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Do Investment Climate Deficiencies Explain Low Manufacturing Productivity in Developing Countries? An Application to the Middle East and North Africa

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Do Investment Climate Deficiencies Explain Low Manufacturing Productivity in Developing Countries? An Application to the Middle East and North Africa

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Abstract

Drawing on the World Bank Investment Climate Assessment (ICA) enterprises' surveys, this paper reveals for a large number of developing countries and eight manufacturing industries, that investment climate (IC) matters for firms' productive performance. This is true (depending on the industry) for the quality of various infrastructure, the experience and education level of the labor force, the cost and access to financing, as well as different dimensions of the government-business relation. The empirical analysis also illustrates that Middle East and North Africa (MENA) low industrial productivity can be linked to the deficiencies of the investment climate in the region. The exception is Morocco, whose firms' investment climate and technical efficiency rank close to the ones of the most efficient economies of the empirical sample. The paper reveals as well that industries more exposed to international competition show a higher sensitivity to IC limitations. This is also true, in some industries, for small and medium domestic firms which are not able to influence their investment climate nor chose their location, in addition to benefit from a less advantageous environment. These findings bear clear policy implications by showing that increasing the firms' size and improving the investment climate (in particular of SMEs and industries more exposed to international competition) constitute powerful tools for the industrial take off and the competitiveness of the developing economies, the MENA region in particular.

Keywords: Manufacturing Industries, Technical Efficiency, Investment Climate, Firms' Survey Data, Developing Countries, Middle East and North Africa. (*MENA*)

JEL classification: D24, O14, O57.

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1- Introduction

Recent developments of the economic literature have put the investment climate at the centre of economic performance. It is now well documented that the investment climate can significantly affect investment, productivity, and growth[1], then conditioning the success of market-based economies.[2] Public governance exerts a strong influence on the investment climate[3]. The role of security of property rights is steadily stressed, supported by a large body of empirical studies[4]. Some authors have also tested the role of corruption[5] and, to as lower extent, regulation[6] and bureaucratic quality[7]. More recently, the literature has evaluated firms' performance and its determinants using enterprises' surveys data[8]. This approach, still quite new, aims at strengthening the institutional literature by providing microeconomic foundation.

Investment climate is defined by the World Bank as the policy, institutional and regulatory environment in which firms operate (see World Bank, 2005). Key factors affecting the investment climate are corruption, taxation, regulatory framework, quality of bureaucracy, legal environment, availability and quality of infrastructures, availability and cost of finance, factor markets, and technological and innovation support. Countries where, for example, property rights are secure, the government provides efficient services, and infrastructure and finance is well developed are considered as having a good investment climate, which in turn reduces the cost of doing business and leads to higher and more certain returns on investment. The forward-looking nature of investment underlines, in particular, the importance of a stable and secure environment. The deficiencies of the investment climate are also seen as constituting barriers to entry, exit and competitions. The World Bank (2004) reports as well that a better investment climate improves bureaucratic performances and predictability, and contributes to the effective delivery of public goods that are necessary for productive business.

In the Middle East and North Africa (MENA), various studies point out the deficiencies of the investment climate. This is the case of the World Bank (2004) for governance, as well as of country studies based on enterprises' surveys, in particular the World Bank Investment Climate Assessments (*ICA*) of *Egypt* (2005 and 2006), *Morocco* (2001 and 2005), and *Algeria* (2002). *Doing Business* (2009a and b) also places MENA low on business climate indicators compare to other regions. These deficiencies have been reported as participating in the slow economic activity in the region[9]. Although MENA countries are defined, in average, as middle income economies, performances in the region have most of the time been disappointing. This has been the case of growth and investment for more than three decades[10]. Attractiveness of FDI has also been weak, as well as competitiveness and exports of manufacturing[11]. In fact, MENA competitiveness has constantly been affected by poor exchange rate policies and insufficient economic reforms. But other factors, such as the investment climate, are likely to explain the low firms' productivity level and their high production costs.

The World Bank Investment Climate (*ICA*) surveys collect data on inputs and outputs, as well as on various aspects of the investment climate at the firm level. *ICA* surveys produce both subjective evaluations of obstacles, as well as other more objective information on the themes of infrastructure, human capital, technology, governance, and financial constraints. These standardized surveys of large, random samples of firms from different sectors permit comparative measures of firms' productive performance. They also provide information to estimate the contribution of investment climate to these performances. In a context of increasing pressure of globalization, *ICA* surveys can be seen as an instrument for identifying key obstacles to firms' productivity and competitiveness. They can be used as a support to policy reforms for an increased economic growth.

Drawing on the World Bank firms' surveys, this paper analyses the relationship between investment climate and firm-level productivity for a large number of developing countries, including 5 MENA economies, for eight manufacturing industries[12]. We first propose a measure of firms' productivity performance by referring to the production frontier approach. These calculations permit to position MENA manufacturing amongst a wide range of observations from other regions. In average, enterprises in MENA prove to perform poorly compared to other countries of the sample. The exception is *Morocco*, where firms rank close to the most performing ones of the empirical sample. Then we generate a few composite indicators of investment climate using Principal Component Analysis (*PCA*), which summarize well the key dimensions of the investment climate. This allows to tackle the multicolinearity problems when explaining firm's productive performances with a wide range of correlated *IC* variables. We define four axes of the investment climate: the Quality of Infrastructure (*Infra*), the Business-Government Relations (*Gov*), the Human Capacity (*H*), and the Financing Constraints (*Fin*).. The analysis suggests that investment climate matters for firms' productive performance in the eight manufacturing industries.

The paper is organized as follows. The second section introduces the methodological aspects linked to the estimation of the firm-level Technical Efficiency (*TE*). Section three presents the investment climate (*ICA*) surveys and summarizes their main limitations. The fourth section compares across countries, our calculations of firm-level Technical Efficiency (*TE*) by industry. The fifth section introduces and categorizes the investment climate variables, and calculates our four broad *IC* indicators. The sixth section highlights MENA investment climate deficiencies. In the seventh section, we estimate to which extent the investment climate constraints firms' productive performance. The last section concludes.

2- Firm-Level Technical Efficiency: A Definition

In this section, we briefly present the methodological aspects linked to the calculations of our indicator of firm-level productive performance. Our first challenge has been to measure this performance adequately. Firm-level productivity can be approached in different ways. Productivity can easily be calculated as the ratio of an output to a specific factor of production, for example labor, or to all relevant factors (e.g., Total Factor Productivity) taking into account all the information about the production technology[13].

Total Factor Productivity (*TFP*) can be calculated from a *parametric production function*. In that case, production is derived from the optimization problem of the firm which, in perfect competition, maximizes current and expected profits by equating production prices to its marginal cost. This hypothesis does not permit any waste of resources or organizational weaknesses. Enterprises can be positioned in regard to the most efficient firms that define the "best practice". Firm-level Technical Efficiency (*TE*) is then defined as the firms' productivity gap (or efficiency gap) to the most efficient organizations located on the frontier. Various hypotheses can be done regarding the technology of production. In our empirical analysis, we refer to the Cobb-Douglas technology, which is the most commonly used allowing an easy interpretation of the regression coefficient.

The *stochastic model* is used to allow the decomposition of the error term into two uncorrelated elements. The first term represents the random shocks *(v)*, which are independent and identically distributed and follow a normal distribution (with zero average and σ^2 standard deviation). The second term represents the Technical Efficiency *(-u)*. We suppose that *u* follows a truncated normal distribution[14]. The equation to estimate is then:

$$y_i = f(x_i, \beta) - u_i + v_i \qquad (1)$$

With

- *Y:* Production
- *X:* Production factors
- *B :* Parameters of the equation
- *v* : External shocks
- *u* : Technical Efficiency (*TE*)
- *i*: Firm index

Firms' inefficiency can be explained by "exogenous" factors which affect either the technology of production, or the firm's ability to transform inputs into outputs. In the literature, these factors have been estimated in two different ways. A simple method consists in estimating the stochastic production frontier and then in regressing technical inefficiencies on a vector of explanatory factors (z)[15]. This "Two Steps" procedure presents some shortcomings. When the efficiency term is correlated with the inputs *(x),* the likelihood estimation of the stochastic production frontier is biased, due to the omission of important explanatory variables in the first regression.

In the "One Step" procedure we use in this paper, the parameters of the equation (β, δ) are simultaneously estimated by the likelihood estimation method. The stochastic version of the model can be written as follows:

$$y_i = f(x_i, z_i, \beta, \delta) - u_i + v_i \qquad (2)$$

With

- *Y*: Production

- X: Production factors
- Z: Factors explaining Technical Efficiency
- v : External shocks
- u : Technical Efficiency
- β / δ: Parameters of the equation
- i: Firm index

3- The World Bank Investment Climate Firms' Surveys

The World Bank Investment Climate (*ICA*) firms' surveys collect data on inputs and outputs, as well as on a large variety of quantitative and qualitative (perception-based) indicators of investment climate. In building our database, we have tried to incorporate as much information as possible. We have integrated 22 countries from the five main regions of the developing world: Sub-Saharan Africa (*AFR*), East Asia (*EAS*), South Asia (*SAS*), Latin America and the Caribbean (*LAC*), Middle East and North Africa (*MENA) (*see *Annex* 1). In the sample, MENA is represented by: *Algeria* (2002), *Saudi Arabia* (2005), *Lebanon* (2006), *Morocco* (2000, 2004) and *Egypt* (2004, 2006)[16]. *Syria* (2003) and *Oman* (2003), initially present, had to be removed because of a very low rate of answer to the questionnaire. By broadening the sample to a large number of countries from different regions, we have intended to compare MENA performances to the ones of emerging major competitors on the world market including *China* and *India.*

To estimate firm-level productivity, we initially considered a population of almost 20,000 firms, coming from 13 manufacturing industries. This initial sample had to be reduced due to various limitations. Calculation of productive performances requires information on at least 5 variables: (1) production, (2) intermediate consumption, (3) labor, (4) wages, and (5) capital stock. For several enterprises, part of this information appeared difficult to get or subject to flagrant inconsistencies. In addition, some industries had to be merged, due to an insufficient number of observations. In fine, 12 414 enterprises (3073 for the MENA region) regrouped in eight industries were retained when estimating the production frontiers (see *Annex 2*).

As for inputs and output, investment climate variables are subject to measuring errors. In the surveys, some firms did not report the full range of investment climate measures. Other firms reported numbers that were not credible. This is also due to the fact that most of investment climate factors are qualitative variables of perception, thus allowing answers to vary depending on the firms, the regions or the countries. Our choice has been to keep as many firms as possible, providing sufficient information on a wide range of investment climate variables. Once outliers and incomplete observations were removed, 5002 observations were left, among which 1483 for the MENA region, what represent 34% of MENA initial population and 30% of the total number of enterprises with *IC* variables (see *Annex 2*).

Another question relates to the endogeneity of the *IC* variables, due to the qualitative nature of investment climate factors. This is particularly true for perception variables (such as obstacles to operation) for which firms are asked to position their answer on a given scale[17]. The perception of the scale might be different across firms, industries, regions and countries.

Besides, when answering the questions on their investment climate, firms may be influenced by the perception they have of their own productivity and may attribute their inefficiencies to external factors. High-performing firms, as well, may be proactive in reducing their investment climate constraints, for example by working with the authorities to limit inspections or secure more reliable power supply. They also can choose a location with better infrastructure and production conditions, what relates to the endogeneity of location.

To tackle the endogeneity problem, consistent econometric estimations can be obtained by using the method of instrumental variables (IV). In addition, we can measure investment climate variables as city or region-sector averages of firm-level observations[18]. This also helps to mitigate the effects of missing observations for some firms. Actually, if we take each investment climate indicator at the firm level, we end up with a smaller sample of observations in which all indicators are available. Furthermore, we have to address the issue of endogeneity of firms' location. If firms do self-select into better climate cities for reasons we do not observe or control for, we cannot distinguish the effect of investment climate on plant performance from its effect on location decisions As in Dollar et al (2005) we investigate the sensitivity of the results to a restricted sample of firms employing no more than 150 workers. Location choice of these domestic firms is overwhelmingly determined by where the founder was born or brought up.

Exchange rate constitutes another source of uncertainty which may lead to over or under evaluate firms' productive performance. This rate is used to convert production and production factors into US dollars. Several exchange rates can be used to calculate and compare firm-level productivity across countries. In this study, we considered the current market rate in US dollars which has the interest to be the rate that firms face in making their transactions and conditions their competitiveness and economic calculations[19].

4- Estimating Firm-Level Technical Efficiency

The technology of production explains the Value Added (Y) by the Capital (K) and the Labor (L). The Value Added is calculated as the difference between Total Sales ($S_{i,j}$) and Total Purchase of Raw Material -- excluding fuel ($IC_{i,j}$)[20]. We make the hypothesis that firms are price takers, thus purchasing raw material at world price, what looks like an acceptable assumption for the manufacturing industry which is exposed to international competition. All values are in current dollars. Labor (L) is measured by the number of Permanent workers. Equation is as follows:

$$\text{Log}(Y_{i,j}) = \alpha \text{ Log } (K_{i,j}) + \beta \text{ Log } (L_{i,j}) + dum_{i,} - u_{i,j} + v_{i,j} \qquad (3)$$

With:

- $Y_{i,j}$: Value Added
- $L_{i,j}$: Number of Permanent Workers
- $K_{i,j}$: Gross Value of Property, Plant and Equipment
- dum_j: Country-dummy variables
- α, β: parameters of the equation

- $v_{i,j}$: Error term
- $u_{i,j:}$ Technical Efficiency (*TE*).
- i / j: Enterprise and country index respectively

A different production frontier has been estimated for each industry, under the reasonable assumption that a sector-based technology leads to a more homogeneous production function and makes it easier to attribute the residual to differences in efficiency. Differences in coefficients of capital and labor have justified this choice; against an alternative assumption consisting in estimating the same production frontier for all sectors, with specific sector-based dummies.

Table 1 presents the estimation results of the production frontiers. In most industries, the sum of the coefficients relative to labor and capital inputs is close to one[21]. For all industries, the coefficients are strongly statistically significant at the 99% level of confidence. Table 1 also specifies the percentage of the residual explained by the Technical Efficiency (*TE*). It can be seen that the efficiency term accounts for a significant part of the total residuals and is statistically significant at 99%. This result justifies the production frontier approach, against the production function approach. In this model, *TE* explains from 24% of the error term in *Garment* to 70% in *Non Metallic & Plastic Materials*.

Table 1: Estimations of the Stochastic Production Frontiers

	Dependant Variable: Value Added							
Independent Variables	**Textile**	**Garment**	**Leather**	**Agro Processing**	**Metal & Machinery Products**	**Chemic & Pharm Products**	**Non Metal & Plastic Materials**	**Wood & Furniture**
Log (labor)	0.659 (30.53)***	0.811 (42.69)***	0.826 (20.20)***	0.695 (31.22)***	0.877 (33.21)***	0.673 (22.21)***	0.886 (22.35)***	0.941 (29.18)***
Log (capital)	0.354 (24.87)***	0.260 (20.96)***	0.277 (11.00)***	0.404 (28.62)***	0.289 (18.52)***	0.444 (22.89)***	0.281 (13.54)***	0.228 (12.79)***
Intercept	2.007 (18.94)***	1.350 (9.22)***	1.419 (9.81)***	1.863 (13.99)***	1.716 (15.61)***	2.065 (15.39)***	1.419 (9.73)***	1.644 (11.51)***
σ^2u	0.33	0.22	0.80	0.73	1.12	0.39	1.30	0.79
σ^2	0.99	0.92	1.40	1.47	1.76	1.13	1.86	1.19
σ^2u/σ^2	0.33*** (6.17)	0.24*** (3.00)	0.57*** (6.33)	0.50*** (8.17)	0.64*** (12.80)	0.35*** (5.00)	0.70*** (10.00)	0.66*** (13.20)
Observations	2011	2800	634	2190	1622	1274	907	1033

Note: * Significance level 10 %; ** 5 %; *** 1 %. Z statistics are into brackets. Regressions include country-dummy variables.
Source: Authors' calculations

Table 2 displays (by country and by industry) the relative firm-level Technical Efficiency averages (*TEs*). For each country, *TEs* are expressed in percent, as the gap to the average *TE* of the most performing country. The analysis reveals a relatively stable ranking of countries. *South African* and *Brazilian* firms perform -- in average and in most industries -- the highest levels. This result is consistent with the relatively high incomes of the two countries, 2710 and 2780 dollars *per capita* respectively (see World Bank, 2005). *Moroccan's* firms also participate in the best performances of the sample, especially in *Metal & Machinery*

Products, Chemical & Pharmaceutical Products and *Non Metal & Plastic Materials.* Only in *Garment* and *Leather*, *Morocco* is surpassed by *Thailand* and *Ecuador*.

Table 2. Firm-Level Technical Efficiency

(Country average, in % of country with the most productive firms)

Country*	Textile	Leather	Garment	Agro Processing	Metal& Machinery Products	Chemic & Pharm Products	Wood & Furniture	Non Metal & Plastic Materials
South-Africa 2003	85		**100**	**100**	**100**	89	**100**	**100**
Brazil 2003	**100**	**100**	87	80	98	**100**	62	
***Morocco** 2004*	*58*	*70*	*81*	*70*	***100***	*72*		*92*
***Saudi-Arabia** 2005*				*72*	*76*		*81*	
***Morocco** 2000*	67	76	80	71	68	83		70
Thailand 2004	64		93	67	65		47	66
Ecuador 2003	57	86	61	61	63	60	57	63
El Salvador 2003	40	62	65	58	55	63		66
Guatemala 2003	51		77	45	57	45	48	67
Honduras 2003	58		66	42	48	60	37	48
India 2000	47		66		45	34		
India 2002	42	56	66	41	46	32		
Pakistan 2002	43	49	61	40		31		
China 2002	46	45	51		35			
Philippines 2003	36		53	39				
***Algeria** 2002*	*33*			*35*	*39*	*38*		*54*
Nicaragua 2003	22	55	41	34	38	30	31	49
Tanzania 2003				43			32	
Zambia 2002	29			30	41	21		
Sri Lanka 2004	17		37	26	33			39
Bangladesh 2002	24	41	32	28		19		
Ethiopia 2002	20	30	36	22			23	
***Egypt** 2004*	*21*	*30*	*21*	*17*	*22*	*17*	*19*	*32*
***Egypt** 2006*	*17*	*15*	*22*	*22*	*25*	*14*	*19*	*24*
***Lebanon** 2006*	*21*		*23*	*16*			*13*	

Note : * Ranking of countries goes from the ones with the most productive firms to the ones with the least productive firms. *Source*. Authors' calculations.

As far as other MENA countries are concerned, the ranking also remains rather stable. *Egyptian* and *Lebanese* firms are systematically among the least performing in all industries (although *Morocco* and *Egypt* have the same GDP *per capita*, at around 1300 US dollars in 2003), while *Algeria* ranks in at an intermediate position. *Moroccan* firms remain, though, the most performing ones in the MENA environment, with levels of *TEs* far ahead from the two Asiatic giants (*China* and *India*)[22].

5- The Investment Climate Indicators

The World Bank Investment Climate (*ICA*) surveys provide information on a large number of investment climate (*IC*) variables -- in addition to general information on firms' status,

productivity, sales and supplies. In the surveys, there are multiple indicators that cover a similar theme, providing high correlations between indicators. One solution to manage efficiently these correlations consists to limit the number of indicators when estimating the frontiers incorporating determinants of inefficiencies. This can, however, lead to a biased estimation, due to the omission of important explanatory variables. Also, it is not sure that the *IC* variables retained are good proxy of investment climate. A solution to overcome these problems consists in generating a few composite indicators. Because we intend to determine which investment climate variables are more detrimental to firms' performance, we tried to take into consideration an as large as possible set of *IC* variables which are not typically used in the literature. Since these variables are likely to be correlated, we applied Principal Component Analysis (*PCA*) to produce a limited number of composite indicators[23].

Based on the *ICA* surveys, we classified the investment climate indicators into four broad categories: Quality of Infrastructure (*Infra*), Business-Government Relations (*Gov*), Human Capacity (*H*), and Financing Constraints (*Fin*). As seen in section 3, our choice of indicators has been restricted by data limitations. This is also why we have not been able to cover all aspects initially developed in the surveys. Indicators have been selected on the bases of being available for the countries of our sample, as well as capturing the different key dimensions of the investment climate. Besides, we have tried to complete as much as possible the qualitative (perception-based) *IC* indicators by quantitative information, in order to get a better picture of the investment climate in each industry and country.

The Quality of Infrastructure indicator (*Infra*) has been defined by six variables: Obstacle[24] for the operation of the enterprise caused by deficiencies in (***a***) Telecommunications, (***b***) Electricity, and (***c***) Transport; (***d***) Does the Firm Own or Share a Generator, (***e***) if yes, which Percentage of Electricity Comes from that Source; Does the Enterprise have access to (***f***) E-mail or (***g***) Internet in its Interaction with Clients and Suppliers. Infrastructure deficiencies constitute an important constraint to private sector development in developing countries (see World Bank, 1994). In the literature, deficiency in infrastructure is seen as a burden for enterprises operations and investment. Infrastructures are considered, as well, as a complementary factor to other production inputs. Infrastructure, in particular, stimulates private productivity by raising the profitability of investment[25]. Furthermore, infrastructure increases firms' productive performance by generating externalities across firms, industries and regions[26].

The Business-Government Relations indicator (*Gov*) includes three to six variables (depending on the industries): Obstacle for the operation of the enterprise caused by (***a***) Tax Rate, (***b***) Tax Administration, (***c***) Customs and Trade Regulations, (***d***) Labor Regulation, (***e***) Business Licensing and Operating Permits, and (***f***) Corruption. This indicator illustrates the capacity of the government to provide an investment-friendly environment and reliable conditions to the private sector. Corruption is seen as having an adverse effect on firms' productive performance. This fact is well documented and often described as one of the major constraints facing enterprises in the developing world (see the World Bank, 2005). Corruption increases the cost of services, as well as the uncertainties about the timing and effects of the application of government regulations (see Tanzi and Davooli, 1997). Taxation and regulations have also a first order implication on firms' costs and productivity. Although

government regulations and taxation are reasonable and warranted in order to protect the general public and to generate revenues to finance the delivery of public services and infrastructures, over-regulation and over-taxation deter productive performances by raising business start-up and firms' operating costs.

The Human Capacity indicator (H) is represented by four variables: (***a***) Obstacle for the operation of the enterprise caused by deficient Skill and Education of Available Workers; (***b***) Education level[27] and (***c***) Years of Experience of the Top Manager; (***d***) Training of the Firm's Employees. Human capital constitutes an essential factor of firms' productive performance. Human capital stimulates capital formation by raising firms' profitability. Human capital is also at the origin of positive externalities[28]. Because skilled workers are better in dealing with changes, a skilled work force is essential for firms to manage the technology and its change overtime (see Acemoglu and Shimer, 1999, Bresnahan, Brynjolfsson and Hitt, 2002). Human capital gives also the opportunity to the enterprises to expand or enter new markets.

The Financing Constraints indicator (Fin) consists of three variables: Obstacle for the operation of the enterprise caused by: (***a***) Cost, and (***b***) Access to Financing; (***c***) Access to an Overdraft Facility or a Line of Credit. Access to (and cost of) financing represent major determinant(s) of firms' productive performances. Access to financing allows firms to finance more investment projects, what leads to an increased productivity through higher capitalistic intensity and technical progress embodied in the new equipments. Besides, financial development has a positive effect on productivity as a result of better selection of investment projects and higher technological specialization through diversification of risk. A developed financial system creates more profitable investment opportunities by mobilizing and allocating resources to the projects that will generate the most surplus (see Levine, 1997, for a synthesis).

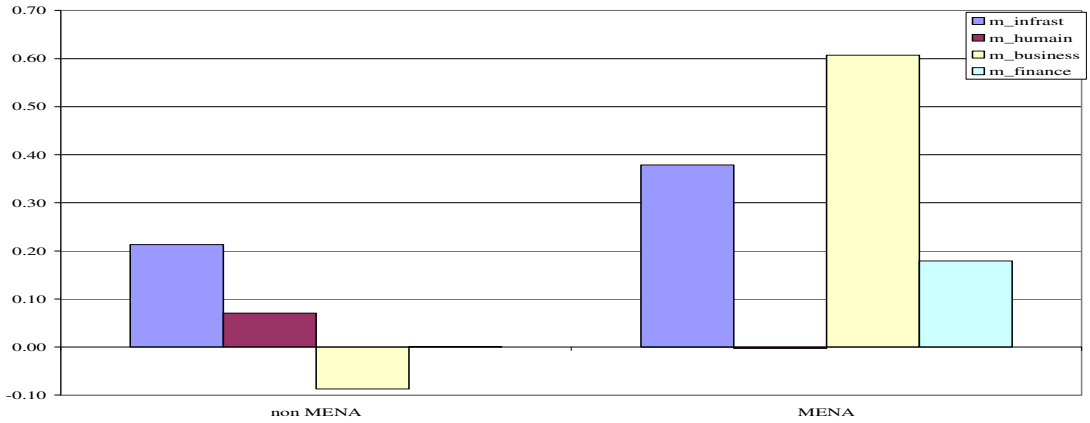
All four aggregated indicators have been generated at the branch level, thus defining in each country the specific investment climate of each industry. This has implied to produce 32 aggregated indicators (e.g., four indicators, one for each of the eight industries) by applying Principal Component Analysis (*PCA*) to the initial variables[29]. The analysis usually treats investment climate as exogenous determinant of firms' performance. As seen in section 3, however, this is not always the case. In order to address this issue, we have measured *IC* variables as city-sector averages of firm-level observations. This has helped, as well, to increase the number of observations by integrating in the sample firms for which information is insufficient. This has been done for *Infrastructure* and *Business-Government Relations*. For *Human Capacity* and *Financing Constraints*, however, the initial indicators having been interpreted as specific to each firm, information has been kept at the firm level (except for the variable Skill and Education of Available Workers).

6- MENA Investment Climate

When MENA composite investment climate is compared to the others, the region always ranks below (see Chart 1). In average, this is true for all four dimensions against East Asia (*EAP)*, Africa (*AF)*, Latin America (*LA)* and South Asia (*SA*) (except for infrastructures

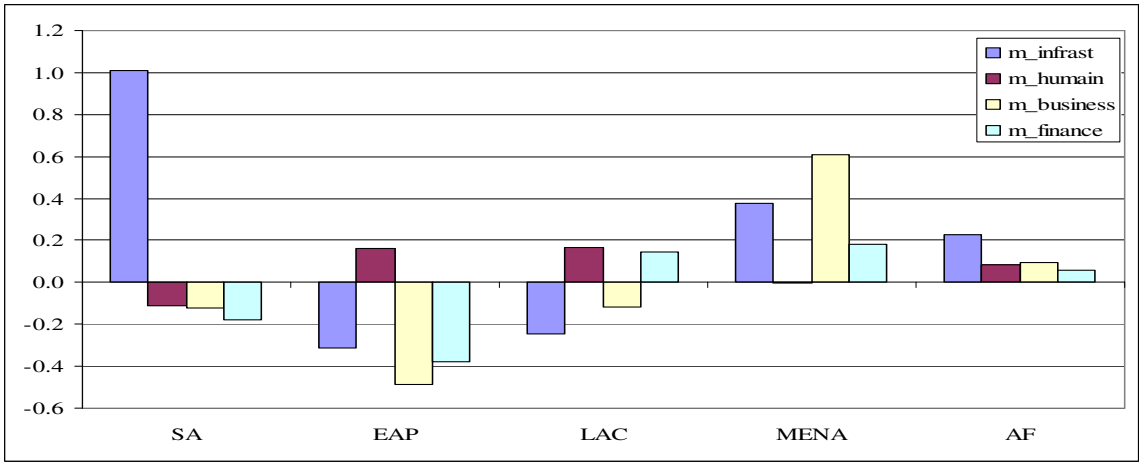
quality in that region, see Chart 2). These findings are in line with the literature. The World Bank (2009a and b), in particular, shows that MENA has globally failed to keep pace with reforms and ranks in the bottom third worldwide as far as business climate is concerned, lower than any other region of the world. This is also true for various aspects of public governance (see World Bank, 2004, and Aysan et ali, 2007). .

Chart 1 : Composite *IC* Indicators (MENA/ non-MENA)



Note: *Infra, Gov Bus*, and *Fin* can be read as obstacles; *Human* can be read as a capacity; "Obstacles" indicators are calculated as an average of dummies going from 0 (none) to 4 (severe);
Source: Authors calculations.

Chart 2 : Composite *IC* Indicators (regions)

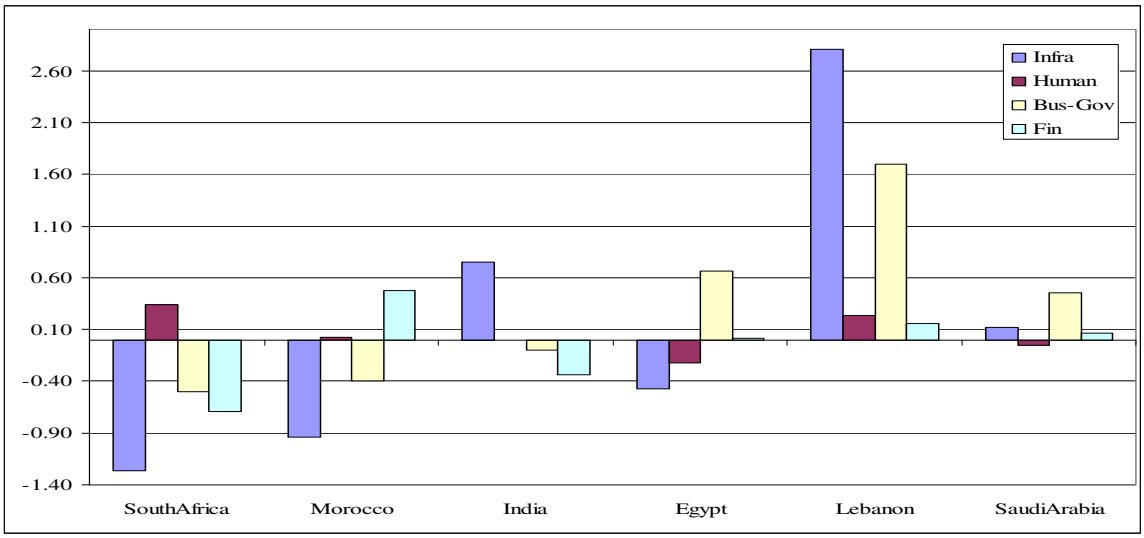


Note. as in Chart 1. *Source*: Authors' calculations.

A more detailed analysis reveals, however, differences across countries and indicators. It is *Morocco* who seems to suffer the least from *IC* limitations, except from financing constraints. Quality of infrastructures, business-government relations and human capacity inadequacies do not appear very much higher in that country than in *South Africa*, the most efficient country in our empirical sample (see Chart 3).. On the opposite, firms in *Lebanon* appear to face strong inadequacies in public services and business-government relations. *Egypt* and *Saudi Arabia* are in an intermediate position, with however relatively high deficiencies in the business-government relation, in particular in *Egypt*. These results are also

in line with the literature (see notably the World Bank Investment Climate Assessments (*ICA*) of *Egypt*, 2005 and 2006, and *Morocco,* 2001 and 2005), as well as with our previous finding on firms' productive performance.

Chart 3: Composite *IC* Indicators (countries)



Note. as in Chart 1. *Source*: Authors' calculations.

As far as the different dimensions of the *IC* are concerned, a disaggregated approach shows which specific aspects are of more concern in the region. Limitations in all three components of the financing constraint demonstrate MENA deficit and cost of funding. This is also true for most dimensions of the human capacity and of the government-business relations (in particular the tax rate and administration, the labor regulations, and the licenses and operating permits, see Table 1 in *Annex* 3). MENA deficient financial system, as well as firms' difficulties in finding affordable credit, is important aspects often emphasized in the literature. With public bank dominating the banking system in many countries and favoring state enterprises, as well as large industrial or offshore firms, *SMEs* in particular find it difficult to get the startup and operating capital they need (see Nabli (2007). *Doing Business* (see the World Bank, 2009a) also ranks MENA low in reforms regarding getting credit, construction permits, starting and closing a business, enforcing contracts, protection of investors, and the labor market[30].

As far as the quality of infrastructures is concerned, our results are more mitigated than what is usually highlighted in the literature. If firms in MENA seem, in average, to face more constraints in electricity delivery (more enterprises relying on their own generator) and in internet connection, the quality of telecommunications or transports does not appear as very strong obstacles for production (see Table 1 in *Annex* 3). Although this finding looks somehow in contradiction with the conclusions of some studies, differences may be due to both the small number of MENA countries and the presence of *Morocco* whose quality of infrastructures is not perceived as a strong limitation[31].

These results are confirmed at the country level, with *Morocco* experiencing more deficiencies in all dimensions of the financing environment, *Egypt* and *Saudi Arabia* in different aspects of the government-business relation and *Lebanon* in all components of the

quality of infrastructure and government-business relation (see Charts 1 to 6 in *Annex* 3). Besides, MENA enterprises are characterized by a smaller size and a lower export orientation than in the rest of the sample (see Table 1 in *Annex* 3). *Morocco*, however, present a high export rate (in particular in the *Textile*, *Leather* and *Garment* industries), as well as *Lebanon* in *Wood and Furniture*. *Morocco* also reveals an above average foreign participation in the capital of the firms (see Chart 7 in *Annex* 3).

7- Does the Investment Climate Explain Firm-Level Technical Efficiency?

In this section, we estimate a model of Technical Efficiency (*TE*) which explains the production frontier and the factors contributing to the efficiency at the same time (following the "one step" procedure discussed in section 2). Investment climate is defined by our four broad composite indicators: (*Infra)*, (*H)*, (*Fin)* and (*Gov)*. After having controlled for the endogeneity of the *IC* variables, we address, in a second stage, the question of a potential self-selection bias, efficient firms concentrating in locations where the investment climate is better. To do it, we investigate the sensitivity of our results to a subsample of firms employing no more than 150 workers.

7.1- The Model Estimated

Our empirical model, which is estimated at the branch level, considers the same specification for all industries. We explain Technical Efficiency (*TE*) by regressing the logarithm of the production factors (capital and labor), as well as various plants characteristics and investment climate (*IC*) variables, on the logarithm of the value added. We maintain our previous assumption about the production technology and use our four *IC* composite indicators, which explain the key dimensions of the investment climate. The model is as follows:

$$\ln(y_{i,j}) = \varphi_i + \alpha_1 \ln(l_{i,j}) + \alpha_2 \ln(k_{i,j}) + \beta\, Size_{i,j} + \gamma\, Foreign_{i,j} + \delta\, Export_{i,j}$$

$$+ \varepsilon_1 RegInfra_{i,j} + \varepsilon_2 RegGov_{i,j} + \varepsilon_3 H_{i,j} + \varepsilon_4 Fin_{i,j} + c + v_{i,j}: \qquad (4)$$

With:

$y_{i,j}$	Value Added[32]
$l_{i,j}$:	Number of Permanent Workers
$k_{i,j}$:	Gross Value of Property, Plant and Equipment
$Size_{i,j}$:	Size of the firm
$Foreign_{i,j}$:	Foreign capital *(% of firm's capital*)
$Export_{i,j}$:	Export *(% of firm's sales*)
$RegInfra_{i,j}$:	Quality of Infrastructure (*composite indicator*)
$RegGov_{i,j}$:	Business-Government Relations (*composite indicator*)
$H_{i,j}$:	Human Capacity (*composite indicator*)
$Fin_{i,j}$:	Financing Constraints (*composite indicator*)
$\varphi_{i:}$	Country-Dummy variables
γ:	Intercept
$v_{i,j}$:	Error terms

i / j: Enterprise and country index respectively

Plants characteristics have consisted in: the percentage of sales exported by the firms (*Export*), the percentage of foreign ownership of firms' capital ($Foreign_{i,j}$), as well as the firm size ($Size_j$). Export is a factor of productivity by confronting firms to international competition. Foreign ownership, as well, increases productivity if foreign investors bring new technologies and management techniques. As for the size, we intend to test the hypotheses of scales economies in big enterprises[33]. The expected sign of these variables is negative, the one step procedure explaining firm-level inefficiency. The same precautions must be taken when interpreting the sign of the coefficients of the other variables[34]. Country-dummy variables have also been introduced when estimating the production frontiers. There are good reasons to think that production may vary across countries for motives other than production factors. The country dummies can pick up the effect of countries specific factors, such as endowment in natural resources, national-level institutions, macro or political instability, trade policy, etc... Country-dummy variables are intentionally not included in the second part of the equation, when explaining Technical Efficiencies (*TEs*), since they could capture part of the heterogeneity across countries resulting from *IC* variables. Equation (*4*) has been estimated by industry on unbalanced panels going from 1555 observations (in *Garment*) to 433 observations (in *Leather*). Sector-based estimates are presented in Table 3.

A first set of conclusions concerns the production frontiers[35]. Our regressions confirm the choice to estimate a production frontier by industry. Elasticites of capital and labor prove different from one industry to another. Impact of capital is strong in *Chemicals & Pharmaceutical Products*, *Agro-Processing* and, to a lower extent, *Textile*. On the opposite, elasticity of labor is higher in *Metal & Machinery, Non Metal & Plastic Materials, Wood & Furniture, Leather* and *Garment*. These industries look like being more intensive in labor. Furthermore, all coefficients are highly significant (at 1% level), what stresses the robustness of our estimations. Another result is that we are still close to the constant returns to scales. Besides, some differences in production frontiers can be explained by countries specific conditions. This hypothesis is supported by the data, as country-dummies are well significant at this stage of estimations.

More interesting, our estimations verify that differences in the investment climate participate in firms' Technical Efficiencies (*TE*) discrepancies. This is true for all aspects of the business environment. Our results confirm that a good quality of different infrastructure, a satisfactory access to financing, the availability of expertise at the firm level, as well as an adequate business-government relation are important factors for enterprises productive performances[36]. This outcome, which is consistent with the theory, makes a real contribution to the empirical literature by validating, for a large sample of industrial firms in developing countries, the role of a substantial set of *IC* variables on firms' productive performance. It is also of first importance for the MENA economies, where improvement of the different dimensions of the investment climate would greatly contribute to the firms' efficiency, as well as the regional catch up with more efficient and competitive countries. Improving the financial environment in *Morocco*, the government-business relation in *Egypt*, *Saudi Arabia* and *Lebanon*, and the quality of infrastructure in *Lebanon* would go in this direction.

Table 3. Estimation Results: Common Model with Aggregated *IC* Variables

(Dependant Variable: Value Added)

Independent Variables	**Textile**	**Leather**	**Garment**	**Agro Industry**	**Metal & Machinery Products**	**Chemic &Pharm Products**	**Wood & Furniture**	**Non Metal & Plastic Materials**
ln(l)	0.637 *(16.01)****	0.778 *(27.90)****	0.879 *(15.19)****	0.551 *(12.54)****	0.885 *(25.26)****	0.578 *(11.84)****	0.836 *(17.87)****	0.923 *(15.50)****
ln(k)	0.337 *(15.06)****	0.252 *(16.57)****	0.196 *(7.40)****	0.397 *(24.54)****	0.258 *(13.11)****	0.447 *(20.05)****	0.248 *(11.91)****	0.254 *(9.31)****
Intercept	1.081 *(2.01)***	2.149 *(5.93)****	1.326 *(4.62)****	4.302 *(5.77)****	1.883 *(5.90)****	2.868 *(4.26)****	1.738 *(4.54)****	1.223 *(2.78)****
Size	-0.809 *(1.54)*	-0.333 *(1.77)**	-0.037 *(0.33)*	-0.212 *(2.75)****	-0.159 *(0.22)*	-0.198 *(1.99)***	-0.490 *(2.22)***	0.273 *(1.10)*
Foreign	-0.426 *(0.90)*	-0.006 *(0.76)*	-0.014 *(0.50)*	-0.005 *(3.48)****	-0.541 *(1.05)*	-0.006 *(1.72)**	0.004 *(0.54)*	-0.019 *(1.28)*
Export	-0.016 *(0.81)*	-0.020 *(1.95)**	-0.078 *(1.81)**	-0.001 *(1.14)*	-0.114 *(1.04)*	-0.008 *(1.49)*	-0.017 *(1.53)*	-0.186 *(1.08)*
RegInfra	0.762 *(2.52)***	-0.079 *(0.66)*	-0.057 *(0.95)*	0.014 *(0.27)*	0.833 *(1.83)**	0.204 *(2.35)***	0.262 *(1.71)**	0.318 *(2.32)***
H	-0.716 *(1.76)**	-0.138 *(0.79)*	-0.116 *(1.08)*	-0.253 *(5.03)****	-1.174 *(1.52)*	-0.147 *(1.71)**	-0.488 *(2.33)***	-0.768 *(2.24)***
RegGov	-0.259 *(1.21)*	-0.072 *(0.72)*	0.185 *(2.48)***	-0.047 *(1.48)*	0.706 *(1.70)**	-0.068 *(1.39)*	-0.060 *(0.54)*	0.136 *(0.86)*
Fin	0.778 *(2.40)***	0.219 *(1.68)**	0.035 *(0.50)*	0.124 *(3.86)****	0.257 *(0.54)*	0.148 *(2.67)****	0.330 *(2.36)***	-0.208 *(1.26)*
Constant	-0.961 *(0.95)*	0.162 *(0.19)*	0.506 *(1.84)**	3.243 *(4.82)****	-6.121 *(2.83)****	1.508 *(2.32)***	0.703 *(1.04)*	-0.522 *(0.71)*
Obs	929	433	1555	1481	826	741	750	461
sigma_u	1.31	1.11	0.25	0.91	1.98	0.70	1.10	0.56
sigma_v	0.86	0.60	0.73	0.37	0.65	0.56	0.53	0.75
Wald chi2	1579.56	2375.90	925.66	1343.79	3117.04	1010.55	1490.81	893.91
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: The one step procedure explains firm-level inefficiency. The expected sign of the investment climate aggregated variables is positive for *RegInfra*, *RegGov* and *Fin,* and negative for H (see definition of variables in section 5). Variables *Size*, *Foreign* and *Export* are also expected with a negative coefficient. All regressions contain country-dummy variables when estimating the production function. * Significance level 10%; ** 5%; and *** 1%. Absolute value of z statistics are in parentheses.
Source. Authors' estimations

Findings by industry bring, as well, quite interesting comments and reveal differences across branches. Our empirical analysis shows, in particular, that some industries: *Textile* (for *H*, *Infra* and *Fin*), *Metal & Machinery Products* (for *H* and *Gov*) and *Wood & Furniture* (for *H* and *Fin*) appear more sensitive and vulnerable than others in front of a deficit of their investment climate (the estimated coefficients of the *IC* variables are higher for these industries). This comment may be extended to *Non Metal & Plastic Materials* and *Garment* for, respectively, Human Capacity (*H*) and Government-Business Relation (*Gov*). This may be due to the fact that most of these industries face international competition and need a supportive investment climate to be able to compete efficiently. This fragility justifies that a particular attention be paid when taking decisions that may affect their investment climate. This also means that the pay off of an improvement of the investment climate would be more substantial in these industries, which could play a leading role in the industrial development and the export capacity of countries. This conclusion is all the more important for the MENA economies, knowing the high specialization of some of them (*Morocco* and *Egypt* in

particular) in the *Textile* and *Garment* industries. Improving the investment climate in these two sectors would greatly help to resist the strong international competitions and reinforce the export orientation of the two countries.

The model also validates the role of some plants characteristics in explaining firm-level Technical Efficiency (*TE*). This is the case of the variable *Size*, which justify scales economies in four industries: *Agro-Processing, Chemicals & Pharmaceutical Products, Wood & Furniture* and *Leather*. This constitutes an interesting result that would justify a policy of concentration of small enterprises, which importance in developing countries is well documented. Concentration could be seen as a powerful means of boosting efficiency and competitiveness of the industrial sector, thus contributing to industrial development and economic growth. This is particularly true in the MENA context where there is a significant proportion of small and medium enterprises. Besides, export orientation (*Export*) explains externalities linked to export activities in *Garment* and *Leather*. This result meets with what we know about these sectors, where external competitive markets are a stimulating source for a high productivity level. Increase the export capacity of these industries appears, though, as another mean to stimulate firm's efficiency and contribute to industrial growth. Regressions results are, however, poor in these two sectors, with very few *IC* variables explaining efficiency (only *Fin* in the case of *Leather* and *Gov* in the case of *Garment*). We will however show in next section that *Garment* is better explained by the data, when dealing with small and medium domestic firms only, what justifies that big enterprises in this sector have the ability to influence their investment climate, or choose their location.

7.2- Endogeneity of Firms' Location

A test of robustness of this first set of estimations has consisted in addressing the question of a possible endogeneity of firms' location. City or region-sector averages *IC* indicators would not be exogenous regressors if more efficient firms tend to establish where the investment climate is better. In order to evaluate this potential bias, we have re-run the previous model on a set of firms which are less likely to choose their location. This restriction implicitly leads to eliminate foreign firms. Following Dollar et *al*. (2005), we define our new sample as the domestically owned firms employing less than 150 workers[37]. Results of this new set of estimations still confirm our previous findings (see Table 4).

A first conclusion concerns the investment climate variables, which impact on firms' performance is still validated by the data. This is true for all four dimensions of the investment climate. This result confirms that small and medium domestic firms are sensitive to changes in the different dimensions of their investment climate. A detailed analysis also reveals that the influence of the investment climate can be different for this category of firms. This is the case in *Textile*, *Garment* and *Non Metal & Plastic Materials*, where the impact of the *IC* variables is stronger than for the whole sample (see section 7.1). In *Textile*, this is true for all three significant dimensions of the investment climate (*Infra, H* and *Fin).* In *Garment*, Financing Constraints *(Fin)* and Infrastructure (*Infra)* appear now as constraints for small firms' productive performance, in addition to a stronger impact of Business-Government Relations (*Gov*). Besides, small and medium domestic firms in *Non Metal & Plastic Material* are more sensitive to limitations in Infrastructure (*Infra)* and Human Capacity *(H)*. This

outcome is likely to show that, in the three industries, big and foreign firms can resist more to a degradation of the investment climate. This finding also tends to confirm that big enterprises have the possibility to influence positively their investment climate, or to establish in locations where the investment climate is more favorable.

Table 4. Estimation Results: Common Model with Aggregated *IC* Variables and Sample Differentiation (domestic firms with less than 150 employees)

(Dependant Variable: Value Added)

Independent Variables	**Textile**	**Leather**	**Garment**	**Agro Industry**	**Metal & Machinery Products**	**Chemic &Pharm Products**	**Wood & Furniture**	**Non Metal & Plastic Materials**
ln(l)	0.547 *(9.01)***	0.882 *(23.30)***	0.975 *(15.3)***	0.460 *(5.92)***	0.834 *(15.85)***	0.549 *(6.74)***	0.779 *(11.39)***	0.981 *(14.07)***
ln(k)	0.319 *(12.38)***	0.252 *(16.25)***	0.177 *(6.06)***	0.384 *(18.61)***	0.251 *(10.87)***	0.390 *(13.89)***	0.223 *(10.01)***	0.252 *(8.74)***
Intercept	2.153 *(4.18)***	1.732 *(5.00)***	-0.309 *(0.93)*	2.105 *(2.33)**	1.903 *(4.86)***	2.426 *(3.11)***	2.238 *(3.16)***	1.024 *(2.42)**
Size	-2.897 *(1.91)**	0.045 *(0.27)*	0.186 *(0.84)*	-0.357 *(2.88)***	-2.331 *(1.76)**	-0.345 *(2.44)**	-0.412 *(2.51)**	0.678 *(1.37)*
Export	-0.417 *(0.98)*	-0.010 *(1.85)**	-0.003 *(0.81)*	-0.005 *(1.79)**	-0.475 *(0.99)*	-0.016 *(1.49)*	-0.013 *(1.62)*	-0.316 *(0.95)*
RegInfra	1.170 *(2.13)**	-0.127 *(1.09)*	0.763 *(2.97)***	0.007 *(0.09)*	0.869 *(2.01)**	0.161 *(1.83)**	0.157 *(1.60)*	0.472 *(1.72)**
H	-1.352 *(2.04)**	-0.133 *(0.86)*	-0.276 *(0.77)*	-0.201 *(2.82)***	-1.103 *(1.35)*	-0.108 *(1.23)*	-0.263 *(2.50)**	-1.444 *(2.09)**
RegGov	-0.171 *(0.51)*	-0.105 *(1.17)*	1.552 *(2.88)***	-0.045 *(1.05)*	0.424 *(0.94)*	-0.067 *(1.48)*	-0.063 *(0.81)*	0.154 *(0.54)*
, Fin	1.170 *(2.05)**	0.222 *(1.97)**	0.665 *(3.33)***	0.093 *(1.96)**	0.496 *(0.99)*	0.146 *(2.60)***	0.178 *(2.42)**	-0.520 *(1.57)*
Constant	-0.254 *(0.15)*	-0.348 *(0.44)*	-3.389 *(2.40)**	1.894 *(2.58)***	-1.468 *(0.73)*	1.509 *(3.33)***	1.389 *(3.36)***	-2.307 *(1.40)*
Observations	730	359	1093	1123	639	607	650	395
sigma_u	1.42	1.02	0.28	0.73	1.41	0.43	0.80	0.91
sigma_v	0.90	0.45	0.73	0.77	0.71	0.80	0.51	0.69
Wald chi2	663.77	1615.42	763.09	787.50	1175.83	479.31	576.56	796.86
Prob > chi2	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

Notes: The one step procedure explains firm-level inefficiency. The expected sign of the investment climate aggregated variables is positive for *RegInfra*, *RegGov* and *Fin,* and negative for *H* (see definition of variables in section 5). Variables *Size*, *Foreign* and *Export* are also expected with a negative coefficient. All regressions contain country-dummy variables when estimating the production function. Significance level 10%; ** 5%; and *** 1%. Absolute value of z statistics are in parentheses. *Source*. Authors' estimations

This outcome can be considered as of first importance, knowing the potential of job creation of small enterprises. Actually, it is well documented that small businesses generally deal with poor investment climate (see World Bank, 2005). They have, for example, a more difficult and more expensive access to the financial system. They have not the power to lobby policy makers to get better regulations. They also attract less qualified people who prefer higher salaries in bigger enterprises. They have less the capacity to compensate deficient infrastructure, buying a generator or paying for expensive internet connections (in addition to the fact that they don't choose their location, see World Bank, 2005). This makes of this category of firms a great potential for an improved performances of the industrial sector. This

is particularly true in our MENA economies, which are characterized by a relatively small size of firms (see section 6).

It is also interesting to note that, when focusing on small and medium domestic firms, we find that more *IC* variables explain firm-level performance. This is due to the fact that big enterprises are less sensitive to *IC* limitations and bias downward the estimated coefficients when dealing with the whole sample. Restricting the sample to small and medium firms better highlight the impact of *IC* and firms' characteristics on firm-level performance and competitiveness, thus drawing more substantial policy implications. This is well illustrated in the case of *Garment*, for which very few *IC* variables were previously significant.

Another conclusion can be drawn from the estimations. As for the whole sample, higher sensibility of relatively small enterprises concerns sectors for which competition is strong on the world market. This is particularly true for *Textile* and *Garment*, but also to some extent for *Non Metal & Plastic Material*. This finding has interesting policy implications. It tends to show that an improvement of various dimension of the investment climate (depending on the industries) would generate substantial productivity gains and largely boost competitiveness of the small and medium firms on the world market. This is particularly true for the financing environment in *Textile*, *Garment* and *Leather* in *Morocco*, for the government-business relation in *Egypt* and *Lebanon* for *Garment*, and for the quality of infrastructure in *Textile* and *Garment* in *Lebanon*.

Interestingly, another result tends to confirm the importance of the size as a factor of productivity and efficiency. Actually, small domestic firms appear to gain more from concentration than big and foreign ones (what looks like a reasonable outcome). This is the case in *Textile* and *Metal & Machinery Products* where the variable *Size* is now significant, as well as in *Agro-Processing* and *Chemicals & Pharmaceutical Products* where the coefficient of this variable shows a significant increase compared to the previous estimations (see section 7.1). This constitutes an interesting result that would also justify a policy of concentration of small enterprises.[38].

8- Conclusions

In this paper, it has been shown that investment climate (*IC*) matters for firms' productive performance. This finding is true for several aspects of the investment climate. This outcome (which is consistent with the theory) makes a real contribution to the empirical literature by validating, for a large sample of industrial firms in developing countries, the role of a substantial set of *IC* variables. This finding also shows that, in global economy where technology diffuses rapidly and capital is mobile, the persistence of firm-level productivity differences across countries can be explained by differences in the investment climate. This conclusion is important for the MENA economies, where the deficiencies of the investment climate explain well why firm-level productive performance have, in average, been disappointing.

Policy implications of our findings are comprehensible by showing what determinants of productivity cause producers to be more efficient, and where should reform be targeted to have the greatest impact on productivity. In most industries, it is the different dimensions of the Quality of Infrastructure (*Infra)* and of the Human Capacity *(H)*, as well as the access to Financing (*Fin)* that account more often for firms' productive performance. Building on these three dimensions would have a large pay off for the efficiency and competitiveness of the manufacturing industry as a whole. This factor should be kept in mind when dealing with the reform agenda of many developing countries, in the MENA region in particular where the deficiencies in the different dimensions of the investment climate appear to be high.

A more in depth analysis also reveals interesting differences across industries. Actually, although most industries appear sensitive to different dimensions of the investment climate, firms in *Textile* and *Metal & Machinery Products* look like to suffer more of investment climate limitations. This comment may be broadened, to some extent, to *Non Metal & Plastic Materials* and *Garment.* This may be due to the fact that these sectors face international competition and need a supportive investment climate to compete efficiently. This fragility justifies that a particular attention be paid when taking decisions that may affect these sectors. This also means that the pay off of an improvement of the investment climate in terms of productive performances and competitiveness would be more substantial in these industries, which could play a leading role for the industrial development and the export capacity of the developing world. This result constitutes an important means of appreciation of the positive impact of the investment climate since MENA manufacturing suffers from a deficient integration into the world economy, as well as from a high competition in the world market.

Another interesting finding can be seen in the fact that impact of investment climate varies for small and medium (under 150 workers) domestic firms. This is the case in *Textile*, *Garment* and *Non Metal & Plastic Materials* (which are sectors exposed to international competition as well), where investment climate constraints emerge stronger than for the whole sample. This result is likely to show that, in these industries, big and foreign firms have the possibility to influence positively their investment climate, and/or establish in locations where the investment climate is better. This finding also implies that improvement of the investment climate of small and medium enterprises in these industries would generate substantial productivity gains and largely boost competitiveness of this category of firms. This outcome has to be considered as of first importance, knowing the significance of small enterprises in developing countries, especially in MENA, as well as their substantial potential of job creation. Interestingly, another result tends to confirm the importance of the size as factor of productivity and efficiency. Actually, small domestic firms appear to gain more from concentration than big and foreign ones. This is true in *Textile* and *Metal & Machinery Products.* This constitutes an interesting result that would justify the concentration of small enterprises as a powerful means of efficiency and competitiveness.

Actually, like other developing countries, MENA is increasingly concerned about improving competitiveness and productivity, as the region face the intensifying pressure of globalization. This is true in *Textile*, *Garment* and *Leather* industries, in which export specialization is high (i.e., *Morocco* and *Egypt* in particular). Among the region, the World

Bank firm-surveys provide a standard instrument for identifying key obstacles to productivity, and prioritize policy reforms. This instrument is to be taken into consideration if MENA wants to diversify, in an increasing competition where *China* and *India* benefit from low labor costs.

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Annex 1: List of countries

MENA	LAC	AFR	SAS	EAP
Algeria (2002)	Brazil (2003)	Ethiopia (2002)	Bangladesh (2002)	China (2002)
Egypt (2004/2006)	Ecuador (2003)	South Africa (2003)	India (2000/2002)	Philippines (2003)
Morocco (2000/2004)	El Salvador (2003)	Tanzania (2003)	Pakistan (2002)	Thailand (2004)
Lebanon (2006)	Guatemala (2003)	Zambia (2002)	Sri Lanka (2004)	
Saudi Arabia(2005)	Honduras (2003)			
	Nicaragua (2003)			

Note: ***MENA*** : Middle East and North Africa; ***LAC****:* Latin America and the Caribbean; ***AFR*** : Sub Sahara Africa; ***SAS****:* South Asia; ***EAS*** : East Asia.

Annex 2: ICA Surveys: Data Limitations

Industries/ (number of firms and %)	**Textile**	**Garment**	**Leather**	**Agro-Processing**	**Metal & Machinery Products**	**Chemical & Pharmac. Products**	**Non Metal & Plastic Materials**	**Wood & Furniture**	**Total**
Total Enterprises	2496	3794	821	2815	2163	1728	1159	1317	16293
MENA Enterprises	761	906	257	655	758	364	487	199	4387
(% total)	*(30%)*	*(24%)*	*(31%)*	*(23%)*	*(35%)*	*(21%)*	*(42%)*	*(15%)*	*(27%)*
Total Frontier	1998	2796	634	2184	1604	1270	897	1031	12414
(% total enterprises)	*(80%)*	*(74%)*	*(77%)*	*(78%)*	*(74%)*	*(73%)*	*(77%)*	*(78%)*	*(76%)*
MENA Frontier	541	711	167	436	538	241	335	120	3073
(% total MENA)	*(69%)*	*(78%)*	*(65%)*	*(67%)*	*(71%)*	*(66%)*	*(69%)*	*(59%)*	*(70%)*
(% total frontier)	*(26%)*	*(25%)*	*(26%)*	*(20%)*	*(34%)*	*(19%)*	*(37%)*	*(11%)*	*(25%)*
Total with	942	1604	380	1525	841	738	478	778	5002
***IC* variables**	*(38%)*	*(42%)*	*(46%)*	*(54%)*	*(39%)*	*(43%)*	*(41%)*	*(59%)*	*(45%)*
MENA with *IC* variables	215	371	91	228	258	95	162	63	1483
(% total MENA)	*(28%)*	*(41%)*	*(35%)*	*(35%)*	*(34%)*	*(26%)*	*(33%)*	*(32%)*	*(34%)*
(% total IC)	*(23%)*	*(23%)*	*(24%)*	*(15%)*	*(31%)*	*(13%)*	*(34%)*	*(8%)*	*(30%)*

Sources: Authors' calculations.

Annex 3: Investment Climate and Firms' Characteristics

Table 1

	MENA			NON MENA			Ho: No diff in means
	Mean	Standard Deviation	Number of firms	Mean	Standard Deviation	Number of firms	[p-values]
Size	127.1	266.9	3075	192.4	555.9	9350	0.0
Export (% sales)	16.8	34.1	2987	18.7	35.0	8815	0.0
Foreign ownership (% K)	8.3	25.4	3072	6.2	21.7	9292	0.0
Use of E-mail (% firms)	52.0	50.0	2289	60.5	48.9	8940	0.0
Use of website (% firms)	26.7	44.2	2550	35.6	47.9	8233	0.0
Telecommunication*	4.7	21.2	2493	11.4	31.8	8635	0.0
Electricity*	18.2	38.6	2512	33.2	47.1	8650	0.0
Transport*	7.6	26.5	2332	15.1	35.8	8634	0.0
% firm with generator	44.9	41.8	3040	35.5	48.6	9332	0.0
% elect from generator	15.3	16.6	2999	6.0	18.7	9110	0.0
Overdraft facility (% firms)	42.6	49.5	3069	56.4	49.6	8519	0.0
Financing Access*	51.5	50.0	2032	34.7	47.6	8492	0.0
Financing Cost*	56.9	49.5	2051	42.0	49.4	8477	0.0
Top Manager Ed. Level	3.9	1.4	2261	4.3	1.5	8083	0.0
Top Manager Exp. (years)	12.5	10.9	2218	8.0	9.0	8260	0.0
% Workers Formal Training	19.8	39.9	3052	39.8	49.0	9248	0.0
Availability Skilled Workers*	30.1	45.9	2505	24.0	42.7	8625	0.0
Labor Regulation*	26.9	44.3	2505	21.8	41.3	8430	0.0
Tax Rate*	57.0	49.5	2493	41.8	49.3	8628	0.0
Tax Administration*	38.5	48.7	2486	34.8	47.6	8618	0.0
Licence/Operating Permits*	20.8	40.6	2486	15.5	36.2	8408	0.0
Customs/Trade Regulations*	18.4	38.7	2448	24.9	43.2	7844	0.0
Corruption*	40.6	49.1	2489	44.6	49.7	8635	0.0

*Note: * Percentage of firms ranking the variable as a major or severe constraint*
Source: Authors calculations

Chart 1: Infrastructures (obstacles)

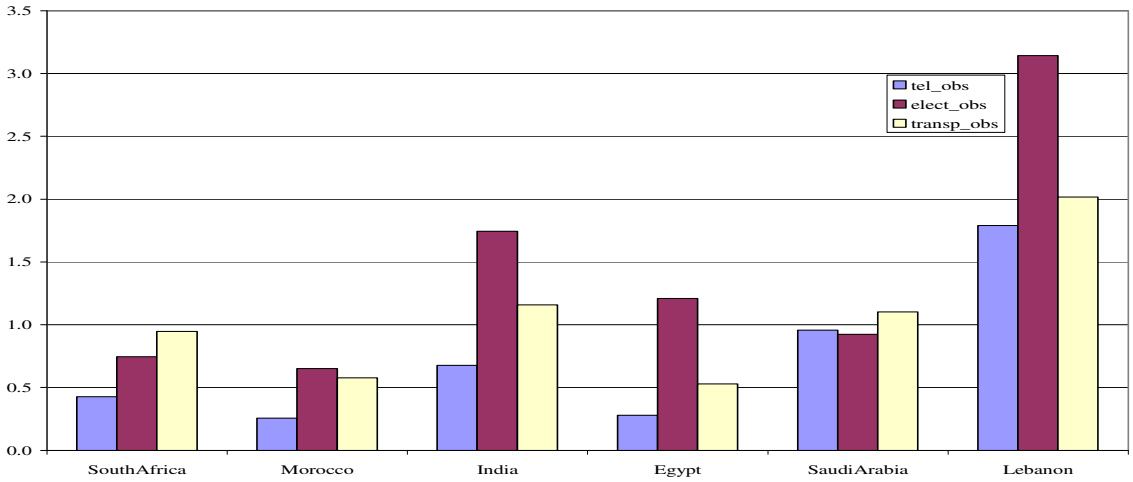


Chart 2: Infrastructures (electricity)

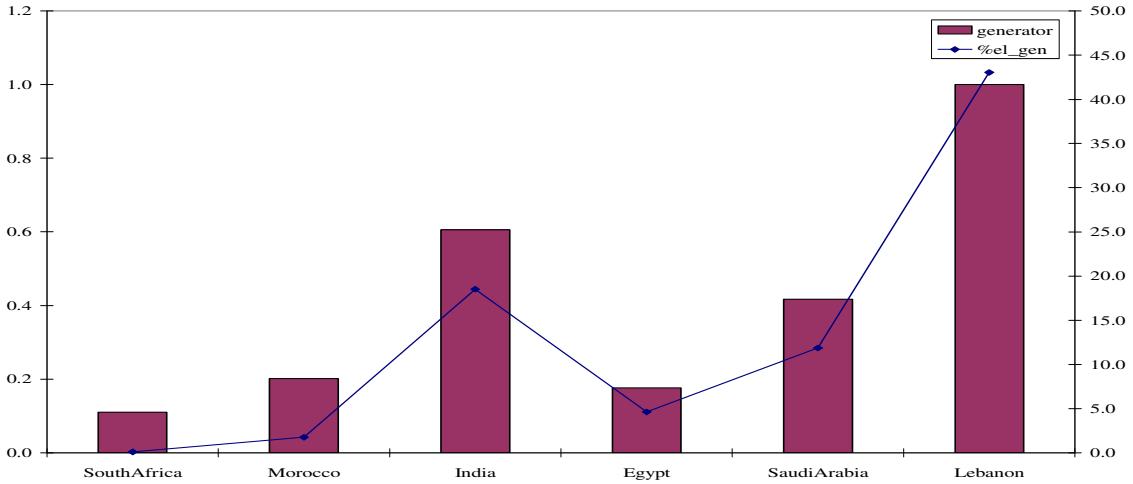


Chart 3 Infrastructures (internet)

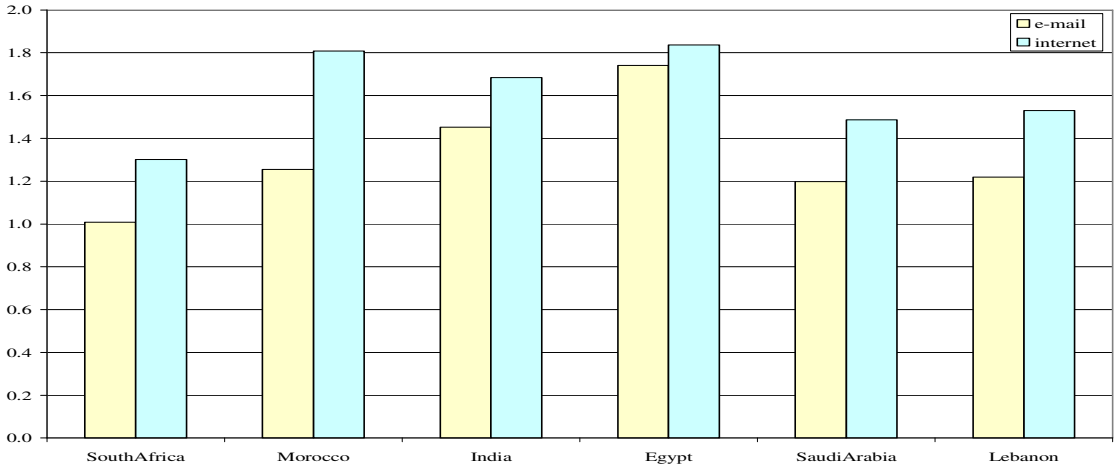


Chart 4 : Human Capacity

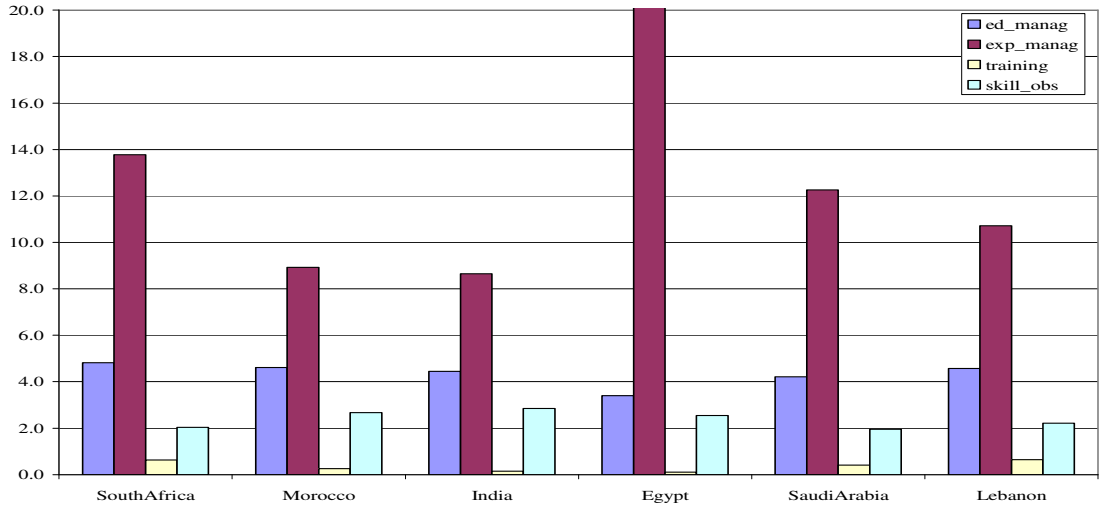


Chart 5 : Gouvernement-Business Relation

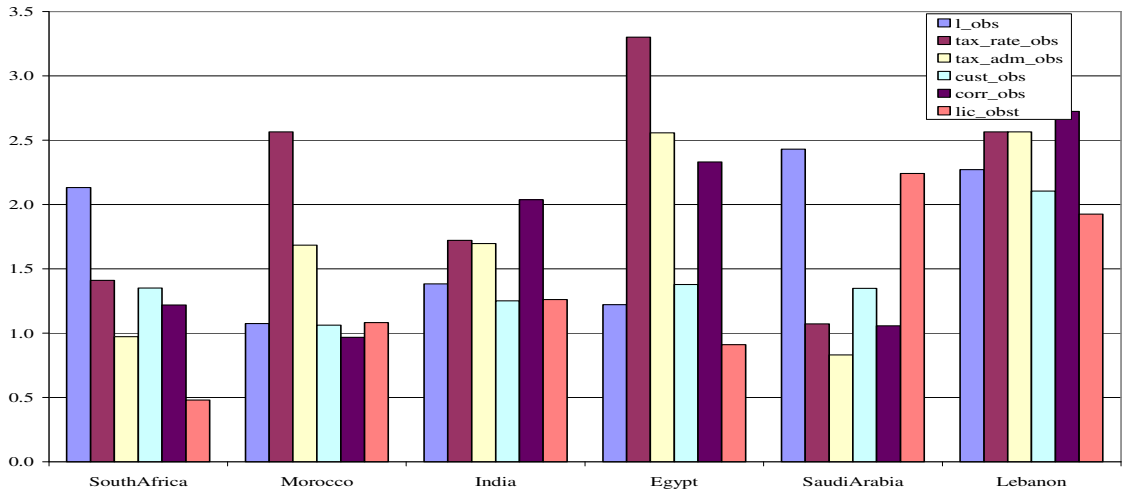


Chart 6 : Financing Contraints

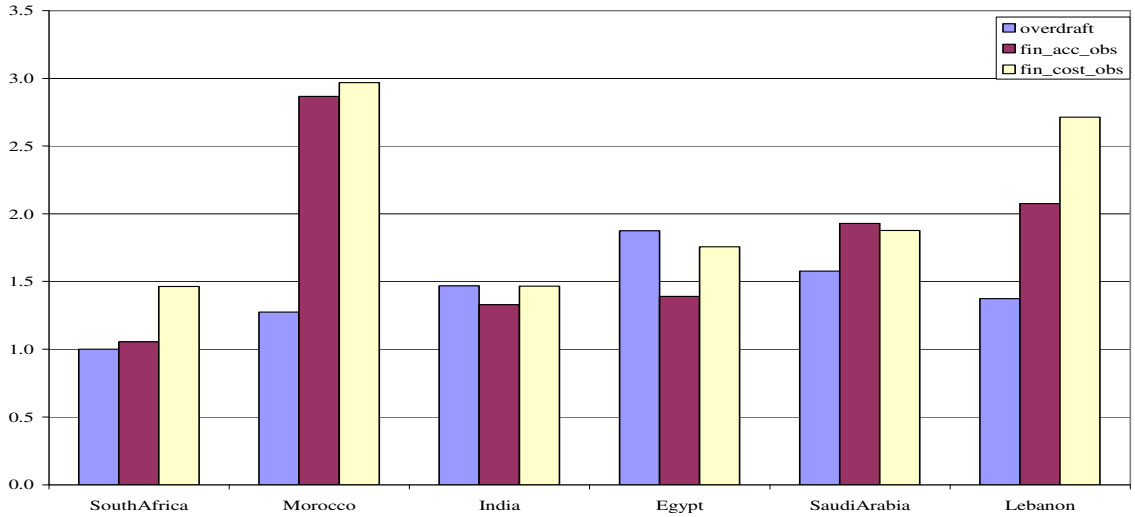
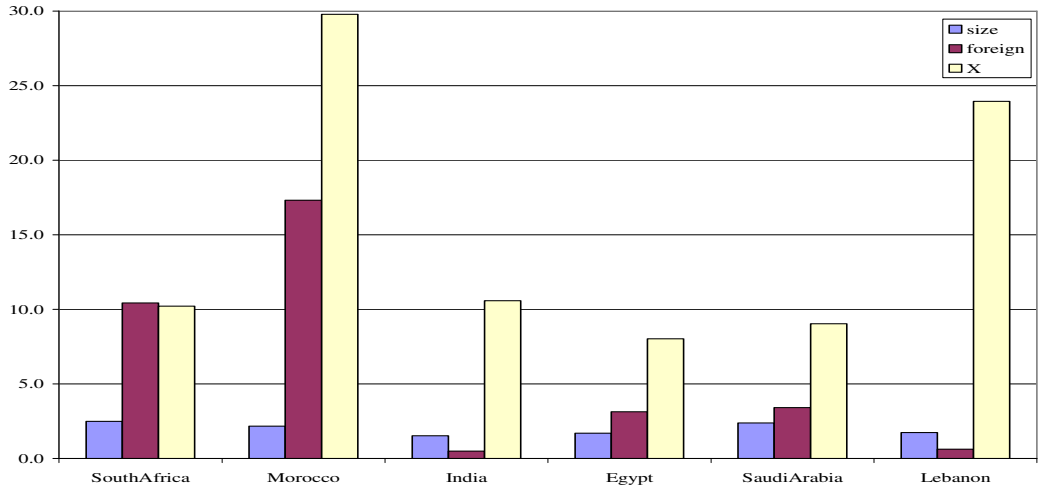


Chart 7 : Firms' Characteristics



Note: All "obstacles" indicators are calculated as an average of dummies going from 0 (none) to 4 (severe); *generator*, *training*, *overdraft* are averages of dummies 0 / 1 (0 for *No* and 1 for *Yes*) and *e-mail* and *internet* of dummies 1 / 2 (1 for *Yes* and 2 for *No*); *ed_manag* is an average of dummies going from 1 to 6; *% el_gen* is the percentage of electricity coming from a generator, *foreign* is the percentage of firm's capital own by foreigners; *X* is the percentage of firm's sales exported; *size* is a variable calculated from the number of permanent workers. *Source*: Authors calculations

Notes

[1] See Bosworth and Collins (2003); Djankov and al. (2002); Dollar and al (2005); Hall and Jones (1999); Haltiwanger (2002); He et al. (2003); Loaya, Ociedo and Serven (2004); OECD (2001); Rodrik, Subramanian (2004); McMillan (1998 and 2004); World Bank (2003, 2004).

[2] See in particular Frankel (2002) and Rodrik (1999).

[3] See for example, Acemoglu, Johnson, and Robinson (2001); Easterly and Levine (2003); Hall and Jones (1999); Knack and Keefer (1995); Rodrik, Subramanian, and Trebbi (2002);.

[4] See Easterly and Levine (2003); Knack and Keefer (1995); North (1990); Rodrik, Subramanian and Trebbi (2002); and Saleh (2004). See Acemoglu, Johnson and Robinson (2001); Calderon and Chong (2000) in the context of growth.

[5] See Mauro (1995); Gupta, Davooli and Alonso-Terme (2002); Mo (2001); Tanzi and Davooli (1997).

[6] See Kerr (2002); Hernando and Soto (2000).

[7] See Evans and Rauch (2000).

[8] See Bastos and Nasir (2004); Dollar and al. (2005); Eifert and al. (2005); Escribano and Gasch (2005).

[9] See El Badawi (2002); the World Bank (2004); Aysan et al. (2009).

[10] See Nabli. (2007); Nabli and Véganzonès-Varoudakis (2004); Aysan et *al*. (2007) and. (2009).

[11] See Sekkat and Véganzonès-Varoudakis, (2007); Nabli and Véganzonès–Varoudakis (2007).

[12] *Agro Processing*, *Leather*, *Textile*, *Garment*, *Wood & Furniture*, *Chemical & Pharmaceutical Products*, *Metal & Machinery Products*, and *Non Metal & Plastic Materials*.

[13] In this paper, we only refer to productivity levels because of the limited time dimension for the production factors (two to three years at the best) and no time dimension for the *IC* variables. Our analysis thus focuses on comparisons of firm-level productivity among enterprises, industries and countries. Measuring productivity in level, although more restrictive than measuring growth rates (it requires for example specific functional forms of the production function) is less demanding in terms of data quality requirement. It allows, in particular, unbalanced panels with short term dimension, measurement errors, or constant value of *IC* variables (see Escribano and Guasch, 2005).

[14] Although there is a wide range of choices in regard to the statistical distribution of the efficiency term (u), the ranking of firms according to the efficiency term is generally not sensible to the choice of the specific distribution (Coelli, Prasada Rao and Battese, 1998).

[15] Different estimation procedures can be used. The simplest way is to run an OLS regression. Another possibility is to apply a Tobit model, in order to address the question of the distribution of the efficiency.

[16] The year of the survey is into brackets. *Lebanon* and *Saudi Arabia* are, however, less represented than the other countries of the region. In the case of *Lebanon*, the low number of observations makes sometimes results difficult to interpret. For *Saudi Arabia*, firms' surveys cover only 3 of the 8 branches studied (*Agro-Processing*, *Wood & Furniture*, *Metal & Machinery*).

[17] Firms are asked to quantify their constraints on a scale going from none to very severe.

[18] We ensure to get a sufficient number of observations by city and sector.

[19] The choice of an adequate exchange rate depends, among other things, on the exchange rate regime of the country. In presence of a floating exchange rate regime, the volatility of the current exchange rate may affect the perception of the productive performances. This is particularly true for the Labor Productivity (*LP*). For Total Factor Productivity (*TFP*), this problem is somewhat attenuated by the fact that the same exchange rate is used to convert intermediate consumptions and capital in the denominator, and production in the numerator. Using current exchange rate introduces, as well, a bias for example when fixed exchange rate policy leads to an overvaluation of the currency or when the floating rate suffers from overshooting.
Current exchange rate has the advantage to represent the rate that firms deal with when making their own economic calculations. This is the rate that the producer faces when he competes on external as well as domestic markets. Both, a constant exchange rate or the use of a Purchasing Power Parity (*PPP*) exchange rate with the US dollar, are surely more problematic for our analysis. *PPP* conversion rate is useful when comparing purchase power of income per capita. We know that the purchasing power in developing countries tends to be higher than when GDP per capita is converted using nominal exchange rate. But when dealing with production, current rate is more representative of the enterprises' economic reality. The choice of exchange rate does not seem, , to change radically the perception of the firms' productive performances. The coefficient of correlation of our three measures of firm-level productivity using alternatively current and constant exchange rates is relatively high.

[20] Because of the absence of time dimension, it is not possible to evaluate the stocks variations that would allow calculating the real Intermediate Consumption during the year.

[21] It is a little bit higher for some sectors than can be suspected to face investment indivisibilities. In comparison with other sectors, *Textile* is probably the most exposed to the competition and the production technology does not reject this hypothesis.

[22] Interpretation of results may, however, be less robust for some countries. This is the case of *Lebanon* and *Saudi Arabia* for which the number of observations can be quite small, de pending on the industries.

[23] See Manly (1994); Mardia, Ken and Bibby, (1997); Nagaraj and *al*. (2000); Mitra and *al*. (2002); Nabli and Véganzonès-Varoudakis (2007); Aysan et *al*. (2007) and. (2009).

[24] Firms are asked to position their answer on a scale going from **0** (no obstacle) to **3** (very severe obstacle).

[25] See Aschauer (1989), Argimon et al., (1997), Barro (1990), Blejer and Kahn (1984), Murphy, Shleifer, and Vishny (1989).

[26] For spatial externalities, see Holtz-Eakin and Schwartz (1995).

[27] Levels of education are from primary to post graduate.

[28] See Lucas (1988), Psacharopoulos (1988), and Mankiw, Romer and Weil (1992).

[29] The principal components of the initial variables were extracted for each aggregated indicators. The four composite indicators were then constructed as the weighted sum of two or three principal components, depending of the explanatory power of each component. We chose the most significant principal components whose eighenvalues were higher than one. In this case, we explain around 70 percent of the variance of the underlying individual indicators. The weight attributed to each principal component corresponds to its relative contribution to the variance of the initial indicators (calculated from the cumulative R^2). The contribution of each individual indicator to the composite indicator can then be computed as a linear combination of the weights associated with the two or three principal components and of the loadings of the individual indicators on each principal component. For more details on the aggregation method using Principal Component Analysis (*PCA*) see Nagaraj, Varoudakis, Véganzonès (2000), and Mitra, Varoudakis, Véganzonès (2002).

[30] The World Bank (2009b) stresses as well MENA above average licenses, domestic taxation, import duties, regulatory and administrative barriers to firms start up and operations, as well as weaknesses in public services and financial system.

[31] In the case of electricity however, although more firms than in other regions seem to rely on a generator, less declare electricity as a strong constraint for operating. This apparent contraction justifies that quantitative indicators must complete the information given by qualitative ones.

[32] We will recall that the Value Added is calculated as the difference between "Total Sales" and "Total Purchase of Raw Material -- excluding fuel".

[33] The new literature on international trade associates firms' size with increasing returns to scale, market imperfections and product heterogeneity linked to technological innovation. The literature on corporate governance, as well, describes the difficulties in inciting and controlling big enterprises, although they are more able to reduce transaction costs and facilitate economic calculations. Small enterprises are described as less capitalistic and more flexible in a volatile environment, in particular in economies characterized by rigidities which encourage the development of the informal economy.

[34] As we actually explain firm-level inefficiency, a positive coefficient is expected for three out of our four *IC* composite indicators. This is the case of *RegInfra*, *RegGov* and *Fin*, which are interpreted as obstacle for the operation of the firms. On the opposite, *H* being constituted of variables which are supposed to improve Technical Efficiency, a negative coefficient is expected for this variable (see section 5 for the definition of the axes of the composite indicators).

[35] It is interesting to note that, although the sample size modifies when incorporating the regressors explaining the firm distance to the frontier, the coefficients of the technology are marginally (but downward) affected. These modifications display the potential impact of the interactions and the limitation that we would face when estimating the Technical Efficiency (*TE*) determinants through the two stage method, as previously discussed. For two sectors: *Chemicals & Pharmaceutical Products*; *Wood & Furniture*, coefficients of capital and labor are slightly smaller than in previous estimation (see table 2).

[36] Human Capacity, Infrastructure, and Financing Constraints appear to be the most robust investment climate factors for firm-level productive performance. All three broad indicators explain quite well the Technical Efficiency discrepancies in most industries while "Business-Government" constitutes a less robust dimension.

[37] Based on the number of observation of the regressions, big foreign enterprises constitute 30% of the sample in *Leather*, 24% in *Agro-Processing*, 23% in *Metal & Machinery Products*, 21% in *Textile*, 18% in *Chemicals & Pharmaceutical Products*, 17% in *Garment*, 14% in *Non Metal & Plastic Materials* and 13% in *Wood & Furniture*.

[38] The overall explanatory power of the model is not very different for both samples. In *Textile*, *Garment* and *Agro-Processing*, firms' Technical Efficiency (*TE*) gap seems to be explained by more *IC* variables or plant characteristics for relatively small domestic enterprises, confirming that these industries are more sensitive to deficiencies in the investment climate. Opposite result is slightly observed in *Wood & Furniture* and *Chemicals & Pharmaceutical Products*. As for *Leather* and *Metal & Machinery Products,* these sectors are still poorly explained in both samples.