Firm Productivity and Investment Climate in Developing Countries: How Does Middle East and North Africa Manufacturing Perform?

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Abstract

Firm productive performances in five Middle East and North African (MENA) economies and eight manufacturing industries are compared to those in 17 other developing countries. Although the broad picture hides some heterogeneity, enterprises in MENA often performed inadequately compared to MENA status of middle-income economies, with the exception of Morocco and, to some extent, Saudi Arabia. Firm competitiveness is a more constant constraint, with a unit labor cost higher than in most competitor countries, as well as investment climate (IC) deficiencies. The empirical analysis also points out how IC matters for firm productivity through the quality of infrastructure, the experience and education of the labor force, the cost and access to financing, and different dimensions of the government-business relationship. These findings bear important policy implications by showing which dimensions of the IC, in which industry, could help manufacturing in MENA to be more competitive in the globalization context.

Key Words: Manufacturing firms, productivity, investment climate, developing countries, Middle East and North Africa (MENA).

JEL Classification: D24, O14, O57.

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1. Introduction

The revival of interest in economic growth has renewed the question of the differences in productivity levels among countries and regions. Productivity, in the form of technical progress and technical efficiency, is actually seen as a potential, if not the major source of long-run economic growth and international convergence. A growing body of research has focused on manufacturing as a place of innovation and an engine of growth. Productivity in manufacturing is also central to international competitiveness, because developing countries face both increasing pressure of globalization and buoyant growth of the labor force. Understanding the factors that affect industrial performance bears important policy implications in MENA countries.[1] Although theses economies are far from homogeneous in long-run performance, most of them have recorded results that are not in accordance with their middle-income economy status. This has been the situation for growth[2] and investment,[3] with a limited capacity to diversify exports[4] and attract FDI,[5] for more than three decades. On average, MENA competitiveness has suffered from insufficient economic reforms. In many countries, the common understanding of the situation is that international remittances and/or Dutch disease handicapped the diversification process and the emergence of efficient manufacturing sectors.[6] But determinants besides relative prices played concomitantly, especially the business climate, which deficiencies have been reported to have affected productivity.[7]

The World Bank Investment Climate (ICA) surveys collect data on inputs and outputs, and on various aspects of the institutional environment at the firm level. ICA surveys produce subjective evaluations of obstacles and other more objective information on infrastructure, human capital, technology, governance, and financial constraints. These standardized surveys of large and random samples of firms permit national and international comparisons of productive performance for different manufacturing sectors. They also provide information to estimate how the investment climate affects these performances. The ICA surveys are an adequate instrument for identifying how firm productivity and competitiveness can be improved. The objective of this paper is to help progress in that direction, especially in the MENA region.

Drawing on World Bank firm surveys, we analyze the relationship between investment climate and firm productivity for the eight most significant manufacturing industries in 22 countries. Five of the countries are from MENA (see list of countries in Annex 1). By broadening the sample to a large number of countries, we compare MENA performance to that of emerging economies that are major competitors on the world market, especially China and India. Section II sheds light on different measures of productive performance and discusses their respective advantages and limits. We begin with simple measures of firm partial productivity levels and then move to stochastic production frontier analyses (SFA). SFA provides technical efficiencies equivalent in our context to relative total factor productivity (TFP) levels where labor and capital are considered together. By focusing more specifically on MENA enterprises, section III comments on the results. The broad picture hides some heterogeneity; but enterprises in several MENA countries have performed inadequately compared to MENA status of middle-income economies, except for Morocco and, to some extent, Saudi Arabia. Based on the literature, we then define, in section IV, the investment climate (IC) and present, in section V, MENA IC deficiencies. In section VI, these deficiencies are linked to productive performance. The SFA model incorporating inefficiency determinants is adopted, allowing a simultaneous estimation of both the production technology and the explanatory factors of inefficiencies. Econometric impacts are explored by considering factors on an individual basis and through composite indicators reflecting various dimensions of the IC. Section VII concludes with results and policy implications, for the MENA region in particular.

II. Measuring Productive Performance Across Firms

Many options are available to appraise firm productivity, all of them having their own strengths and weaknesses. Partial labor productivity (LP), as defined by the ratio of the value added (Y) to the number of employees (L), is a common indicator. In the formula below i/j denotes the enterprise and country index, respectively.

$$LP_{i,j} = Y_{i,j} / L_{i,j} \qquad (1)$$

Compared to alternative partial productivity measures, such as capital productivity, this ratio is less affected by the error in measurement of the denominator. Indeed, the capital stock refers to the value of machinery and equipment bought in different periods. Each transaction is accounted at the historical value. In addition, labor is the main productive input, generally contributing from 40 percent to 80 percent of the value added (Y) according to the industrial sector we look at. Counterbalancing these advantages the LP ratio suffers some deficiencies.

First, as with any partial productivity index, this indicator considers only one input and ignores the others. For a static analysis, the all things being equal principle looks embarrassing. Use of these partial indicators in the formulation of management and policy advice can be misleading, potentially resulting in an excessive use of those inputs not included in the efficiency measure. Second, the indicator can be biased by the choice of the exchange rate when converting production into US dollars. This is important in our framework where calculations are proposed for international comparison.

Following previous remarks, all relevant inputs might be considered together. This objective can be achieved through parametric total factor productivity (TFP) analyses or by referring to the technical efficiency (TE) concept. In a dynamic analysis, TFP growth can be the result of a technical change or the consequence of a TE improvement. The former channel represents an upward shift of the production frontier, while the latter depicts a move within the feasible production set toward the frontier, the technology being unchanged. Within a static framework, TFP and TE levels can be used interchangeably. Indeed, TE is no more than a relative productivity level, all sample firms being benchmarked by those operating on the frontier (e.g., “best practice”). To determine how MENA organizations perform compared with their counterparts, the parametric technical efficiency concept looks particularly attractive; it accounts for random noise and then does not consider the whole residual as a TFP measure, which is the case in the Solow approach.

The Cobb-Douglas technology is the most commonly used functional form, with properties on the production structure (e.g., elasticity of substitution equal to unity) that can be seen as restrictive. The translog technology is more flexible but generally suffers from a collinearity problem among the regressors. Correlations between inputs and/or their interactions make the interpretation of estimated coefficients less easy than the ones we get with the Cobb-Douglass functional form.

Estimation of the stochastic model relies on a two-component error term. The first component (v) is the classical random noise, which may reflect unpredictable variations in machine or labor performance. Such random noise potentially occurs in any firm, although certain industries are more prone to stochastic fluctuations than others. For example, the production of steel is highly dependent on the quality of power provision. It can be a systematic problem or a random one if power production is related to the impact of rains on dam levels. These shocks are supposed to be independent and identically distributed, following a normal distribution with a zero mean and a σ^2 standard deviation. The second term captures the technical inefficiency (-u) that may follow different statistical distributions. This u-term is an asymmetrically distributed negative error term reflecting the fact that firms lie on or below the stochastic production frontier. Distributional assumptions for the u-term do not necessarily have a significant influence on predicted inefficiencies (Coelli, Prasada Rao, and Battese, 1999). Any choice can be criticized and is not deprived of any arbitrariness. In the empirical work conducted, the Cobb-Douglass technology and the truncated normal distribution for the u-term are retained. This statistical law complies with the analysis of the inefficiency determinants, when using the Battese and Coelli (1995) model, which can be written as:

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

The production (y) is linked to inputs (x), with β the parameters to be estimated and i the firm index. For convenience, we keep the country index we used earlier for the partial productivity of labor (j).

A complement to this analysis, which is of particular importance in our paper, is to determine the reasons firms are not necessarily efficient and some are far from "best practice." Factors influencing this situation are numerous, and their respective impact can be tested by different methods. In the literature, one way to do this is to estimate the stochastic production frontier and to regress, in a second run, the obtained TE on a vector of explanatory factors (z). This "two-step" procedure presents several shortcomings, including an identification problem. When any of the production frontier input (X) is influenced by common causes affecting efficiency, there is a simultaneity problem owing to omission of explanatory variables in the first stage of the estimation. The most recent literature proposes that the parameters of the equation (β, δ) be simultaneously estimated in a "one-step" procedure. Following this method the stochastic frontier model can be rewritten as:

$$Y_i = f(X_i, \beta) e^{V_i - U_i(Z_i, \delta)} \qquad (3)$$

Yi is the output for the i-th firm and Xi the vector of inputs (K, L). The total error term is decomposed into the random noise (V) and the asymmetric error term U (Z, □), which depends on a vector of inefficiency determinants, the so-called z-factors that affect the inefficiency distribution denoted U (Battese and Coelli, 1995):

$$U_i = Z_i^{'} \delta + \eta_i \qquad (4)$$

$Z_i^{'} = (1, z_{2i}, ..., z_{pi})$ is the vector of the p-1 variables (z_j) associated with inefficiency determinants. As mentioned above, η_i follows a truncated normal distribution and δ is a (1xp) vector of parameters to estimate.

III. Productive Performance of MENA Manufacturing Firms

Table 1 shows, by country and industry, the averages of firm labor productivity (LP) expressed in percentage of the country with the most performing firms.[8] The analysis reveals a relatively stable ranking of countries across industries. On average, South African and Brazilian firms perform best. This result is consistent with the relatively high GDP per capita in the two countries (3,530 and 2,788 US dollars in 2003 respectively, see World Bank, 2005). Moroccan firms also are among the best performers of the sample, along with Saudi Arabia in the three industries covered by the survey, both ahead from the two Asian giants (China and India). The Moroccan performance is the most remarkable, considering its relatively low level of income (1,477 US dollars GDP per capita in 2003) compared to the two leader countries. The Saudi Arabian performance, however, looks more disappointing when contrasted with its status of high-middle income economy (8,366 US dollars GDP per capita in 2003). As far as the other MENA countries are concerned, the ranking also remains rather stable across industries. Egyptian and Lebanese firms are systematically among the worst performers, although Egypt exhibits a rather similar level of *GDP* per capita to Morocco (1,220 US dollars in 2003) and Lebanon a higher one than South Africa and Brazil (4,224 US dollars in 2003). In Algeria, firm productivity of labor (LP) ranks at a low-intermediate position, close to India in *Agro-Processing* and *Chemical & Pharmaceutical Products,* but behind in *Textile* and *Metal & Machinery Products* (firm performances are, in any case, always lower than in China). Algeria's GDP per capita (2,073 US dollars in 2003) is higher than Morocco's.

The partial labor productivity of some MENA countries does not mean, however, that the labor cost of this region is not competitive and does not support the integration of manufacturing sectors into the world economy. The story is more complicated, as average wages (e.g., ratio of total wages to the number of firm employees) that represents the nominal remuneration of the labor input can be in line with its productive performance. By combining all the relevant information, the relative unit labor cost (ULC) gives a better idea of sector-based competitiveness. In MENA, this cost is one of the highest of our empirical sample (Table 2). This is particularly true in Algeria and Egypt— countries where firm productive performance of labor (LP) is among the lowest—but also in Morocco, Saudi Arabia, and, to some extent, Lebanon. In MENA, the ULC tends to be higher than in the majority of Asian economies (India, China, Sri Lanka, Bangladesh, and Thailand). In China and India*,* salaries (around 100 US dollars per month for unskilled workers) are far lower than in Morocco (more than double). In the labor-intensive sectors of *Textile* and *Garment*, the cost of labor is two to two and a half times higher in Egypt and Morocco than in India. This situation constitutes a serious handicap for MENA competiveness, which suffers from both faster technological innovations and lower wages in Asia.

Table 1 - Firm-Level Relative Productivity of Labor

In Table 3, we move to the TE concept and then take into account all the relevant inputs participating in the production process. Industry-based efficiencies are estimated under the reasonable assumption that a homogenous technology exists across all firms of the same industry. Differences in coefficients of capital and labor have justified this choice, against an alternative assumption where the same production frontier would be hypothesized across all industries, with only industry-based fixed effects to differentiate them.[9] The same hypotheses and definitions as before have applied to input and output variables.[10] As for productivity of labor, results are presented by country and industry in percentage of the average TE of the best-performing country.

Table 2 - Firm-Level Relative Unit Labor Costs

In average, TE results are close to the ones obtained for productivity of labor. The ranking of countries remains broadly unchanged, with South Africa and Brazil having (in most industries) the best-performing firms. These countries are again followed by Morocco and Saudi Arabia. Only in *Garment* and *Leather*, are Moroccan firms surpassed by Thailand and Ecuador, respectively. As far as other MENA countries are concerned, Egypt and Lebanon still rank at the bottom of the sample (with a very limited number of enterprises for the latter country), and Algeria is at a low intermediate position. Technical efficiency calculations thus confirm the relatively poor productive performance of firms in several MENA countries, in contrast to MENA status of middle-income economies, as well as the relative heterogeneity of our MENA sample.[11]

Table 3 - Firm-Level Technical Efficiency

These relative poor achievements are also confirmed when comparing MENA average firms' performance to the one in the non MENA zone of our sample. This is done in Table 4 for Labor Productivity (LP), Unit Labor Cost (ULC) and Technical Efficiency (TE). Table 4 clearly shows that firms in MENA have in average performed less satisfactorily than in the non MENA area for most indicators and in most industries. Interestingly, it is in Textile and Leather that firms' realizations are the most problematic, with low achievements in all indicators. This fragility is all the more damageable for the MENA region, knowing the high specialization of some MENA countries (Morocco and Egypt in particular) and exposure to international competition of firms in these industries. As for the other industries, when differences in LP between the MENA and the non MENA region are not significant, firms' competitiveness is handicapped by high ULC. This is the case in *Metal & Machinery Products*, *Chemical & Pharmaceutical Products* and *Wood & Furniture*. In only one sector: *Agro Industry*, there is no significant difference between MENA and non MENA for LP and ULC. As regard TE, MENA firms demonstrate more technical inefficiency in all industries but *Garment* and *Chemical & Pharmaceutical Products*. To some extent these inefficiencies are related to investment climate that is explored further. But the heterogeneity of MENA economies, as well as the small size of the control group call for cautious interpretations of our results.

Table 4 – MENA/ Non MENA Firm-Level Relative Productivity of Labor, Unit Labor Costs and Technical Efficiency (Average)

IV. Measuring the Investment Climate

Recent developments in the economic literature have put the investment climate at the center of economic performance. It is now well documented that the investment climate can significantly affect investment, productivity, and growth,[12] thus conditioning the success of market-based economies.[13] Many empirical studies have first relied on cross-country analysis, to link governance and institutions to economic performance at the macroeconomic level.[14] More recently, the literature has evaluated firm performance and its determinants using enterprises survey data[15]. This approach, still quite new, intends to strengthen the institutional literature by providing microeconomic foundation and generating policy recommendations based on the identification of the main constraints faced by firms.

The investment climate is defined by the World Bank (2004) as the policy, institutional, and regulatory environment in which firms operate. A main hypothesis in the literature is that IC affects particularly activity through the incentive to invest. Improving the IC reduces the cost of doing business and leads to higher and more certain returns on investment. It also creates new opportunities (for example, through trade or access to new technology) and puts competitive pressure on firms. The World Bank (2004) reports, as well, that a better investment climate contributes to the effective delivery of public goods necessary for productive business. The deficiencies of the investment climate are also seen as barriers to entry, exit, and competition. A short review, in Annex 2, presents the main justifications and findings of the literature for different dimensions of IC.

The World Bank Investment Climate (ICA) surveys classify the information on the business environment in six broad categories.[16] Because of data limitations, we have focused the investigation on four dimensions: Quality of Infrastructure *(Infra)*, Business-Government Relations *(Gov)*[17], Financing Constraints *(Finance)*, and Human Capacity *(Human).*[18] This categorization has the advantage of respecting different axes of investigation developed in the literature (Annex 2) and synthesizing most of the information given in the surveys. Annex 3 is a detailed list of variables in this classification.

Although most of the empirical literature relies on individual variables to capture the different dimensions of the investment climate, few authors have shown interest in substituting aggregate measures for individual variables.[19] When multiple indicators cover a similar theme, the correlation between them is quite high. The solution of restricting the analysis to a limited number of indicators has the disadvantage of accepting a potential omitted variable bias. This option also poses the question whether the selected variables provide a representative description of the investment climate or not. The solution of using composite indicators has the advantage of obtaining more accurate estimates, in addition to including more dimensions of the IC.

In our empirical analysis, both individual variables and aggregated indicators have been considered (section VI). Although different methods of aggregation exist, the principal component analysis (*PCA*) aggregates basic indicators in a more rigorous way than a subjective scoring system does.[20] The Principal Component Analysis (*PCA*) methodology is a widely used aggregation technique, designed to linearly transform a set of initial variables into a new set of uncorrelated components, which account for all of the variance in the original variables. Each component corresponds to a virtual axe on which the data are projected. The earlier component explains more of the variance of the series than do the later component. The number of components is proportional to the number of initial variables that are used in the *PCA*. Usually, only the first components are retrained, because they explain most of the variance in the dataset. The cumulative R^2gives the explanatory power of the cumulative components.

Based on the above-mentioned classifications, we have generated four aggregated indicators at the branch level, defining in each country the specific investment climate of each industry. This has produced 32 aggregated indicators (four indicators for each of the eight industries). Our initial indicators were selected because they are available for as many countries as possible and because they capture the different key dimensions of the IC. Besides, we have tried to complete, as much as possible, the qualitative (perception-based) IC indicators with quantitative information, to get a better picture of the investment climate in each industry. The analysis usually treats the IC indicators as exogenous determinants of firm performance. However, this is not always the case.[21] To address this issue, we have measured IC variables as city-sector averages of firm-level observations, as in Dollar (2005). This has helped, as well, to increase the number of observations, by integrating in the sample firms for which information was insufficient. This has been done for *Infrastructure* and *Business-Government Relations*. For *Human Capacity* and *Financing Constraints*, however, the initial indicators have been interpreted as specific to each firm, and the information has been kept at the firm level (except for the variable *Skill and Education of Available Workers*).

After extracting the principal components of the initial variables, the four composite indicators were constructed as the weighted sum of two or three principal components, depending on 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 been 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 [22].

V. MENA Investment Climate

Table 5 summarizes the value of MENA IC individual variables entering our four aggregated indicators. Average deficient investment climate must have contributed to the disappointing productive performance of several MENA countries. When compared to the rest of the sample, MENA tends to fall behind in most areas. This is true for all dimensions of *Financing Constraints* and most dimensions of *Human Capacity* and *Government-Business* relations. MENA's deficient financial system contributes to firm difficulties in getting credit and is an important aspect often emphasized in the literature. With public banks dominating the banking system and favoring state enterprises, large industrial firms, and offshore enterprises in many countries, small and medium-size firms find it difficult to get the startup and operating capital they need (Nabli, 2007). This is also the case for limitations of various dimensions of the government-business environment and for lack of training and expertise in the labor force. *Doing Business* (2005–2009) for example ranks MENA particularly low on labor market, enforcing contracts, construction permits, starting and closing a business, protecting investors, in addition to getting credit (World Bank, 2009a). Nabli (2007) also emphasizes MENA’s above-average number of licenses, domestic taxation, import duties, regulatory and administrative barriers to firm start up and operations, and weaknesses in infrastructure and the financial system.[23] The World Bank (2009a and b) points 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 in the world. This is also true, in average, for various aspects of public governance (see World Bank, 2005 and Aysan *et al.,* 2007).

Table 5- Investment Climate and Firm Characteristics

Regarding the *Quality of Infrastructure*, our results are more mitigated than what is usually highlighted in the literature. If, on the one hand, firms in MENA seem, on average, to face more constraints in electricity delivery (more enterprises rely on their own generator), as well as in internet connection, on the other hand, telecommunications, and transport networks do not appear as very strong obstacles to firm operation. These differences may be due to our small number of MENA countries and to the presence in the sample of Morocco and Saudi Arabia, whose infrastructures are more in line with the level of development of their economies. Actually, the literature reveals differences across countries in various aspects of the IC. In our sample for example, it is Morocco who seems to suffer the least from IC limitation. Except from financing, other aspects of the IC do not appear as high constraint (see Morocco, 2001 and 2005). On the opposite, firms in Lebanon appear to face strong limitations, in infrastructures and business-government relation in particular (World Bank, 2009a and b). As for Egypt and Saudi Arabia, firms seem to deal with an intermediate situation, with relatively high deficiencies in various aspects of the business-government relation, in Egypt in particular (see World Bank, 2009a and b; Egypt, 2001 and 2005). Interestingly, these outcomes are in line with our findings on firm's productive performances. Finally, Table 5 also shows the average smaller firm size and export capacity of the MENA region.

VI. MENA and the Explanation of Technical Efficiency

Equation (3) in section II incorporates firm technical inefficiencies determinants by considering, besides the logarithm of the production factors (capital k and labor l), various plant characteristics (*Size, Foreign, Export)* and IC individual variables. The IC variables retained participate in the four axes we discussed earlier. Their number has, however, been limited by problems of multicolinearity. To address endogeneity, the city or region averages have been considered for electricity delivery (*RegElect*), access to the Internet (*RegWeb*), access to financing (*RegAccessF),* labor regulation (*RegLreg*), and corruption (*RegCorrup*). We use the same methodology adopted by Dollar (2005). The other individual variables: overdraft facility (*Cred*), level of education (*EduM*) or experience (*ExpM*) of the top manager, and training of workers (*Training*) are regarded as specific to each firm; the identification of their impact does not pose econometric problems.

As for the control variables, the level of exports (*Export*, in percent of firm sales) is included in the regressions because exporting is a learning process, which enables companies to improve productivity by learning from customers and by facing international competition.[24] Likewise, foreign ownership (*Foreign*, in percent of firm capital) may increase productivity if foreign investors bring new technologies and management techniques.[25] As for the size (*Size*), we intend to test the hypotheses of scales economies and increasing returns to scale in large enterprises.[26]

Equations have been estimated on unbalanced panels, going from 380 observations (in *Leather*) to 1601 observations (in *Garment*), depending on the industry. The results of the regressions confirm the choice to estimate a production frontier by industry. Elasticities of capital and labor are different from one industry to another (Table 6).[27] Coefficients of the technology are highly statistically significant and close to the constant returns to scale. Some differences in production frontiers can be explained by invariant country-specific conditions incorporated at the level of the technology through country-dummy variables. Although these dummies are not given with the regression results, they have been considered and proved to be statistically significant.

More interestingly, our estimations do not reject that differences in the investment climate participate in firm TE discrepancies. This is true for all aspects of the IC, except for *Government-Business* relations. This finding confirms that good quality infrastructure (proxied by the quality of the electric network and the availability of Internet access), satisfactory access to financing, and availability of expertise at the firm level (such as education level and experience of the manager and training of the employees) are important factors for the enterprise's productive performance. This outcome is consistent with the empirical literature.

This finding appears, however, quite different from one industry to another. First, as expected, it looks like the estimations have suffered from the collinearity of several IC variables. In fact, although each broad category of IC variables (except *Government-Business* relations) ends up being significant in almost all industries, it is rare to find two significant IC variables in the same category.[28] Besides, in an interesting turn, *Textile* and *Metal & Machinery Products* look more sensitive to IC deficiencies than other industries. In these two sectors also, firm performance depends on more dimensions of the IC. This finding may be explained by greater exposure of these industries to international competition and thus their need for a supportive investment climate to help them compete efficiently.

As for *Business-Government* relations, neither labor regulations (*RegLreg*), nor corruption (*RegCorrup*) emerge as obstacles to firm productive performance, although this outcome should be viewed with caution because of the potential correlation between explanatory variables. Difficulties have also occurred in validating the impact of other individual variables. Firm size (*Size*) and foreign ownership of capital (*Foreign*) justify scale economies and externalities linked to participation of foreign capital in just two sectors: *Agro-Processing* and *Chemical & Pharmaceutical Products*, which are industries where foreign companies can be present. Export orientation (*Export*) appears as a determinant of productivity only in one sector: *Garment*, what corresponds to what we know about this sector, where external competitive markets and flexible partnership with foreign companies stimulate sources for a high productivity level. Identically, regression results are poor in two sectors: *Leather* and *Wood & Furniture.*[29]

Table 6 - Estimation Results: Common Model with Individual IC Variables

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The difficulty in estimating separately the productive impact of the IC and other control variables can partly be due to multicolinearity problems. As a result, an extension of the empirical work has been replacing individual factors with the four IC composite indicators: Quality of Infrastructure (*Infra*), Business-Government relations (*Gov*), Human Capacity (*Human*), and Financing Constraints (*Finance*). Results by industry of this new set of estimations confirm this hypothesis and our previous findings (Table 7). Production frontiers are robust to the introduction of different IC variables, with few changes in the returns to scale and elasticities of production factors across industries. The countries' specific conditions are also validated by the data. As far as the investment climate, the four dimensions are now significant with the expected sign. Besides, our model validates the impact of a much more substantial number of IC variables incorporated in the aggregated indicators. This result is all the more important for the MENA region, where an improvement of different dimensions of the investment climate could contribute to firm efficiency and the regional catch-up with more efficient and competitive economies. Improving *Financial Environment*, *Government-Business* relations, and *Human Capacity,* in line with the region deficiencies (see Table 5 in section V on MENA IC limitations), would certainly go in that direction.

The findings by industry also bring quite interesting comments. Our empirical analysis reveals that some industries: *Textile* (for *Human*, *Infra,* and *Finance*), *Metal & Machinery Products* (for *Infra* and *Gov*) and *Wood & Furniture* (for *Human* and *Finance*), appear more sensitive and vulnerable than others in a poor investment climate. This comment may be extended to *Nonmetal & Plastic Materials* and *Garment* for, respectively, *Infrastructure* and *Government-Business* relations. Interestingly, firms in these industries, except in *Garment*, have in average been found less efficient in MENA than in the non MENA sample (see section III). These findings also confirm, in a different way, some conclusions of the previous model. As mentioned before, this result may be because most of these industries face international competition. As well, it looks like that heavy industries (*Metal & Machinery Products, Nonmetal & Plastic Materials*), are more sensitive to infrastructure deficiencies than others, what constitutes an intuitive result too. This fragility justifies special attention when making decisions that may affect the investment climate in these sectors. This also means that the payoff of an improvement of the investment climate would be more substantial in these industries.[30] This conclusion is all the more important for MENA, where an improvement of the investment climate would greatly help industrial diversification and export strengthening in these sectors characterized by a low efficiency. This finding is particularly true for *Textile* and *Garment,* notably in countries like Morocco and Egypt where the specialization in these products is high. Enhancing the investment climate in these two industries would contribute to resisting strong international competition and reinforcing the export orientation of more countries in the region as well. More research on industry-particularities would, however, be needed for further comments of the results.

Regarding firm characteristics, *Size* suggests potential scale economies in four industries instead of two with the individual factor-based models (e.g., *Wood and Furniture,* and *Leather* in addition to *Agro-Processing* and *Chemicals and Pharmaceutical Products).* In a context of growing competition, this result supports a concentration process of small organizations. This finding is particularly useful for the MENA countries, where firms are of relative small size (Table 5). Besides, export orientation (*Export*) explains externalities linked to export activities in *Leather* in addition to *Garment,* confirming the exposure to international competition of these two industries. The increase in export capacity of some industries is another means to stimulate firm technical efficiency and to promote a diversified economic growth process, where industry plays a major role. The implication for MENA again is straightforward, knowing the weak manufacturing export capacity of the region. A policy favoring exports would contribute to productivity gains and strengthening of the manufacturing sector of many countries in the region[31].

Table 7 - Estimation Results: Common Model with Aggregated IC Variables

VII. Conclusions

Although the picture hides some heterogeneity, enterprises in MENA have tended to perform inadequately in contrast to MENA status of middle income economies. This is true for labor productivity (LP) and technical efficiency (TE) in Egypt, Lebanon and to some extent Algeria, compared to a broad sample of firms from eight industries in 22 developing countries. The exception is Morocco and, to some extent, Saudi Arabia, where firms match the most productive performances. Average low performances of MENA countries have been linked to deficiencies in the investment climate that handicap manufacturing competitiveness. Differences in the quality of various infrastructures, the experience and level of education of the labor force, the cost and access to financing, and several dimensions of government-business relations have explained firm performance discrepancies. Results are stronger than those usually found in the literature because of the large number of countries, manufacturing branches and indicators of investment climate on which our analysis relied. These findings support the idea that a deficient investment climate can be at the origin of a loss of domestic and international competitiveness, and of export capacities. Therefore, enhancing the investment climate is a powerful engine of take-off in the manufacturing. These results are an important means of understanding the positive impact of an improvement of the MENA investment climate, because the region suffers from deficient industrial diversification and integration into world markets.

Our findings allowed, moreover, the identification of industrial sectors where technical efficiency suffers particularly from investment climate limitations. This is the case of heavy industries like *Metal & Machinery Products* and *Nonmetal & Plastic Material*, for infrastructure especially, as well as sectors more exposed to international competition such as *Textile* and *Garment*. Improvement of various dimensions of the investment climate (depending on the sectors) would show a comparatively stronger impact in these industries, which could play a leading role in the development of an efficient manufacturing sector. These conclusions however call for more research on the subject of industry particularities. Moreover, our results showed that in some sectors**.**

Ors, increasing the firms' size and, to a lesser extent, the export capacity, are other means to encourage a higher level of productive performance. This is particularly true for *Leather*, *Agro-Industry* and *Wood & Furniture*, which are small-sized-firm sectors, as well as for *Garment* and *Leather*, which are more exposed to foreign competition.

In fact, with the implementation of a broad economic reform agenda, MENA's export-capacity strengthening and diversification is becoming a priority. Improving manufacturing productivity could thus be a powerful factor in economic growth, facilitating the long-run convergence process of the MENA region. Targeting reforms on small and medium-size enterprises, whose importance in MENA is high, and on those investment climate variables and industries that most favor productivity and competitiveness could, therefore, be an important element of MENA strategy of growth and employment in the future. Actually, like other developing countries, MENA economies are increasingly concerned about improving competitiveness and productivity, as the region faces the intensifying pressure of globalization. The World Bank firm surveys provide a standard instrument for identifying key obstacles to firm-level performance and prioritize policy reforms. This instrument can be used to boost competitiveness and diversify MENA economies in a context of an increasing external competition with big emergent countries such as China and India but also Brazil.

Annex 1. Countries of the Empirical Analysis

Table A.1. List of Countries of the Sample

MENA*	LAC	AFR	SAS	EAP
Algeria	Brazil	Ethiopia	Bangladesh	China
Egypt	Ecuador	South Africa	India	Philippines
Morocco	El Salvador	Tanzania	Pakistan	Thailand
Lebanon	Guatemala	Zambia	Sri Lanka	
Saudi Arabia	Honduras			
	Nicaragua			

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

*Syria (2003) and Oman (2003) were removed from the sample because of a very low rate of answers to the questionnaire.

Annex 2. Investment Climate: the Main Findings of the Literature

Quality of Public Services and Infrastructure Deficiencies

In developing countries, infrastructure is a significant constraint to firm productivity and competitiveness (World Bank, 1994). Infrastructure is considered a complementary factor to other production inputs and stimulates private productivity by raising the profitability of investment.[32] Infrastructure also increases productive performance by generating externalities across firms, industries, and regions.[33] In the literature, energy emerges as a severe problem for firms in the poorest countries.[34] Some authors also highlight that small firms, which rely more in public services, are particularly affected by infrastructure deficiencies (owing to scale economies in private provision of electricity and water in particular). [35]

Regression analyses confirm the harmfulness of infrastructure deficiencies on firm performance. At the macroeconomic level, Romp and De Haans (2005) find that public capital furthers economic growth. Escribano and Guash (2005), using enterprises surveys from three Central America countries, obtain a strong relationship between several of their 10 different measures of productivity and various IC variables (four are infrastructure indicators). Bastos and Nasir (2004) observe the same result for TFP in five Eastern and Central Asian countries, as well as Dollar, Hallward-Driemeier, and Mengistae (2005) and Hallward-Driemeier and Wallsten (2006) for different firm performance (TFP, investment rate, sale, employment growth) in four Asian economies and China respectively**.** Reinikka and Svensonn (2002) confirm the negative impact of the number of days of power interruption on firm investment. Papers that find no significant effects of infrastructure on firm performance are a minority and have generally very specific sample or clear methodological limitations.[36]

Financial Constraints

In the literature, access to financing is associated with the ability of firms to finance investment projects. A developed financial system creates more investment opportunities and allocates resources to the most profitable ones (Levine, 2005). This leads to increased productivity through higher capital intensity and technical progress embodied in new equipment. Besides, financial development has a positive effect on productivity as a result of higher technological specialization through diversification of risk. Cost and access to financing are reported as important constraints in developing countries. The World Bank (2004) indicates a high reported severity of the financial constraint in poorer countries. Carlin, Schafferand, and Seabright (2006) find the cost of finance ranked above average in severity in their country groups. Some authors find that smaller firms are more constrained than large ones.[37]

Results in the empirical literature validate the importance of access to finance for firm economic performance. Carlin, Schafferand, and Seabright (2006) find a negative impact of high cost of finance on firm output, in both between and within-country regressions. Aterido and Hallward-Driemeier (2007) show that a higher share of investment financed externally is associated with greater employment. Beck, Demirguc-kunt, and Maksimovi (2005) confirm that financial constraints affect particularly small firm employment and growth. Dollar (2006) highlights the link between access to finance and the probability to be an exporter[38]. By contrast, Commander and Svejnar (2007) do not show evidence of a link between the cost of finance and firm revenue for Eastern and Central Asian countries, and Hallward-Driemeier et al. (2006) do not show a link between bank access and firm performance in China.[39].

Corruption and Bureaucratic Quality

Corruption has a clear adverse effect on the firm productive performance. This fact is well documented and often described as one of the major constraints facing enterprises in the developing world (World Bank, 2005). Carlin, Schafferand, and Seabright (2006) and Gelb, and others (2007) identify corruption as a problem reported primarily in less developed countries. Corruption increases the costs and the uncertainties about the timing and effects of the application of government regulations. Corruption also increases the investment and operational costs of public enterprises, which are detrimental to private investment through insufficient and low quality infrastructures (Tanzi and Davooli, 1997). The quality of administration is also part of the investment climate of the economy. Delay and inefficient delivery of services increase the cost of doing business. Low bureaucratic quality also increases operational costs of public enterprises (Evans and Rauch, 2000).

At the macroeconomic level, Mauro (1995), in his cross-country analysis, shows that corruption reduces growth and Mo (2001) documents a causal chain through reduced human and physical capital. Likewise Evans and Rauch (2000) stress the role of bureaucratic quality. At the firm level, Escribano and Guash (2005) reveal a strong negative effect of red tape and corruption on productivity, and of rent predation (a combination of corruption and regulation). Aterido and Hallward-Driemeier (2007) demonstrate the negative relationship between various indicators of corruption and the growth of small, medium, and large firms. Fisman and Svensson (2005) investigate the relationship with bribery in Ugandan firms, and Hallward-Driemeier, Wallsten, and Xu (2006) for Chinese firm sales.[40] Beck, Demirguc-kunt, and Maksimovi (2005) do not confirm the impact of corruption on sales growth[41].

Competition, Taxation, and Regulation

The view that competition promotes efficiency (Aghion and Griffith, 2005) leads us to expect a positive effect on firm performance and a negative one of excessive taxation and regulation. Taxation and regulation have a first order implication on costs and therefore productivity. Although government regulations and taxation are warranted, to protect the general public and generate revenues to finance the delivery of public services, overregulation and overtaxation deter productive performance by raising business start-up and firm operating costs. Carlin, Schaffer, and Seabright (2006) show that anticompetitive practices are ranked greater than average importance in the 60 countries of their sample. Gelb and others (2007) see tax administration and labor regulation as problem respectively in middle and higher income countries.

A number of studies have focused on cross-country variations to indentify the effect of labor regulation,[42] regulation of entry,[43] or a wide set of regulations[44] on economic performance. These studies relate measures of regulation at the country level to aggregated country outcomes. At the firm level, Escribano and Guasch (2005) and Beck, Demirguc-kunt, and Maksimovi (2005) show a negative impact of various regulations on productivity, Hallward-Driemeier, Wallsten, and Xu (2006) of the variable "senior management time in dealing with regulatory requirement" on sale and employment of Chinese enterprises.[45] Hallward-Driemeier and Aterido (2007) highlight, however, that regulation can also have positive sides, especially if they are consistently enforced.[46] On competition, Bastos and Nasir (2004) find a strongly positive and significant impact of this variable on productivity, and Commmander and Svejnar (2007) on firm revenue.

Annex 3. Investment Climate Variables

The Quality of Infrastructure (*Infra*) component is defined by five variables: obstacles (from *none* [0] to *very severe* [4]) for the operation of the enterprise caused by deficiencies in (*a*) Telecommunications, (*b*) Electricity, (*c*)Transport; (*d*) Presence of a firm generator; (*e*) Percentage of electricity coming from that source; (*f*) Possibility for the enterprise to access the Internet.

The Government Business relations (*Gov*) axis 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.

The Financing Constraints dimension (*Finance*) consists of three variables: obstacles for the operation of the enterprise caused by: (*a*) Cost, (*b*) Access to Financing, and (*c*) Access to an Overdraft Facility or a Line of Credit.

The Human Capacity (*Human*) component is represented by three to four variables: obstacle for the operation of the enterprise caused by deficient (*a*) Skill and Education of Available Workers, (*b*) Education, (*c*) Experience in number of years of the Top Manager, and (*d*) Training of the Firms' Employees.

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Table 1 - Firm-Level Relative Productivity of Labor

(Country average, in % of the 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)	52		**100**	**100**	94	97	87	**100**
Brazil (2003)	**100**	**100**	50	50	66	**100**	38	
Morocco (2004)	***54***	***80***	***54***	***79***	**100**	***91***		***66***
Saudi Arabia (2005)				***77***	***92***		**100**	
Ecuador (2003)	58	91	80	48	50	54	42	66
El Salvador (2003)	71	59	55	35	28	51		46
China (2002)	52	69	45		31			
Thailand (2004)	62		62	45	40		31	43
Guatemala (2003)	43		64	31	26	36	33	48
India (2002)	35	66	53	21	22	17		
Honduras (2003)	56		50	29	23	39	21	26
Pakistan (2002)	40	35	49	22		17		
Tanzania (2003)				35			20	
Philippines (2003)	32		32	14				
Algeria (2002)	***27***			***21***	***19***	***19***		***31***
Bangladesh (2002)	18	53	16	9		11		
Nicaragua (2003)	13	38	26	17	13	17	16	21
Sri Lanka (2004)	13		27	9	17			28
Zambia (2002)	16			13	24	18		
Ethiopia (2002)	11	20	20	10			10	
Egypt (2006)	***14***	***15***	***14***	***12***	***16***	***11***	***10***	***13***
Lebanon (2006)	***11***		***17***	***8***			***7***	

Note: * Ranking is from countries with the most productive firms to the ones with the least productive firms. Years of surveys are into brackets. *Source*: World Bank, ICA database and authors' estimations.

Table 2 - Firm-Level Relative Unit Labor Costs
(Country average, % of the country with the highest unit cost)

Country*	Textile	Leather	Garment	Agro Processing	Metal & Machinery Products	Chemic & Pharm Products	Wood & Furniture	Non Metal & Plastic Materials
El Salvador (2003)	52	**100**	**100**	85	**100**	63		87
Nicaragua (2003)	**100**	72	80	87	88	**100**	92	79
Guatemala (2003)	64		83	**100**	79	87	89	74
Algeria (2002)	***73***			***89***	***89***	***96***		**100**
Philippines (2003)	66		92	83				
South Africa (2003)	86		97	74	80	88	69	64
Morocco 2004)	***81***	***79***	***91***	***75***	***75***	***76***		***60***
Honduras (2003)	36		78	88	76	63	96	86
Egypt (2006)	***60***	***86***	***76***	***71***	***46***	***80***	***92***	***51***
Saudi Arabia (2005)				***89***	***59***		***55***	
Lebanon (2006)	***55***		***53***	***61***			***92***	
Zambia (2002)	46			75	48	88		
Brazil (2003)	48	54	72	68	56	49	65	
Sri Lanka (2004)	86		64	71	39			32
Bangladesh (2002)	49	34	60	69		55		
Ethiopia (2002)	71	25	45	56			55	
Ecuador (2003)	48	59	52	50	42	32	62	53
Thailand (2004)	42		56	49	35		52	34
China (2002)	39	41	54		38			
Pakistan (2002)	31	41	33	47		51		
India (2002)	32	27	35	42	35	44		
Tanzania (2003)				33			31	

Note : * Ranking is from countries with the most expensive labor to the ones with the least expensive one. Years of surveys are into brackets. *Source*: World Bank, ICA database, and authors' estimations.

Table 3 - 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***	
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 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 2006	***17***	***15***	***22***	***22***	***25***	***14***	***19***	***24***
Lebanon 2006	***21***		***23***	***16***			***13***	

Note : * Ranking is from countries with the most productive firms to the ones with the least productive firms. Years of surveys are into brackets. *Source*: World Bank, ICA database, and authors' estimations.

Table 4 – MENA/ Non MENA Firm-Level Relative Productivity of Labor, Unit Labor Costs and Technical Efficiency (Averages)

	Textile	Leather	Garment	Agro Processing	Metal & Machinery Products	Chemic & Pharm Products	Wood & Furniture	Non Metal & Plastic Materials
Labor Productivity (LP) (US dollars at current exchange rate)								
Non MENA	10.08***	6.80***	6.65*	14.9	16.0	18.5	7.5	11.1**
MENA	7.93	4.91	4.96	15.2	15.6	18.6	7.3	8.8
Unit Labor Costs (ULC)								
Non MENA	0.37***	0.46***	0.69	0.46	0.44**	0.33*	0.58**	0.54
MENA	0.49	0.82	0.63	0.42	0.50	0.43	0.68	0.48
Technical Efficiency (TE)								
Non MENA	44.6**	63.9***	62.3	44.5***	60.6***	40.8	48.3***	61.6***
MENA	***42.8***	***54.7***	***64.8***	***40.3***	***44.4***	***42.5***	***37.5***	***49.8***

Source: Authors' calculations

For labor Productivity (LP) and Technical Efficiency (TE), the mean comparison tests indicate that Non MENA is significantly higher than MENA at 10 %(*), 5%(**), and 1%(***).

For Unit Labor Cost (ULC), the mean comparison tests indicate that Non MENA is significantly lower than MENA at 10%(*), 5%(**), and 1%(***).

Table 5- Investment Climate and Firm Characteristics

	MENA countries			NON-MENA countries			Ho: No difference 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
% of firms with generator	22.5	41.8	3040	38.1	48.6	9332	0.0
% of electricity from generator	4.8	16.6	2999	7.5	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 educational level	3.9	1.4	2261	4.3	1.5	8083	0.0
Top manager experience in firm (years)	12.5	10.9	2218	8.0	9.0	8260	0.0
% of workers with formal training	19.8	39.9	3052	39.8	49.0	9248	0.0
Availability of 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
License/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

* Percentage of firms ranking the variable as a major or severe constraint. *Source*: World Bank, ICA database, and authors' estimations.

Table 6 - Estimation Results: Common Model with Individual *IC* Variables

Dependent Variable: Value Added (y)

Independent Variables	Textile	Leather	Garment	Agro Industry	Metal& Machinery Products	Chemic & Pharm Products	Wood & Furniture	Non Metal & Plastic Materials
ln(l)	0.657 *(16.14)****	0.789 *(28.82)****	0.735 *(7.12)****	0.560 *(13.32)****	0.871 *(21.75)****	0.540 *(11.09)****	0.883 *(18.78)****	0.860 *(10.18)****
ln(k)	0.321 *(14.61)****	0.255 *(14.93)****	0.242 *(7.18)****	0.395 *(24.64)****	0.268 *(13.21)****	0.444 *(20.01)****	0.235 *(11.28)****	0.249 *(8.81)****
Size	0.018 *(0.11)*	-0.105 *(0.21)*	-0.092 *(0.48)*	-0.195 *(2.57)***	0.600 *(0.96)*	-0.193 *(1.92)**	-0.316 *(1.29)*	0.014 *(0.07)*
Foreign	-0.242 *(0.53)*	-0.384 *(0.43)*	-0.011 *(1.30)*	-0.005 *(3.36)****	-0.397 *(1.16)*	-0.005 *(1.88)**	-0.000 *(0.01)*	-0.007 *(1.07)*
Export	-0.006 *(1.06)*	-0.183 *(1.43)*	-0.007 *(2.87)****	-0.001 *(1.06)*	-0.107 *(0.97)*	-0.005 *(1.64)*	-0.019 *(1.22)*	-0.009 *(1.32)*
RegElect	0.077 *(0.54)*	0.323 *(0.60)*	0.228 *(1.94)**	0.042 *(0.83)*	1.006 *(1.92)**	0.053 *(0.86)*	-0.025 *(0.16)*	0.068 *(0.60)*
RegWeb	-2.641 *(2.43)***	2.138 *(1.26)*	0.329 *(0.94)*	-0.426 *(2.07)***	0.768 *(0.50)*	-0.757 *(3.39)****	-1.542 *(1.77)**	-0.847 *(1.57)*
Cred	-1.011 *(2.08)***	-2.421 *(2.42)***	-0.403 *(2.74)****	-0.144 *(2.38)***	-1.842 *(2.07)***	-0.085 *(1.02)*	-0.304 *(1.25)*	-0.554 *(2.26)***
AccessF	0.006 (0.11)	0.118 (0.65)	0.059 (1.41)	0.044 (2.34)**	-0.022 (0.11)	0.068 (2.43)**	0.126 (1.74)*	-0.051 (1.22)
Training	-0.135 *(0.43)*	0.234 *(0.33)*	-0.142 *(0.93)*	-0.217 *(3.23)****	0.428 *(0.56)*	-0.123 *(1.22)*	-0.400 *(1.34)*	-0.103 *(0.59)*
EduM	-0.148 (2.02)**	-0.282 (1.53)	-0.076 (2.08)**	-0.064 (3.03)***	-0.673 (2.61)***	-0.073 (1.96)*	-0.096 (1.46)	-0.158 (2.84)***
ExpM	-0.037 *(2.26)***	0.045 *(1.50)*	-0.000 *(0.05)*	-0.003 *(0.90)*	0.014 *(0.48)*	-0.002 *(0.38)*	-0.006 *(0.56)*	-0.000 *(0.04)*
RegLregul	0.024 *(0.13)*	-0.827 *(1.52)*	-0.069 *(0.50)*	0.007 *(0.10)*	0.362 *(0.70)*	0.020 *(0.20)*	-0.112 *(0.53)*	-0.006 *(0.05)*
RegCorrup	0.081 *(0.51)*	0.074 *(0.17)*	0.168 *(1.53)*	-0.054 *(0.96)*	-0.272 *(0.59)*	-0.008 *(0.11)*	0.073 *(0.52)*	0.124 *(1.40)*
Intercept	1.460 *(2.87)****	-2.422 *(1.25)*	1.493 *(2.00)***	3.388 *(5.45)****	-2.612 *(1.34)*	2.358 *(4.94)****	1.279 *(1.91)**	1.568 *(2.66)****
Observations	942	380	1601	1494	838	695	774	480
sigma_u	0.75	1.69	0.77	0.90	1.46	0.75	1.10	0.64
sigma_v	0.86	0.81	0.54	0.43	0.76	0.46	0.57	0.67
Wald chi2	1351.4***	2787.7***	241.0***	1306.4***	2484.5***	1060.3***	1321.2***	300.7***
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. Variables *Size*, *Foreign, Export, RegWeb, Cred, EduM, ExpM,* and *Training* are expected with a negative coefficient; Variables *RegElec*, *AccessF*, *RegLreg*, and *RegCorrup* with a positive coefficient All regressions have been estimated by introducing country-dummy variables at the level of the production technology. These dummies are not provided by the table. Significance levels of the coefficients: *10%; ** 5%; *** 1%. Absolute value of z statistics are in parentheses. Wald chi2 tests do not reject the probability of the statistically significance of regressions at the 99% level. *Source*: World Bank, ICA database, and authors' estimations.

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Table 7 - Estimation Results: Common Model with Aggregated *IC* Variables

Dependent Variable: Value Added (y)

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)****
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)***
Human	-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)*
Finance	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)*
Intercept	-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)*
Observations	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 *IC* aggregated variables is positive for *RegInfra*, *RegGov* and *Finance,* and negative for *Human* (see definition of variables in Annex 2). Variables *Size*, *Foreign* and *Export* are also expected with a negative coefficient. All regressions have been estimated by introducing country-dummy variables at the level of the production technology. These dummies are not provided by the table. * Significance levels of the coefficients: 10%; ** 5%; *** 1%. Absolute value of z statistics are in parentheses. Wald chi 2 tests do not reject the probability of the statistically significance of regressions at the 99% level. *Source*: World Bank, ICA database, and authors' estimations.

[1] The Middle East and North Africa (MENA) covers an extensive region, extending from Morocco in northwest Africa to Iran in southwest Asia. According to the World Bank, it includes all the Arab Middle East and North Africa countries, as well as Iran and Israel (see list in Table A). The population of MENA comprises about 5% of the total world population. MENA region generally has an arid and hot climate, with several major rivers providing for irrigation to support agriculture in limited areas. Many countries located around the Persian Gulf, along with Algeria and Libya, have large quantities of natural gas and crude oil, estimated at 45% and 60% of the world's reserves, respectively. As of 2009, 8 of the 12 OPEC nations are within the region. This makes of MENA a strategic area economically. But MENA is also a politically, culturally and religiously sensitive region. Economies range from very poor (West Bank and Gaza, Yemen), to extremely wealthy nations such as most of the Gulf countries. The economic structure of MENA can be different in the sense that, while some nations are heavily dependent on export of only oil and oil-related products (Gulf countries, Algeria, Libya), others have a more diverse economic base (Egypt, Morocco Tunisia, Jordan, Lebanon). It is no coincidence that these countries, which are lacking natural resources, are also the "early reformers" in the region and the most integrated in the world economy, as regards manufacturing products.

[2] See Nabli. (2007) and Nabli and Véganzonès-Varoudakis (2007).

[3] See Nabli. (2007) and Aysan et *al*. (2007 and 2009).

[4] See Nabli and Véganzonès–Varoudakis (2004).

[5] See Sekkat and Véganzonès-Varoudakis, (2007).

[6] See Nabli. (2007).

[7] See Aysan et *al*. (2007); Elbadawi (2002); Serdar Sayan (2009); the World Bank (2004 and 2009b), as well as the World Bank Investment Climate Assessments (*ICA*) of *Egypt* (2005 and 2006), *Morocco* (2001 and 2005), and *Algeria* (2002).

[8] As seen in section 2, firm-level Labor Productivity (*LP*) is estimated as the ratio of the firms' Value Added (*Y*) to the Number of Permanent Workers (*L*). The Value Added is calculated as the difference between "Total Sales" and "Total Purchase of Raw Material" (excluding fuel). Various hypotheses can be done regarding the exchange rate that is used to convert production and production factors into US dollars. Several exchange rates can be chosen 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 use for their economic calculations. This choice, however, does not seem to change radically the perception of the firms' productive performances, the coefficient of correlation of the measures of firm-level productivity using alternatively current, constant and *PPP* exchange rates being relatively high.

[9] Results of these estimations are not reported here. They are very similar to the ones obtained when estimating the TE (see section VI).

[10] The technology of production explains the Value Added (*Y*) by the Gross Value of Property, Plant and Equipment (*K*) and the Number of Permanent Workers (*L*).

[11] Interpretation of results has, however, to be cautious for some countries. This is the case of *Lebanon*, for which the number of observations can be too small (5 for *Textile* and 16 for *Agro-Processing*) to reach a reliable conclusion. The combination of two surveys for *Morocco* and *Egypt* allows more than one hundred observations by branch. *Morocco,* for example, benefits from 500 enterprises in *Garments*. In *Saudi Arabia*, the three branches suffer also from a relative small number of observations.

[12] See Bosworth and Collins (2003); Rodrik and Subramanian (2004); the World Bank (2003 and 2004).

[13] See in particular Frankel (2002) and Rodrik et al. (2002).

[14] See for example, Acemoglu et al. (2005); Hall and Jones (1999); Knack and Keefer (1995); Rodrik et al. (2002).

[15] See Durlauf et al. (2008); Haltiwanger (2002); Pande and Udry (2005); the World Bank (2004), Batra et al. (2003).

[16] **a**) Infrastructures and Public Services; **b**) Finance; **c**) Business-Government Relations; **d**) Conflict Resolution / Legal Environment; **e**) Crime; **f**) Learning, Capacity and Innovation; **g**) Labor Relations.

[17] This axe includes variables from the: c) Business-Government and g) Labor Relation components entering the *ICA* surveys classification. It regroups several dimensions of the most common classification of the literature testing for *IC* individual variables (ie variables entering the Competition, Taxes, Regulation, Quality of Administration, and Corruption axes, see Annex 2 on the literature)

[18] Human Capacity includes various aspects of the: g) Labor Relation component of the *ICA* surveys. Although not present in the literature on institutions and governance, human capacity constitutes an essential factor of the firm productive performance, by stimulating capital formation and raising firm profitability. Because skilled workers are better in dealing with changes, a skilled workforce is essential for firms to manage new technologies that require a more efficient organizational know-how (see, for example, Acemoglu and Shimer, 1999, and Bresnahan, et al. 2002). Human capital is also at the origin of positive externalities (Lucas, 1988, Psacharopoulos, 1988, and Mankiw, et al., 1992) and gives as well the opportunity to expand or enter new markets.

[19] See Basto and Nasir (2004); Manly (1994); Mardia, Ken and Bibby, (1997); the World Bank (2003 and 2009b).

[20] See, for example, the rating system elaborated by the *International Country Risk Guide*, ICRG.

[21] An important 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· 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.

[22] See also Nagaraj et *al*. (2000), and Mitra et *al*. (2002) for more developments on methodological aspects.

[23] See also the Investment Climate Assessments (*ICA*) of *Egypt* (2005 and 2006), *Morocco* (2001 and 2005), and *Algeria* (2002).

[24] See Balassa (1978).

[25] See Borensztein, J., J. De Gregorio and J-W. Lee (1998).

[26] 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, however, 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.

[27] The impact of capital is strong in *Chemicals & Pharmaceutical Products*, *Agro-Processing* and, to a lesser extent, *Textile*. On the opposite side, the elasticity of labor is high in *Metal & Machinery, Non Metal & Plastic Materials, Wood & Furniture, Leather,* and *Garment*. These industries appear to be more intensive in labor, although two of them (*Metal & Machinery* and *Non Metal & Plastic Materials*) are usually considered as applying more capitalistic technologies in developed countries.

[28] For Infrastructure, the quality of the electrical network (*RegElect*) increases firms' performances in *Garment* and *Metal & Machinery Products*. It is, however, the access to internet (*RegWeb*) which emerges as a factor of productivity in more industries (*Textile*, *Agro-Processing, Chemical & Pharmaceutical Products* and *Wood & Furniture).* As far as Human Capacity is concerned, the level of education of the top manager (*EduM*) is significant in almost all sectors (except *Leather* and *Wood & Furniture)*, meanwhile the number of years of expertise of manager (*ExpM*) and the training of employees (*Training*) seem to play a role in only one sector each (*Textile* and

Agro-Processing respectively). Same conclusions can be drawn for Financing Constraints, where the access to credit line or overdraft facility (*Cred*) appear to stimulate productivity gains (except in *Chemical & Pharmaceutical Products* and *Wood & Furniture*), though the qualitative variable of access to financing (*AccessF*) is significant in only three sectors (*Agro-Processing, Chemical & Pharmaceutical Products,* and *Wood & Furniture*).

The impact of *IC* variables can also vary. The access to credit (*Cred*) seems more detrimental in *Leather, Metal & Machinery Products* and *Textile*) and the access to the Internet (*RegWeb*) looks more critical in *Textile* and *Wood & Furniture*. As for Human Capacity, the education of the top manager (*EdM*) should be more of a high priority in *Metal & Machinery Products*, *Textile* and *Non Metal & Plastic Materials.*

[29] In these industries, a few factors seem to explain efficiency (only access to credit line (*Cred*) in the case of *Leather* and, internet access (*RegWeb*) and access to financing (*AccessF*) in the case of *Wood & Furniture*). On the opposite, *Agro-Processing, Chemical & Pharmaceutical Products, Garment,* and *Textile* display a broader set of factors explaining firms' productivity gains.

[30] By using our *IC* aggregate indicators, however, we don't always explain productivity better. This is the case of *Garment* for which very few aspects of the investment climate seem to help firms to perform better (the loss of information appears essentially for "Human Capacity" and "Infrastructure" for which one of the initial individual indicators was previously significant). No improvement is seen, either, in *Leather*, which is again poorly explained by the model. This fact is, however, largely compensated by the tremendous gain of information through the large set of *IC* variables now explaining firm-level productive performances, as well as by the validation of another variable of interest: the Government-Business Relation (Gov). Besides, this model explains better *Wood & Furniture*

[31] Let us mention that we have tested the possibility for MENA firms' productive performances to be differently affected by IC variables, compare to the other firms of the sample. This has been done by introducing MENA dummies as multiplicative factors of the coefficients of the IC variables. These attempts have not given the expected outcome. Actually, the multiplicative dummies did not come out statistically significant and led to singular matrix and convergence problems when introducing several variables simultaneously. Beyond the pure estimation problem resulting from potential colinearity across variables, one explanation of this failure can be the strong heterogeneity of the MENA group countries (see section III) and the partial nature of the sub-sample we deal with, because of empirical limitations in relation with the dataset. As suggested by a referee more work would be needed to shed light on these important points.

[32] See Aschauer (1989), Barro (1990), Blejer and Kahn (1984), Murphy et al. (1989).

[33] See Holtz-Eakin and Schwartz (1995).

[34] See Carlin et al. (2006); Gelb and al. (2007).

[35] See Lee et al. (1996) for *Thailand, Indonesia* and *Nigeria.* Reinikka and Svensonn (2002) found a positive relationship between the probability of owning a generator and the fact of being a large firm, an exporter, or a foreign company in Uganda.

[36]See Commander and Svejnar (2007), and Fismann and Svensson (2005) on Ugandan enterprises.

[37] See also Galindo and Micco (2007); Love and Mylenko (2005), Beck et al. (2005). Aterino et al. (2007), in particular, show that smaller firms have significantly less access to the financial system and tend to finance a smaller share of their investment with formal credit. Bigsten et al. (2003) confirm that 2/3 of micro-firms in their sample of *African* countries are credit constrained, but only 10 % of larger firms.

[38] See also Galindo and Micco (2007).

[39] The authors attribute this result to the peculiar nature of *Chinese* state-owned banks.

[40] But not for employment and productivity

[41] The authors mention that it might be because of problems of multicolinearity.

[42] See Botero et al. (2004), and Heckman and Pages (2004).

[43] See Djantov et al. (2002).

[44] See Loayza et al. (2004).

[45] See also Kerr (2002) on regulation, investment and growth; Hernando and Soto (2002), on regulation and property rights. Botero et al (2004); Haltiwanger et al. (2006); on employment regulation and firms adjustment; Djankov et al. (2002) on regulations of entry of firms on firm's creation and growth.

[46] The authors found a positive association with employment growth, though in a non linear way: at about 15% of management time, the marginal impact of additional interaction with government is negative.