	
	[ ]	[0.000]	[ ]	[0.000]	[0.000]	[ ]
Sargan OIR		1.823		4.401	4.525	
	[ ]	[0.609]	[ ]	[0.221]	[0.209]	[ ]
Adjusted R^2	-0.046	0.476	-0.040	0.231	0.030	-0.026
Fisher		28.309***		32.227***	4.042***	
Observations		125		125	125	
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

Table IV.36: Effect of governance on FDI inflows (with HAC standard errors)

	Dependent variable: FDI Inflows					
Constant	-8.092	-0.392		0.008	1.912	
	(-1.018)	(-0.082)		(0.001)	(0.214)	
Voice & Accountability	-1.563	---	---	---	---	---
	(-1.024)					
Political Stability	---	0.555	---	---	---	---
		(0.621)				
Government Effectiveness	---	---		---	---	---
				1.472		
Regulation Quality	---	---	---	(1.381)	---	---
Rule of Law	---	---	---	---	0.977	---
					(0.491)	
Control of Corruption	---	---	---	---	---	
Population Growth	-0.812	-1.150		-0.709	-1.259	
	(-0.976)	(-1.241)		(-0.867)	(-1.288)	
Inflation	0.249	0.117		0.143	0.126	
	(1.424)	(1.128)		(1.208)	(1.137)	
Government Expenditure	0.211**	0.203**		0.244**	0.151	
	(2.324)	(2.084)		(2.532)	(1.237)	
Economic Prosperity	0.500	1.116		0.501	1.399	

	(0.385)	(0.866)		(0.431)	(1.025)	
Domestic Investment	-0.129	-0.057		0.036	-0.047	
	(-0.670)	(-0.294)		(0.182)	(-0.262)	
Financial Size	8.266	-0.932		-3.016	-3.951	
	(0.870)	(-0.204)		(-0.612)	(-0.525)	
Financial Efficiency	3.675	1.076		2.329	0.056	
	(1.018)	(0.368)		(0.963)	(0.014)	
Hausman test	31.723***	22.486***		18.92**	24.114***	
	[0.000]	[0.004]	[ ]	[0.015]	[0.002]	[ ]
Sargan OIR	11.393***	11.496***		13.199***	10.126**	
	[0.009]	[0.009]	[ ]	[0.004]	[0.017]	[ ]
Adjusted R^2	0.021	0.049	-0.033	0.113	0.041	
Fisher	2.737***	2.052**		3.512***	0.966	0.851
Observations	141	141		141	141	
Instruments	const Constitution Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English Christians					

[]:P-values

VI. Knowledge Economy and Economic growth: A Panel data Approach

This section tries to establish the status of African economies in terms of their transformation to knowledge economies and empirically examine the impact of knowledge and its related variables on economic performance in 22 African and Arab countries over the period 1996-2010. Both cross country and time specific variations were used to explain the determinants of economic growth. Policy implications are also discussed.

Over the last years, the determinants of economic growth have attracted increasing attention on the empirical and theoretical side.

Despite the lack of a unifying theory, there are several partial theories that discuss the role of various factors in determining economic growth. Two main strands can be distinguished: the neoclassical, based on Solow's growth model (1961), has emphasized the importance of investment and, the more recent, theory of endogenous growth developed by Romer (1986) and Lucas (1988) has drawn attention to human capital and innovation capacity

Our main interest is to find out whether knowledge acquisition, creation utilization and access (captured by economic incentive regime, innovation, education and information infrastructure variables separately) has led to an increase in economic growth among Arab and African countries.

The structure of this paper is as follows. The next section presents the main economic growth theories and points out the most important determinants of economic growth. Then, we outline the empirical model and present the data. The fourth section discusses the empirical results, and final section concludes the paper summarizing the main findings.

Most of the empirical studies use the standard neoclassical growth model (Solow, 1951) or its extended version that includes human capital or more recent studies focus on endogenous growth models. One of the key elements of this model is convergence. This neoclassical model predicts that poorer countries will grow faster compared with rich ones. Technological progress, though important in the long run, is regarded exogenous to the system.

The endogenous grow theories propose that the introduction of new accumulation factors such as knowledge, innovation, etc. Triggered by Romer's (1986) and Lucas' (1988) seminal studies, work within this framework highlighted three significant sources of growth: new knowledge (Romer, 1990, Grossman and Helpman, 1991), innovation (Aghion and Howitt, 1992) and public infrastructure (Barro, 1990). As a result, and in contrast to the neoclassic side, policies are deemed to play a substantial role in advancing growth on a long-run basis. Indeed, the endogenous growth models suggest that convergence would not occur at all.

Much of much of the empirical cross-country growth research (following the pioneering work by Barro (1991), as well as research at country levels -aims at identifying statistically significant and economically relevant deep determinants of growth, including domestic policies, the quality of institutions, international factors, geography, and even good luck.

The relationship between demographic factors and economic growth has been largely examined in the empirical literature. For example population growth plays an important role. High population growth could have a negative impact on economic growth influencing the dependency ratio, investment and saving behaviour and quality of human capital.

The relationship between knowledge economy and economic growth has not attracted lot of attention, particularly in the last years. We are only aware of one study examining the relationship between economic growth and knowledge economy for a sample of 22 Arab and African countries.

1. Methodology and data

In our analysis it is assumed that countries produce wealth based on three independent input aggregates which include knowledge, technology and human resources besides human capital. The knowledge aggregate variable should be able to measure the extent of knowledge acquisition, creation, utilization or use and access in a given country. These will basically encompass issues to do with the economic environment that is favorable to enhancing the above mentioned measures, innovation capabilities, education and information infrastructure, which are deemed crucial in the development of the knowledge economy.

Most of the empirical studies that have analyzed the relationship between knowledge economy and economic growth have focused on cross-section growth regressions in which a knowledge economy variable is added to the set of explanatory variables in a convergence equation. One of the main criticisms of these kinds of regressions is that they suffer from two inconsistency sources. On the one hand, cross-section estimations fail to control for specific characteristics of countries, such as differences in technology, tastes, climate or institutions, whose omission may bias the coefficient of the explanatory variables. On the other hand, they do not address properly the treatment of some explanatory variables that, according to the theory, should be considered to be endogenous. In our case, the causality might run in both directions. Thus, the knowledge economy variable could be considered as endogenous and therefore correlated with the error term.

Therefore, we propose to analyze the effect of knowledge on economic growth by estimating the following standard growth regression equation:

$$y_{it} = MlogYi0 + OXi + Zi + Qi$$

The definition of the variables is as follows: yit is the growth rate of real GDP per capita in country 'i' measured at year t, KE measures knowledge economy in country i at time t. In order to reduce any omitted variable bias, vector X contains k explanatory variables suggested by previous literature as important determinants of growth rates (Barro, 2000). The empirical models include a broader version of the neoclassical growth models that includes the convergence property as well as other variables that determine the steady state. The parameters in the Solow growth model, in our empirical application, we include GDI is the average country's domestic investment 2007; PS90 is country it's gross primary school enrolment in 2000, which is used as a proxy for human capital stock. Finally, the growth rate is a determined by a range of 'Z' variables that lie outside of the Solow model. This equation has been the workhorse of empirical growth research. The neo-classical heritage lies in the convergence term and the Solow growth model, while the endogenous growth theory provided the rationale to expand the explanatory boundary to include a range of 'Z' variables. In this vector Z is included the specific knowledge component variables. We identified four knowledge components: economic incentive regime, innovation, education, and information infrastructure. The same regression specification was applied to these knowledge components. Are parameters to be estimated, and is the classical error term. Results from cross sectional models can be misleading when unobserved country specific effects and endogeneity issues are ignored.

In our empirical approach, we use the same variables as in Barro (1991). The same endogenous economic growth model was employed by Driouchi (2006), Qiang (2009), and Waverman et al. (2005). Based on the knowledge economy index from the World Bank, we construct our set of independent variables. Each component consists of several indicators. For instance, the KEI components of the economic incentive regime might include variables such as: trade policy, intellectual property protection, and government regulation. Trade policies include trade barriers, trade openness, credit to the private sector, and interest rate spread.

Another key component to assess knowledge is innovation. In order to measure the innovative capacity of any particular country, it is crucial to examine the number of scientific articles published in technical journals per year, and the FDI outflows. The latter indicator measures the productivity of researchers to come up with new ideas and technical innovations. Countries are expected to have an effective innovation system that involves firms, research institutions, universities and other organisations that keep up with new emerging knowledge and technology.

The education component captures the possibilities that any particular country offers to its citizens to acquire knowledge, and access and utilize the knowledge base. The education component consists of several educational indicators: the adult literacy rate, the secondary school enrolment ratio, and the tertiary school enrolment ratio. All these variables intend to capture the capabilities of any particular country to absorb and utilize knowledge.

Information communication technologies (ICTs) play an important role in the knowledge economies context. ICTs reduce access, time, and transaction costs. Therefore, it is vital to measure the country's information technology infrastructure and its role in enhancing the transfer of knowledge and economic development. For that purpose, we use as indicators of a country's information technology infrastructure: the number of telephone lines, the number of internet hosts and the number of mobile subscribers. Also, countries with good infrastructures are also more likely to attract more FDI (Morriset, 2000)

With regards to other control variables, population growth seems to be an important determinant of economic growth. High population growth can have a negative influence on economic growth influencing the dependency ratio, investment, saving behavior, and the quality of human capital (Barro, 1997; Bloom and Williamson, 1998; Kelley and Schimdt, 2000).

2. Data

Data on the selected the identified knowledge economy and economic growth variables in different Arab and African countries are used to investigate the impact of knowledge and technological developments on economic growth. Due to the limited nature of data, we are forced to narrow down our primary database. The dataset includes include annual observations for twenty two Arab and African countries for the years 19960-2010 (some countries dropped out of the analysis due to missing data). The list of countries included are: Algeria, Bahrain, Botswana, Cameron, Egypt, Jordan, Kuwait, Kenya, Lebanon, Libya, Mauritius, Morocco, Nigeria, Oman, Qatar, Saudi Arabia, Senegal, South Africa, Tunisia, United Arab Emirates, Yemen and Zambia.

The selection was based on the availability of data on output, investment, human capital captured by school enrolment and the knowledge economy variables. The sources of data for the variables used are the World Bank's World Development Indicators (World Bank, 2012) and the Africa Development Indicators (ADI) databases. Details about the variable definitions, data sources and summary statistics are provided in Table 1. In our sample period, the average growth rate of per capita GDP was 1.92 percent. The average population growth rate was 2.76 percent. The average domestic investment (GDI) as a proportion of GDP was 20.53. The results section follows.

3. Results

In this section, we empirically assess to what extent knowledge influences economic growth. We estimate several economic growth regression equations by employing different knowledge components in the spirit of the Knowledge economy index from the World Bank. All estimations were carried out by using STATA v.12.

Table 1 displays the Ordinary Least Square Regression (OLS) models. In each specification, we use different knowledge components. The overall fit of all models in Table 1 is decent as evidenced by the statistically significant F-value and an R2 that is at least 0.68. As a general test of the specification of the estimated relation, a RESET test was conducted. The corresponding results (reported at the bottom of Table1). In all models, the average GDP per capita growth rate is positively associated with the initial level of GDP. Convergence in the neoclassical economic growth model indicates that per capita growth tends to be negatively correlated with the initial level of GDP. Our coefficient show that poorer countries tend to grow faster than richer countries. In all specification, the coefficient on the initial level of GDP is negative and statistically significant at conventional significance levels. Looking at the impact of the economic incentive regime, trade openness has a positive impact on economic growth.

With regards to the variables employed to that capture the innovation capacity of African and Arab countries seem not to have a significant impact on economic growth. The results also reveal that the information infrastructure indicators have a significant impact on GDP per capita growth.

In addition, we employ a 2SLS approach. This technique has the advantage of dealing with the issue of endogeneity. Thus, the instrumental variables estimator can overcome the bias that OLS estimates suffer when the explanatory variables are correlated with the error term. In the context of our paper, the relationship between knowledge economy and economic growth might also run in both ways. Instrumental variables used are: main Intellectual Property Law, Intellectual Property Rights Law, WIPO Treaties, Multilateral Treaties, Bilateral Treaties, Income-levels, and Legal-origin.

In our analysis, (1) we justify the choice of a 2SLS approach over an OLS estimation technique with the Hausman-test for endogeneity; (2) verify the instruments are exogenous to the endogenous components of explaining (corruption channels) and control variables; (3) ensure the instruments are valid and not correlated with the error-term in the main equation with an over-identifying restrictions (OIR) test. Further robustness checks will be ensured with robust Heteroskedasticity and Autocorrelation (HAC) standard errors. Table 2 displays the 2SLS estimation results. In our empirical evidence we do find evidence of endogeneity. The estimated OLS coefficients are not consistent and efficient. With regards to the validity of the instruments, the null hypothesis of the Sargan test is not rejected and therefore the instruments are clearly exogenous (uncorrelated with the error term).

Using data from a large sample of countries and employing a fairly standard growth model, this research examines the effect of knowledge economy on economic growth.

This line of inquiry may be fine tuned by including additional determinants of economic growth and examining their sensitivity to knowledge economy (see, Levine and Renelt, 1992) and via the availability of data at a finer level of detail. A dynamic econometric model of the determinants of economic growth should be considered in future research. This methodology allows us to control for endogeneity, and unobserved heterogeneity. At this respect, the system GMM estimator performs better than the first difference GMM estimator.

The above attainments lead to the introduction of a framework that is now largely discussed in the literature. This is the model of the triple helix as it helps coordinate the better attainment of development outcomes when large number of players is involved. The knowledge economy accounts for the interests of researchers, innovators and developers. These include university, industry and governments. Coordination among these different players can be better ensured through this new framework as applied to the Arab economies.

TABLE 1
KNOWLEDGE ECONOMY AND ECONOMIC GROWTH
Dependent Variable: GDP growth.
ORDINARY LEAST SQUARES (OLS)

		Dependent Variable: GDP growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant		0.644			0.644	
			(0.074)			(0.115)	
Economic Incentive Regime	IR Spread		---			---	
	Priv. Credit		---			---	
	Tariff		---			---	
	Trade		---			---	
Innovation and Education	FDI inflows		**0.133*** **			**0.133** **	
			(2.789)			**(2.119)**	
	Journals		-0.245			-0.245	
			(-0.806)			(-1.273)	
	Primary E.		1.466			1.466	
			(0.285)			(0.432)	
	Secondary E.		0.186			0.186	
			(0.131)			(0.144)	
Information Infrastructure	Loginternet		---			---	
	Logtel		---			---	
Control Variables	Popg		-0.074			-0.074	
			(-0.410)			(-1.114)	
	Fin. Size		1.223			1.223	
			(0.901)			(0.800)	
Adjusted R^2			0.038			0.038	
Fisher			**2.000***			**2.000***	
RESET			3.31[0.03]**			3.31[0.03]**	
Observations			153			153	
		Dependent Variable: GDP per capita growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant		0.613			0.613	
			(0.072)			(0.112)	
Economic Incentive	IR Spread		---			---	
	Priv.		---			---	

Regime	Credit						
	Tariff		---			---	
	Trade		---			---	
Innovation and Education	FDI inflows		**0.131*** **			**0.131** **	
			(2.792)			**(2.112)**	
	Journals		-0.242			-0.242	
			(-0.813)			(-1.274)	
	Primary E.		1.446			1.446	
			(0.287)			(0.436)	
	Secondary E.		0.206			0.206	
			(0.148)			(0.164)	
Information Infrastructure	Loginternet		---			---	
	Logtel		---			---	
Control Variables	Popg		**-1.080*** **			**-1.080*** **	
			(-6.063)			**(-16.90)**	
	Fin. Size		1.206			1.206	
			(0.907)			(0.810)	
Adjusted R^2			0.232			0.232	
Fisher			**8.685*** **			**8.685*** **	
RESET test			**0.595[0.552]**			**0.595[0.552]**	
Observations			153			153	

Table 2
Knowledge Economy and Economic Growth
Dependent variable: GDP growth.
Two stage Least Squares (2SLS)

		Dependent Variable: GDP growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant	**4.957** **	26.959	3.112	**4.957** **	**26.959***	3.112
		(2.306)	(1.104)	(1.125)	**(2.047)**	**(1.796)**	(1.125)
Economic Incentive Regime	IR Spread	-0.102	---	---	-0.102	---	---
		(-1.116)			(-1.075)		
	Priv. Credit	-0.018	---	---	-0.018	---	---
		(-0.011)			(-0.011)		
	Tariff	-0.093	---	---	-0.093	---	---
		(-1.272)			(-1.414)		
	Trade	0.015	---	---	0.015	---	---
		(0.958)			(0.940)		
Innovation and Education	FDI inflows	---	**0.246** **	---	---	**0.246*** **	---
			(2.373)			**(4.155)**	
	Journals	---	-0.461	---	---	**-0.461***	---

			(-1.145)			**(-1.882)**	
	Primary E.	---	-13.425	---	---	-13.425	---
			(-0.961)			(-1.548)	
	Secondary E.	---	2.765	---	---	**2.765***	---
			(1.203)			**(1.700)**	
Information Infrastructure	Logintern et	---	---	**0.835****	---	---	**0.835****
				(1.968)			**(1.968)**
	Logtel	---	---	-0.691	---	---	-0.691
				(-1.258)			(-1.258)
Control Variables	Popg	---	---	**0.359*****	---	---	**0.359*****
				(2.830)			**(2.830)**
	Fin. Size	---	---	---	---	---	---
Hausman test		6.07[0.19]	3.49[0.478]	**8.41**[0.03]**	6.07[0.19]	3.493[0.478]	**8.41**[0.038]**
Sargan OIR		**11.67[0.11]**	**3.673 [0.816]**	**10.33[0.24]**	**11.67[0.11]**	**3.673[0.816]**	**10.33[0.24]**
Adjusted R²		0.106	0.010	0.142	0.106	0.010	0.142
Fisher		**2.566****	**2.237***	**4.588*****	**3.835*****	**8.541*****	**4.588*****
Number of Observations		96	165	274	96	165	274
		Dependent Variable: GDP per capita growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant	0.251	26.455	3.199	0.251	26.455	3.199
		(0.101)	(1.036)	(1.218)	(0.152)	(1.146)	(1.144)
Economic Incentive Regime	IR Spread	0.053	---	---	0.053	---	---
		(0.557)			(0.766)		
	Priv. Credit	**2.821***	---	---	**2.821****	---	---
		(1.659)			**(2.260)**		
	Tariff	0.030	---	---	0.030	---	---
		(0.399)			(0.857)		
	Trade	0.008	---	---	0.008	---	---
		(0.568)			(0.777)		
Innovation and Education	FDI inflows	---	**0.324*****	---	---	**0.324*****	---
			(3.022)			**(5.930)**	
	Journals	---	-0.111	---	---	-0.111	---
			(-0.291)			(-0.848)	
	Primary E.	---	-11.569	---	---	-11.569	---
			(-0.788)			(-0.870)	
	Secondary E.	---	-1.269	---	---	-1.269	---
			(-0.361)			(-0.418)	
Information Infrastructure	Logintern et	---	---	**0.706***	---	---	0.706
				(1.753)			(1.359)

	Logtel	---	---	-0.574	---	---	-0.574
				(-1.102)			(-0.876)
Control Variables	Popg	-0.305	**-1.243*****	**-0.685*****	-0.305	**-1.243*****	**-0.685*****
		(-1.293)	**(-3.651)**	**(-5.692)**	(-1.452)	**(-6.408)**	**(-3.263)**
	Fin. Size	---	3.512	---	---	**3.512***	---
			(1.182)			**(1.708)**	
Hausman test		**10.45*[0.06]**	3.070[0.546]	**8.55**[0.035]**	**10.45*[0.06]**	7.475 [0.279]	**8.55**[0.03]**
Sargan OIR		**3.73[0.71]**	**1.733[0.884]**	**8.89[0.35]**	**3.73[0.71]**	**1.733 [0.884]**	**8.89[0.35]**
Adjusted R^2		0.100	0.202	0.167	0.100	0.202	0.167
Fisher		**2.354****	**5.054*****	**11.390*****	**17.357*****	**35.824*****	**3.936*****
Observations		96	142	274	96	142	274
Instruments	const Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English French Christians						

VII. The Triple Helix as a Framework for Knowledge Production and Diffusion: The Case of Arab Countries

An overall framework for analyzing production and diffusion of knowledge in relation to the three major players that are universities, industry and Government is provided by the triple helix approach. This model has been used to account for the new requirements of knowledge for development but also the interests of series of stakeholders. This theory and applications apply for both developed and developing countries and account for series of international, national and local initiatives. The objective of this part of this research document is to underline the potential of this framework, its use in the context of developing economies but mainly for Arab countries.

This part is composed of a literature review followed by an empirical assessment of the Arab economies with a discussion of the major trends characterizing these countries.

1. Previous contributions

This literature review looks at the most important features that relate to knowledge production and diffusion as expressed through the framework of the triple helix with application to the economies of the Arab World. This is introduced first as an overview followed by series of applications before focusing on its use for both global and local development in the Arab countries.

1.1. Overview of the Framework

Knowledge diffusion models have evolved through time to account for both production-transfer processes and the related agents or institutions. These models are useful frameworks that ensure strategies and means for the enhancement and acceleration of knowledge for development through its production and transfers. They are useful for both countries and localities besides sectors in addition to the variety of players that are behind these processes. As such, they account for the interferences between policy, science, innovation, entrepreneurship and markets.

Vialle and Etzkowitz (2005) provide an excellent historical background about single, double and triple helices as they have been used to describe and analyze knowledge related processes. To these authors, the single helix relates to the insulated individual inventor, during the first industrial revolution where the knowledge is mainly tacit. With more explicit knowledge, this previous stage is replaced during the second industrial revolution by the double helix as a representation of the weak relationships between the industry and the university where the first one is not fully following a scientific path while the second not completely adhering to an industrialization process. As in Carayol (2003), cognitive integration between science and technology contribute to the generation of major needs of societies. Governments and public organizations have to intervene to facilitate knowledge production, diffusion and financial support. Three institutional spheres are then involved under the triple helix framework. The quadruple helix accounts also for the roles played by civil society as the fourth institutional player in the creation and diffusion of knowledge for development (Carayannis and Campbell, 2012). With the inclusion of other institutions and key actors in this process, the game becomes larger and some authors talk about Nth-Helix (Leydesdorff, 2012). But, major theoretical and empirical debates are still occurring at this level.

Etzkowitz and Zhou (2006) have discussed this matter already. They consider that the debate over the Triple Helix model has focused on the question of whether there is a fourth helix. Various candidates have been suggested, such as labor, venture capital, the informal sector and civil society. However, introduction of a fourth helix might cause a triadic model to lose its creative dynamic. Nevertheless, an expanded model is required to incorporate a critical dimension. To resolve this paradox, we propose a Sustainability Triple Helix of university-public-government as a complement to the Innovation Triple Helix of university-industry-government, thereby introducing a missing element into the model, while retaining its dynamic properties.

Carayannis and Campbell (2012) discuss the diversity of models that could be mobilized. The traditional Triple Helix innovation model focuses on university–industry–government relations. The Quadruple Helix innovation systems bring in the perspectives of the media-based and culture-based public as well as that of civil society. The Quintuple Helix emphasizes the natural environments of society, also for the knowledge production and innovation. Therefore, the quadruple helix contextualizes the triple helix, and the quintuple helix the quadruple helix. Features of the quadruple helix are: culture (cultures) and innovation culture (innovation cultures); the knowledge of culture and the culture of knowledge; values and lifestyles; multiculturalism, multiculture, and creativity; media; arts and arts universities; and multi-level innovation systems (local, national, global), with universities of the sciences, but also universities of the arts.

The Triple Helix concept comprises three basic elements: a more prominent role for the university in innovation with industry and government in a knowledge–based society, a movement toward collaborative relationships among the three major institutional spheres, in which innovation policy is increasingly an outcome of interaction rather than a prescription from government and in addition to fulfilling their traditional functions, each institutional sphere also "takes the role of the other" performing new roles as well as their traditional function. Institutions taking non-traditional roles are viewed as a major potential source of innovation in "innovation". Industry operates in the Triple Helix as the locus of production; government as the source of contractual relations that guarantee stable interactions and exchange; the university as a source of new knowledge and technology, the generative principle of knowledge-based economies.

Consequently, the most dominant approach is focusing on the triple helix model and its variations as it has been applied to series of situations in both developed and developing economies.

1.2. Applications of the Framework

The above framework has been largely applied to series of countries, starting with the developed ones, series of regions and sectors worldwide.

Jensen and Tragardh (2004) critically examine the positive narrative surrounding the Triple Helix concept as a model for development in all kinds of regions. They claim that existing and problematic structural preconditions should be taken into consideration when applying the Triple Helix concept in weak regions. Empirically, they base their paper on two longitudinal case studies in Sweden, where government are trying to break the negative trends in weak regions by initiating Triple Helix-like programs. However, due to poor preconditions, such initiatives tend to fail. Thus, a negative narrative can be related about Triple Helix cooperation when applied in weak regions.

Merle (2006) analyzes the relationship between science and policy through looking at the political discourses about the use of knowledge. The findings underline the importance of knowledge utilization as useful for policy conduct and analysis.

Fogelberg and Thorpenberg (2012) recognize the importance of the players in knowledge production and diffusion and that convergence of interests of these partners is key for development. The case of Sweden is used to illustrate the potential and limits of the triple helix model. They establish that policies for regional innovation in Sweden rely on the view of different groups of actors. One recent organizational expression of this view is the development of innovation policy and development organizations known as 'Arenas'. These organizations were modeled on the Triple Helix innovation theory, which is known for promoting innovation as collaboration between industry, university and policy. This paper analyses the historical development of two such Arenas, which were created by public and private actors in two Swedish cities. The study used a historical case-study approach, combined with interviews with project management and project workers, to highlight the difficulties in stabilizing broad collaboration patterns.

Carayannis and Campbell (2012) consider that developed and developing economies alike face increased resource scarcity and competitive rivalry. In this context, science and technology appear as an essential source of competitive and sustainable advantage at national and regional levels. However, the key determinant of their efficacy is the quality and quantity of entrepreneurship-enabled innovation that unlocks and captures the benefits of the science enterprise in the form of private, public, or hybrid goods. Linking basic and applied research with the market, via technology transfer and commercialization mechanisms, including government–university–industry partnerships and capital investments, constitutes the essential trigger mechanism and driving force of sustainable competitive advantage and prosperity. In this volume, the authors define the terms and principles of knowledge creation, diffusion, and use, and establish a theoretical framework for their study. In particular, they focus on the "Quadruple Helix" model, through which government, academia, industry, and civil society are seen as key actors promoting a democratic approach to innovation through which strategy development and decision-making are exposed to feedback from key stakeholders, resulting in socially accountable policies and practices.

Natario et al. (2012) analyze the dynamics of the triple helix model in less favored regions, examining the role of three spheres: universities, firms, and government. They identify profiles of behavior in terms of triple helix model performance from the firm's perspective and recognize key factors for successful innovation dynamics in a less favored region of Portugal. A brief bibliographic revision regarding development of the triple helix model in the innovation process is followed by a description of the role of the helixes and the presentation of a model, after which the hypotheses are defined for testing. The methodology consists of a survey involving companies in a less favored region of Portugal and the application of multivariate statistical analysis "k-means clusters" to detect behavioral patterns in terms of performance and dynamics of the triple helix model from the firm's viewpoint. In order to verify the hypotheses, tests of multiple average differences are used to assess the unique characteristics of each cluster and the independent test of Chi-square. The results point to the existence of a positive relationship between the dynamics of the triple helix model in terms of different types and objectives to innovate, namely, in regards to introducing new products as well as ecological innovation and their efforts to improve communications relative to the obstacles to innovate – explicitly, the lack of information and geographical location, the companies' innovation performance, and the level of cooperation and interaction with the university producing benefits for them in obtaining additional financial resources and prestige for the researcher, as well as by obtaining information for the education process.

Mac Gregor et al. (2012) explore the readiness for the quadruple helix in 16 European innovation systems located in medium sized cities. The role of local and regional actors that are mainly policy makers within each innovation system is emphasized. The findings indicate that the attained results are transferable to other medium and small sized cities faced with further competition and scale threats.

Kaukonen and Nieminen (1999) have pioneering discussions on the science and technology system particularly two perspectives have been visible, one emphasizing the transitory changes in the modes of knowledge production, the other focusing on the institutional integration of the S&T system (Triple Helix). The article analyzes the development of the Finnish S&T system and policy as a national case from the point of view of the Triple Helix thesis. It concludes that both perspectives—systemic transition and integration—are essential for understanding recent changes in S&T, but do not yet cover the whole range of relevant issues. In addition, one should take into account the spatial, or international, dimension of S&T, which is crucial especially when viewed from a small country perspective. Furthermore, it is important to consider the cognitive dimension of S&T, as the socio-cognitive diversity of research fields affects their specific role in the transformation processes.

Other applications are expanded to cover diversities of economies in the developing world.

In “Theory and Practice of Triple Helix Model in Developing Countries: Issues and Challenges” by Saad (2011), the authors uses practical cases and experiences from Africa, Latin America and Asia with the examination of the best practices pursued. This book is a considered by the author as a response to the growing awareness about the needs for policy shifts from traditional technology shifts to a more sustainable approach to the role of technology and innovation in development. The book explores the triple helix system of innovation based on the dynamics of the interactive relationships between government, industry and universities in the creation, dissemination and sharing of knowledge. A major point addressed by the author is the extent to which the “triple helix” system of relationships between university, industry and government can enhance the effectiveness of universities in developing countries as agents of innovation, industrialization and sustainable development.

Shin and Yangson (2012) analyze the research productivity of Saudi academics using the triple-helix model. In the analysis, they combine domestic and international collaboration of university, industry. According to the analysis, research collaboration in Saudi Arabia which is measured by the triple-helix, is found to be uncertainty (negative t-value) while scientific productivity has been dramatically increasing since the late 2000s. The triple-helix collaboration does not quite differ between domestic collaboration and "domestic and international" collaborations. In our further analysis, we found that technological development was not based on scientific research in Saudi Arabia; rather, the technological development relies on prior technology (patent references). From that point, Saudi Arabia's current long-term strategic plan to develop a scientific base for a knowledge-based industry is well aligned to the current contexts of Saudi Arabia.

Hussain et al. (2012) look at the dynamics of the collaboration of university, industry and government.

The study maps these emergence dynamics of the knowledge base of innovations of Research & Development (R&D) by exploring the longitudinal trend within the networked research relations in Bangladesh using a triple helix model. They use data on publications, the social sciences and the arts and humanities for analysis of science indicators and the patent data with the patent success ratio as a measure of innovation within TH domains. The findings show that the network dynamics have varied considerably according to the R&D policies of the government. The collaboration patterns of co-authorship relations in the SCI publications prominently increased, with some variation, from 1996 to 2006. Nevertheless, inter-institutional collaboration negatively influenced by the national science and technology (S&T) research policies in the last 5 years due to their evaluation criteria. Finally, the findings reveal that the R&D system of Bangladesh is still undergoing a process of institutionalizing S&T and has failed to boost its research capacity for building the knowledge base of innovations by neglecting the network effects of TH dynamics.

Furthermore, the triple helix approach applies also for sectors of the economy, regions and cities. They also apply to a specific technology.

Khatib et al. (2012) analyze knowledge, research, and innovation as of crucial importance for the competitiveness of the Palestinian economy. The authors conduct and analyze a community innovation survey on two major industrial sectors that are quarrying and stone fabrication besides the food and beverages sector. Very promising indicators and high innovative potentials are shown in both sectors. Employment, export, and revenues are clearly improved in innovative enterprises. Lack of cooperation between the industrial sector and the higher education and research and development institutions is found to be a major problem that should be tackled in order to strengthen the enterprises' ability to innovate.

Haneul et al. (2012) analyze the agricultural innovation systems in Korea and China with comparisons from the perspective of triple helix innovation. The qualitative analysis is based on information about agricultural scientific publications from 1990 to 2010 and patent information from 1980 to 2010. By calculating transmission of uncertainty that indicates collaboration of industry, government and university, the authors track the dynamics of the units comprising the triple helix. In addition, they analyze topics in scientific publications and patents in order to compare the areas of focus in the two countries. The findings reveal both commonalities and differences between the two countries, thus providing knowledge and insights into the agricultural sector.

Creative industries have also benefited from the application of the triple helix model. The study by Colapinto and Porlezza (2010) is one example. The authors focus on theoretical approaches to explain the current paradigm shift in innovation and knowledge production and use: the Triple Helix model (and its developments) and the systems theory. The Creative Enterprise Australia is analyzed according to the theoretical approaches shown. The paper sheds new light on the evolving role of knowledge pointing out the overlapping relationships between all actors involved, the interpenetration of systems and the prominent appointment of the media as an interpretative framework of the convergence of the depicted theories.

Rao et al., (2012) consider that the triple helix theory stresses co-evolution and interaction among governments, enterprises and universities, and is paid great attention by governments, universities and enterprises worldwide. The purpose of this paper is to investigate the role that Chinese government R&D investments play in the interaction between enterprises and universities. Basing on provincial panel data of Chinese universities from 2004-2010, the impact of government R&D investments on patent technology transfer activities of Chinese universities is studied by empirical analysis. More specifically, the paper examines the impact of both Chinese government R&D funding and national R&D programs on the number and the revenue of patent technology transfer contracts. The study finds that the amount of government R&D funding and the number of 973 Programs in one region have significantly increased the number and the revenue of patent technology transfer contracts in that region. Moreover, the number of National S&T Pillar Programs, 863 Program and National Natural Science Foundation Program are also determinants of the number of patent technology transfer contracts. This paper studies government's role in university-enterprise patent technology transfer activities in a Chinese context. It reveals a government-dominant position to promote patent technology transfer activities in Chinese triple helix model. It also provides a reference for decision makers in governments, industries and universities.

Rodrigues and Melo (2012) discuss the role of the triple helix model (THM) is being widely used as a source of inspiration for policies and programs aimed at fostering innovation. This is evolving across the range of policymaking geographical scales, as well as independently of the geographies of context that determine different framework conditions for promoting innovation. This article questions the extent to which the THM provides a solid conceptual basis for development policies, particularly at the local level. It does this by exploring the experience of a Portuguese small municipality, in which the development policy effort is not only guided by the model itself, but is also targeted at the materialization of local ‘triple helices’. The authors take advantage of their direct involvement in the local policymaking exercise and confront their observations of the change dynamics evolving in the municipality with the ‘endless transitions’ that are at the very core of the THM.

Simon and Marquès (2012) discuss the necessary public support of the triple helix R&D collaboration in the context of Europe. For that, they emphasize the role of the fourth pillar that is the organizations that benefit from public and private sector funds. To the authors, these organizations are likely to facilitate the complex collaboration among triple helix partners. These types of units are analyzed in Holland, Spain and Sweden.

But, the Arab world still need further applications of the triple helix approach in order to promote sustainable inclusion of knowledge to be the driver and the engine of economic growth.

It is observed that only few studies are available about the situation and prospects of the Arab economies. Besides the one cited above and related to Saudi Arabia, there are other research papers that shed light on some features related to the knowledge economies. Kohl and Hashemi (2011) after noting the deficiencies in knowledge generation, acquisition and use in relation to development, they focus on the roles that could be played by Science Parks. The case of the UAE is largely used to underline the managerial changes that can be necessary to generate the desired direct effects and spillovers needed for development. Al Suqri (2011) focuses on Oman. Using qualitative data through email and face to face interviews, the authors analyzes the barriers preventing users from access to knowledge and to overcome them.

In another paper, Hanafi (2011) looks at the barriers to the production of social knowledge. The author attempts to show how the university system and the system of social knowledge production influence elite formation in the Arab East (in Egypt, Syria, the Palestinian territory, Jordan and Lebanon) by focusing on the factors: compartmentalization of scholarly activities, the demise of the university as a public sphere and the criteria for publication that count towards promotion. Universities have often produced compartmentalized elites inside each nation-state and they don't communicate with one another. To the author, they are either elite that publish globally and perish locally or elite that publish locally and perish globally. The article pays special attention to elite universities.

1.3. The case of Arab Countries

The international, national and regional efforts for the effective promotion of a knowledge economy that is based on functional relationships between series of players in the related areas appear up to now, to be not fully successful in bridging the gap between these countries and the rest of the world. The Golf countries appear though to be more advanced than the others but major investments are still needed to cope with the requirements of the triple helix framework.

Fig.IV.8: Government bodies responsible for R&D policies and co-ordination in the Arab world, 2006
source: UNESCO report 2010

Algeria: Ministry of Higher Education and Scientific Research
Bahrain: Centre for Studies and Research
Egypt: Ministry of State for Scientific Research
Iraq: Ministry of Higher Education and Scientific Research
Jordan: Ministry of Higher Education and Scientific Research and Higher Council for Science and Technology
Kuwait: Kuwait Foundation for the Advancement of Sciences, Institute for Scientific Research and University/Research Center
Lebanon: National Council for Scientific Research
Libya: Higher Education and Research Secretary, Jamahiriya General Planning Council and National Authority for

Scientific Research
Mauritania: Ministry of National Education
Morocco: Hassan II Academy of Sciences and Technologies, Ministry of National Education, Higher Education, Staff-Training and Scientific Research, Permanent "Interministrial" Commission of Scientific Research and Technological Development, National Centre for Scientific and Technical Research, Coordination Council of Higher Education and Institutions outside Universities
Oman: Research Council
Palestine: Ministry of Higher Education, Autonomous R&D Unit at Ministry of Planning Territories
Qatar: Secretariat General, Council of Ministers
Saudi Arabia: King Abdul Aziz City for Science and Technology
Sudan: Ministry of Education and Scientific Research
Syria: Higher Council for Sciences and Ministry of Higher Education
Tunisia: Ministry of Higher Education, Research and Technology
UAE: University of United Arab Emirates and Emirates Ministry of Agriculture
Yemen: Ministry of Higher Education and Scientific Research

Arab countries hosting a national or supranational academy of science, 2009

Egypt: Academy of Scientific Research and Technology founded in 1948 and Egyptian Academy of Sciences founded in 1944
Iraq: Iraq Academy of Sciences founded in 1944
Jordan: Islamic World Academy of Sciences founded in 1986
Lebanon: Arab Academy of Sciences 2002
Morocco: Hassan II Academy of Sciences and Technology founded in 2006
Palestine: Palestine Academy of Sciences and Autonomous Technology1997
Sudan: Sudan National Academy of Science 2006

It can be observed from the above that Arab countries have institutions that are either limited in number (Algeria, Egypt, Lebanon) or exist under the need of further coordination (Morocco, Libya, Kuwait). Some of these institutions have existed for a long time. Assumptions about limited institutional efficiency for the promotion of research are likely to be formulated.

As said in the UNESCO 2010 report, research is shown to be linked to series of bureaucracies mainly related to the higher education. The report shows that, in eight Arab countries, the ministries of higher education and scientific research are responsible for R&D. In another five countries, councils and government academies assume this role. This function falls to universities and research centers in four Arab countries, to ministries of education in three and to the ministry of planning in one. Only seven Arab countries or territories out of 22 have a national academy of sciences or play host to a supranational academ. This is an astounding fact, as academies of sciences, being strong advocates of science and impartial advisory bodies have been at the vanguard of scientific Endeavour in advanced countries such as the USA, UK and France for centuries. They are also part of the landscape in economically emerging economies such as Brazil, China, India, Malaysia and Mexico.

The NECTAR initiative

Launched by UNESCO's Regional Bureau for Science in the Arab States in Cairo (Egypt) in June 2011, the Network for the Expansion of Converging Technologies in the Arab Region (NECTAR) is in charge of monitoring that Arab countries be able to embrace the knowledge economy and sustainable development through strengthening their capacity for innovation.

The UNESCO Science Report (2010) has placed emphasis on the fact that university research in the Arab world is only academic, even though higher education is considered as engine for discovery and innovation. Innovation is further hindered by the weak linkages between academia and industry. Also, universities are not focusing on the features of the knowledge economy. This report does also show the gap between the skills needed by businesses and those produced by Arab universities.

The development of partnerships between academia and industry with emphasis on new technologies is the main goal of NECTAR. Plans are consequently set to reorient academia towards problem-solving and removal of barriers between disciplines. These constraints are identified to be limiting innovation in the Arab world. For instance, Nanotechnology is at the crossroads of a large range of disciplines (biology, chemistry and physics, materials science, engineering and computer science). It is one of the fastest-growing fields in science, with applications ranging from health care to microelectronics, renewable energies and water purification, but nanotechnology research is still limited in the Arab world.

Nectar has now three centers of excellence. The first centre is affiliated with the Science and Technology Center for Excellence of the Egyptian Ministry of Military Production. The second is within the Faculty of Engineering at Khartoum University and the third is situated in the École normale supérieure de l'enseignement technique in Rabat (Morocco), part of Mohamed V–Souissi University. Other centers of excellence are planned in Bahrain, Iraq, Jordon and Syria plan to establish their own units.

The UNISPAR initiative:

Since 2002, UNISPAR has focused on capacity-building and technical assistance in the governance of science and technology parks.

The expected results from the above network are supported by the promotion of science parks that aim at developing:

- Stronger partnerships and linkages between universities and industry, including small and medium-sized enterprises, to promote innovation, engineering education, North-South cooperation, gender mainstreaming, maintenance and related areas for technological development,
- Human resources, including the training of engineers in the transfer of research results, maintenance of equipment and related areas,
- Stronger networking of technology for development, sponsored by industry with UNESCO support.

These contributions of UNESCO are supported by collaboration with the international professional organizations such as the World Technopolis Association (WTA) and the International Association of Science Parks (IASP).

This is now attracting international development agencies like the Korean International Cooperation Agency (KOICA). In September 2006, UNESCO, KOICA and Daejeon Metropolitan City signed a five-year agreement to help developing countries manage science and technology parks in such areas as biotechnology and ICTs. As part of this agreement, international training workshops are being organized annually for park managers. The project is also developing regional networks.

Special country supports

UNESCO and the Iraqi launched an initiative in to help rebuild the country's intellectual infrastructure and begin the transition towards a knowledge-based economy via the development of a science, technology and innovation (STI) policy.

Once an engine of innovation in the Middle East, Iraq is sorely dependent on imported technology today, after years of isolation and conflict. There are modest signs of recovery, however. Iraqi scientist's authored 55 scientific papers in 2000 but 184 in 2008, according to the UNESCO Science Report 2010, mostly in clinical medicine. The share of papers authored within international collaboration also grew, from 27% to 45%.

The major tasks will be to pilot a comprehensive assessment of research infrastructure across the country. The task force will be composed of national and international government experts, scientists, academics and entrepreneurs. They will articulate policy priorities over a 12 month period within a consultation intended to foster a national dialogue on ways in which science, technology and innovation can spur economic growth and improve the quality of life in Iraq. They will examine mechanisms for encouraging technology transfer and private sector engagement, identifying the needs of researchers and innovators, channeling funding in line with regional and local priorities. Once policy priorities identified, the program will provide a comprehensive national STI policy.

However, to build competitive knowledge based economies requires a number of key ingredients to be in place. These include substantial investment in research and development (R&D), the investment in and employment of highly skilled personnel, ongoing financial support, proper legislation and policy framework, accessibility to scientific and technological information, and the existence of a socio-economic strategy to channel the results of R&D into the various sectors of the diversifying economies and societies.

2. Empirical Assessment for Arab and EEE economies

Table IV.37: Public and private technology development through industrialization efforts in the MENA region

	Country reference number													Sector	
Industry and technology	1	2	3	4	5	6	7	8	9	10	11	12	13	Public	Private
Aerospace industry	✓		✓	✓		✓				✓			✓	✓	✓
Car manufacturing	✓	✓	✓	✓			✓	✓		✓		✓	✓	✓	✓
Capital goods	✓													✓	✓
Chemical	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	✓
IC technologies	✓	✓	✓	✓		✓			✓	✓		✓	✓	✓	✓
Micro-electronics	✓	✓	✓	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓
Pharmaceutical industry	✓		✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Software industries	✓	✓	✓	✓		✓		✓		✓	✓	✓	✓	✓	✓
Nanotechnology	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	✓	
Biotechnology	✓		✓	✓						✓		✓	✓	✓	

Source: http://investing.businessweek.com/research/common/symbollookup/symbollookup.asp?lookuptype=private&region=all&letterIn=O.

1=Algeria, 2=Bahrain, 3=Egypt, 4=Jordan, 5=Kuwait, 6=Lebanon, 7=Libya, 8=Morocco, 9=Oman, 10=Qatar, 11=Saudi Arabia, 12=Tunisia, 13=United Arab Emirates.

Table IV.38: Patents granted to 13 MENA countries by US Patent Office (01/01/1977–12/31/2009)

Country	Number of patents	% to total
Saudi Arabia	324	40.75
Kuwait	126	15.84
Egypt	97	12.20
UAE	77	9.68
Lebanon	58	7.29
Morocco	42	5.28
Jordan	24	3.01
Tunisia	18	2.26
Oman	8	1.006
Qatar	8	1.006
Algeria	5	0.628
Bahrain	5	0.628
Yemen	3	0.377
Total	795	100%

Appendix 2. Examples of private industrial and technology companies in 13 MENA countries (alphabetic order)

Country	Firm	Industry
Algeria	Al Dar Al Arabia Pharmaceutical/Manuf.	Pharmaceutical/Biotechnology
	Alfatron Electronic Industries Spa.	Electronic equipment
	Alstron Algerie Spa.	Electrical equipment
Bahrain	Arab Shipbuilding and Repair Yard Co.	Heavy machinery
Egypt	Advanced Computer Technology	Software & tech services
	Amereya Pharmaceutical Co.	Pharmaceutical/Biotechnology
	Arab Cables Co.	Electrical equipment
Jordan	Al Asalah Electro Mechanics Co.	Electronic equipment
	Al-Anfal Fertilizer Industry Co.	Chemicals
	Alnejma Bulk Pharmaceutical Co.	Pharmaceutical/Biotechnology.
Kuwait	Arab Bild Industrial Resources Co.	Chemicals
	Al Bahar United Co.	Computers
Lebanon	Alliances Jewelleries, Pvt Ltd.	Textiles
	Arabia GIS SAL.	Software & tech services
Libya	Akakus Catering Co.	Energy

	Allibiya Co.	Chemicals
Morocco	Agapolymer.	Chemicals
	Alcoa Fixations Maroc.	Metals & mining
Oman	Al Anwar bank Co. SAOG	Metals & mining
	Al Intaj Sulphochemical Indus. Co.	Chemicals
Qatar	Afrina Trading and Construction	Engineering
Saudi Arabia	Advanced Electronics Co. Ltd.	Electronic equipment
	AES Arabia Ltd.	Heavy machinery
	Alsalam Aircraft Co.	Aerospace/Defense
Tunisia	Afrique Travaux Sarl.	Engineering
	Almed Sa	Heavy machinery
United	Advanced Military Maintenance	Aerospace/Defense
Arab	Al Badie Group	Heavy machinery
Emirates	Gulf Automobile Industry Corp.	Car manufacturing

Source: http://investing.businessweek.com/research/common/symbollookup/symbollookup.asp?lookuptype=private&region=all&letterIn=O

Chouchane et al. (2011) in their paper, discuss the case of medical technology. They argue about the fact that this has known lately significant advances and the new discoveries in biomedical research have the needed potential to enhance the human health in a considerable way. Due to this new trend, many economies in the Arab Gulf regions, namely Qatar are placing huge investments for establishing new centers in biomedical research. However, many challenges are faced when it comes to the establishment of this new kind of centers dedicated to biomedical research. In fact, one of the major faced challenges, one could mention the low profile of medical centers and their insignificant endowments in the region. To overcome these confronts, Qatar Foundation for Education, Science and Community Development has been able to attract six branch campuses of American centers of higher education in Qatar. One important example of those growing institutions is the Weill Cornell Medical College in Qatar of Cornell University, which is the first and only medical institution in Qatar. The discoveries allowed by this program have the potential to influence public policy in a positive way and thus reducing premature mortality.

The role of universities has long been recognized as main suppliers of basic scientific knowledge for industrial innovation throughout their research and related activities. Universities are usually seen as one of the major contributors to the wealth creation as well as the economic development. (Dooley and Kirk, 2007). In the Tunisian context, higher education and scientific research represent pillars to the knowledge-based society. Indeed, the Tunisian tertiary education faces challenges of cooperating positively with the economic, social, and technological changes and trends. (Eleventh Tunisian Development Plan 2007-2011). Bouhamid et al, in their paper, explore the different initiatives taken by the Tunisian University so that it can be able to enhance the socio-economic development, by studying the different types of mechanisms. This study explores two approaches: A triple helix model focusing on the role of the university in knowledge based economies and the development of the entrepreneurial university, which has three set of responsibilities: teaching, research and service through the different entrepreneurial initiatives. From this perspective, universities contribute positively to the nation's economic development throughout the creation of scientific centers, business incubation and advanced training programs that enhance the cross-institutional mobility of both people and businesses. (Gunasekara, 2006). The study also emphasized on the third role of the university as a main contributor to the development, not from the perspective of the triple helix model. Instead, it focuses on the placing a strong focus on the teaching and research missons. As a result, this mechanisms allow a stronger regional focus on student recruitment and needs, shaping regional networking, entrepreneurial initiatives, and finally a regionally focuses teaching and research. (Gunasekara, 2006). The empirical study is mainly based on both qualitative and quantitative data collected about the Sfax University (DU). The analysis of the findings demonstrate the fact that some knowledge capitalization and hybrid, boundary-spanning mechanisms are developed by the Tunisian government for the sake of enhancing SU capacity in social economic development throughout encouraging the mobility of researchers between research parks and production firms, creation of Sfax technopark that enhances a suitable environment for the transfer and sharing of technological knowledge, and the establishment of business incubators.

The important role of knowledge is now advocated by a various number of academics, business and policy sources. In fact, the knowledge-based economy is characterized by its continuous need for learning in order to allow organizations to renovate and cope with the current fierce competition. (OCDE, 1996, Lundvall and Archibugi, 2002).

The main objective of the authors, Bouraoui et al. (2010) behind this study is to investigate the inter-organizational learning implemented by different Tunisian pharmaceutical companies throughout various cooperative agreements including: north-south, south-north, and firm-university cooperation. The main reason behind this study is to explore the relevance of the pharmaceutical company alliance capability in managing its portfolio of cooperation by considering the particularity of each agreement. The empirical research is based upon a Tunisian pharmaceutical company (ALPHA). The results obtained show and demonstrate the degree to which inter-organizational learning differs among companies and university partners. The findings demonstrate the fact that collaboration with pharmaceutical companies represents a main enabler of the transfer of knowledge required for the production of medicines. It is also proved that the collaboration with universities is short-term relations that aspire to attain some scientific activities needed by ALPHA caused by the shortage in some technological resources.

Oukil's paper (2011) about the technology-based entrepreneurship deals with the case of the Arab region. In this study, the author stresses the importance of technology-based entrepreneurship as a mean to achieve industrialization and technological development. First, the paper describes the environment of entrepreneurship in the developing economies of the Arab region. The paper uses the method developed by the Organization for Economic Cooperation and Development (OECD) of ranking economies depending on their degree complexity as well as the power of their knowledge. In fact, the author, throughout this paper, proposes another approach of dealing with the issue of technological development. The empirical research is based on secondary data gathered from the business website Bloomberg. The findings demonstrate that entrepreneurship and technological advancements is the subject of a growing attention in the Arab region. However, the supportive educational measures needed for the latter are either missing or weak. The support of this idea is the fact that the private sector is as active as the public sector when it comes to the processes relative to the industrialization and technological development.

Arab countries are currently struggling to incorporate the international business and close the gaps with the rest of the world in the quickest way. The main problem behind this issue is that the policies pertaining to Arab countries lack many important features. In order to gain a competitive advantage and reach growth and competitiveness, huge investments and business creation are needed. Many scholars argue about the strong necessity of changes in management and government along with the improvement of the business culture through education. Said

Oukil (2011) centers his study on the case of Arab countries, using secondary data and relevant academic researches. The results of his research show that many challenges are facing the Arab countries that should be encountered to be able to move forward.

The UN Arab Human Development Reports included a number of indicators that demonstrate the slow progress towards the development of knowledge economies in the Arab region and stressed the role of the intensification of knowledge acquisition as a main key to success. David McGlennon's paper discusses the major developments in research, and innovation performance in the GCC since the early 2000s, studies the different trends in higher education, with the specific cases of Qatar and the United Arab Emirates (UAE), and finally suggested ways of improving the current situation. Indeed, the latest international indicators relative to research capacity did not know any progress for GCC countries. The appropriate example revealing this situation is the fact that the 2006 World Bank Knowledge Economy Index demonstrated that all GCC countries are rate under the world average for the indices relative to both innovation and education, with the only exception of the UAE and Bahrain.

The role of Business and Technology incubators is of a major importance in the development of innovation and new business development structures of national economies. These incubators differ in the way they function and influence national development programs depending on the region. Thomas Hedner, Hanadi Almubaraki, Michael Busler and Adli Abpizeedan (2011), in their study, investigated the different roles of business and technology incubators in two different regions of the world, particularly, the Gulf Cooperation Council (GCC) countries, and Kuwait, Bahrain, Qatar, UAE and Saudi Arabia and some countries of Europe. The study also discussed the existing management methods that enable the functioning of daily activities of these institutes. Finally, the paper discussed the important contribution of these business and technology incubators in the nation's regional growth

The need for different technologies enabling the production of energy, materials, products and services at the local level, is growing progressively with the economic diversification of GCC countries. Many conditions including the geographical location, demographic trends, health and education challenges and rapid expansion and diversification of GCC countries represent significant socio-economic basis for national science and technologies policies and rules necessary for the development of national research, development and innovation capacity and making sure they cope with the local needs. According to Wilson, K and O'Sullivan, K (2011), the adoption of diversification will allow the youth of the GCC region to have a diversified set of employment options. To be able to do that, a number of initiatives need to be taken including an adequate investment in research and development, employment of highly skilled labor, financial support, appropriate rules and legislation, the ease of access to both scientific and technological information, and finally the implementation of a socio-economic strategy to make sure that the results of research and development cover the different sector of the diversifying nations.

By the end of these analyzes, it is time to assess the major achievements and gains from the above sections.

VIII. Policy Outcomes from the Research

1. What can be learnt by Arab countries from EEE countries at the aggregate and local levels?

According to OCDE (2011) the Arab Spring has brought to light key challenges in the Arab region that had already existed for some time. High unemployment levels (in particular among youth), persistent corruption and lack of accountability and transparency, state-owned enterprises that crowd out the development of private enterprise and investment, low levels of enterprise creation and, for a number of countries, a high dependence on fuel and food imports are all structural and interconnected challenges. They can be addressed only through a coordinated and comprehensive strategy that involves governments, the private sector, civil society, and the international community.

The world's attention to the countries of the Middle East and North Africa countries has centered on instability and uncertainty in the region and more recently the interest has been related to the strategically well-position of oil producing economies. But little international attention has been devoted to the development challenges facing these countries. Providing quality and appropriate jobs to the increasing and changing labor market, reducing poverty, promoting the private sector, expanding gender equity, improving education quality and accessibility and effectively managing scarce water resources and finite oil wealth are only a few of the challenges facing the countries of this region.

Countries in the Arab region have a substantial opportunity to drive economic growth by transforming their economies into knowledge based economies. The first direction is developing a vibrant and innovative technology sector. Even if many Arab countries enjoy the gains in efficiency that come from using products and services within the information and communications technology (ICT) sector, they have to become more innovative across all sectors of their economies not only as consumers and net importers of technology.

In this chapter we start with a short literature review about the opportunities and challenges on Arab countries. Then, we continue with some lessons to be learned from EEE countries based on the conclusions from previous chapters and some descriptive analysis. We finish our chapter with a SWOT analysis as a synthesis of all strengths, weaknesses, opportunities and threats of Arab region. This analysis could be used by policy makers to formulate a coherent reform for the sustainable development of the region based on knowledge based economy principles and according to the particularities of each country and to the previous experience of other developing countries.

2. Previous contributions

According to Jaramillo and Mélonio (2011) the Arab Spring has clearly shown the will to change young people of the region, seeking a better education and demand to have easier access to skilled jobs. The economic growth in recent years in Arab region has not been sufficient to absorb the increased labor force, for various reasons: excessive volatility of GDP, demand for labor heavily dominated by public sector too strong dependence of the economy on oil revenues and low value-added products, insufficient integration into the global economy.

Makdisi (2011) offers important remarks that he believes might shed led light on basic issues pertinent to the situation of the Arab region from a political stand point. The author focuses on the reasons for the hesitant Arab democratization process and on the reasons for the persisting Arab democracy deficit through 2010. He follows with brief observations on the transition from autocracy to a democracy in the Arab World. But the author underlines the uncertainties related to changes.

El-Darwiche & al. (2010) have stated that innovation within the ICT sector can lead to innovation in all sectors of a national economy and thus make it more competitive. Countries of the Arab region have an opportunity to develop a strong innovation culture for their ICT sectors by fostering technology startups, creating business-friendly policies and regulations in such areas as patent filings, and devoting a larger percentage of their GDP to R&D. Some sectors with strong local potential are Arabic and Islamic services and applications, IT services and smart devices for the energy and utilities sectors, e-education and e-health systems, and devices and systems for urban and infrastructure management.

Increased globalization over the last two decades has led to strong growth of international business activity and FDI. They have contributed to increasing efficiency and productivity, technology transfer, export development, job and skill creation and the improvement of knowledge and skills. However, comparing the distribution of FDI inflows across developing regions, the Arab region has attracted only small proportion of the global stock of FDI (UNCTAD, 2003). Therefore, Mohamed and Sidiropoulos (2010) analyzed in their paper the main determinants of foreign direct investment in Arab countries. Their study reveals that the key determinants of FDI inflows in Arab countries are the size of the host economy, the government size, natural resources and the institutional variables. The external factors are represented by global liquidity and trade variables. So, the policy makers in the Arab region should remove all barriers to trade, develop their financial system and build appropriate institutions, reduce the level of corruption, improve policy environment. Reducing the size of the government through privatization and reducing macroeconomic instability are important too and should not be overlooked.

To the extent that transition to democracy brings better and more accountable institutions, we expect higher growth in post-transition Arab region. World Bank (2011) stated that short-run sacrifices are to be expected and with appropriate policies they are likely to be limited in duration and scope. Ongoing research examining 50 transitions to democracy around the world

(Freund and Mottaghi 2011) shows that on average income growth declines by 3-4 percentage points during transition, but the dip lasts only one year and growth quickly resumes or exceeds pre-transition rates.

If Arab countries move to more accountable and transparent governance and to a complete reform that promotes competition, inclusiveness, openness and knowledge spread, this will promote robust growth in the region and many more opportunities for the young population.

What can be learnt by Arab Countries from EEE Countries?

Governance Institutions

In Arab countries, improved governance institutions would greatly stimulate private investment and economy development. This is the case for all components of governance, with special attention to civil liberties and political rights, corruption and bureaucratic quality, and conflicts and ethnic tensions.

In a previous analysis we have observed that Qatar, Arab Emirates and Oman should focus their efforts in improving Political Stability and Absence of Violence/Terrorism and/or Voice and Accountability indicators (Fig.IV.9). In case of Israel, the lowest value is recorded for Political Stability and Absence of Violence/Terrorism. All the other governance indicators are comparable with the values recorded in EEE countries. The Government Effectiveness is even higher than in EEE countries and in Regulatory Quality, only Estonia registered a better result than Israel.

Oman, Qatar and United Arab Emirates should focus their efforts in improving Voice and Accountability indicator. All the other governance indicators are comparable with the values recorded in EEE countries. In United Arab Emirates and Qatar the Control of Corruption is even higher than in all EEE countries. For Oman, Qatar and United Emirates, an example should be Estonia, which records high values for all the indicators. During the period 1996-2010, Estonia improved significantly the indicator Voice and Accountability (from 0.87 to 1.13).

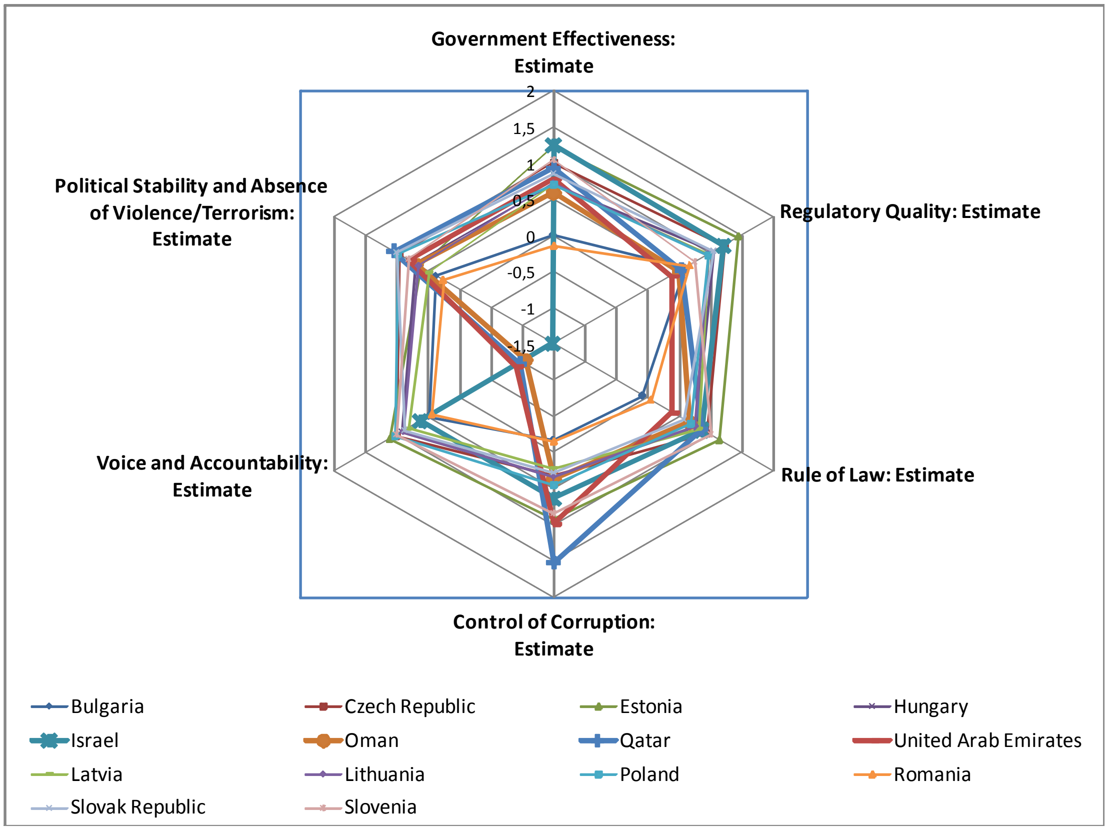


Fig.IV.9: Governance indicators for Israel, Oman, Qatar and United Arab Emirates compared to EEE countries, 2010

In Algeria, Iran, West Bank and Gaza, during the analyzed period (1996-2010), it could be observed an improvement in Political Stability and Absence of Violence/Terrorism and/or Voice and Accountability indicators, but not sufficient. We could observe that all the Governance indicators are much lower than in EEE countries. An exception is West Bank and Gaza which has values very close to EEE countries for Government Effectiveness, Regulatory Quality, Rule of Law and Control of Corruption, but the lowest value of Political Stability and Absence of Violence/Terrorism, even lower than Israel. For Algeria, Iran and West Bank and Gaza, an example should be Romania or Bulgaria, which improved significantly all the governance indicators during the period 1996-2010.

All the other Arab countries should improve all the governance indicators. Iraq and Yemen should focus their attention on improving their Political Stability and Absence of Violence/ Terrorism indicator. Libya, Syria and Saudi Arabia should focus their attention on Voice and

Accountability indicator. Morocco, Tunisia, Lebanon, Djibouti are the closest countries to EEE countries in terms of governance (Fig.IV.12).

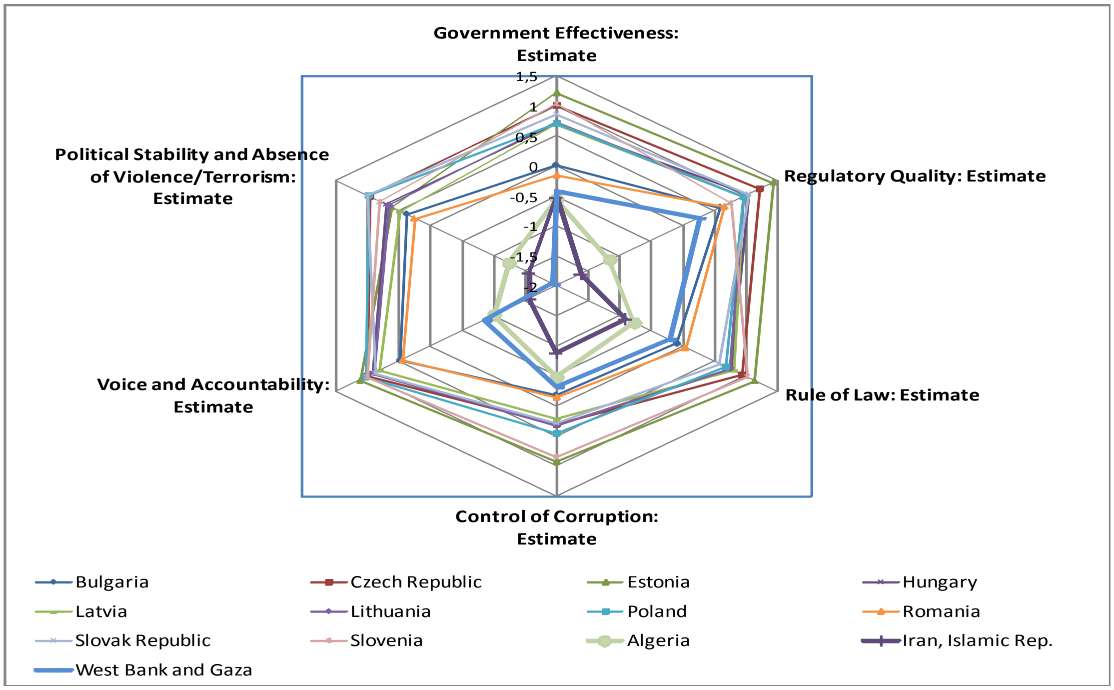


Fig.IV.11: Governance indicators for Algeria, Iran and West Bank and Gaza compared to EEE countries, 2010

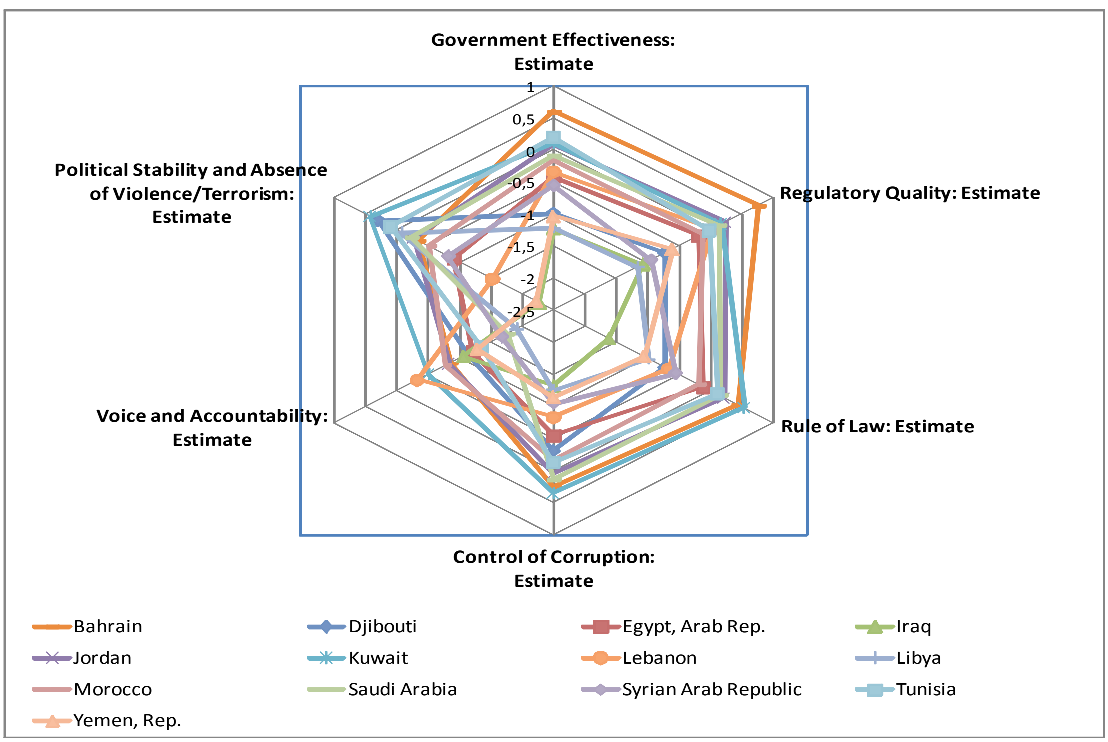


Fig.IV.12 – Governance indicators for some Arab countries, 2010

Education indicators

The education systems face major challenges: the continuous development of technology require young people to be equipped with specific skills demanded by the labor market the access to education for all, increasing and diversifying the funding sources to meet growing demand for a high quality education.

In Arab countries these problems are of particular relevance as long as in these countries the enrolment in all levels of education increased during the last decade. Moreover, the Arab Spring has clearly shown the will to change young people of the region, seeking a better education and easier access to skilled jobs. The strong frictions between the supply and the demand of work and the very slow employability of young people have left the education system of insufficient quality. Because of the high dropout rates in secondary schools makes most of these young enter the workforce equipped with low basic skills, not creating the premises for a sustainable economic development and of knowledge economy.

By analyzing the school enrolment and the educational expenditure on education in Arab countries compared to EEE countries (reference year is 2008) we could conclude that only Israel is very close to EEE countries, members of EU in terms of education. This country invests more in education than other Arab countries. Therefore, improving the quality of education in general and of tertiary education in particular should help this country to obtain local and global economic development using new knowledge economy principles.

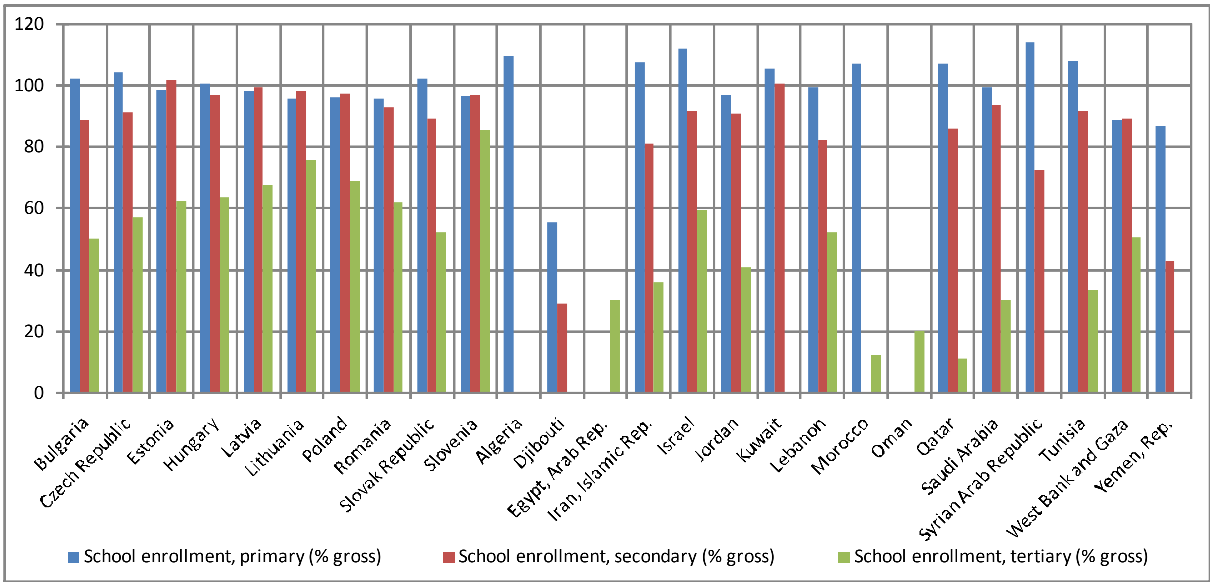


Fig.IV.13: School enrolment in Arab countries compared to EEE countries, 2008

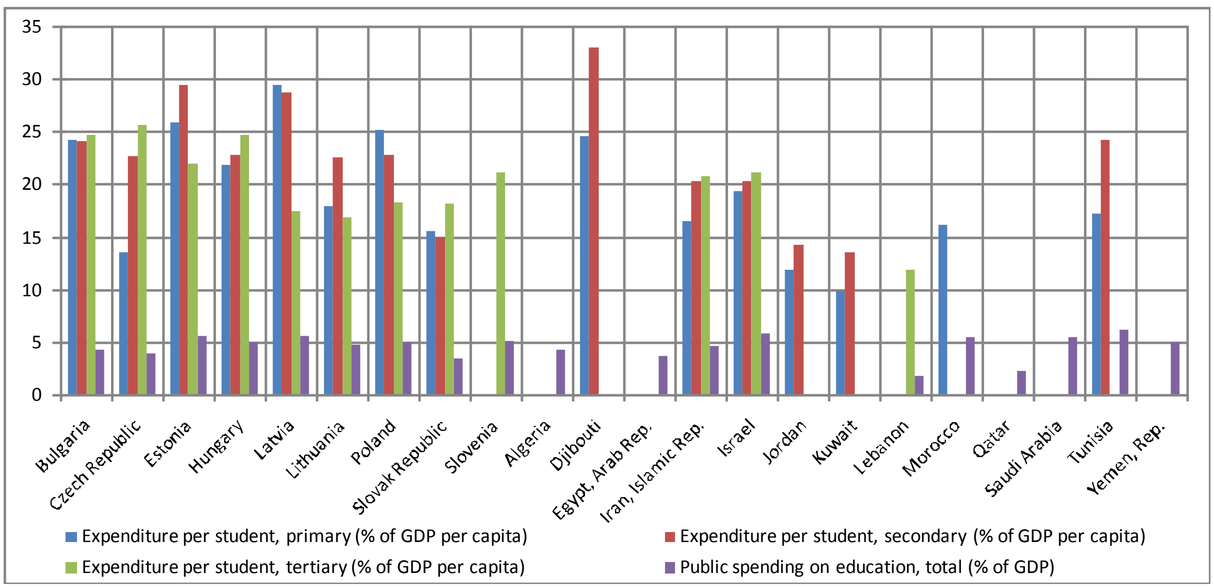


Fig.IV14: Expenditure per student in Arab countries compared to EEE countries, 2008

The expenditure per student as % in GDP per capita for primary and secondary education is the highest between Arab countries. As well Yemen has a very low level of school enrolment and high level of expenditure per student as % in GDP per capita. Because these countries have the GDP per capita much lower than all the other Arab countries, they have to concentrate their attention in improving in the first time the access to primary and secondary education and to increase the GDP per capita by using a more educated labor force. A human capital higher quality could contribute to obtain better economic results and high economic growth.

Qatar and Syria have high levels of school enrolment in primary education but low levels in secondary education. Compared to other Arab countries Lebanon has low values of school enrolment in secondary education but very high levels in tertiary education. These countries should concentrate their attention for improving firstly the access to primary and secondary education in order to have a higher quality of labor force which will help the country to improve their capacity of economic development. They should follow the example of Romania, Lithuania and Latvia which have improved significantly their levels of school enrolment in secondary education after the fall of communism (Romania from 76.5% in 1996 to 95.1% in 2009, Lithuania from 87.67% in 1996 to 98.04 in 2009 and Latvia from 88.04% to 94.08% in 2009).

Morocco, Egypt, Saudi Arabia, Tunisia should focus their attention in improving the level of school enrolment in tertiary education. Having a high skilled labor force helps in obtaining a high economic growth and knowledge based economy which leads to sustainable development on long term.

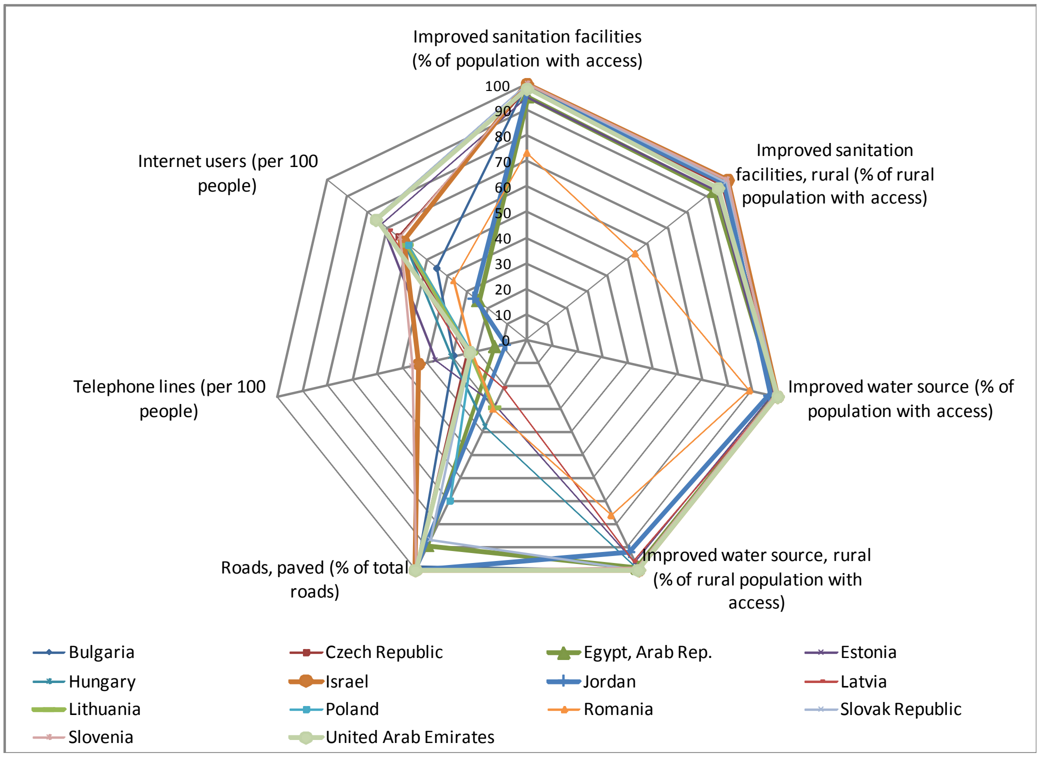
Local and regional development

Arab countries enjoy a favorable geographical position with their proximity to European markets. To ensure the economic, social and institutional development of these countries it should identify specific territorial capital (environment, infrastructure) of each region and place it in its wider geographical context.

Compared to other regions, the Arab region is less globally and regionally integrated in terms of trade, investment and capital flows with high costs for these countries. According to many studies, limited regional integration means 1-2% lower GDP growth. In the new world, being competitive requires not just been able to produce at low cost but also to establish a competitive supply and logistics chain, including transport, customs, communications and financial services.

EEE countries during their transition have put into practice some reforms in the process of decentralization in order to create a public administration able to fulfill their functions and responsibilities so that to ensure a good infrastructure necessary for a sustainable global development. By analyzing infrastructure indicators (telephone, electricity supply, water and sanitation facilities, roads) in Arab countries compared to EEE countries (reference year is 2008) we will try to identify some directions to be followed.

In a previous analysis we have observed that Jordan, United Arab Emirates and Egypt have a very good sanitation and water facilities (very close to 100%) compared to the other Arab countries and similar with EEE countries. Jordan and United Arab Emirates have 100% of roads paved and Egypt more than 90%. Israel has a very good connectivity to telephone lines (43 telephone lines per 100 people, when in EEE countries the highest level is attained by Slovenia with 46 telephone lines per 100 people). United Arab Emirates has a very high number of internet users (75 internet users per 100 people, when in EEE countries the highest level is attained by Slovak Republic with 75.63 users per 100 people). Therefore, Israel has a very good infrastructure, the only direction of improvement in order to implement a knowledge based economy, being the internet use. For United Arab Emirates we observe that the number of telephone lines have decreased during the last period, probably being replaced by the increase number of users of internet. Therefore, this country has a very good infrastructure, by means of internet, telephony, paved roads, sanitation and water source facilities and it has to find other direction of infrastructure improvement like constructing more roads, railways, airports etc. Jordan and Egypt have very low levels of internet users and telephone lines per 100 people, and therefore this could be a direction of improvement. These countries should follow the example of other EEE countries (like Slovenia or Slovak Republic) which have improved substantially these two indicators.



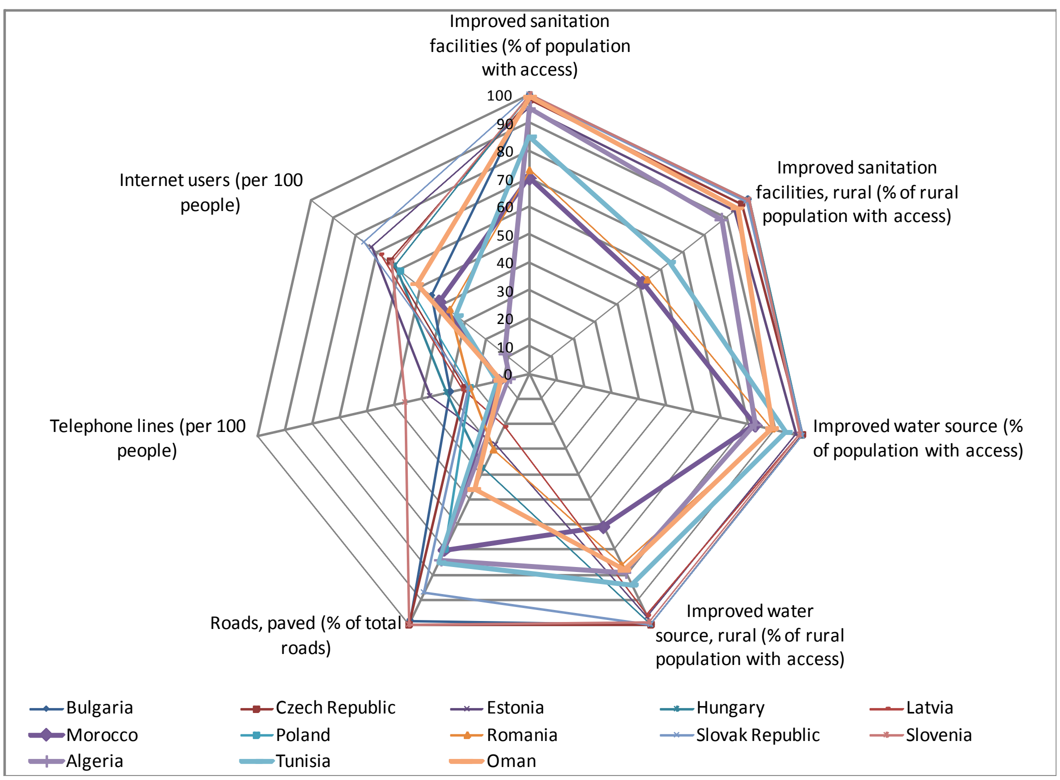


Fig.IV15: Infrastructure indicators in Arab countries compared to EEE countries, 2009

Another group of Arab countries is Algeria, Morocco, Oman and Tunisia. These countries need some policies for the development of rural regions. We observe that they are very close to EEE countries in infrastructure indicators, high differences appearing in rural indicators. They have to improve firstly sanitation and water source facilities in rural areas, to improve the roads and to increase the internet and telephone line users. They should follow the example of Romania, which tries also to catch up the other EU countries in terms of infrastructure.

Global development

Social instability in a number of Arab countries in 2011 has captured global attention because of its speed and contagion effects. Even if a number of countries in the region have experienced strong economic growth in the last decade, persistently high levels of unemployment, particularly among youth, are a major source of dissatisfaction in Arab countries (IV.16). In Algeria, for example the total unemployment rate attained 30% in 2000 and the unemployment among youth attained almost 50% in 2001. In 2009-2010 in all analyzed Arab countries (Morocco, Algeria, Egypt, Israel, Tunisia and Syria) the unemployment was around 10% but the youth unemployment still remain very high (21,9% in Morocco, 19,2% in Syria). During the last decade could be observed an increasing tendency of exports of goods and services as % in GDP and also in the exports of goods and services as % in GDP. In Algeria, Israel and Syria from 2004 it could be observed a decrease in trade and exports compared to the previous year.

Therefore policies to enhance economic growth should be harmonized with those which stimulate employment creation both for low skilled and for high skilled labor force. For a region that has a stock of 20 million unemployed men and women and a labor force that grows by 3.4% annually, the forgone opportunity for job creation is large. Regional and global integration would go a long way in increasing productivity and economic growth through economies of scale and enhanced country specialization and in this manner creating jobs for Arab youth (World Bank 2010).

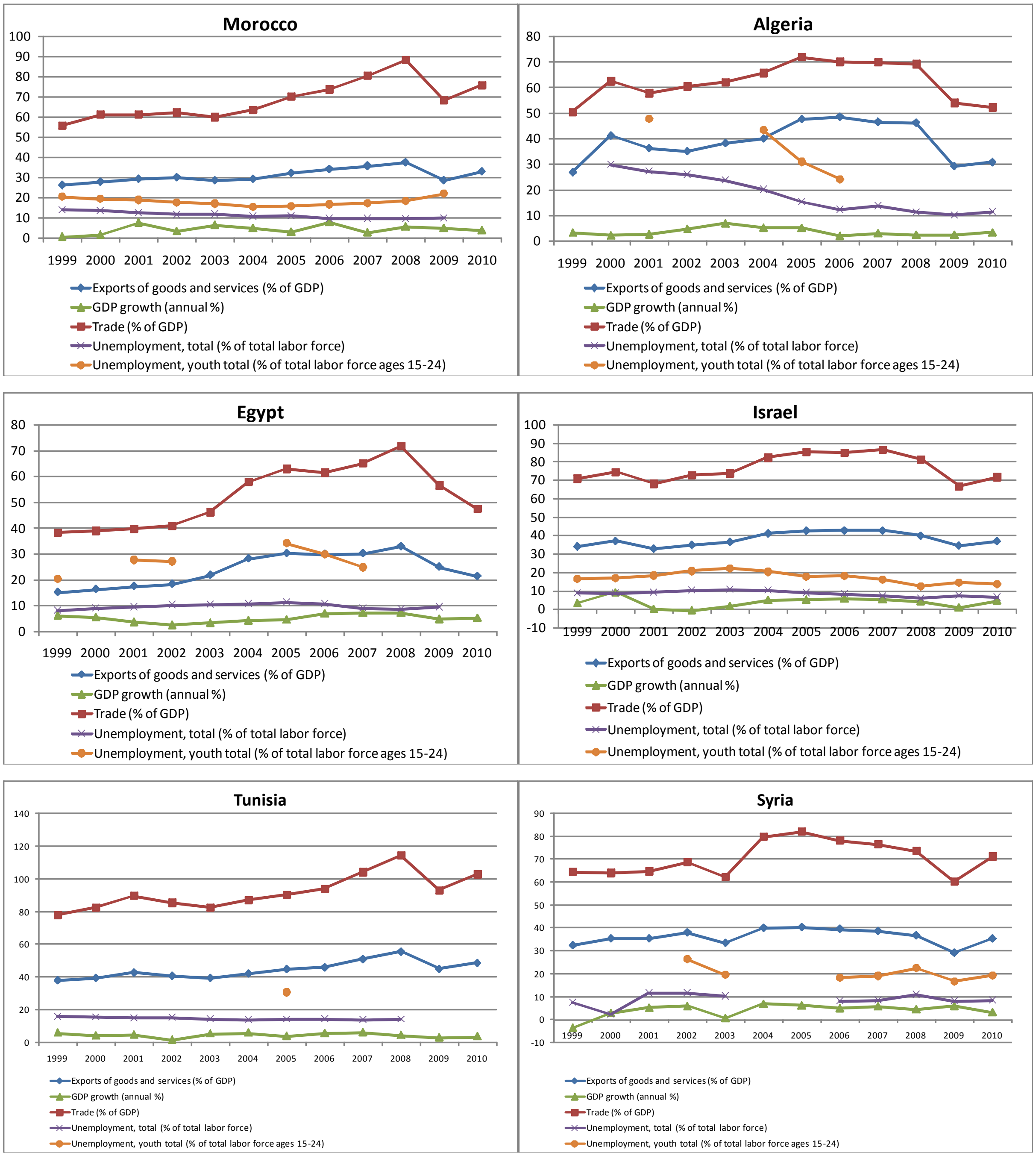
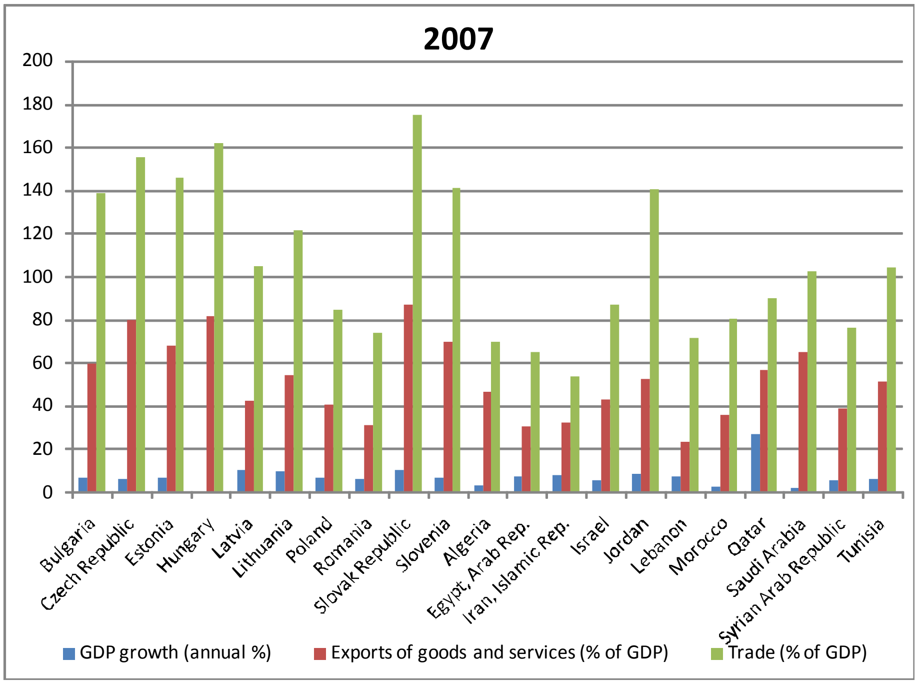


Fig.IV16: The evolution of global development indicators in some Arab countries, 1999-2010

In the next paragraph we analyze the unemployment, the GDP growth, the exports and trade in Arab countries compared to EEE countries (Fig.IV.17). We observe that even if the GDP growth, the exports and trade are in Israel, Jordan, Saudi Arabia, Qatar, Morocco and Tunisia very close to the level of EEE countries, the unemployment rate is much higher.



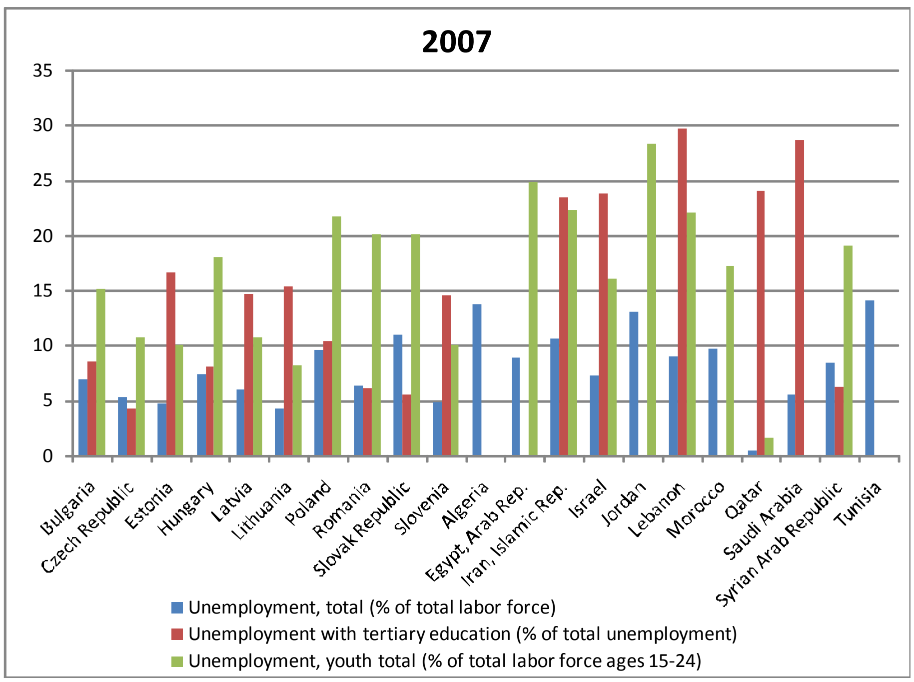


Fig.IV.17 – Main global development indicators for some Arab countries compared to EEE countries, 2007

By analyzing the unemployment rate in EEE countries after the fall of the Iron curtain we observe that it has attained very high levels in Bulgaria (21% in 1993), Lithuania (17.4% in 1994), Poland (14.4% in 1994), Latvia (20% in 1996) or Slovak Republic (19.3% in 2001)((Fig.IV.18). During the pre-accession period were implemented many policies and an entire economic program under the supervision of EU, such that to help these countries to improve the main macroeconomic indicators. The unemployment was one of them. The lifelong learning, professional requalification, the education for all and the job creation, are some of the measures taken to reduce the unemployment level. The effect of these measures could be seen from 2002 when the unemployment rate started to decrease until level under 10% in 2008. During the crisis period (since 2008), the unemployment rate have started to increase again attaining very high levels (between 15 and 20%) in Latvia, Lithuania, Estonia and Slovak Republic. Therefore Arab countries should analyze the policies implemented by Bulgaria, Poland, Slovak Republic, Lithuania and Latvia for the economic development in conjunction with the unemployment decrease.

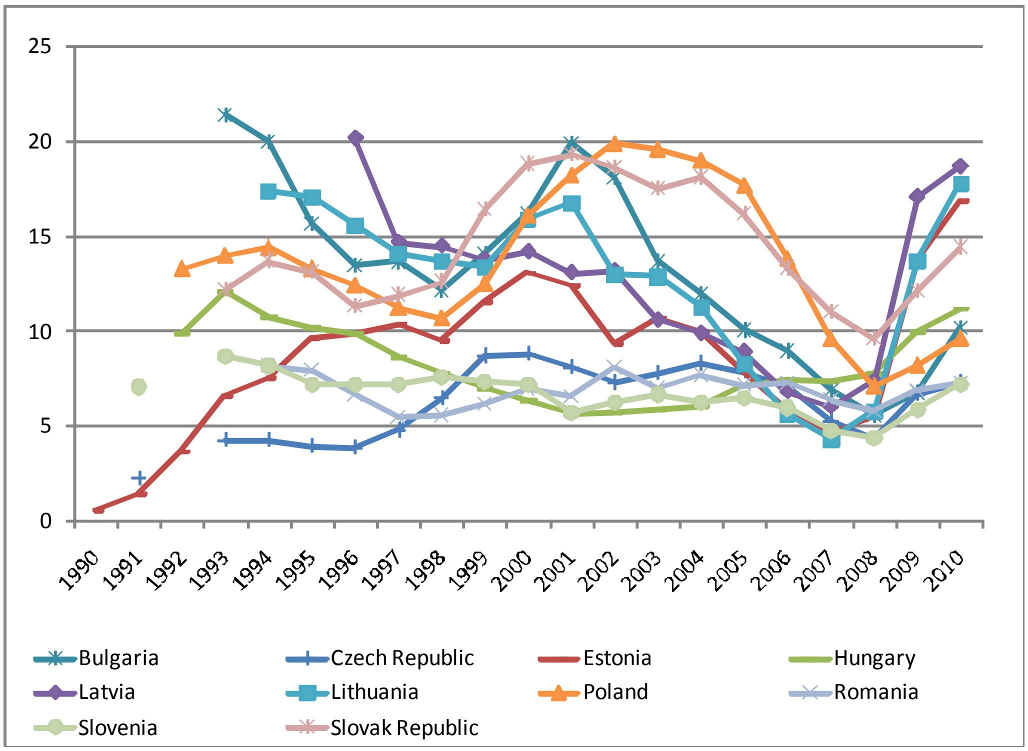


Fig.IV.18: The evolution of unemployment rate in EEE countries, 1990-2010

3. Policy outcomes

According to World Bank regional report (2011) the global financial crisis and the Arab Spring have affected the short term macroeconomic outlook and the status and speed of economic reforms in the region. While political change is associated with short-run challenges, the transition has the potential to significantly boost economic growth and raise living standards, in the medium run.

Nowadays, the opportunity for political reform in the Arab region is unprecedented. If political changes lead to greater accountability and transparency in governance, countries could reduce significantly unproductive rent-seeking behavior which will boost economic growth by using resources more productively on research and development, improved business practices, employee training, or additional capital goods instead of political lobbying.

Better rule of law and political stability will attract investment, facilitating more rapid growth in a sustainable way. Foreign Direct Investment has risen to unprecedented levels, targeting a myriad of services and manufacturing-related sectors in addition to nontraditional activities.

More voice for civil society will prevent the unequal application of regulations, and can lead to more inclusive growth. While there is still significant wealth in the region, many infrastructure projects could be planned in transportation, education and healthcare such that to speed up the human development and the expansion of knowledge based economy.

Structural political change cannot be dissociated from further economic reforms. Many countries in the region faces a lot of interdependent structural challenges such as high unemployment, low female labor force participation rates, low levels of private sector development, weak public and corporate governance, bloated public sectors, limited competition and pervasive corruption.

Evidence from other countries that have experienced political transitions (EEE countries for example) implies that growth typically dips for one year, and then returns to or even exceeds pre-crisis levels.

If new governments in Arab countries are able to gain public confidence, to demonstrate commitment to more transparency, voice and accountability and to respond to citizens' demands, then the political reform will probably be accompanied by better living standards.

Many Arab countries have already implemented some reforms to improve the overall environment for economic growth: monetary and fiscal reforms are in progress, their macroeconomic framework, fiscal sustainability and performance are improving, in almost all countries in the region have taken significant steps to remove impediments to trade.

However, World Bank (2007, 2009) state that Arab region is one of the least business-friendly regions worldwide with the lowest private sector investment among developing regions, both in terms of the share in total investment and growth rate. ILO (2011) considers unemployment and lack of economic development as core reasons for the protests in the Arab region.

Two interrelated factors constrain regional development in Arab countries: the first one is the access to education and the second one is employment opportunities. The education provides the skills needed to prosper in the knowledge economy. As in case of EEE countries at the beginning of transition, there is a mismatch between the education system and the skill requirements of the job market. New technologies and the knowledge based societies require people with problem-solving skills and familiarity with emerging technologies. Moreover, the creation of jobs for highly skilled professionals is lagging behind the graduation rate. Therefore, many Arab countries, like many EEE countries face a growing "brain drain," as many of the most promising youth leave the birth countries to pursue university education and better job opportunities in the Western countries of EU. This mismatch between the quality of the labor supply and the requirements of the labor market can largely be tackled by improving the quality of education. A sustainable educational reform implies better educational systems to prepare workers for a competitive global environment, as well as better signals from the labor market to the education sector.

Moreover, in all Arab countries a fundamental shift of curricula to promoting problem solving and application of knowledge is required, and secondly a more responsive education system to the needs of knowledge based economy and open to private enterprises. They should follow the EEE countries, new members of EU, which have aligned their educational systems to Bologna Accords in order to provide a high quality education and a higher education and research responsive to the increasingly complex societies with the most demanding qualification needs.

Over the last few years in EEE countries there was a shift of jobs from low value added activities like agriculture to high value added activities like services, high tech industries, etc. In order to improve the competitiveness of economy it is needed a more dynamic and open economic environment even if it leads to higher job insecurity and higher income inequality.

Therefore, by comparing with the EEE countries and their transition to a market economy, we could say that Arab countries should introduce some complete structural reforms in their economies and strengthening the safety mechanisms. Labor policy needs to balance two fundamental objectives: protecting workers from the risks of unemployment, lost income, or poor working conditions, and encouraging job creation and the allocation of labor to their most productive uses.

Arab countries should encourage the creation of small and micro enterprises by introducing a more transparent and lighten regulatory framework which will have as effect on long term, the reduction of the productivity gap compared to other regions (see the example of EEE countries).

The knowledge based economy creates a challenge for policy makers. The policy response should be the development of information and communication technology, the increasing access to knowledge and the opening of markets. It lies in enhanced educational and skills development programs both for entrants into the labor markets and for those who have to retrain and return to the markets. In EEE countries, programs of professional requalification and adult educational programs are developed to help people to be prepared for the new demands on the labor market, for the increasing need of skilled labor force. In order to stimulate the innovation there were created research centers around universities. Moreover the cooperation between university and private sector is stimulated such that to have the education and research closer to the needs of economic agents.

Some increases in public investment may be required to improve the quality of infrastructure and services in less developed rural areas. The key role will have to be played by the private sector, including by attracting foreign direct investment. Government policies should support an enabling environment in which the private sector flourishes. In countries with limited fiscal freedom, public investment may require international support.

The following table (IV.39) summarizes the main points described previously with regard to the strength, weaknesses, opportunities and threats.

Table IV.39: Analysis for Arab countries

Strengths	Weaknesses
Rich countries with high oil reserves The beginning of political democratization The international support	High unemployment Large informal sector Low private sector investment Low levels of education Business unfriendly region Macroeconomic imbalances
Opportunities	**Threats**
Enhance a strong innovation culture Investment attractiveness Increase of private sector Boost economic growth Rise living standards	Pushing up international oil prices Political instability

Overall Conclusion

This research targeted the identification of new economic and social policies devoted to the enhancement of the outcomes of different components of the knowledge economy in the Arab world with comparisons with countries of Eastern Europe. This latter exercise considers the cultural, political, economic and geographical proximity of these countries with the European Union as a center of knowledge economy. It also emphasizes the proximity of the Eastern European countries with Arab countries with regard to the on-going transition to market economies.

The conduct of this research was pursued through the analysis of series of issues related to the knowledge economy in both Arab and East Europe. These issues were grouped into four major interdependent parts:

1. Methodological matter's where more emphasis is placed on the research questions, the methods pursued and the data used. It also underlines the main reasons for choosing the benchmark with Eastern Europe.

2. Characterization of the situation of knowledge economy in both groups of countries while accounting for global, local and regional development.

3. Main Issues related to knowledge economy in the Arab countries

4. Directions of economic and social policies those are likely to be promising for the enhancement of the benefits from the knowledge economy.

The methods used in this study include descriptive statistics, regression analyzes and principal components approach. The applications vary with the issue discussed as for each dimension; a specific analytical tool is used. The data used are mainly secondary and provided by international, regional and national organizations. But most of the data is from international organization. More details about the methods and data are provided under the specific section.

The Arab Spring could be compared to the Autumn of Nations in 1989. The collapse of communism in 1989 was followed by a very interesting and important period from economical and political point of view. Nowadays, the current wave of political change in MENA countries provides an exceptional chance to introduce the transparent and accountable policies and institutions that will lead to increased competitiveness and better living standards.

By gaining public confidence, demonstrating commitment to greater transparency, voice and accountability in governance and responding to citizens' demands, the political reform will be accompanied by better living standards. The economic growth will be enhanced. More investments in research and development, improved business practices, employee training will create a more dynamic and open economic environment and will improve the competitiveness of economy.

While there is still significant wealth in the region, some infrastructure projects should be planned in transportation, education and healthcare, such that to speed up the human development and the expansion of knowledge based economy.

Some increases in public and private investment may be required to improve the quality of infrastructure and services mainly in less developed rural areas. Government policies should create a friendly business environment facilitating the development of private sector, including by attracting foreign direct investment. The creation of small and micro enterprises should be encouraged by introducing a more transparent and lighten regulatory framework which will have as effect on long term, the reduction of the productivity gap compared to other regions.

The education provides the skills needed to prosper in the knowledge economy. New technologies require people with problem solving skills and familiarity with emerging technologies. The creation of jobs for highly skilled professionals is lagging behind the graduation rate. The policy response should be a sustainable educational reform which implies better educational systems to prepare workers for a competitive global environment. The alignment of educational systems to Bologna Accords will provide a high quality education and a higher education and research responsive to the increasingly complex societies with the most demanding qualification needs. Moreover, it should be implemented educational and skill development programs both for entrants into the labor market and for those who have to retrain and to return to the markets. Programs of professional requalification and adult educational programs would help people to be prepared for the new demands on the labor market and for the increasing need of skilled labor force. The innovation should be stimulated by the creation of research centers around universities. Moreover by the cooperation between university and private sector would help education and research to be closer to the needs of economic agents.

Another political goal should be a better economic and political inclusion of the entire population mainly of young people, women and high skilled people. More voice for civil society will prevent the unequal application of regulations and can lead to more inclusive growth. The unemployment could be reduced through policies for supporting women to be integrated on the labor force. Facilities in children care, pregnancy and parental leaves, assistance in reintegration on the labor market are only some of the policies which could help women to take care of their families and also to be part of the labor force.

Arab countries countries should be aware of the fact that the development of knowledge based economy needs a competitive and well developed research sector which could also solve the problem of job creation for high skilled people.

An important direction to be followed is the openness to international trade. This will help the national economies to became more competitive on international markets and therefore to increase the productivity and the efficiency of local industries. Moreover, the increasing trade will contribute to the development of new products, industries and services, creating new jobs, more skilled and adapted to the new economy. By removing the regulatory barriers, alleviating the rules of low, reducing the corruption, the overall business environment will be improved. Therefore, foreign investors and international companies will be attracted to start businesses in the country, creating very good jobs for nationals, contributing to development of the economy and increasing the standard of living.

The shift of jobs from low value added activities like agriculture to high value added activities like services, high tech industries, etc, will improve the competitiveness of economy. Because these policies could leads to a higher job insecurity and higher income inequality by the creation of a more dynamic and open economic environment, some labor policies are needed. These policies should balance two fundamental objectives: protecting workers from the risks of unemployment, lost income or poor working conditions and encouraging job creation and the allocation of labor to their most productive uses.

The orientation of investments in local industry and the initiation of some business on own account could contribute to business development, producing sustainable local or community development. Moreover, it should emphasize national policies to attract specialists through: business support for new projects; assist young people who want to start a new business, innovation support and the research development.

The overall results attained include:

1. The highly imperfect adoption and diffusion of the knowledge economy in every country but with a promising trend were shown by the oil producing and exporting countries in contrast with North African economies. This latter countries and especially Morocco, Tunisia, Jordan and Egypt may need more financial support to accelerate their engagements in research, innovation and enterprise creation.

2. The implicit resilience of rent based economies with regard to further adoption of knowledge based activities including the limited new smart enterprises could be reduced by reforming the political economies in each of the countries under further openness to new generations and new technological, institutional and social innovations.

3. The clear negative relationships between rents and knowledge economic variables show clearly that abundant financial resources can also be targeted to new knowledge economic based projects and ventures.

4. The excessive need for a new growth path is clearly expressed for these countries as unemployment is at very high levels. The social and economic needs of the younger generations require changes in the growth and development visions with focus on knowledge economic dimensions.

5. Local and regional development could be further promoted through knowledge economy as currently there is concentration of growth in major global agglomerations. The

expansion of knowledge to territories is likely to generate new opportunities for local and global development.

6. The promotion of the political, economic and social policies in favor of knowledge economy are important drivers to researchers and innovators to engage further in technological, institutional and social innovations.

7. The expansion of the intellectual property rights at levels of institutions, groups and researchers globally and at the level of territories constitutes an important facilitator for development incentives. This applies also to enterprise creation and development.

8. There are similarities in some areas of knowledge economy between EEE and Arab countries but they are also promising experiences to be learnt by Arab economies.

9. The experiences include education, research, enterprise incubation and development. Territorial initiatives in EEE are also important sources that show the promising effects of engagement in knowledge economies.

10. Inclusion of all the segments of the population is very concrete process where all find opportunities that they can value and that enhance the welfare, the growth and development of each of the economies.

Besides these overall results, some specific matters are also attained in this study. They account for the following elements:

1. The advancement in knowledge economy requires more openness and more transparency

2. Knowledge economy provides new alternatives for participative development

3. Enterprise creation needs to be promoted

4. Research and innovation besides the culture of IPR protection is unavoidable source for accelerating investments and then generating new types of growth in the Arab region

5. While EEE countries appear to be smoothly engaged in knowledge economy, their experiences are important for some Arab countries for both global and local engagement in research innovation and enterprise creation

6. There are policy frameworks and initiatives that need further monitoring through global and local engagement of Arab countries in vision setting and pursuit of knowledge friendly development.

From an analytical point of view, knowledge governance encompasses intellectual property rights system. Using as benchmark, the software industry, our findings suggest that poor knowledge governance reduces economic growth over the medium term but the relationship is non-linear – the rate of decrease in economic growth diminishes with poor knowledge governance.

More substantially, the findings support the relevance of good governance measures in developing countries wishing to complement their emerging IPR regimes. However, we have not been able to give policy makers the much needed guidance on which governance tools are best in the process of economic growth. From our point of view, two major policy implications can be derived from the initial findings. (1) Adherence to international IPRs protection treaties (laws) may not impede per capita economic prosperity. Hence results on GDP per capita are in line with Maskus (2000) who cautions that weaker protection of IPRs will not necessarily be beneficial to developing countries as it may cause them to remain dependent on older and less efficient technologies. Hence, we recommend adherence to less strict IPR laws (treaties) in the educational sector. This position supports the growing preference of multilateral and bilateral IPR laws (treaties) by developing countries in the stead of more stringent international IPR laws (treaties) which restrict diffusion of knowledge. As the countries grow in capacity to become significant contributors to knowledge and educational innovations, they could adhere to tighter IPR regimes

Our results are in line with the statement by Prof. John Joseph Puthenkalam who claims that economic growth depends on micro knowledge and macro knowledge. The joint determination of economic growth and knowledge explains at least some of our results. In our empirical model, education has a negative effect on national income. This is probably because of low enrollment. Enrollment rates are low because GDP is low. When GDP is low people cannot afford an education, or the opportunity cost of schooling is high in terms of alternative uses of time. This is not a new idea, and can be found in Arrow's seminal learning-by-doing paper (1961). In both cases knowledge determines production, but without investment there would be no knowledge accumulation and transmission.

Special attention should also be paid to a number of factors affecting socioeconomic conditions of researchers, notably gender equity, linguistic balance and career structure. Ultimately, in view of further reinforcing the human potential for research in sampled regions, human resource and mobility actions should target the best and most promising researchers from undeveloped countries, promote the training of regional researchers abroad and stimulate the return of scientists established outside Africa and the Middle East. *Improving communication between experts and policymakers* by supporting the establishment of joint work and communication platforms between them at the regional level. Accurate statistical indicators: able to describe the characteristics, structure and performance of knowledge-based economy should be developed at national and regional levels.

Given the growing relevance of IPRs and the imperative of good governance mechanisms for their enforcements, our research has assessed how the upholding to IPR laws (treaties) by formal institutions will influence various components of the knowledge economy. The results show that the enforcement of IPR laws (treaties) by formal institutions is not a sufficient condition for greater knowledge economy.

Henceforth, two major policy implications can be derived from the empirical findings: (1) Enforcements of very tight IPR regimes through good governance mechanisms is not a sufficient condition for knowledge economy in in SSA and MENA countries. Hence, such upholding of IPRs could seriously undermine efforts towards KE by restricting dissemination of knowledge, ICTs and innovation. (2) There are other crucial determinants of KE besides the upholding of

IPRs through good governance mechanisms. These results are in line with the Chinese model which we have already substantially discussed in the body of the work.

There are international institutions and organizations besides countries such as those of the EU that could accompany as partners the processes of further engagement in knowledge economy of the Arab countries. The frameworks provided by ISESCO, UNESCO as well as World Bank and the European Investment Bank are very promising.

New economic and social policies that are targeting the use and contribution to knowledge economy in the Arab countries appear to be possible as each of these economies is facing major challenges of employment, investments and new growth paths.

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Appendices

Annex 1: Governance Indicators

Classification functions coefficients (Fisher)

	Ward Method		
	1	2	3
Government Effectiveness: Estimate	-2,586	-3,127	4,943
Regulatory Quality: Estimate	,032	3,031	5,124
Rule of Law: Estimate	-8,502	-5,826	-2,039
Control of Corruption: Estimate	-3,491	-6,694	-5,847
Voice and Accountability: Estimate	11,616	16,062	15,717
Political Stability and Absence of Violence/Terrorism: Estimate	-4,966	2,090	2,188
(Constant)	-6,063	-6,634	-11,678

Structure matrix

	Function	
	1	2
Government Effectiveness: Estimate	,811*	-,475
Rule of Law: Estimate	,793*	-,231
Voice and Accountability: Estimate	,746*	,128
Regulatory Quality: Estimate	,722*	-,016
Political Stability and Absence of Violence/Terrorism: Estimate	,704*	,521
Control of Corruption: Estimate	,565*	-,359

The correlations intra-groups between discriminating variables and discriminant functions are ordered by absolute size of correlation

*. Largest absolute correlation between each variable and the corresponding discriminant function

Classification results

			Ward Method	Predicted group			Total
				1	2	3	
EEE countries	Observed group	Number	1	55	2	0	57
			2	0	29	0	29
			3	0	4	100	104
		%	1	96,5	3,5	,0	100,0
			2	,0	100,0	,0	100,0
			3	,0	3,8	96,2	100,0
Arab countries	Observed group	Number	1	0	0	0	0
			2	0	0	0	0
			3	0	0	0	0
			Non-classified observations	178	3	59	240
		%	1	,0	,0	,0	100,0
			2	,0	,0	,0	100,0
			3	,0	,0	,0	100,0

			Non-classified observations	74,2	1,3	24,6	100,0

Annex 2: Local and regional indicators

Structure matrix

	Function	
	1	2
Population in the largest city (% of urban population)[a]	-,381*	-,021
Employment in agriculture (% of total employment)	,275*	,079
Improved sanitation facilities, rural (% of rural population with access)	-,192*	,091
Improved sanitation facilities (% of population with access)	-,189*	,092
Improved water source (% of population with access)	-,156*	,036
Improved water source, rural (% of rural population with access)	-,146*	,030
Improved water source, urban (% of urban population with access)	-,112*	,093
Roads, paved (% of total roads)	-,156	,783*
Rural population (% of total population)[a]	-,151	,422*
Improved sanitation facilities, urban (% of urban population with access)	-,088	,091*
Arable land (% of land area)	,031	-,087*

Classification functions coefficients (Fisher)

	Ward Method		
	1	2	3
Arable land (% of land area)	-17,238	-17,026	-16,958
Improved water source (% of population with access)	-853,604	-860,843	-865,290
Improved water source, rural (% of rural population with access)	237,491	242,986	237,181
Improved water source, urban (% of urban population with access)	1995,874	1990,996	2014,699
Improved sanitation facilities (% of population with access)	205,692	211,049	177,211
Improved sanitation facilities, rural (% of rural population with access)	-130,710	-134,184	-119,213
Improved sanitation facilities, urban (% of urban population with access)	-15,682	-17,635	1,389
Employment in agriculture (% of total employment)	2,852	2,920	5,604
Roads, paved (% of total roads)	2,150	1,490	1,531
(Constante)	-71856,552	-71150,347	-72682,967

Equality tests for groups mean

	Lambda de Wilks	F	ddl1	ddl2	Sign.
Arable land (% of land area)	,897	4,875	2	85	,010
Improved water source (% of population with access)	,474	47,102	2	85	,000
Improved water source, rural (% of rural population with access)	,510	40,880	2	85	,000
Improved water source, urban (% of urban population with access)	,607	27,549	2	85	,000
Improved sanitation facilities (% of population with access)	,372	71,847	2	85	,000
Improved sanitation facilities, rural (% of rural population with access)	,366	73,542	2	85	,000
Improved sanitation facilities, urban (% of urban population with access)	,701	18,118	2	85	,000
Employment in agriculture (% of total employment)	,224	146,961	2	85	,000
Population in the largest city (% of urban population)	,817	9,494	2	85	,000
Roads, paved (% of total roads)	,129	287,661	2	85	,000
Rural population (% of total population)	,564	32,821	2	85	,000

Annex 3: Education indicators

Descriptive statistics

	Mean	Standard deviation	Number of observations
Total expenditure on educational institutions and administration as a % of GDP. Public sources. Tertiary	,836	,178	83
Number of students in tertiary education per 100,000 inhabitants. Total	4039,103	1102,382	83
Expenditure per student, primary (% of GDP per capita)	20,333	9,305	83
Expenditure per student, secondary (% of GDP per capita)	21,254	3,959	83
Expenditure per student, tertiary (% of GDP per capita)	24,665	6,513	83

Public spending on education, total (% of GDP)	4,710	,771	83
School enrollment, secondary (% gross)	94,178	5,800	83
School enrollment, tertiary (% gross)	53,160	14,093	83

Total variance explained

Composante	Valeurs propres initiales		
	Total	% de la variance	% cumulés
1	4,059	50,743	50,743
2	1,935	24,187	74,930
3	,954	11,927	86,857
4	,514	6,423	93,280
5	,280	3,503	96,783
6	,166	2,078	98,861
7	,066	,826	99,687
8	,025	,313	100,000

Principal components – rotated

	Composante	
	1	2
Number of students in tertiary education per 100,000 inhabitants. Total	,945	,069
School enrollment, tertiary (% gross)	,936	,122
School enrollment, secondary (% gross)	,775	,326
Expenditure per student, tertiary (% of GDP per capita)	-,733	,609
Public spending on education, total (% of GDP)	,666	,582
Expenditure per student, secondary (% of GDP per capita)	,619	,154
Total expenditure on educational institutions and administration as a % of GDP. Public sources. Tertiary	,147	,901
Expenditure per student, primary (% of GDP per capita)	,159	,737

Annex 4: Case studies from EEE region

Romania. The process of regional development in Romania is historically marked by a few important moments. The most intense preoccupations for regional development were after World War II, when the Communist Government guided the process of industrialization of the country. After the fall of Communism in 1989, Romanian government recognizes the role of regional policy as an integral part of the social and economic policy. In March 1997 the Green Paper for Regional Development is elaborated. This document becomes soon the model of regional policy and regionalization of Romania. In 1998, by the Regional Development Act (Law 151/1998), were created the Romanian regions of development. Between 1998 and 1999 specific institutions were created at the central level (National Regional Development Council with a deliberative role and the National Agency for Regional Development carrying an executive role), as well as eight other regional development agencies with an executive role within the Councils for Regional Development (Surd & al., 2011).

Nowadays, the regional development is based on the Regional Operational Program 2007-2013 (REGIO), an operational program agreed with the European Union. REGIO envisages the reduction of the economic and social disparities among the most developed and less developed regions of Romania. It is co-financed in proportion of 84% of its total by the European Regional Development Fund that assists European regions with a GDP per capital under 75% of the European average.

The regional development policy comprises a set of planned measures, implemented by the local and central authorities, in partnership with actors of various types (private, public, volunteers) with the aim to ensure a dynamic and sustainable economic growth, for the efficient exploitation of regional and local potential so as to increase the quality of life. The main aspects targeted by the regional policy are: enterprise development, labour market, attraction of investments, technology transfer, SMEs development, and infrastructure improvement, quality of the environment, rural development, health, education and culture.

In Romania higher education institutions have a visible role in regional initiatives and closely connected to the community. For example, the largest university in the North-Western region, the “Babes-Bolyai” University, is promoting the regional initiative “Cluj – European cultural capital of 2020” employing human resources and the material infrastructure. Another example is the organization of the “Academic Days of Arad” by the University “Vasile Goldis”, an event that promoted the communication between the academic environment and the community.

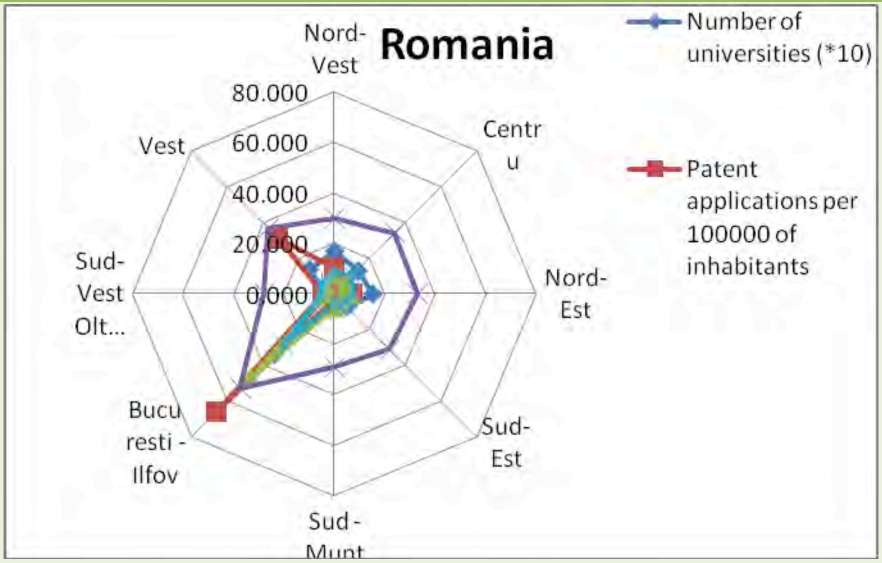

Fig.1 - The regional disparities in education, research, ICT and innovation, 2010

Bulgaria. It is a country situated in the South-East part of Europe on the Balkan Peninsula covering an area of 110,993.6 km^2, having a total population of 7.35 million (this figure is for 2011). As a former communist country, Bulgaria had the same characteristics as all the other countries in the region, suffering a decline in economic growth in the '90, and after joining the European Union in 2007, a process of recovery has begun. Like Romania, Bulgaria benefits in the period 2007-2013 from Structural Funds assistance, having allocated around 7 billion euros.

The regional structure of Bulgaria consists of six NUTS II regions (Severozapaden, Severentsentralen, Severoiztochen, Yugozapaden, Yuzhentsentralen and Yugoiztochen), with a GDP per capita of less than 75% of the EU average. The distribution of students on the six regions of Bulgaria is presented in fig .2

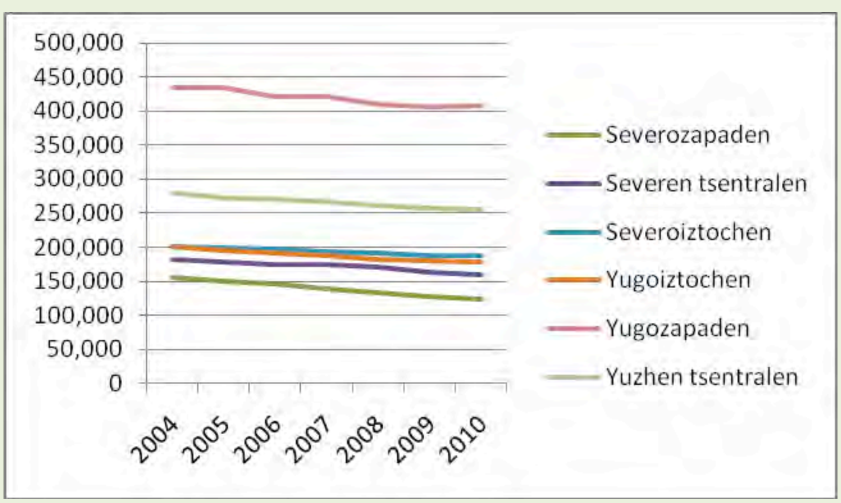

Fig.2 - The regional disparities in the number of students in Bulgaria during the period 2004-2010

Poland.

Poland is the largest country in the Central and Eastern Europe, with the most successful evolution during the past 20 years, after the fall of communist regime. Despite his tragic history(during the World War II the country disappeared, being disputed between Nazi Germany and Soviet Union), in the 70's Poland had a social and political recovery trough the Solidarnosc, the famous union which had a significant impact on the transition from the communism to a democratic regime. Starting 1990, a series of reforms have been implemented in all the areas of economy, education and health system, creating the premises for a sustainable development.

Poland developed Technology Parks as key drivers of economic and regional development. Nowadays there are 17 Special Economic Zones in Poland: Cracow Technology Park, Czestochowa, Kamienna Gora, Katowice, Kostrzyn-Slubice, Legnica, Lodz, Mielec, Modlin Techno-Park, Slupsk, Starachowice, Suwalki, Tarnobrzeg Wislosan Euro-Park, Tczew, Walbrzych, Warmia-Mazury and Zarnowiec. The main purposes of the zones are: creating new employment, protection of the environment, application of new technology, management of natural resources and taking advantage of unused assets and infrastructure.

The relationship between the universities, regional development and economic competitiveness has been recently studied in Kwiek(2011) for the case of Poland. According to this author "the universities' regional engagement generally occurs in teaching rather than in research and the role of universities for economic growth can be considerably lower than it is assumed in the knowledge-economy discourse used to support Polish higher education reforms". Also, "their academic entrepreneurialism is low, universities' partnerships with enterprises are relatively rare and their scientific and technological parks are small, with underdeveloped links to the business community, their regional mission in research is underdeveloped (although their regional mission in teaching is well-grounded) and their role in national innovation systems is low ".

Czech Republic. The R&D activities are also well developed, under the supervision of government and the collaboration of private actors. The programme National Research Centres can be considered as a successful example of improved cross-sectorial R&D co-operation.

The Business Innovation Centre (BIC) in Prague became an important actor in the regional R&D-based co-operation and networking. The Technology Centre of the Academy of Sciences had established this centre in order to support SMEs in their efforts to get access to advanced technologies and their application. The BIC is a member of the European Business Innovation Centre Network and of the corresponding domestic network. This domestic network includes BIC Prague, Czech Technical University in Prague, BIC Plzen, BIC Ostrava and BIC Brno.

Annex 5: Case studies from EEE region

Romania. An initiative for increasing the interaction between higher education institutions or research centers and business environment for regional development was the creation of science and technology parks:

- **Scientific and Technological Park "TEHNOPOLIS"** is a consortium located in North Eastern region, in Iasi, created in 2002 and authorized to function from 2004. The members of consortium are: Technical University "Gheorghe Asachi" of Iasi, University "A.I. Cuza" of Iasi, University of Agronomical Sciences and Veterinary Medicine "Ion Ionescu de la Brad", University of Medicine and Pharmacy "Gr.T.Popa"; County Council and Local Council of the city of Iasi. TEHNOPOLIS aims to increase the usage of the research results, to apply the cutting edge technologies in economy and to support the participation of higher education institutions in the process of economic and social development.

- **"Software Park"** is a consortium located in South Eastern Region, in Galati. His members are: University "Dunarea de Jos", the County Council, the Local Council and S.C. Navrom S.A. Galatzi. The main goal of this scientific park the development of industrial sector by using high technologies, the promotion of technology transfer and the jobs creation in South-Eastern region. Nowadays, 34 companies are located in the software park, with around 300 employees. The University Dunarea de Jos offers courses of high specialization in high technology, participate in joint research programs, involve students in the research projects developed within the science park through internships.

- **Science and Technology Park for Micro and Nanotechnologies MINATECH-RO** is the first non-software science and technology infrastructure in Romania, focused on R&D for micro and nanotechnologies. It was created in 2004 and in 2006 was officially launched as a prominent Infrastructure for Technology Transfer and Innovation. The consortium is located in Bucharest and has as members: “Polytechnic” University of Bucharest, The National Institute for Research and Development in Microtechnologies (IMT) and SC ROMES S.A. The main goals of this park are to enhance technology transfer and innovation, to provide education and training to companies, to facilitate the access of Romanian innovative SMEs to European networks and partnerships.

- Scientific and Technological Park “TIM SCIENCE PARK” is a consortium located in Western region, in Timisoara, created in 2006. The members of the consortium are: Western University “Vasile Goldis” of Arad, the National Institute for Research – Development in Electrochemistry and Condensed Matter (INCEMC), the Foundation for Culture and Learning “Ioan Slavici” from the University “Ioan Slavici” of Timisoara, the Trade, Industry and Agriculture Chamber of Timisoara, SC ELBA SA, and others. The main goals of the science park are: the use of scientific, economic and technological potential for regional development, the technological and innovation transfer, the valorization of the research results, the creation of new jobs, the youth formation, improving the attractivity of region for foreign investors.

Bulgaria. Bulgaria today spends about half a percent of its GDP on R&D, compared to about 2 percent EU-27 average. Investments in research and development have been identified as core contributors to Bulgaria’s global competitiveness in the Government’s National Reform Program (NRP) 2011–2015. To meet the national target of 1.5 percent R&D/GPD by 2020, Bulgaria would need to greatly increase the absorption of EU funds and boost public R&D spending, while maintaining a prudent fiscal position. Business as usual will not deliver the needed increase in R&D investments, the report asserts.

Data from recent enterprise surveys indicates that Bulgarian firms that innovate tend to grow one-and-a-half times faster than non-innovating firms. Innovative firms also tend to create more jobs: in recent years, innovative companies have enjoyed an 8% annual increase in employment, whereas job growth in non-innovative companies has been stagnant. The report found that one in five firms in Bulgaria said that they do not have access to the external finance they need to make long-term R&D investments. ”

In Bulgaria there are established a few **business incubator centers**, in various fileds:

- Technology Business Incubators: Hi Tech Incubator Gabrovo

- Business Incubators: Innovative Business Incubator Sliven, Agribusiness Center Kubrat, Business Incubator - Gotse Delchev, SME Business Support Center – Rousse, Agency for Regional Development and Business Center – Vidin

- Virtual Business Incubators: High Tech Business Incubator – Burgas

Moreover, nowadays there is a project for setting up the first **Science and Technology Park in Sofia**, the capital of the country.

Hungary. The business incubators and technological parks established in Hungary are:

- Innotech Technical University Innovation Park in Budapest
- INNONET Innovation and Technology Center in Győr Ipari Park
- CHIC Central Hungarian Innovation Centre in Budaörs
- Ajka Regional Business Development Center in Ajka
- Innostart National Business and Innovation Center in Budapest
- Labirintus Office Center and Incubator Ltd. in Budapest
- Somogy-Flandria Business Incubators in Kaposvár
- Kazincbarcika Business Development Center in Kazincbarcika
- Zemplén County Business Development Foundation in Sátoraljaújhely
- Vas County & Szombathely Regional Business Development Center in Szombathely.

Smahó (2010) emphasize the role of knowledge in explanation of economic growth and regional development of Hungary and Austria: ” the link between knowledge and regional development are established by innovation i.e. the application of knowledge”.

Poland. The scientific production, quantified and the number of scientific and technical journal articles published have a high growth rate, ranking Poland the 19th among 175 world countries.

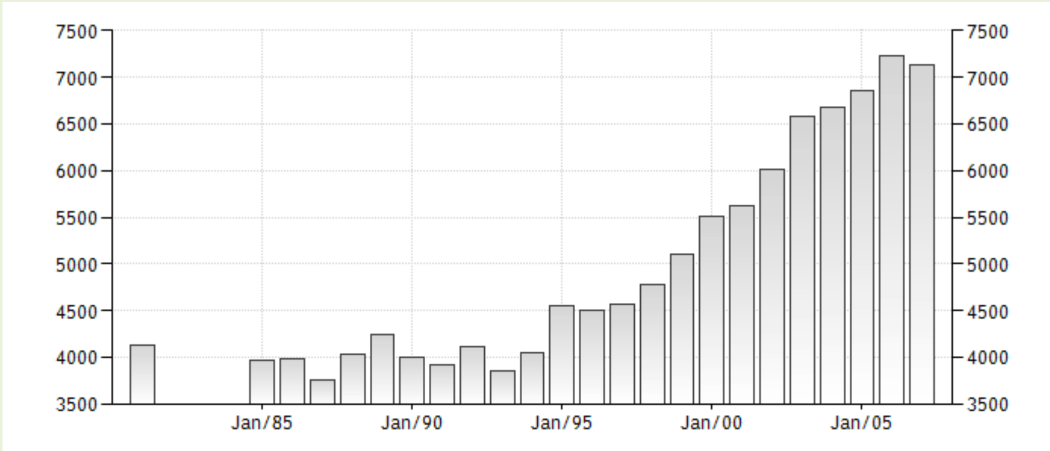

Fig.4 Scientific and technical journal articles (Source data: www.tradingecononomics.com)

Czech Republic. The Czech system of tertiary education has made great reforms in reestablishing its universities as scientific organizations. The production of scientific and technical journal articles has increased during the past 10 years, in 2009 Czech Republic being ranked on 31th position from 175 countries.

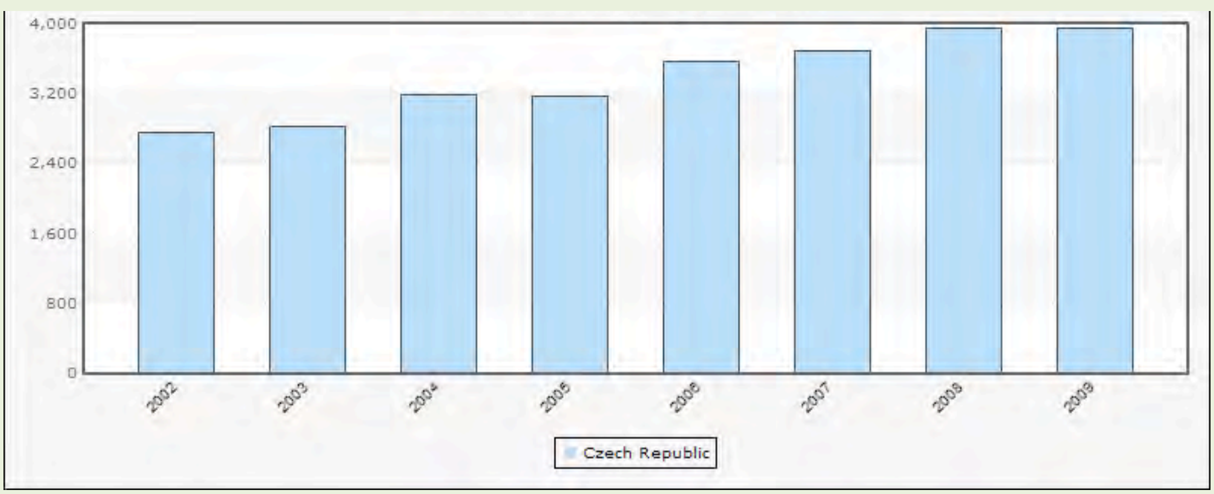

Fig.5 Scientific and technical journal articles (Source data: UNESCO)

Annex 6: Case studies from EEE region

Romania. The Romanian educational system is regulated and enforced by the Ministry of Education, Research, Youth and Sports (MECTS). Access to free education is guaranteed by Article 32 in the Constitution of Romania. Since the downfall of the communist regime, the Romanian educational system has been restructured many times. National Education Law (Law no. 1/2011) was released last year and entered into force, bringing major changes to the educational system in Romania.

Each education cycle has its own form of organization and is subject to different laws and directives. Kindergarten is optional under the age of six. At the age of six, children must join the "preparatory school year", which is mandatory in order to enter the first grade. Schooling is compulsory until the tenth grade but the school educational cycle ends in the twelfth grade, when students graduate the baccalaureate. Higher education is aligned onto the European Higher Education Area.

Higher education in Romania is less centralized than in many countries in the Western Europe, with every university having its own internal policies regarding admission, exams and conditions for graduation.

Higher education is provided by a total number of 108 higher education institutions: 56 public and 52 private. Private higher education emerged in Romania after 1990, registering a spectacular evolution. Participation in higher education has constantly increased in the last 20 years, with the exception of the last two years of economic crisis.

Looking at the distribution of higher education institutions and of students enrolled over the eight development regions of Romania, we observe a concentration of higher education in Bucharest where are located almost one third of the total number of public and private higher education institutions. The second region with a high concentration of higher education institutions is North Western region, with the faimous universities of Cluj (10 institutions) and Oradea (4 institutions).

The development of knowledge based economy increases the role of universities in regional innovation, both in terms of enlargement of the knowledge sector itself and in terms of the increasing use of information and knowledge in all sectors and activities. Moreover, higher education institutions have a good research infrastructure that can be used in joint research programs with business environment. In Romania, the Structural Funds, the Regional Development Agencies created to foster knowledge-building and the interaction between local universities and their proximate industry are examples in this respect. Moreover, the Romanian universities provide research services and research infrastructure to the business environment through Research Centers. For example, University of Bucharest has 79 research centres, University “Babes-Bolyai” of Cluj has 47 research centres, Academy of Economic Studies – 22 research centres, University of Medicine and Pharmacy “Victor Babes” of Timisoara – 10 research centres. Unfortunately, these research centers have a reduced activity, mostly depending on the availability of funds through national or internal competitions. In other words, private funds attracted for research and development activities have a much lower share in the total research funds.

Popescu (2011) analysis on Romanian case reveals the need to improve the relevance of university education, to widen and strengthen the collaboration between higher education institutions and the business environment, to improve the flexibility of the workforce by re-skilling and up-skilling through lifelong learning. In collaboration with regional and local authorities, universities are in the need to develop and expand learning and skills development programs, research activities and outreach efforts to support the cultural and creative industry development of the regions they are embedded in, taking also into consideration the international dimension by building stronger connections with students, researchers and professionals from Europe and abroad.

Bulgaria. The educational system is regulated by two main laws: *Higher Education Act* (1995) and the *Amendment to the Higher Education Act* (1999). This legal framework introduced a new system of academic degrees and an agency for quality assessment and accreditation of postsecondary school. The 1999 amendment abolished free education and introduced tuition fees at all public universities.

Marinova-Christidi(2009) discuss the development of educational process in Bulgaria and summarize the main challenges :

- Absorption from the EU Structural Funds and increasing investments in education;
- Ongoing work on the elaboration of a Strategy for the Development of Higher Education;
- Strengthening the status of higher education institutions as research centers;

- Encouraging co-operation between private sector and higher education.

Hungary. According to Investment and Trade Agency in Hungary (2009), there are several competitive advantages in R&D and education development:

- **World-class scientific knowledge** – Hungary ranks 4th of 13 countries in the Central and Eastern European Talent Index and 23rd of 133 countries for the quality of its scientific research institutions.

- *Large presence of multinationals investing in R&D activities* – a large number of investments in the automotive and life sciences sector, as well as software development.

- *Continuously expanding R&D investments in the corporate sector* – 50% of all investment originates from the business sector.

- *Open-minded researchers, high level of foreign research cooperation* – more than 15 knowledge centers provide great opportunities for academic researchers to meet market demand for innovation.

- *Efficient incentive system for new investments* – the government supports investments aiming to establish new research and development facilities worth at least EUR 10 million with a special incentive package and ITD Hungary's one-stop services.

- *A boom in technology park developments in university cities* – seven new parks, partly assisted by EU funds, are currently in the planning phase.

- *Quality of research* - The World Economic Forum Global Competitiveness Report surveys company executives and evaluate 130 countries every year. One criterion is the quality of scientific research institutions, in which Hungary was among the best 25 countries in 2009.

Poland was the only country in the Central and Eastern Europe unaffected by the negative impact of the economic and financial crisis, having a positive economic growth. Moreover, Poland managed to achieve a 100% rate from the structural funds for development from the European Union, after the accession in 2004. All these positive macroeconomic evolutions were reflected in an increased quality of education system and an impressive development of research and innovation. According to the latest OECD and UNESCO statistics, Poland spends 5.62% of GDP for education (rank 39 from 136 countries) and 11.4% government expenditure(rank 57 from 103 countries).

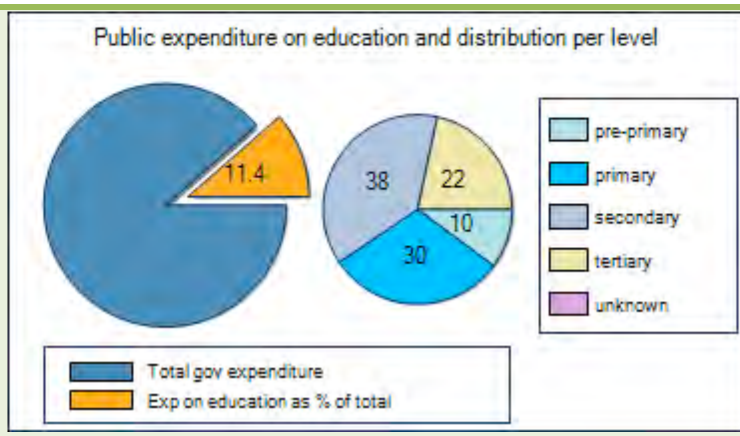

Fig.6 - Public expenditure (Source data: UNESCO)

Also public and private expenditure for research and development (R&D) are at a very high rate among the countries in Central and Eastern Europe. In 2009 almost 40% of R&D was founded by the private sector, while 34% of R&D was carried out in the government sector.

There are approximately 500 universities and schools for higher education in the country, and two of them are in the top 500 universities in Shanghai Academic Ranking(2011) : Jagiellonian University from Krakow and University of Warsaw(both of them are ranked 301-400).

Czech Republic is one of the most developed countries among the new members of the EU, with a solid market economy and with high education and research potential. After the Velvet Revolution Czech higher education institutions found themselves confronting to challenges like: "change their governance and management structures to more democratic ones that would allow more autonomous behaviour; change their curricula to match the transformation from socialist economies to market economies; change their mission from mainly teaching oriented to incorporate research; compete with a new sector of private higher education institutions of varying kinds" (Westerheijden and Sorensen, 1999).

According to the latest data from OECD, the education expenditure is around 4.4% from GDP (rank 75 of 132 countries), while the share from total government expenditure is around 10%.

The Czech Republic's higher education system consists of over 25 public and more than 40 private universities and colleges and the government fully funds public universities and colleges. Some of the most important are:

- Czech Technical University in Prague, the oldest institute of technology in Central Europe and among the world's top 400 institutions (394th) in the QS World University Ranking 2009.

- Masaryk University, the second-largest public university in the Czech Republic and among the world's top 600 universities in QS World University Rankings 2009.

- Charles University ranked 1st in the country and 110th in the world according to the Webometrics Rankings in January 2010.

- Brno University of Technology, placed among the 400 to 600 best universities world-wide.

Annex 7: Emigration Rates of Students from Arab and EEE countries

Years	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	1999-2010
Algeria	0.000124		0.000089	0.000086	0.000096	0.000105	0.000094	0.000090	0.000074		0.000057	0.000057	0.000087
Bahrain	0.020815				0.016645	0.019162	0.020819	0.019700				0.008174	0.019428
Egypt	0.000004				0.000005	0.000004	0.000004	0.000004	0.000004	0.000005			0.000004
Iraq	0.000047	0.000044		0.000039		0.000021	0.000032						0.000036
Jordan			0.001192		0.001064	0.000894	0.000750	0.000731	0.000728	0.000705	0.000650	0.000672	0.000821
Kowait	0.014805		0.013146	0.012986	0.011674	0.012922							0.013106
Lebanon	0.001763	0.001788	0.001730	0.001927	0.002110	0.002007	0.001816	0.001775	0.001619	0.001601	0.001548	0.001486	0.001764
Libye	0.000099	0.000106	0.000122	0.000129	0.000124								0.000116
Mauritania	0.000556	0.000745	0.000722	0.000691	0.000757	0.000811	0.000764	0.000842	0.000879	0.000903	0.000942	0.000986	0.000800
Morocco	0.000479	0.000534	0.000505	0.000565	0.000561	0.000472	0.000411	0.000369	0.000353	0.000330	0.000320		0.000445
Palestine	0.002958	0.002829	0.002579	0.002347	0.002054	0.001713	0.001605	0.001494	0.001452	0.001426	0.001556	0.001334	0.001946
Oman				0.005245	0.005329	0.005599	0.004250	0.003771	0.003149	0.003234	0.002413	0.002347	0.003926
Qatar	0.020327		0.023768	0.023712	0.023485	0.018618	0.021501	0.016944	0.014484	0.011875	0.011294		0.018601
Saudi Arabia	0.000935	0.000850	0.000800	0.000826	0.000626	0.000564	0.000523	0.000472	0.000555	0.000559	0.000588	0.000509	0.000651
Tunisia	0.000617	0.000587	0.000551	0.000563	0.000549	0.000503	0.000476	0.000503	0.000507	0.000494	0.000499		0.002405
UAE	0.003531	0.003143	0.002429	0.002157	0.001942						0.001230		0.002405
Yemen	0.000142	0.000143				0.000178	0.000176	0.000174	0.000137				0.000158
Albania	0.006507	0.007769	0.009420	0.010491	0.013350	0.013052							0.010098
Belarus	0.000286	0.000288	0.000264	0.000319	0.000275	0.000372	0.000385	0.000409	0.000477	0.000928	0.000884	0.000862	0.000479
Bosnia										0.006849	0.005695	0.005554	0.006033
Bulgaria	0.000762	0.000971	0.001310	0.001893	0.002329	0.002636	0.002666	0.002533	0.002302	0.002076	0.002040		0.001956
Croatia	0.003630		0.003947	0.003787	0.003618		0.003227	0.001791	0.001770	0.001869	0.002021		0.002851
Tchec	0.000354	0.000354	0.000399	0.000413	0.000467	0.000404	0.000382	0.000373	0.000354	0.000416	0.000428		0.000395
Estonia	0.008165	0.007920	0.008329	0.007039	0.007679	0.006348	0.006365	0.006006	0.005761	0.006207	0.006614		0.006949
Hungaria	0.000419	0.000414	0.000401	0.000399	0.000369	0.000309	0.000296	0.000276	0.000285	0.000292	0.000331		0.000345
Lettonia	0.001963	0.001901	0.002015	0.001964	0.002131	0.001856	0.001832	0.001852	0.002052	0.002175	0.002355	0.002659	0.002063
Lituania	0.001439	0.001521	0.001747	0.001811	0.001898	0.001719	0.001695	0.001624	0.001668	0.001728	0.001870		0.001702
Poland	0.000051	0.000051	0.000051	0.000055	0.000062	0.000062	0.000067	0.000066	0.000070	0.000069	0.000069		0.000061
Roumania	0.000219	0.000240	0.000240	0.000255	0.000258	0.000247	0.000234	0.000221	0.000200	0.000178	0.000182		0.000225

Serbia								0.000954	0.001037	0.001014	0.001188		0.001048
Slovaquia	0.001297	0.001574	0.002294	0.002674	0.003026	0.003217	0.003414	0.003607	0.003484	0.003516	0.003658		0.002887
Slovenia	0.002029	0.006170	0.002072	0.001996	0.006924	0.002174	0.002088	0.001757	0.001678	0.001734	0.001848		0.002770
Turkey	0.000131		0.000115	0.000114	0.000097	0.000095	0.000087	0.000051	0.000051	0.000054	0.000052		0.000085
Ukrainia	0.000029	0.000045	0.000037	0.000040	0.000032	0.000040	0.000040	0.000037	0.000038	0.000045	0.000048	0.000052	0.000040

Annex 8: Regional Positioning of Universities

Host Country		Name of the University	Origin Country
Qatar		Carnegie Mellon University	USA
		Cornell University- Weill Medical College	USA
		Georgetown University School of Foreign Service	USA
		Northwestern University	USA
		Texas A&M University	USA
		Virginia Commonwealth University	USA
United Arab Emirates, Abu Dhabi		INSEAD	France
		New York Film Academy	USA
		New York Institute of Technology	USA
		New York University	USA
		Sorbonne University	France
United Arab Emirates, Dubai	**Dubai Health Care City** (Free Zone)	Boston University Institute for Dental Research and Education	USA
		Royal College of Surgeons	Ireland
	Dubai International Academic City/Dubai Knowledge Village (Free Zone)	Bharati Vidyapeeth University	India
		Birla Institute of Technology and Science	India
		Cambridge College International	Australia
		EHSAL-Hogeschool-Universiteit Brussels (does not appear to have KHDA licensure)	Belgium
		French Fashion University Esmod	France
		Heriot-Watt University	UK
		Hult International Business School	USA
		Institute of Management Technology	India
		Islamic Azad University	Iran
		Manchester Business School	UK
		Manipal University	India
		Michigan State University (closed most of its operations in July, 2010)	USA
		Middlesex University	UK
		Murdoch University	Australia
		Postgraduate Institute of Management, The University of Sri Jayewardenepura (Closed 2009)	Sri Lanka
		Saint-Petersburg State University of Engineering and Economics	Russia
		Shaheed Zulfikar Ali Bhutto Institute of Science and Technology	Pakistan
		Saint Joseph University	Lebanon
		SP Jain Centre of Management	India
		University of Bradford	UK

		University of Exeter	UK
		University of Southern Queensland (Closed in 2005)	Australia
		University of Wollongong	Australia
	Dubai International Financial City (Free Zone)	CASS Business School	UK
		London School of Business	UK
	Silicon Oasis (Free Zone)	Rochester Institute of Technology	USA
United Arab Emirates, Ras Al Khaimah		Federal Institute of Technology Lausanne-EPFL	Switzerland
		George Mason University (closed in 2009, campus turned into American University of RAK)	USA
		Madurai Kamaraj University	India
		Mahatma Gandhi University (Appears to be moving to RAK from Dubai)	India
		University of Bolton	UK
		University of Pune	India
		Vatel International Business School	France

Arab countries:

Host Country	Name of the University	Origin Country
Tunisia	Esmod	France
	Paris- Dauphine University Dauphine Institute	France
Bahrain	AMA Computer University	The Philippines
	New York Institute of Technology	USA
	Royal College of Surgeons	Ireland
Jordan	DePaul University	USA
	New York Institute of Technology	USA
Kuwait	Box Hill Institute	Australia
Qatar	College of North Atlantic	Canada
	Houston Community College	USA
	Stenden Hogeschool	The Netherlands
	University of Calgary	Canada
Yemen	International University College of Technology Twintech	Malaysia

Annex 9: ICTs' Role in and Impact on Enhancing Social and Economic Performances in the Arab Region

Table 1:

Country Name/ 2010	Internet Users	HEPC 2009	GDP pc 2009	GDP 2009	TLEB 2009
Bahrain	694009.25	770.623628	17608.8298	2.0595E+10	75.0238293
Egypt, Arab Rep.	21691776	113.620268	2370.71111	1.8898E+11	72.9752683
Iraq	791789.775	200.414688	2096.85105	6.5193E+10	68.4860488
Jordan	2351146.26	373.287909	4242.1537	2.5092E+10	73.2896585

Kuwait	1046799.99	1578.75097	41364.6893	1.0946E+11	74.6047317
Lebanon	1310555.07	617.131462	8321.37074	3.4925E+10	72.4087561
Libya	889715.68	427.236419	9957.49041	6.236E+10	74.753122
Morocco	15656191.9	151.51309	2827.81855	9.0908E+10	71.8646341
Oman	1725109.7	520.379297	17280.0972	4.6866E+10	73.1246098
Qatar	1435175.09	1612.1451	61531.6921	9.8313E+10	78.0975854
Syrian Arab Republic	4224995.44	95.44027	2691.59766	5.3935E+10	75.702561
Tunisia	3856983.71	242.550288	4168.93675	4.3522E+10	74.6
United Arab Emirates	5859118.2	1704.05982	38959.8122	2.7033E+11	76.5736098
Yemen, Rep.	2970485.48	63.4003858	1077.24014	2.513E+10	65.0304634
Middle East & North Africa (all income levels)	96625274	306.340769	5823.36424	2.1861E+12	72.4873235
Middle East & North Africa (developing only)	69363777.2	189.290494	3268.28162	1.0642E+12	72.0012722
OECD members	844430192	4185.63766	33407.9107	4.1053E+13	79.3237783
World	2038644960	900.073245	8520.25178	5.8074E+13	69.6272321

Table 2:

Country Name/ 2010	**Ln(Internet Users)**	**Ln(HEPC 2009)**	**Ln(GDP pc 2009)**	**Ln(GDP 2009)**	**Ln(TLEB 2009)**
Bahrain	13.4502406	6.64720009	9.77615575	23.7483093	4.31780579
Egypt, Arab Rep.	16.8924438	4.73286191	7.77094524	25.9649287	4.29012059
Iraq	13.5820512	5.30038866	7.648192	24.9006133	4.22663006
Jordan	14.6704135	5.92235	8.35282637	23.9458284	4.29441951
Kuwait	13.8612484	7.36438929	10.6301829	25.4188506	4.31220393
Lebanon	14.0859613	6.42508207	9.02658227	24.2764604	4.28232723
Libya	13.6986572	6.05733754	9.20608035	24.856197	4.31419098
Morocco	16.566377	5.02067202	7.94726086	25.2331183	4.27478427
Oman	14.3608012	6.25455796	9.75731067	24.5705596	4.29216497
Qatar	14.1767974	7.38532093	11.0273076	25.311424	4.35795914
Syrian Arab Republic	15.2565287	4.55850061	7.89789022	24.7110368	4.32681199
Tunisia	15.165396	5.49120906	8.33541631	24.4965331	4.31214051
United Arab Emirates	15.5835097	7.44076882	10.5702859	26.3229275	4.3382525
Yemen, Rep.	14.904236	4.14946995	6.98215763	23.9473317	4.17485583
Middle East & North Africa (all income levels)	18.3863509	5.72469811	8.66963342	28.4131307	4.2834117
Middle East & North Africa (developing only)	18.0548753	5.24328284	8.09201963	27.6932757	4.27668379
OECD members	20.5541726	8.33941434	10.416548	31.3458743	4.37353794
World	21.4355512	6.80247614	9.05020117	31.6927407	4.24315576

Table 3:

Country Name/ 2010	Investment in Telecoms 2010	Health Exp PC 2009	GDP pc 2009	GDP 2009	Total Life Expectancy at Birth 2009
Egypt, Arab Rep.	2113000000	113.620268	2370.71111	1.8898E+11	72.9752683
Iraq	456000000	200.414688	2096.85105	6.5193E+10	68.4860488
Jordan	301000000	373.287909	4242.1537	2.5092E+10	73.2896585
Morocco	1124000000	151.51309	2827.81855	9.0908E+10	71.8646341
Syrian Arab Republic	65000000	95.44027	2691.59766	5.3935E+10	75.702561
Tunisia	966000000	242.550288	4168.93675	4.3522E+10	74.6
Yemen, Rep.	59000000	63.4003858	1077.24014	2.513E+10	65.0304634
Middle East & North Africa (developing only)	5854000000	189.290494	3268.28162	1.0642E+12	72.0012722

Table 4:

Country Name/ 2010	Ln(Investment in Telecoms 2010)	Ln(Health Exp PC 2009)	Ln(GDP 2009)	Ln(GDP pc 2009)	Ln(Total Life Expectancy at Birth 2009)
Egypt, Arab Rep.	21.4713746	4.73286191	25.9649287	7.77094524	4.29012059
Iraq	19.9380034	5.30038866	24.9006133	7.648192	4.22663006
Jordan	19.5226208	5.92235	23.9458284	8.35282637	4.29441951
Morocco	20.8401596	5.02067202	25.2331183	7.94726086	4.27478427
Syrian Arab Republic	17.9898978	4.55850061	24.7110368	7.89789022	4.32681199
Tunisia	20.6886744	5.49120906	24.4965331	8.33541631	4.31214051
Yemen, Rep.	17.893048	4.14946995	23.9473317	6.98215763	4.17485583
Middle East & North Africa (developing only)	22.490391	5.24328284	27.6932757	8.09201963	4.27668379

Table 5:

Country Name	TLEB 2010	HEPC 2010	GDP per Cap 2010	GDP 2010	Invest. in Telecom 2009	Internet Users 2009
Bahrain	75.02	864.15				619876.34
Egypt, Arab Rep.	72.98	123.19	2698.37	218894280919.77	1791000000.00	19355094.09
Iraq	68.49	246.75	2564.71	82150312820.51	447000000.00	325680.91
Jordan	73.29	357.44	4559.87	27573536000.00	164000000.00	1566653.92
Kuwait	74.60	1223.30				975165.74
Lebanon	72.41	651.04	9227.87	39006223284.17		993847.23
Libya	74.75	483.72				676368.04
Morocco	71.86	147.95	2795.54	90804562195.56	240000000.00	13065058.41
Oman	73.12	574.31				1396752.62
Syrian Arab Republic	75.70	96.59	2892.70	59147033451.85	108000000.00	3469297.54
Tunisia	74.60	237.84	4198.58	44290845562.54	287000000.00	3531385.82

United Arab Emirates	76.57	1449.92	39623.07	297648476848.08		5204111.25
Yemen, Rep.	65.03	63.19	1300.05	31270054959.64	50000000.00	2323490.11
Middle East & North Africa (all income levels)	72.49	322.24	6468.44	2476139937207.63		81840676.76
Middle East & North Africa (developing only)	72.00	203.18	3643.58	1206982758168.50	4565000000.00	58629801.41

Table 6:

Country Name	Ln(TLEB 2010)	Ln(HEPC 2010)	Ln(GDP per Cap 2010)	Ln(GDP 2010)	Ln(Internet Users 2009)
Egypt, Arab Rep.	4.290121	4.8137086	7.90040229	26.11185471	16.7784662
Iraq	4.22663	5.5083888	7.849601748	25.13181649	12.69367337
Jordan	4.29442	5.8789639	8.42504947	24.04012231	14.26445264
Lebanon	4.282327	6.4785751	9.129983962	24.38698704	13.80933878
Morocco	4.274784	4.9968767	7.935781427	25.23197537	16.38545193
Syrian Arab Republic	4.326812	4.5704236	7.969945543	24.80329227	15.05946269
Tunisia	4.312141	5.4715859	8.34250222	24.51404385	15.07720094
United Arab Emirates	4.338252	7.279266	10.58716672	26.41917902	15.4649595
Yemen, Rep.	4.174856	4.1461933	7.170156479	24.16592677	14.65858097
Middle East & North Africa (all income levels)	4.283412	5.7752848	8.774690932	28.53772199	18.22028495
Middle East & North Africa (developing only)	4.276684	5.3140963	8.200721593	27.81914477	17.88675368

Table 7:

Country Name	Ln(TLEB 2010)	Ln(HEPC 2010)	Ln(GDP per Cap 2010)	Ln(GDP 2010)	Ln(Invest. in Telecom 2009)	Ln(Internet Users 2009)
Egypt, Arab Rep.	4.290121	4.8137086	7.90040229	26.11185471	21.30603996	16.7784662
Iraq	4.22663	5.5083888	7.849601748	25.13181649	19.91806915	12.69367337
Jordan	4.29442	5.8789639	8.42504947	24.04012231	18.91537699	14.26445264
Morocco	4.274784	4.9968767	7.935781427	25.23197537	19.29614948	16.38545193
Syrian Arab Republic	4.326812	4.5704236	7.969945543	24.80329227	18.49764179	15.05946269
Tunisia	4.312141	5.4715859	8.34250222	24.51404385	19.47499277	15.07720094
Yemen, Rep.	4.174856	4.1461933	7.170156479	24.16592677	17.72753356	14.65858097
Middle East & North Africa (developing only)	4.276684	5.3140963	8.200721593	27.81914477	22.24168435	17.88675368

Annex 10: Trade Liberalization & Export

Country	Intercept	Coefficients	R^2
Algeria	97.318 (22.353)	1.845 (2.507)	0.411
Egypt	234.681 (83.675)	0.136 (0.287)	0.009
Jordan	245.090 (151.305)	0.491 (1.792)	0.263
Lebanon	248.863 (193.643)	0.354 (1.632)	0.228
Mauritania	138.500 (9.461)	2.754 (1.113)	0.121
Palestine	126.318 (6.169)	4.390 (1.268)	0.151
Qatar	230.454 (48.509)	1.036 (1.290)	0.156
Sudan	133.954 (4.024)	-2.791 (-0.496)	0.026
Tunisia	201.590 (23.649)	2.263 (1.571)	0.215
UAE	258.227 (1076.602)	0.190 (4.708)	1.571
Bahrain	236.227 (118.816)	1.081 (3.219)	0.535
Iraq	79.590 (2.875)	9.627 (2.057)	0.319
Kuwait	235.409 (42.679)	0.190 (0.204)	0.004
Libya	63.818 (3.235)	9.490 (2.846)	0.473
Morocco	246.409 (245.637)	0.518 (3.056)	0.509
Oman	236.045 (47.895)	0.118 (0.141)	0.002
Saudi Arabia	256.454 (101.202)	-0.636 (-1.485)	0.196
Syria	241.090 (35.062)	0.600 (0.516)	0.028
Yemen	157.090 (6.142)	0.327 (0.075)	0.0006

Annex 11: Oil and gas revenues in relation to prices

Country	**Cst**	**Coe. Pt**	**Coe. Pt-1**	**Coe. Pt-2**	**R^2**
Algeria	11.5090506	0.130426	-0.01765	-0.0959	0.413906
	(6.7650)	(4.2681)	(-0.4766)	(-2.9083)	
	11.09226	0.104336	-0.07546		0.268099
	(0.0000)	(0.0026)	(0.0350)		
	10.34399	0.04154			0.167501
	(5.3585)	(2.6913)			
	12.3109		0.023825		0.048186

	(5.9864)		(1.3500)		
	13.67941			0.0099	0.007879
	(6.6564)			(0.5346)	
Bahrain	17.39808	0.024324	-0.13688	0.176577	0.175166
	(5.3718)	(0.6075)	(-1.9515)	(2.0303)	
	21.33437	0.034693	-0.0222		0.033497
	(7.7535)	(0.8237)	(-0.5033)		
	21.00993	0.016241			0.0237
	(7.9693)	(0.7944)			
	21.77497		0.009416		0.007266
	(8.1179)		(0.4362)		
	19.79642			0.030794	0.042776
	(6.3831)			(1.0779)	
Egypt	11.87381	0.033577	2.72E-05	-0.03457	0.024694
	(4.8168)	(0.7583)	(0.0005)	(-0.7234)	
	11.72359	0.024174	-0.02081		0.009681
	(4.8057)	(0.5750)	(-0.4629)		
	11.51723	0.006856			0.003617
	(4.8552)	(0.3614)			
	12.00594		0.002194		0.000324
	(5.0716)		(0.1079)		
	12.49434			-0.00317	0.00064
	(5.3931)			(-0.1517)	

Country	Cst	Coe. Pt	Coe. Pt-1	Coe. Pt-2	R²
Jordan	0.006054	-1.2E-05	-3.6E-05	3.67E-05	0.055133
	(2.0616)	(-0.2593)	(-0.6811)	(0.7362)	
	0.006342	1.36E-06	-1.8E-05		0.029526
	(2.2032)	(0.0317)	(-0.3941)		
	0.006138	-1.4E-05			0.022347
	(2.2105)	(-0.7091)			
	0.006361		-1.7E-05		0.029479
	(2.3121)		(-0.8174)		
	0.005342			-7.9E-06	0.005822
	(1.9212)			(-0.3589)	
Kuwait	51.0106	0.260313	0.023471	-0.36126	0.338563
	(10.7001)	(3.3572)	(0.1846)	(-2.5838)	
	46.09711	0.246294	-0.23298		0.204742
	(9.7612)	(2.9476)	(-2.7168)		
	44.22094	0.046348			0.032097
	(8.7053)	(1.0773)			

	49.64049		-0.01034		0.001517
	(9.8422)		(-0.2305)		
	52.81992			-0.05028	0.022511
	(9.6975)			(-0.8977)	
Libya	24.84566	0.22944	0.095154	-0.26309	0.717253
	(5.2286)	(4.1632)	(0.8362)	(-1.6564)	
	20.45493	0.205192	-0.07015		0.661841
	(4.9091)	(3.6553)	(-1.2149)		
	19.72043	0.145816			0.628565
	(4.7138)	(5.2034)			
	24.68393		0.113612		0.360612
	(4.6316)		(3.0039)		
	23.14318			0.145602	0.317563
	(3.7149)			(2.7286)	

Annex 12: Trends

Algeria

Variable	Cst	Coeff	R²
EPI	47.266 (118.989)	.237 (3.537)	.582
EH	54.379 (89.171)	1.288 (12.497)	.946
EV	44.217 (84.746)	-.213 (-2.413)	.393
EHEH	49.449 (255.809)	1.047 (32.040)	.991
EHAIR	70.988 (28.011)	3.074 (7.177)	.851
EHWATER	47.631 (526.079)	-.015 (-1.010)	.102
EVAIR	49.425 (36.403)	1.547 (6.742)	.835
EVWATER	30.7		
EVBH	37.5		
EVAG	61.0		
EVFOREST	63.163 (11.968)	-2.347 (-2.631)	.435
EVFISH	40.401 (23.698)	-1.440 (-4.998)	.735
EVCLIMATE	44.368 (277.254)	-.380 (-14.042)	.956
CHMORT_pt	49.449 (255.809)	1.047 (32.040)	.991

INDOOR_pt	41.976 (8.282)	6.149 (7.177)	.851
PM25_pt	100		
WATSUPINV_pt	42.493 (97.927)	-.990 (-13.504)	.953
ACSATINV_pt	52.768 (167.064)	.960 (17.972)	.973
SO2CAP_pt	49.103 (42.509)	1.310 (6.708)	.833
SO2GDP_pt	49.747 (31.776)	1.785 (6.744)	.835
WATUSEINV_pt	30.7		
PACOV_pt	37.1		
MPAEEZ_pt	47.4		
AZE_pt	--		
AGSUB_pt	64.2		
POPs_pt	54.5		
FORGROINV_pt	122.663 (8.498)	-8.448 (-3.462)	.571
FORLOSS_pt			
FORCOVINV_pt	21.266 (12.994)	1.407 (5.086)	.742
FSOC_pt	57.190 (18.722)	-2.846 (-5.511)	.771
TCEEZ_pt	23.613 (44.389)	-.035 (-.386)	.016
CO2CAP_pt	81.648 (267.535)	-.995 (-19.289)	.976
CO2GDP_pt	43.197 (131.743)	-.164 (-2.955)	.492
CO2KWH_pt	4.061 (24.600)	.119 (4.255)	.668
RENEW_pt	.422 (1.944)	.053 (1.442)	.188
Oil Cons	200.355 (43.204)	11.117 (14.182)	.957
Oil Prod	1562.536 (24.132)	48.227 (4.406)	.683
Oil Exp	865.735 (6.055)	.808 (.030)	.000
Oil Rents	13.294 (6.428)	.824 (2.357)	.382

Bahrain

Variable	Cst	Coeff	R^2
EPI			
EH			

EV	13.747 (5.065)	1.690 (3.684)	.601
EHEH	79.549 (553.967)	.282 (11.608)	.937
EHAIR			
EHWATER			
EVAIR	11.243 (15.879)	.503 (4.206)	.663
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	27.862 (18.945)	-.873 (-3.511)	.578
EVCLIMATE	1.661 (12.002)	.069 (2.966)	.494
CHMORT_pt	79.549 (553.967)	.282 (11.608)	.937
INDOOR_pt			
PM25_pt			
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	1.326 (2.840)	.332 (4.211)	.663
SO2GDP_pt	21.160 (22.194)	.674 (4.185)	.661
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	53.555 (17.648)	-1.509 (-2.941)	.490
TCEEZ_pt	2.169 (5.078)	-.237 (-3.284)	.545
CO2CAP_pt			
CO2GDP_pt	4.074 (15.806)	.177 (4.057)	.646

CO2KWH_pt	1.567 (1.839)	.050 (.348)	.013
RENEW_pt			
Oil Cons	20.178 (14.181)	2.763 (11.487)	.936
Oil Prod	48.146 (105.386)	-.328 (-4.248)	.667
Oil Exp			
Oil Rents	17.938 (8.317)	.555 (1.373)	.191

Egypt

Variable	Cst	Coeff	R²
EPI	50.386 (89.378)	.569 (5.970)	.798
EH	58.309 (92.845)	1.857 (17.489)	.971
EV	46.991 (72.202)	.017 (.154)	.003
EHEH	58.678 (128.508)	1.415 (18.340)	.974
EHAIR	62.277 (60.937)	2.577 (14.918)	.961
EHWATER	53.605 (68.053)	2.018 (15.160)	.962
EVAIR	39.446 (93.058)	.348 (4.851)	.723
EVWATER			
EVBH	37.236 (27.770)	.783 (3.456)	.570
EVAG	82.327 (14.115)	1.868 (1.894)	.285
EVFOREST			
EVFISH	50.482 (20.240)	-2.594 (-6.154)	.808
EVCLIMATE	48.529 (73.279)	-.647 (-5.779)	.788
CHMORT_pt	58.678 (128.508)	1.415 (18.340)	.974
INDOOR_pt	58.209 (26.092)	4.847 (12.854)	.948
PM25_pt	66.345 (130.599)	.307 (3.573)	.587

WATSUPINV_pt	63.538 (92.609)	2.315 (19.965)	.978
ACSATINV_pt	43.673 (39.879)	1.722 (9.300)	.906
SO2CAP_pt	43.334 (125.390)	.243 (4.155)	.657
SO2GDP_pt	35.557 (69.968)	.453 (5.268)	.755
WATUSEINV_pt			
PACOV_pt	28.524 (19.179)	.844 (3.357)	.556
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	76.549 (13.371)	-6.066 (-6.269)	.814
TCEEZ_pt	24.415 (22.136)	.878 (4.708)	.711
CO2CAP_pt	91.098 (120.663)	-1.260 (-9.871)	.915
CO2GDP_pt	36.106 (40.872)	-.178 (-1.195)	.915
CO2KWH_pt	9.592 (24.886)	-.202 (-3.099)	.516
RENEW_pt	-.755 (-6.843)	17.124 (26.22)	.839
Oil Cons	513.193 (43.593)	26.151 (13.142)	.950
Oil Prod	762.971 (45.346)	-7.392 (-2.599)	.429
Oil Exp	155.067 (6.124)	-13.010 (-2.743)	.485
Oil Rents	6.270 (4.625)	.257 (1.123)	.123

Iraq

Variable	Cst	Coeff	R²
EPI	25.614 (190.590)	-.018 (-.793)	.065

EH	46.294 (311.019)	-.207 (-8.243)	.883
EV	16.751 (92.527)	.063 (2.063)	.321
EHEH	53.289 (900.388)	.224 (22.388)	.982
EHAIR	50.781 (96.709)	-1.374 (-15.485)	.964
EHWATER	27.817 (547.003)	.097 (11.266)	.934
EVAIR	22.004 (39.362)	-.087 (-.922)	.086
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	15.792 (31.694)	.108 (1.284)	.155
EVCLIMATE	22.492 (28.838)	.239 (1.813)	.268
CHMORT_pt	53.289 (900.388)	.224 (22.388)	.982
INDOOR_pt	51.659 (52.598)	-1.228 (-7.398)	.859
PM25_pt	49.903 (35.880)	-1.521 (-6.468)	.823
WATSUPINV_pt	30.796 (243.021)	-.132 (-6.158)	.808
ACSATINV_pt	24.838 (241.637)	.326 (18.739)	.975
SO2CAP_pt	28.318 (53.928)	.215 (2.424)	.395
SO2GDP_pt	15.690 (10.539)	-.389 (-1.547)	.210
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			

FSOC_pt			
TCEEZ_pt	15.792 (31.694)	.108 (1.284)	.155
CO2CAP_pt	62.811 (43.747)	.182 (.750)	.059
CO2GDP_pt			
CO2KWH_pt	.781 (1.479)	.089 (.998)	.100
RENEW_pt	2.609 (.674)	1.080 (1.651)	.232
Oil Cons	439.595 (26.370)	20.601 (7.311)	.856
Oil Prod	2068.454 (9.949)	15.321 (.436)	.021
Oil Exp	1611.290 (8.011)	-1.354 (-.036)	.000
Oil Rents			

Jordan

Variable	Cst	Coeff	R^2
EPI	39.696 (578.397)	.261 (22.495)	.983
EH	71.857 (452.767)	.481 (17.913)	.973
EV	25.912 (352.325)	.167 (13.422)	.952
EHEH	65.041 (749.521)	.607 (41.387)	.995
EHAIR	87.611 (139.255)	.708 (6.658)	.831
EHWATER			
EVAIR	.776 (5.382)	20.621 (24.163)	.763
EVWATER			
EVBH	9.021 (527.018)	.013 (4.431)	.686
EVAG			
EVFOREST			
EVFISH	27.340 (27.856)	.138 (.829)	.071
EVCLIMATE	33.219 (68.848)	.165 (2.022)	.312

CHMORT_pt	65.041 (749.521)	.607 (41.387)	.995
INDOOR_pt	89.055 (123.781)	1.277 (10.500)	.925
PM25_pt	86.167 (90.922)	.139 (.868)	.077
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	27.228 (42.694)	.527 (4.891)	.727
SO2GDP_pt	14.015 (13.024)	1.026 (5.638)	.779
WATUSEINV_pt			
PACOV_pt	8.925 (520.885)	.013 (4.431)	.686
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt			
TCEEZ_pt	27.340 (27.856)	.138 (.829)	.071
CO2CAP_pt	68.840 (82.267)	-.441 (-3.119)	.519
CO2GDP_pt	24.444 (42.000)	.807 (8.208)	.882
CO2KWH_pt	3.096 (14.137)	.265 (7.147)	.850
RENEW_pt	.698 (18.879)	-.020 (-3.170)	.528
Oil Cons	104.997 (36.464)	-.402 (-.827)	.071
Oil Prod	.032 (8.919)	-.002 (-2.714)	.450
Oil Exp			
Oil Rents	.003 (3.887)	-4.058E-5 (-.322)	.011

Kuwait

Variable	Cst	Coeff	R^2

EPI	37.186 (390.656)	-.162 (-10.060)	.918
EH	87.975 (326.740)	-.442 (-9.718)	.913
EV	15.420 (68.790)	-.042 (-1.100)	.119
EHEH	79.980 (645.639)	-.109 (-5.196)	.750
EHAIR	99.850 (112.018)	-1.551 (-10.297)	.922
EHWATER			
EVAIR	10.649 (80.709)	-.111 (-4.973)	.733
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	27.823 (16.716)	-.658 (-2.337)	.378
EVCLIMATE	3.671 (5.589)	.122 (1.097)	.118
CHMORT_pt	79.980 (645.639)	-.109 (-5.196)	.750
INDOOR_pt			
PM25_pt	99.699 (55.925)	-3.103 (-10.297)	.922
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt			
SO2GDP_pt	21.298 (80.709)	-.222 (-4.973)	.733
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	44.362 (12.592)	-1.192 (-2.001)	.308

TCEEZ_pt	11.284 (29.501)	-.123 (-1.907)	.288
CO2CAP_pt			
CO2GDP_pt	8.997 (5.927)	.436 (1.700)	.243
CO2KWH_pt	3.484 (3.971)	-.206 (-1.388)	.176
RENEW_pt			
Oil Cons	267.306 (41.406)	9.227 (8.455)	.888
Oil Prod	2164.510 (21.534)	52.529 (3.092)	.515
Oil Exp	1228.501 (10.979)	52.543 (2.507)	.440
Oil Rents	44.049 (9.509)	1.134 (1.306)	.176

Lebanon

Variable	Cst	Coeff	R^2
EPI	46.929 (136.681)	.094 (1.618)	.225
EH	78.286 (1430.183)	.345 (37.270)	.994
EV	33.490 (68.10)	-.014 (-.164)	.003
EHEH	62.523 (571.097)	.690 (37.269)	.994
EHAIR			
EHWATER			
EVAIR	24.742 (45.398)	.163 (1.774)	.259
EVWATER			
EVBH			
EVAG	61.872 (263.018)	.207 (5.196)	.750
EVFOREST			
EVFISH	50.252 (20.033)	-1.689 (-3.983)	.638
EVCLIMATE	27.936 (15.278)	.358 (1.157)	.130
CHMORT_pt	62.523 (571.097)	.690 (37.269)	.994
INDOOR_pt			

PM25_pt			
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	23.177 (50.38)	.056 (.717)	.054
SO2GDP_pt	26.307 (40.535)	.271 (2.471)	.404
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt	71.694 (101.591)	.620 (5.196)	.750
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	74.201 (15.00)	-2.988 (-3.575)	.587
TCEEZ_pt	26.303 (84.631)	-.389 (-7.412)	.859
CO2CAP_pt	59.387 (18.853)	-.067 (-.126)	.002
CO2GDP_pt	16.810 (7.479)	1.023 (2.693)	.446
CO2KWH_pt	1.706 (2.567)	.329 (2.930)	.488
RENEW_pt	6.741 (4.662)	-.175 (-.717)	.054
Oil Cons	108.003 (41.954)	-2.987 (-6.864)	.840
Oil Prod			
Oil Exp			
Oil Rents			

Libya

Variable	Cst	Coeff	R^2
EPI	34.813 (133.990)	.365 (8.307)	.885
EH	71.309 (260.543)	.700 (15.124)	.962

EV	19.171 (72.196)	.221 (4.931)	.730
EHEH	79.282 (497.401)	.537 (19.921)	.978
EHAIR	85.623 (94.162)	1.725 (11.225)	.933
EHWATER			
EVAIR	34.548 (41.818)	.883 (6.321)	.816
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	58.893 (111.060)	.368 (4.105)	.652
EVCLIMATE	19.457 (30.595)	.248 (2.302)	.371
CHMORT_pt	79.282 (497.401)	.537 (19.921)	.978
INDOOR_pt	71.245 (39.175)	3.451 (11.225)	.933
PM25_pt			
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	29.516 (45.628)	.663 (6.062)	.803
SO2GDP_pt	39.580 (38.118)	1.103 (6.282)	.814
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt			
TCEEZ_pt	45.546 (42.945)	.736 (4.105)	.652
CO2CAP_pt	35.921 (45.804)	-.067 (-.506)	.028
CO2GDP_pt	19.671	.774	.675

	Cst	Coeff	R^2
	(18.586)	(4.328)	
CO2KWH_pt			
RENEW_pt			
Oil Cons	221.579 (39.704)	6.270 (6.646)	.831
Oil Prod	1404.476 (28.027)	49.719 (5.870)	.793
Oil Exp	1082.442 (13.723)	23.670 (1.602)	.243
Oil Rents	40.194 (6.980)	2.032 (1.884)	.307

Mauritania

Variable	Cst	Coeff	R^2
EPI			
EH	21.162 (246.618)	.270 (18.596)	.975
EV			
EHEH	17.002 (147.343)	.346 (17.760)	.972
EHAIR	44.999 (146.919)	.107 (2.060)	.320
EHWATER	5.644 (68.334)	.279 (20.018)	.978
EVAIR			
EVWATER			
EVBH			
EVAG			
EVFOREST	-12.844 (-2.047)	6.514 (6.142)	.807
EVFISH	14.673 (58.880)	.025 (.603)	.039
EVCLIMATE			
CHMORT_pt	17.002 (147.343)	.346 (17.760)	.972
INDOOR_pt	5.155 (21.498)	.224 (5.518)	.772
PM25_pt	84.843 (151.169)	-.010 (-.110)	.001
WATSUPINV_pt	6.196 (51.727)	.405 (20.018)	.978

ACSATINV_pt	5.092 (107.142)	.154 (19.129)	.976
SO2CAP_pt			
SO2GDP_pt			
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt	-24.924 (-1.992)	12.763 (6.034)	.802
FORLOSS_pt			
FORCOVINV_pt	-.763 (-1.223)	.266 (2.521)	.414
FSOC_pt	12.766 (22.121)	-.247 (-2.537)	.417
TCEEZ_pt	16.581 (28.511)	.298 (3.034)	.506
CO2CAP_pt			
CO2GDP_pt			
CO2KWH_pt			
RENEW_pt			
Oil Cons	23.630 (32.453)	-.393 (-3.194)	.531
Oil Prod	-1.336 (-.277)	1.684 (2.067)	.322
Oil Exp	-2.171 (-.418)	1.896 (1.948)	.322
Oil Rents			

Morocco

Variable	Cst	Coeff	R²
EPI	43.528 (213.759)	.261 (7.581)	.865
EH	53.097 (454.690)	.724 (36.682)	.993
EV	39.427 (136.421)	.062 (1.278)	.154
EHEH	57.845 (765.702)	1.417 (110.946)	.999

EHAIR	71.305 (124.062)	-.276 (-2.837)	.472
EHWATER	25.391 (165.835)	.338 (13.073)	.950
EVAIR	29.914 (56.234)	.237 (2.634)	.435
EVWATER			
EVBH	22.335 (21386.719)	.001 (4.583)	.700
EVAG	73.745 (296.222)	.193 (4.583)	.700
EVFOREST	82.109 (32.765)	.307 (.725)	.055
EVFISH	25.759 (40.043)	-.257 (-2.363)	.383
EVCLIMATE	55.360 (94.215)	.050 (.499)	.027
CHMORT_pt	57.845 (765.702)	1.417 (110.946)	.999
INDOOR_pt	42.610 (37.068)	-.551 (-2.837)	.472
PM25_pt			
WATSUPINV_pt	28.632 (229.715)	.346 (16.420)	.968
ACSATINV_pt	22.151 (117.836)	.331 (10.409)	.923
SO2CAP_pt	37.222 (109.264)	.063 (1.087)	.116
SO2GDP_pt	22.606 (30.605)	.411 (3.293)	.547
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt	65.247 (17280.313)	.003 (4.583)	.700
AZE_pt			
AGSUB_pt			
POPs_pt	77.273 (103.464)	.579 (4.583)	.700
FORGROINV_pt	103.925 (23.256)	-1.308 (-1.732)	.250
FORLOSS_pt			
FORCOVINV_pt	84.021 (17.260)	2.229 (2.709)	.449

FSOC_pt	48.192 (31.578)	-.627 (-2.429)	.396
TCEEZ_pt	3.327 (2.231)	.113 (.447)	.022
CO2CAP_pt	100.339 (266.164)	-.273 (-4.284)	.671
CO2GDP_pt	54.461 (87.292)	.131 (1.241)	.146
CO2KWH_pt	2.084 (6.452)	.176 (3.219)	.535
RENEW_pt	5.785 (3.551)	.486 (1.766)	.257
Oil Cons	152.529 (34.528)	5.642 (7.556)	.864
Oil Prod	5.259 (95.078)	.027 (2.936)	.489
Oil Exp			
Oil Rents	.005 (5.478)	3.521E-5 (.234)	.006

Oman

Variable	Cst	Coeff	R^2
EPI	43.511 (233.410)	.085 (2.687)	.445
EH	67.473 (180.572)	.744 (11.784)	.939
EV	33.242 (192.451)	-.198 (-6.783)	.836
EHEH	68.847 (108.934)	1.557 (14.576)	.959
EHAIR	93.717 (250.673)	-.548 (-8.671)	.893
EHWATER	38.481 (315.503)	.411 (19.931)	.978
EVAIR	17.486 (52.577)	.050 (.892)	.081
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	24.902 (22.698)	.163 (.878)	.079
EVCLIMATE	19.888 (48.749)	-.806 (-11.681)	.938

CHMORT_pt	68.847 (108.934)	1.557 (14.576)	.959
INDOOR_pt			
PM25_pt	87.433 (116.933)	-1.096 (-8.671)	.893
WATSUPINV_pt	34.145 (139.976)	.822 (19.931)	.978
ACSATINV_pt			
SO2CAP_pt	9.203 (25.321)	-.020 (-.322)	.011
SO2GDP_pt	25.769 (78.763)	.120 (2.172)	.344
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	22.082 (9.626)	.447 (1.152)	.128
TCEEZ_pt	27.722 (52.292)	-.121 (-1.351)	.169
CO2CAP_pt	30.286 (43.979)	-1.768 (-15.191)	.962
CO2GDP_pt	26.351 (48.057)	-.509 (-5.487)	.770
CO2KWH_pt	.435 (3.926)	-.058 (-3.074)	.512
RENEW_pt			
Oil Cons	46.104 (19.468)	5.879 (14.686)	.960
Oil Prod	895.580 (22.505)	-14.228 (-2.115)	.332
Oil Exp	870.897 (35.605)	-27.680 (-6.041	.820

Oil Rents	37.336 (12.891)	.113 (.207)	.005

Qatar

Variable	Cst	Coeff	R²
EPI	45.947 (540.288)	.071 (4.936)	.730
EH	89.791 (755.698)	-.007 (-.361)	.014
EV	27.157 (182.864)	.104 (4.162)	.658
EHEH	79.581 (334.884)	-.015 (-.361)	.014
EHAIR			
EHWATER			
EVAIR	30.061 (100.397)	.335 (6.616)	.829
EVWATER			
EVBH	39.901 (648.924)	.038 (3.674)	.600
EVAG			
EVFOREST			
EVFISH	50.195 (48.510)	.254 (1.452)	.190
EVCLIMATE	2.681 (15.739)	.093 (3.225)	.536
CHMORT_pt	79.581 (334.884)	-.015 (-.361)	.014
INDOOR_pt			
PM25_pt			
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	10.259 (41.627)	.267 (6.411)	.820
SO2GDP_pt	49.863 (119.855)	.403 (5.725)	.785
WATUSEINV_pt			
PACOV_pt	13.064 (74.375)	.109 (3.674)	.600

MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	59.500 (24.065)	1.490 (3.564)	.585
TCEEZ_pt	40.891 (45.131)	-.982 (-6.410)	.820
CO2CAP_pt			
CO2GDP_pt	.070 (2.875)	-.010 (-2.313)	.373
CO2KWH_pt	17.709 (15.951)	.641 (3.418)	.565
RENEW_pt			
Oil Cons	42.265 (13.479)	10.317 (19.466)	.977
Oil Prod	802.912 (23.809)	52.159 (9.150)	.903
Oil Exp	713.545 (8.565)	7.672 (.492)	.029
Oil Rents	29.936 (13.091)	-1.075 (-2.510)	.441

Saudi Arabia

Variable	Cst	Coeff	R^2
EPI	50.985 (1117.254)	-.115 (-14.967)	.961
EH	70.018 (434.571)	.093 (3.415)	.564
EV	42.828 (810.493)	-.205 (-22.927)	.983
EHEH	72.684 (368.609)	.364 (10.912)	.930
EHAIR	89.424 (233.443)	-.355 (-5.489)	.770
EHWATER			
EVAIR	15.697 (41.045)	.401 (6.196)	.810

EVWATER			
EVBH			
EVAG			
EVFOREST	112.421 (14.486)	-4.725 (-3.602)	.590
EVFISH	28.390 (26.603)	-.950 (-5.267)	.755
EVCLIMATE	13.104 (51.450)	-.634 (-14.737)	.960
CHMORT_pt	72.684 (368.609)	.364 (10.912)	.930
INDOOR_pt			
PM25_pt	78.847 (102.916)	-.711 (-5.489)	.770
WATSUPINV_pt			
ACSATINV_pt			
SO2CAP_pt	7.616 (20.888)	.336 (5.458)	.768
SO2GDP_pt	23.778 (56.356)	.465 (6.516)	.825
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt	124.843 (8.043)	-9.451 (-3.602)	.590
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	36.354 (18.861)	-1.572 (-4.827)	.721
TCEEZ_pt	20.426 (60.150)	-.328 (-5.711)	.784
CO2CAP_pt	18.189 (57.734)	-1.176 (-22.078)	.982
CO2GDP_pt	17.392 (33.711)	-.624 (-7.158)	.851
CO2KWH_pt	4.335 (19.727)	-.030 (-.799)	.066

RENEW_pt			
Oil Cons	1469.893 (40.651)	105.781 (17.307)	.971
Oil Prod	9456.872 (27.322)	127.400 (2.178)	.345
Oil Exp	9456.872 (27.322)	127.400 (2.178)	.345
Oil Rents	6442.700 (24.634)	68.150 (1.391)	.195

UAE

Variable	Cst	Coeff	R^2
EPI	47.375 (59.565)	.451 (3.356)	.556
EH	81.886 (247.501)	.647 (11.577)	.937
EV	32.585 (30.462)	.367 (2.030)	.314
EHEH	76.648 (154.971)	1.606 (19.209)	.976
EHAIR	89.267 (186.265)	-.622 (-7.679)	.868
EHWATER			
EVAIR	28.557 (63.512)	.505 (6.639)	.830
EVWATER			
EVBH	76.454 (18.559)	1.315 (1.889)	.284
EVAG			
EVFOREST			
EVFISH	34.951 (25.251)	-.830 (-3.548)	.583
EVCLIMATE	2.547 (8.385)	.055 (1.068)	.112
CHMORT_pt	76.648 (154.971)	1.606 (19.209)	.976
INDOOR_pt			
PM25_pt	78.535 (81.935)	-1.244 (-7.679)	.868
WATSUPINV_pt			

ACSATINV_pt			
SO2CAP_pt	11.770 (30.639)	.437 (6.736)	.834
SO2GDP_pt	45.343 (84.265)	.572 (6.285)	.814
WATUSEINV_pt			
PACOV_pt	76.997 (17.769)	1.409 (1.924)	.291
MPAEEZ_pt	74.577 (22.027)	.991 (1.732)	.250
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			
FSOC_pt	40.085 (16.805)	-1.520 (-3.770)	.612
TCEEZ_pt	29.816 (57.941)	-.140 (-1.610)	.224
CO2CAP_pt	6.998 (6.670)	.101 (.569)	.035
CO2GDP_pt	.648 (.774)	.130 (.918)	.086
CO2KWH_pt			
RENEW_pt			
Oil Cons	286.552 (17.630)	25.780 (9.383)	.907
Oil Prod	2515.759 (32.045)	45.870 (3.457)	.570
Oil Exp	1764.561 (17.612)	61.265 (3.265)	.571
Oil Rents	16.149 (7.426)	.496 (1.349)	.168

Yemen

Variable	Cst	Coeff	R^2
EPI	32.789 (301.846)	.277 (15.071)	.962
EH	25.939 (306.990)	.781 (54.678)	.997
EV	35.725 (238.983)	.061 (2.400)	.390

EHEH	27.669 (605.150)	1.424 (184.263)	1.000
EHAIR	34.377 (87.632)	.054 (.820)	.069
EHWATER	14.041 (212.230)	.221 (19.776)	.978
EVAIR	18.699 (16.234)	1.200 (6.162)	.808
EVWATER			
EVBH			
EVAG			
EVFOREST			
EVFISH	40.754 (24.257)	-.738 (-2.598)	.429
EVCLIMATE	40.749 (206.814)	-.132 (-3.951)	.634
CHMORT_pt	27.669 (605.150)	1.424 (184.263)	1.000
INDOOR_pt	13.335 (103.973)	.182 (8.402)	.887
PM25_pt	55.419 (77.783)	-.073 (-.610)	.040
WATSUPINV_pt	18.095 (235.298)	-.197 (-15.158)	.962
ACSATINV_pt	9.987 (52.317)	.639 (19.814)	.978
SO2CAP_pt	30.372 (30.018)	1.043 (6.100)	.805
SO2GDP_pt	7.025 (5.436)	1.356 (6.209)	.811
WATUSEINV_pt			
PACOV_pt			
MPAEEZ_pt			
AZE_pt			
AGSUB_pt			
POPs_pt			
FORGROINV_pt			
FORLOSS_pt			
FORCOVINV_pt			

FSOC_pt	51.740 (17.819)	-.908 (-1.850)	.275
TCEEZ_pt	29.768 (41.334)	-.568 (-4.664)	.707
CO2CAP_pt			
CO2GDP_pt	16.501 (33.081)	-.623 (-7.394)	.859
CO2KWH_pt	-.175 (-.566)	.577 (11.029)	.931
RENEW_pt			
Oil Cons	97.926 (20.746)	6.249 (7.832)	.872
Oil Prod	471.425 (40.974)	-19.987 (-10.277)	.921
Oil Exp	379.101 (29.013)	-21.145 (-8.639)	.903
Oil Rents	36.795 (10.621)	-1.072 (-1.831)	.271

Annex 13: Comparisons of models of green economy adoption

All countries

Variable	Cst	Coef cos	Coef rent	R^2
EPI	46.617 (99.419)	.008 (10.754)	-.238 (-17.366)	.654
EH	66.849 (31.766)	.006 (1.894)	-.128 (-2.070)	.033
EV	37.945 (41.864)	.008 (6.063)	-.286 (-10.774)	.414
EHEH	63.275 (32.804)	.007 (2.563)	-.010 (-.172)	.040
EHAIR	82.357 (35.050)	.007 (1.933)	-.252 (-3.662)	.074
EHWATER	58.489 (19.491)	.002 (.503)	-.239 (-2.719)	.042
EVAIR	35.927 (22.90)	-.004 (-1.671)	-.146 (-3.174)	.098
EVWATER	14.378 (14.606)	-.004 (-2.657)	.057 (1.988)	.046
EVBH	28.190 (11.869)	.039 (10.976)	-.328 (-4.719)	.413
EVAG	70.254 (29.433)	.010 (2.714)	-.495 (-7.081)	.225

EVFISH	35.365 (26.835)	-.006 (-2.886)	-.034 (-.874)	.066
EVCLIMATE	40.524 (21.253)	-.007 (-2.410)	-.007 (-2.410)	.241
CHMORT	63.275 (32.80)	.007 (2.563)	-.010 (-.172)	.040
INDOOR	72.955 (20.05)	.018 (3.299)	-.158 (-1.482)	.060
WATSUPINV	61.003 (18.584)	.007 (1.364)	-.414 (-4.311)	.097
SO2CAP	35.994 (17.642)	-.007 (-2.255)	-.167 (-2.803)	.102
SO2GDP	35.859 (21.045)	-.001 (-.375)	-.124 (-2.487)	.044
WATUSEINV	14.378 (14.606)	-.004 (-2.657)	.057 (1.988)	.046
PACOV	15.762 (5.986)	.045 (11.343)	-.234 (-3.030)	.428
MPAEEZ	69.390 (39.521)	.025 (9.495)	-.825 (-16.044)	.614
POPs	57.521 (14.338)	.036 (5.985)	-.771 (-6.566)	.254
TCEEZ	24.570 (20.454)	-.004 (-2.339)	.051 (1.452)	.033
CO2CAP	71.512 (18.685)	-.016 (-2.757)	-.442 (-3.947)	.167
CO2GDP	38.558 (20.22	-.003 (-1.129)	-.429 (-7.695)	.304
CO2KWH	6.306 (11.409)	.000 (.242)	-.061 (-3.787)	.083
RENEW	7.023 (6.289)	-.002 (-1.012)	-.044 (-1.358)	.024

Group 1: oil non-exporting countries

Variable	Cst	Coef cos	Coef rent	R^2
EPI	43.096 (95.380)	.010 (4.409)	.456 (2.866)	.710
EH	69.641 (39.976)	-.005 (-.559)	.056 (.092)	.012
EV	31.720 (39.219)	.017 (4.035)	.627 (2.202)	.644
EHEH	65.138 (93.057)	005 (1.405)	-.279 (-1.132)	.037
EHAIR	90.107 (39.796)	-.037 (-3.149)	1.138 (1.428)	.199

EHWATER	58.178 (13.785)	.007 (.301)	-.355 (-.239)	.002
EVAIR	23.593 (52.39)	.027 (11.532)	.041 (.261)	.876
EVWATER	9.094 (11.71)	.002 (.490)	-.079 (-.290)	.005
EVBH	17.189 (14.745)	.020 (3.371)	1.416 (3.453)	.682
EVAG	65.083 (51.188)	.046 (6.885)	-.322 (-.721)	.673
EVFISH	28.314 (16.359)	.019 (2.160)	-.775 (-1.272)	.091
EVCLIMATE	41.010 (21.632)	.001 (.127)	.687 (1.030)	.062
CHMORT	65.138 (93.057)	.005 (1.405)	-.279 (-1.132)	.037
INDOOR	78.108 (15.888)	-.025 (-.974)	2.368 (1.369)	.035
WATSUPINV	61.055 (13.171)	.010 (.419)	.453 (.278)	.022
SO2CAP	25.834 (33.503)	.035 (8.643)	-.416 (-1.533)	.742
SO2GDP	21.352 (30.654)	.019 (5.343)	.499 (2.035)	.719
WATUSEINV	9.094 (11.710)	.002 (.490)	-.079 (-.290)	.005
PACOV	1.885 (4.070)	.040 (16.753)	.602 (3.690)	.953
MPAEEZ	66.665 (18.258)	.021 (1.119)	.476 (.370)	.095
POPs	50.086 (11.778)	.191 (8.605)	-11.869 (-7.932)	.598
TCEEZ	15.445 (8.253)	.018 (1.808)	.015 (.022)	.146
CO2CAP	74.207 (26.835)	.018 (1.267)	.146 (.150)	.090
CO2GDP	40.404 (15.269)	-.024 (-1.763)	1.765 (1.896)	.068
CO2KWH	4.335 (13.585)	-.002 (-1.401)	.725 (6.460)	.601
RENEW	1.639 (2.510)	.025 (7.284)	-.603 (-2.626)	.604

Group2: oil exporting countries

Variable	Cst	Coef cos	Coef rent	R^2
EPI	49.251 (68.636)	.007 (9.756)	-.287 (-16.297)	.712

EH	65.391 (17.051)	.007 (1.724)	-.103 (-1.096)	.028
EV	42.334 (28.853)	.007 (4.885)	-.366 (-10.159)	.476
EHEH	61.840 (17.057)	.008 (2.145)	.017 (.191)	.043
EHAIR	79.972 (19.285)	.009 (2.144)	-.222 (-2.179)	.058
EHWATER	57.911 (11.419)	.002 (.394)	-.225 (-1.806)	.027
EVAIR	45.173 (17.217)	-.006 (-2.220)	-.317 (-4.918)	.249
EVWATER	21.479 (13.493)	-.004 (-2.355)	-.087 (-2.226)	.112
EVBH	46.912 (12.277)	.041 (10.670)	-.718 (-7.649)	.535
EVAG	66.198 (15.411)	.006 (1.522)	-.387 (-3.671)	.104
EVFISH	40.827 (19.231)	-.007 (-3.129)	-.135 (-2.599)	.166
EVCLIMATE	33.837 (10.377)	-.009 (-2.752)	-.171 (-2.139)	.127
CHMORT	61.840 (17.057)	.008 (2.145)	.017 (.191)	.043
INDOOR	70.909 (11.500)	.019 (3.102)	-.127 (-.842)	.075
WATSUPINV	57.055 (10.368)	.005 (.990)	-.325 (-2.407)	.047
SO2CAP	39.508 (10.752)	-.010 (-2.642)	-.216 (-2.390)	.133
SO2GDP	50.838 (19.667)	-.002 (-.751)	-.418 (-6.587)	.304
WATUSEINV	21.479 (13.493)	-.004 (-2.355)	-.087 (-2.226)	.112
PACOV	37.294 (8.743)	.046 (10.881)	-.678 (-6.471)	.524
MPAEEZ	71.000 (29.257)	.024 (10.087)	-.853 (-14.312)	.672
POPs	53.039 (8.068)	.033 (5.108)	-.647 (-4.008)	.218
TCEEZ	32.325 (19.438)	-.005 (-3.199)	-.096 (-2.355)	.159
CO2CAP	53.880 (8.163)	-.020 (-3.101)	-.052 (-.320)	.088
CO2GDP	35.663 (11.266)	-.004 (-1.183)	-.370 (-4.756)	.203

CO2KWH	7.897 (8.052)	.000 (-.168)	-.091 (-3.787)	.121
RENEW	8.752 (4.387)	-.003 (-1.578)	-.067 (-1.366)	.050

Chow test:

EPI		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	2913.579	3	176	2178.292	735.287	170	12.81348	245.0957	19.12795
	Group 1	280.727	3	55						(**)
	Group 2	1897.565	3	121						
EH		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	58687.97	3	176	58372.74	315.227	170	343.3691	105.0757	0.306014
	Group 1	4172.973	3	55						
	Group 2	54199.77	3	121						
EV		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	10887.58	3	176	8832.828	2054.752	170	51.95781	684.9173	13.18218
	Group 1	899.486	3	55						(**)
	Group 2	7933.342	3	121						
EHEH		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	49304.28	3	176	49115.21	189.077	170	288.913	63.02567	0.218148
	Group 1	673.742	3	55						
	Group 2	48441.47	3	121						
EHAIR		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	73166.61	3	176	70425.18	2741.43	170	414.2658	913.81	2.205854
	Group 1	7049.597	3	55						
	Group 2	63375.59	3	121						
EHWATER		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	119331.4	3	176	119282	49.442	170	701.6588	16.48067	0.023488
	Group 1	24491.75	3	55						
	Group 2	94790.25	3	121						
EVAIR		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	32600.61	3	176	25648.37	6952.242	170	150.8728	2317.414	15.36006
	Group 1	278.845	3	55						(**)
	Group 2	25369.52	3	121						
EVWATER		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	12841.87	3	176	10167.08	2674.792	170	59.80635	891.5973	14.90807
	Group 1	829.283	3	55						(**)
	Group 2	9337.796	3	121						
EVBH		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**

	Comb.	74756.23	3	176	55679.2	19077.03	170	327.5247	6359.009	19.41536
	Group 1	1868.444	3	55						(**)
	Group 2	53810.76	3	121						
EVAG		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	75500.18	3	176	70217.48	5282.7	170	413.044	1760.9	4.263226
	Group 1	2222.842	3	55						(**)
	Group 2	67994.64	3	121						
EVFISH		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	23016.63	3	176	20728.67	2287.959	170	121.9333	762.653	6.254672
	Group 1	4119.24	3	55						(**)
	Group 2	16609.43	3	121						
EVCLIMATE		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	48178.94	3	176	44123.05	4055.889	170	259.5473	1351.963	5.208926
	Group 1	4942.195	3	55						(**)
	Group 2	39180.85	3	121						
CHMORT		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	49304.28	3	176	49115.21	189.077	170	288.913	63.02567	0.218148
	Group 1	673.742	3	55						
	Group 2	48441.47	3	121						
INDOOR		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	175399	3	176	173342.7	2056.302	170	1019.663	685.434	0.672216
	Group 1	33231.57	3	55						
	Group 2	140111.2	3	121						
WATSUPINV		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	142800.2	3	176	141152.2	1647.982	170	830.3071	549.3273	0.661595
	Group 1	29547.9	3	55						
	Group 2	111604.3	3	121						
SO2CAP		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	55161.48	3	176	50574.29	4587.19	170	297.4958	1529.063	5.139781
	Group 1	817.598	3	55						(**)
	Group 2	49756.69	3	121						
SO2GDP		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	38478.31	3	176	25290.97	13187.34	170	148.7704	4395.781	29.54741
	Group 1	667.165	3	55						(**)
	Group 2	24623.8	3	121						
WATUSEINV		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	12841.87	3	176	10167.08	2674.792	170	59.80635	891.5973	14.90807
	Group 1	829.283	3	55						(**)
	Group 2	9337.796	3	121						
PACOV		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	91898.56	3	176	67348.87	24549.69	170	396.1698	8183.229	20.65586

	Group 1	295.075	3	55						(**)
	Group 2	67053.79	3	121						
MPAEEZ		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	40854.32	3	176	40034.12	820.2	170	235.4948	273.4	1.16096
	Group 1	18330.9	3	55						
	Group 2	21703.22	3	121						
POPs		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	213296.2	3	176	184135.1	29161.04	170	1083.148	9720.347	8.974165
	Group 1	24866.39	3	55						(**)
	Group 2	159268.7	3	121						
TCEEZ		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	19123.13	3	176	15007.09	4116.04	170	88.27702	1372.013	15.54213
	Group 1	4815.469	3	55						(**)
	Group 2	10191.63	3	121						
CO2CAP		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	194118.9	3	176	171073.2	23045.64	170	1006.313	7681.881	7.633689
	Group 1	10515.05	3	55						(**)
	Group 2	160558.2	3	121						
CO2KWH		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	4048.125	3	176	3685.254	362.871	170	21.67796	120.957	5.579721
	Group 1	139.999	3	55						(**)
	Group 2	3545.255	3	121						
CO2GDP		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	48156.49	3	176	46556.53	1599.96	170	273.8619	533.32	1.947405
	Group 1	9628.36	3	55						
	Group 2	36928.17	3	121						
RENEW		**SSR**	**k**	**N**	**S1+S2**	**Sc-(S1+S2)**	**N1+N2-2k**	**Den**	**Num**	**F**
	Comb.	16523.6	3	176	15251.57	1272.029	170	89.71511	424.0097	4.726179
	Group 1	586.74	3	55						(**)
	Group 2	14664.83	3	121						

Annex 14: Simple business related indices and the Arab countries

- The business disclosure index (BDI) is among the indicators produced by the World Bank. It assesses the degree of protection of investors through disclosure of information about ownership and finance. Its scale is between 0 for less disclosure to 10 for more disclosure. Developed countries have values of the index that are around 10 meaning that the business climate is such that higher levels of disclosures are observed. The 2008-2009 values of the Arab countries show that Tunisia and Sudan exhibit no disclosure at all.

Saudi Arabia (9), Egypt (8), Bahrain (8), Oman (8), Kuwait (7), Palestine (6), Yemen (6) Syria (6) and Morocco (6) show the highest values of the index with respect to the average of the Arab region (5.92). Qatar (5), Mauritania (5), Jordan (5) besides Iraq (4) and UAE (4) have lower values. But most of the EEE countries exhibit higher values that are in the range of 6 and 9 with an average 2009 of 6.43.

- With regard to the Intellectual Property Protection and according to the available indices that include IPP (scale of 1 to 7 with 7 for the highest protection) the highest level is around 5 attained by the UAE (5.2), Qatar (5.1), Oman and Bahrain (4.9). This index is lower for the remaining Arab countries. It is around 2.5 for Algeria, 3.3 in Morocco, 3.6 in Kuwait and Egypt. Syria, Tunisia and Saudi Arabia show respectively the values of 3.8, 4.4 and 4.5.

- Protection against market imperfections can be represented by the index of the Intensity of Local Competition (ILC) within the range of 1 to 7 where 7 is referring to the most intense market competition with market leadership changing over time. The lowest value of 1 indicates that the country has limitations of market competitive mechanisms in most industries. In 2008, the Arab countries show values that are around 5 with Jordan and UAE having the highest levels of the index (5.6). These countries are followed by Tunisia (5.4), Bahrain (5.3) Saudi Arabia (5.2), Kuwait (5.1) and Qatar (5.1) Morocco and Egypt have lowest value (4.6) with Algeria having the lowest (4.1).

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- Rigidity of employment index (REI) is in the range from 0=(less rigid)to 100=more rigid. The rigidity of employment index measures the regulation of employment, specifically the hiring and firing of workers and the rigidity of working hours. This index is the average of three sub-indices: a difficulty of hiring index, a rigidity of hours index, and a difficulty of firing index. The index ranges from 0 to 100, with higher values indicating more rigid regulations. Based on this clarification, less employment rigidity is observed for Kuwait, UAE, Qatar, Oman, Saudi Arabia and Bahrain. Jordan, Syria and Lebanon have lower values in comparison with in Morocco, Tunisia and Algeria.

- The Soundness of Banks (SB) is based on the statistical score on a 1-7 scale of a large sample group in a particular country responding to the question of whether "banks are generally sound" in their country. (1= insolvent and may require government bailout, 7= generally healthy with sound balance sheets). Bahrain (6.4) UAE (6.2) and Qatar (6.2) show the highest values. These are followed by Jordan (5.8) and Saudi Arabia (5.7). Oman (5.4), Tunisia (5.3), Morocco (5.2) and Syria (5) occupy the third position. Egypt (4.7) and Algeria (3.9) show the lowest values. This implies that banks are relatively sound but exhibit lower values in some countries. As banks have important roles in supporting businesses, the perception of their strengths can have limiting effects on businesses and especially that related to foreign direct investments.

- The Corporate Ethics Index (CEI) is the percentage firms in the country giving satisfactory rating to questions about the percentage Corporate Illegal Corruption over the Corporate Legal Corruption Components. The range of the index is 0 - 100% and a higher value implies a higher ethical standard rating given by the country's enterprise sector. The percentage value reflects the share of the country's enterprises providing a satisfactory rating. Given the margin of error in this type of index, comparisons between countries have to be made with caution. Morocco, Algeria and Egypt seem to show low values implying that that there might be lower ethical values in the enterprises of these two economies. The situation is likely to be better in the UAE, Jordan, Bahrain and Tunisia.

- The Corporate Governance Index (CGI) represents the percentage firms in the country giving satisfactory ratings to questions on protection of minority shareholders, quality of training, willingness to delegate authority, nepotism and corporate governance. The range of the index is 0 - 100% and a higher value implies a higher ethical standard rating given by the country's enterprise sector. The percentage value reflects the share of the country's enterprises providing a satisfactory rating. Given the margin of error in this type of index, comparisons between countries have to be made with caution. All Arab countries appear to have CGI that is lower than 50 at the exception of Bahrain (52.39). Algeria has the lowest value for this index.

- The ***Corporate Illegal Corruption Index Component*** (CICI): This measures the percentage of firms in the country giving satisfactory ratings to questions on corporate ethics, illegal political funding, state capture cost, average of frequency of bribery in procurement and active capture, corruption in banking (average of formal money laundering and bribery for loans), and percentage firms reporting 0 percent procurement and administrative bribe shares. The theoretical range of the index is 0 - 100% and a higher value implies a higher ethical standard rating given by the country's businesses. The percentage value reflects the share of the country's enterprises providing a satisfactory rating. Given the margin of error in this type of index, comparisons between countries have to be made with caution. The UAE, Jordan and Tunisia have the highest values for this index while Algeria shows the lowest.

- Corporate Legal Corruption Index (CLCI): Percentage firms in the country with satisfactory ratings to the questions on influencing legal political funding and undue political influence. The theoretical range of the index is 0 - 100% and a higher value implies a higher ethical standard rating given by the country's enterprise sector. The percentage value reflects the share of the country's enterprises providing a satisfactory rating. Given the margin of error in this type of index, comparisons between countries have to be made with caution. But again UAE (68.19), Jordan (59.42) and Bahrain (52.3) show higher values in comparison with Morocco (28.64) and Algeria (39.25).

- Public Sector Ethics Index: Percentage firms in the country giving satisfactory ratings to the questions on honesty of politicians, government favoritism in procurement, diversion of public funds, trust in postal office and average bribe frequencies for permits, utilities and taxes. The theoretical range of the index is 0 - 100% and a higher value implies a higher ethical standard rating given by the country's enterprise sector. The percentage value reflects the share of the country's enterprises providing a satisfactory rating. Given the margin of error in this type of index, comparisons between countries have to be made with caution. The same trends are expressed under this index by the Arab countries. UAE has the lead with 76.16. It is followed by Tunisia (61.96), Jordan (58.8) and Bahrain (57.27). Algeria shows the lowest value for this index (27).

- ***Index of Economic Freedom***: The Economic Freedom Index (EFI) accounts for economic liberalization in a given country. The economic freedom index has a range of 0 to 100 with higher values showing higher economic liberalization. The highest values attained by Arab countries are for Qatar, Oman, the UAE, Kuwait and Jordan. The other economies do have average scores.

- ***Bertelsmann Transformation Index*** (Management index): The Management index evaluates management performance criteria such as steering capability, resource efficiency, consensus-building, and international cooperation, taking societal constraints into account. Scores range from 1 to an ideal of 10. Scores ranging between 4.2 - 5.24 mean management with moderate success; scores ranging between 3.14 - 4.2 mean management with little success; and scores between 1.55 - 3.03 mean failed or non-existent management. Syria, Sudan and Iraq are in this latter case.

- ***Bertelsmann Transformation Index*** (Status Index): The Status index provides a comprehensive view of the progress toward democracy and a market-based economy of developing and transitional countries. Scores range from 1 to 10 with the highest 2006 Arab country score being in the range of 5.5 - 7 which assess the country as being deficient in terms of a market based democracy; and other scores ranging between 4 - 5.5 which assess the country as having an unfavorable pre-condition for a market based democracy; and scores ranging between 1.3 - 4 mean that there are serious obstacles to a market-based democracy. Bahrain (6.01), Lebanon (6.16) besides Oman (5.3), Kuwait (5.2), UAE (5.23), Tunisia (5.37) and Jordan (5.12) exhibit values that are between 5 and 6. The others are in the 4-5 range at the exception of Iraq (3.28), Sudan (3) and Yemen (3.91).

- ***Contract Intensive Money***: Contract Intensive Money (CIM) = (M2 - money outside the banking system)/M2 where M2= Money + Quasi money. Proportion of money supply held by the banking system, sometimes interpreted as a proxy for the rule of law or an indicator of the credibility of financial institutions. The highest values for this index are achieved by Lebanon (0.98), Kuwait (0.97), Qatar (0.96), Bahrain (0.95), UAE (0.94) and Oman (0.92).

- ***Global Peace Index*** (GPI): This is an attempt to measure the relative position of nations' and regions' peacefulness. It is the product of Institute for Economics and Peace and developed in consultation with an international panel of peace experts from peace institutes and think tanks with data collected and collated by the Economist Intelligence Unit. The list is claimed to be the first study to rank countries around the world according to their peacefulness. The index is based on 23 qualitative and quantitative indicators related to the concept of peace. GPI has rankings for 149 countries in 2010, 144 countries in 2009, 140 countries in 2008 and 121 countries in 2007. Nations considered more peaceful have lower index scores within the range 1 to 5. The lowest values (less than 2) for the Arab countries are shown for Qatar (1.394), Oman (1.561), Tunisia (1.678), Bahrain (1.956), Egypt (1.784), Kuwait (1.693), Libya (1.839), Morocco (1.861), UAE (1.739) and Jordan (1.948).

- Government Effectiveness (GE): A subjective governance indicator aggregated from a variety of sources and measuring perceptions of the following concepts: bureaucratic quality, transaction costs, quality of public health care and government stability. Estimates range between -2.5 and 2.5; higher is better. Qatar, Jordan, Kuwait, Oman, UAE and Tunisia appear to have the highest values but they are all less than 2. The values are all negative for the remaining Arab countries.

- ***Political Stability and Absence of Violence/Terrorism***: A subjective governance indicator aggregated from a variety of sources and measuring perceptions of the likelihood of destabilization (ethnic tensions, armed conflict, social unrest, terrorist threat, internal conflict, and fractionalization of the political spectrum, constitutional changes, and military coups). Estimates range between -2.5 and 2.5; higher is better. Qatar (1.12), Kuwait (0.42), Oman (0.81), UAE (0.91) and Tunisia (0.23) are the countries that show positive values for the index. The values for the other countries are negative.

- ***The Silatech Index: Access Index Scores***: The Access Index measures several factors that address both individual and macro-level engagement in business. The four overarching concepts addressed in the index are basic systems and framework for access, economic demand, job availability or placement, and access to capital and business development. Measured over 100, Qatar (67), UAE (68) and Kuwait (66) attain the highest values. Yemen (19), Egypt (22), Lebanon (24), Libya (25), Iraq (26), Mauritania (32) and Morocco have low values.

- ***The Silatech Index: Mindset Index Scores***: The Mindset Index measures several factors that either help or hinder young people's inclusion and productivity within society. The four overarching concepts addressed are attitudes toward work, attitudes toward self-determination, community support to accelerate youth and community support to enhance engagement in society and the economy. The highest values are for Kuwait, Bahrain, Qatar and UAE.

- ***Regulatory Quality (RQ)***: A subjective governance indicator aggregated from a variety of sources and measuring perceptions of the following concepts: the incidence of market-unfriendly policies (such as price controls or inadequate bank supervision), and perceptions of the burdens imposed by excessive regulation in areas such as foreign trade and business development. Estimates range between -2.5 and 2.5; higher is better. Again, positive values are attained by Bahrain (0.78), Jordan (0.36), Kuwait (0.2), Oman (0.66), Qatar (0.62), UAE (0.56) and Saudi Arabia (0.22). Negative values are shown for the other countries.

Annex 15: Comparison of Means of starting business time between Arab Countries

ST	Alg	Bahrain	Egy	Iraq	Jord	Kuw	Leban	Moro	Oman	Qatar	Saudi	Syria	Tuni	UAE	WB& Gaza	Yemen
Alg		--	**2.21**	--	**0.46**	**-33.46**	**-0.86**	**4.47**	**0.12**	**18.80**	**-0.81**	**-1.19**	--	**12.21**	**-6.74**	**-2.04**
Bahrain			**-2.15**	--	**-2.08**	**-88.88**	**-3.74**	**-2.45**	**-4.32**	**0.39**	**-2.68**	**-4.84**	--	**-12.21**	**-8.84**	**-4.03**
Egypt				**-16.38**	**-0.72**	**-4.83**	**-1.94**	**0.51**	**-1.49**	**2.18**	**-1.61**	**-2.33**	**1.60**	**-0.03**	**-7.03**	**-2.78**
Iraq					**8.73**	**146.67**	**8.50**	**26.99**	**14.56**	**78.65**	**5.28**	**10.67**	--	**91.56**	**0.10**	**4.42**
Jordan						**-1.99**	**-0.91**	**1.11**	**-0.33**	**2.12**	**-0.92**	**-1.06**	**1.76**	**0.81**	**-5.48**	**-1.89**
Kuwait							**0.88**	**8.59**	**2.79**	**28.39**	**0.32**	**1.01**	**81.96**	**24.66**	**-5.46**	**-0.84**
Lebanon								**2.51**	**0.78**	**3.75**	**-0.20**	**-0.06**	**3.38**	**2.28**	**-4.93**	**-1.19**
Moroc									**-2.31**	**2.43**	**-1.95**	**-3.14**	**1.58**	**-0.97**	**-7.75**	**-3.20**
Oman										**4.28**	**-0.79**	**-0.99**	**3.76**	**2.06**	**-6.14**	**-1.92**
Qatar											**-2.71**	**-4.83**	**-2.69**	**-7.66**	**-8.83**	**-4.05**
Saudi												**0.17**	**2.45**	**1.74**	**-3.88**	**-0.81**
Syria													**4.38**	**2.98**	**-5.24**	**-1.22**
Tunisia														**-9.15**	**-8.58**	**-3.78**
UAE															**-7.76**	**-3.03**
WB&Gaza																**3.14**

Comparison of means of procedures of starting a business between Arab countries:

SP	Alg	Bahrain	Egy	Iraq	Jord	Kuw	Leban	Moro	Oman	Qatar	Saudi	Syria	Tuni	UAE	WB &Gaza	Yemen
Alg		--	6.28	--	8.78	11.75	56.29	15.54	8.52	22.43	4.34	5.25	--	15.60	16.32	5.19
Bahrain			-1.79	--	-3.22	-61.72	9.66	0.94	-1.42	-1.11	-1.47	-3.94	--	-6.24	-30.31	-2.78
Egypt				-2.82	-0.31	-4.96	3.41	2.02	0.49	1.33	-0.15	-1.25	-1.67	-0.48	-3.41	-0.72
Iraq					3.63	-19.73	36.31	9.28	4.26	12.34	1.85	1.31	--	6.24	-3.66	1.77
Jordan						-6.77	5.53	3.08	0.96	2.37	0.08	-1.16	-1.92	-0.18	-4.43	-0.53
Kuwait							41.23	12.95	6.86	17.77	3.40	3.75	30.23	11.61	7.48	3.89
Lebanon								-1.99	-3.40	-5.34	-2.65	-5.73	-29.64	-9.75	-28.26	-4.37
Moroc									-1.70	-1.38	-1.71	-3.83	-7.19	-4.25	-9.95	-2.89
Oman										0.87	-0.55	-1.93	-2.84	-1.29	-4.93	-1.28
Qatar											-1.16	-3.26	-8.98	-3.82	-12.67	-2.27
Saudi												-0.86	-1.02	-0.18	-2.29	-0.45
Syria													0	1.21	-1.99	0.48

Tunisia														3.12	-10.32	0.64
UAE															-7.21	-0.47
WB &Gaza																2.37

Comparison of means of procedures of starting a business between Arab countries

ECP	Alg	Bahrain	Egy	Iraq	Jord	Kuw	Leban	Moro	Oman	Qatar	Saudi	Syria	Tuni	UAE	WB &Gaza	Yemen
Alg		-5.77	16.19	53.98	23.77	-12.70	32.33	21.94	87.76	11.55	11.54	-30.02	25.40	-9.88	8.08	35.79
Bahrain			--	--	64.71	--	--	--	--	--	--	--	--	-10.32	--	--
Egypt				--	20.78	--	--	--	--	--	--	--	--	-52.56	--	--
Iraq					-54.80	--	--	--	--	--	--	--	--	-125.24	--	--
Jordan						-78.56	11.50	-9.28	122.35	-30.07	-30.07	-113.20	-2.35	-52.29	-36.99	18.43
Kuwait							--	--	--	--	--	--	--	--	--	--
Lebanon								--	--	--	--	--	--	-83.60	--	--
Moroc									--	--	--	--	--	-63.61	--	--
Oman										--	--	--	--	-190.19	--	--
Qatar											--	--	--	-43.63	--	--
Saudi												--	--	-43.63	--	--
Syria													--	36.31	--	--
Tunisia														-70.28	--	--
UAE															36.97	90.26
WB &Gaza																--
Yemen																

Comparison of means of registering property time between Arab countries

RPT	Alg	Bahrain	Egy	Iraq	Jord	Kuw	Leban	Moro	Oman	Qatar	Saudi	Syria	Tuni	UAE	WB& Gaza	Yemen
Alg		42.11	-3.96	-2.51	64.42	-3.05	55.50	-54.04	75.58	53.80	86.37	20.49	6.17	106.81	-3.15	68.88
Bahrain			-4.97	--	--	-9.46	--	-301.37	--	34.22	91.50	6.49	-9.20	--	-9.42	--
Egypt				3.90	5.51	3.43	5.29	2.59	5.77	5.84	6.47	5.39	4.37	6.53	3.40	5.62
Iraq					--	-2.70	--	-165.53	--	76.46	156.86	22.71	7.53	--	-2.81	--
Jordan						-12.84	--	-369.30	--	13.09	58.82	-1.62	-17.57	--	-12.72	--
Kuwait							11.49	-5.52	14.53	14.75	18.82	11.23	5.33	19.26	-0.12	13.52
Lebanon								-342.13	--	21.54	71.89	1.62	-14.22	--	-11.40	--
Moroc									403.26	122.17	213.12	42.18	27.71	498.35	5.24	382.88
Oman										2.53	42.48	-5.68	-21.75	--	-14.38	--
Qatar											20.93	-6.21	-21.16	27.04	-14.59	-8.87
Saudi												-15.75	-31.61	3.27	-18.58	-52.28
Syria													-11.06	17.03	-11.17	3.24
Tunisia														33.47	-5.38	19.24
UAE															-19.01	--
WB &Gaza																13.38

Comparison of means of procedures of registering property between Arab countries

RPP	Alg	Bahrain	Egy	Iraq	Jord	Kuw	Leban	Moro	Oman	Qatar	Saudi	Syria	Tuni	UAE	WB &Gaza	Yemen
Alg		17.57	9.20	12.55	9.20	7.53	7.53	7.54	17.57	4.85	14.15	14.22	14.22	19.24	9.20	10.87
Bahrain			--	--	--	--	--	-10.88	--	-14.36	-3.27	--	--	--	--	--
Egypt				--	--	--	--	0.29	--	-3.80	13.07	--	--	--	--	--
Iraq					--	--	--	-4.18	--	-8.03	6.54	--	--	--	--	--
Jordan						--	--	0.29	--	-3.80	13.07	--	--	--	--	--
Kuwait							--	2.52	--	-1.69	16.34	--	--	--	--	--

Lebanon								2.52	--	-1.69	16.34	--	--	--	--	--
Moroc									10.88	-2.96	7.14	6.41	6.41	13.12	-0.29	1.94
Oman										-14.36	-3.27	--	--	--	--	--
Qatar											10.29	10.14	10.14	16.47	3.80	5.91
Saudi												-3.27	-3.27	6.54	-13.07	-9.80
Syria													--	--	--	--
Tunisia														--	--	--
UAE															--	--
WB&Gaza																--
Yemen																

Annex 16: Enterprise Created in Tunisia

Sector		**Year**					
		2005	**2006**	**2007**	**2008**	**2009**	**2010**
Agriculture. Chasse & Pêche. Sylviculture. Pisciculture et Aquaculture		1,900	2,021	2,101	2,277	2,404	2,633
Industry	Mining	1,123	1,202	1,257	1,305	1,371	1,448
	Food processing	9,534	9,982	10,272	10,637	11,092	11,637
	Textile and clothing	13,082	13,532	13,973	14,155	14,349	15,074
	Leather and shoes	2,420	2,481	2,510	2,556	2,613	2,699
	Wood based	11,189	11,543	11,667	11,956	12,286	12,627
	Paper and publishing	1,556	1,661	1,845	2,079	2,382	2,678
	Chemical	1,432	1,503	1,565	1,618	1,674	1,776
	Plastic and related	766	847	933	983	1,032	1,128
	Other minerals but not metallic	2,516	2,648	2,788	2,939	3,102	3,262
	Metal	7,495	7,890	8,270	8,687	9,214	9,864
	Equipments	3,212	3,459	3,700	3,954	4,258	4,684
	Transportation material	376	405	427	453	467	492
	Other industries	4,395	4,559	4,629	4,766	4,886	5,055
	Total	59,096	61,712	63,836	66,088	68,726	72,424
Construction		18,735	19,873	20,671	22,022	23,762	25,348
Commerce, Réparation Automobile et d'Articles Domestiques	Car rapair services	21,153	21,955	22,468	23,356	24,202	24,951
	Wholesale	23,150	24,988	26,495	28,371	30,502	32,101
	retail	174,599	182,891	184,994	190,521	198,073	206,610
	Total	218,902	229,834	233,957	242,248	252,777	263,662
Hotels & Restaurants		21,447	22,604	23,551	24,733	26,438	27,603

Transports	73,175	77,128	80,204	82,912	85,709	88,578
Postes et Télécommunications	10,274	10,769	10,689	10,538	10,401	10,265
Activités financières	1,192	1,235	1,278	1,330	1,387	1,474
Immobilier. Locations et Services aux Entreprises	35,297	38,326	41,768	45,765	50,243	56,359
Education. Santé et action sociale	12,660	13,718	14,791	16,027	17,520	18,995
Services Collectifs, Sociaux et Personnels & Autres Activités	24,982	26,388	27,232	28,189	29,076	29,980
TOTAL	**477,660**	**503,608**	**520,078**	**542,129**	**568,443**	**597,321**

FORME JURIDIQUE	**ANNEE**					
	2005	**2006**	**2007**	**2008**	**2009**	**2010**
Personne physique	419,275	439,628	449,571	464,565	483,360	501,734
Société anonyme	4,791	5,018	5,169	5,391	5,601	5,883
Société à responsabilité limitée	47,559	51,718	56,494	61,586	67,101	74,880
Société unipersonnelle à responsabilité limitée	3,065	4,160	5,718	7,303	9,019	11,273
Autres	2,970	3,084	3,126	3,284	3,362	3,551
TOTAL	**477,660**	**503,608**	**520,078**	**542,129**	**568,443**	**597,321**

Annex 17: Rents as percent of GDP (source WB)

	Ranked by AVG2000				
	AVG2000	AVG90	AVG80	AVG70	Ratio2000 over 1970
Lebanon	0.006424	0.019681	0.007912	0.0079	0.813145
Jordan	1.323509	0.236457	0.356531	1.062412	1.245759
Morocco	1.549818	0.581404	2.230848	3.155989	0.491072
Tunisia	5.41763	3.566321	10.97922	7.983697	0.678587
Egypt	15.15793	10.34191	22.12079	9.893038	1.532182
Sudan	18.18588	2.831486	1.170472	1.641631	11.07793
Mauritania	21.41986	8.129692	10.70619	14.84876	1.442535
Syria	25.30291	23.52125	12.36641	8.11405	3.118407
Bahrain	30.41538	23.75888	46.91227	46.91	0.648377
UAE	31.52792	31.42353	40.59285	45.73739	0.689325
Yemen	33.34589	27.63558	27.63	27.63	1.206872
Algeria	33.65206	16.17218	16.34645	20.20645	1.665412
Qatar	44.76356	33.72777	47.888	66.07603	0.677455
Kuwait	47.78578	37.06023	47.31588	65.47057	0.729882
Oman	49.11157	32.6585	43.19188	59.5618	0.824548

S.Arabia	50.43384	34.48267	42.98475	55.25291	0.912782

Annex 18: Knowledge Governance and Economic Growth in Arab Countries

APPENDIX

Correlation Matrix of Key Variables

	PIRACY	***GDPgr***	***GDPpc***	***GDI***	***LABgr***	***LIT***
PIRACY	1.00					
GDPgr	0.37	1.00				
GDPpc	-0.48*	-0 .46*	1.00			
GDI	0.10	0.07	0.15	1.00		
LABgr	-0.28	-0.62*	0.86*	0.24	1.00	
LIT	-0.50*	-0.14	0.55*	-0.22	0.29	1.00
N = 22						

Table 1

Variable Definitions, Summary Statistics and Data Sources

Variable	***Definition (mean; std. dev.)***	***Source***
PIRACY	Software Piracy Rate, 2000-07 average (Percentage of software acquired illegally) Higher values, more piracy (67.96%;16.21)	Business Software Alliance (BSA, 2007)
GDPgr	Growth in GDP per capita, PPP, 2000-07 average (4.36%; 0.88)	World Bank Development Indicators, World Bank, 2012
GDPpc	GDP per capita, PPP, 2000 ($13,191.91; 15,629.2)	World Bank Development Indicators, World Bank, 2012
GDI	Gross domestic investment, 2000-07 average (% of GDP) (21.16%; 4.46)	World Bank Development Indicators, World Bank, 2012
LABgr	Growth rate in labor force, 2000-07 average (3.93%; 3.38)	World Bank Development Indicators, World Bank, 2012
LIT	Literacy rate (percentage of literate population age 15 and over), 2000-07 average (77.84%; 14.59)	World Bank Development Indicators , World Bank, 2012

Annex 19:

TABLE 1
KNOWLEDGE ECONOMY AND ECONOMIC GROWTH
Dependent Variable: GDP growth.

ORDINARY LEAST SQUARES (OLS)							
		Dependent Variable: GDP growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant		0.644			0.644	
			(0.074)			(0.115)	
Economic Incentive Regime	IR Spread		---			---	
	Priv. Credit		---			---	
	Tariff		---			---	
	Trade		---			---	
Innovation and Education	FDI inflows		**0.133*****			**0.133****	
			(2.789)			**(2.119)**	
	Journals		-0.245			-0.245	
			(-0.806)			(-1.273)	
	Primary E.		1.466			1.466	
			(0.285)			(0.432)	
	Secondary E.		0.186			0.186	
			(0.131)			(0.144)	
Information Infrastructure	Logintern et		---			---	
	Logtel		---			---	
Control Variables	Popg		-0.074			-0.074	
			(-0.410)			(-1.114)	
	Fin. Size		1.223			1.223	
			(0.901)			(0.800)	
Adjusted R^2			0.038			0.038	
Fisher			**2.000***			**2.000***	
RESET			3.31[0.03]**			3.31[0.03]**	
Observations			153			153	
		Dependent Variable: GDP per capita growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant		0.613			0.613	
			(0.072)			(0.112)	
Economic Incentive Regime	IR Spread		---			---	
	Priv. Credit		---			---	

	Tariff		---			---	
	Trade		---			---	
Innovation and Education	FDI inflows		**0.131*** **			**0.131** **	
			(2.792)			**(2.112)**	
	Journals		-0.242			-0.242	
			(-0.813)			(-1.274)	
	Primary E.		1.446			1.446	
			(0.287)			(0.436)	
	Secondary E.		0.206			0.206	
			(0.148)			(0.164)	
Information Infrastructure	Loginternet		---			---	
	Logtel		---			---	
Control Variables	Popg		**-1.080*** **			**-1.080*** **	
			(-6.063)			**(-16.90)**	
	Fin. Size		1.206			1.206	
			(0.907)			(0.810)	
Adjusted R^2			0.232			0.232	
Fisher			**8.685*** **			**8.685*** **	
RESET test			**0.595[0.552]**			**0.595[0.552]**	
Observations			153			153	

Table 2
Knowledge Economy and Economic Growth
Dependent variable: GDP growth.
Two stage Least Squares (2SLS)

		Dependent Variable: GDP growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant	**4.957** **	26.959	3.112	**4.957** **	**26.959***	3.112
		(2.306)	(1.104)	(1.125)	**(2.047)**	**(1.796)**	(1.125)
Economic Incentive Regime	IR Spread	-0.102	---	---	-0.102	---	---
		(-1.116)			(-1.075)		
	Priv. Credit	-0.018	---	---	-0.018	---	---
		(-0.011)			(-0.011)		
	Tariff	-0.093	---	---	-0.093	---	---
		(-1.272)			(-1.414)		
	Trade	0.015	---	---	0.015	---	---
		(0.958)			(0.940)		
Innovation and Education	FDI inflows	---	**0.246** **	---	---	**0.246*** **	---
			(2.373)			**(4.155)**	
	Journals	---	-0.461	---	---	**-0.461***	---
			(-1.145)			**(-1.882)**	

	Primary E.	---	-13.425	---	---	-13.425	---
			(-0.961)			(-1.548)	
	Secondary E.	---	2.765	---	---	**2.765***	---
			(1.203)			**(1.700)**	
Information Infrastructure	Loginternet	---	---	**0.835****	---	---	**0.835****
				(1.968)			**(1.968)**
	Logtel	---	---	-0.691	---	---	-0.691
				(-1.258)			(-1.258)
Control Variables	Popg	---	---	**0.359*****	---	---	**0.359*****
				(2.830)			**(2.830)**
	Fin. Size	---	---	---	---	---	---
Hausman test		6.07[0.19]	3.49[0.478]	**8.41**[0.03]**	6.07[0.19]	3.493[0.478]	**8.41**[0.038]**
Sargan OIR		**11.67[0.11]**	**3.673 [0.816]**	**10.33[0.24]**	**11.67[0.11]**	**3.673[0.816]**	**10.33[0.24]**
Adjusted R²		0.106	0.010	0.142	0.106	0.010	0.142
Fisher		**2.566****	**2.237***	**4.588*****	**3.835*****	**8.541*****	**4.588*****
Number of Observations		96	165	274	96	165	274
		Dependent Variable: GDP per capita growth					
		Regressions without HAC standard errors			Regressions with HAC standard errors		
	Constant	0.251	26.455	3.199	0.251	26.455	3.199
		(0.101)	(1.036)	(1.218)	(0.152)	(1.146)	(1.144)
Economic Incentive Regime	IR Spread	0.053	---	---	0.053	---	---
		(0.557)			(0.766)		
	Priv. Credit	**2.821***	---	---	**2.821****	---	---
		(1.659)			**(2.260)**		
	Tariff	0.030	---	---	0.030	---	---
		(0.399)			(0.857)		
	Trade	0.008	---	---	0.008	---	---
		(0.568)			(0.777)		
Innovation and Education	FDI inflows	---	**0.324*****	---	---	**0.324*****	---
			(3.022)			**(5.930)**	
	Journals	---	-0.111	---	---	-0.111	---
			(-0.291)			(-0.848)	
	Primary E.	---	-11.569	---	---	-11.569	---
			(-0.788)			(-0.870)	
	Secondary E.	---	-1.269	---	---	-1.269	---
			(-0.361)			(-0.418)	
Information Infrastructure	Loginternet	---	---	**0.706***	---	---	0.706
				(1.753)			(1.359)
	Logtel	---	---	-0.574	---	---	-0.574

				(-1.102)			(-0.876)
Control Variables	Popg	-0.305	**-1.243*****	**-0.685*****	-0.305	**-1.243*****	**-0.685*****
		(-1.293)	**(-3.651)**	**(-5.692)**	(-1.452)	**(-6.408)**	**(-3.263)**
	Fin. Size	---	3.512	---	---	**3.512***	---
			(1.182)			**(1.708)**	
Hausman test		**10.45*[0.06]**	3.070[0.546]	**8.55**[0.035]**	**10.45*[0.06]**	7.475 [0.279]	**8.55**[0.03]**
Sargan OIR		**3.73[0.71]**	**1.733[0.884]**	**8.89[0.35]**	**3.73[0.71]**	**1.733 [0.884]**	**8.89[0.35]**
Adjusted R²		0.100	0.202	0.167	0.100	0.202	0.167
Fisher		**2.354****	**5.054*****	**11.390*****	**17.357*****	**35.824*****	**3.936*****
Observations		96	142	274	96	142	274
Instruments	const Main_IP_law IP_rlaw Wipo_treaties Mutilateral Bilateral LM_Income M_Income H_Income English French Christians						

Table 3

Variable Definitions, Summary Statistics and Data Sources

Variable	***Definition (mean; std. dev.)***	***Source***
GDPg	Growth in GDP (4.69;3.45)	World Bank Development Indicators, (World Bank, 2012)
GDPpcg	Growth in GDP per capita, PPP (1.92; 3.31)	World Bank Development Indicators, (World Bank, 2012)
MOBILE	Mobile cellular subscriptions (per 100 people) (5.88;0.99)	World Bank Development Indicators, (World Bank, 2012)
TELEPHONE	Telephone lines per (per 100 people) (5.62; 0.59)	World Bank Development Indicators, World Bank, 2012)
INTERNET	Internet users (per 100 people) (5.33; 0.98)	World Bank Development Indicators, (World Bank, 2012)
PRIVCRD	Credit to the private sector (0.35; 0.24)	World Bank Development Indicators, (World Bank, 2012)
GDI	Gross domestic investment (% of GDP) (20.53%; 6.91)	World Bank Development Indicators, (World Bank, 2012)
INTEREST	Interest rate spread (lending rate minus the deposit rate) (6.71;4.25)	World Bank Development Indicators, (World Bank, 2012)
JOURNALS	Scientific and technical journal articles (2.14; 0.67)	World Bank Development Indicators, (World Bank, 2012)
SET	Tertiary school enrollment ratio, gross (1.30; 0.43)	World Bank Development Indicators (World Bank, 2012)
SES	Secondary school enrollment ratio, gross (1.77;0.23)	World Bank Development Indicators, World Bank, 2012)
SEP	Primary school enrollment ratio, gross (1.99;0.06)	World Bank Development Indicators, (World Bank, 2012)

Trade	Exports plus imports as a % GDP	World Bank Development Indicators, (World Bank, 2012)
FDI inflows	Foreign Direct Investment; net inflows (% GDP)	World Bank Development Indicators, World Bank, 2012
TARIFF	Tariff rate, applied, simple mean, all products (9.96;6.08)	World Bank Development Indicators, (World Bank, 2012)
POPg	Population growth (2.76; 2.67)	World Bank Development Indicators, (World Bank, 2012)
FinSize	Deposit banks assets/(deposit banks assets + central bank assets) (0.85; 0.22)	World Bank Development Indicators, (World Bank, 2012)