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Does Investment Climate Affect Domestic and Foreign Owned Firms Differently?

Master's Thesis

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Name and signature of supervisor…….

Allowed for defense on.....

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I have written this master's thesis independently. All viewpoints of other authors, literary sources, and data from elsewhere used for writing this paper have been referenced.

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Abstract

Investment climate is one of the factors associated with explaining differences in productivity among firms. This study examines the relationship between firm productivity and a subgroup of investment climate variables, namely access to finance, regulatory environment, and infrastructure by focusing on foreign or domestic ownership of firms. To this end, it uses cross-sectional firm-level data for countries in Central and Eastern Europe as well as the Middle East and North Africa. By examining labor productivity and TFP measures, the study highlights how the relationship between investment climate and productivity can be heterogeneous based on ownership. The results suggest that domestically owned firms incur total factor productivity loss resulting from regulatory burden and lack of finance, whereas foreign owned firms experience loss only in labor productivity due to regulatory burden. Additionally, it explores the channels that might better explain this heterogeneity.

Keywords: firm productivity, investment climate, ownership.

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1. Introduction

The productivity of firms and the factors that inhibit or promote firm productivity are of great interest to policymakers, governments, and multilateral organizations. These factors can be dependent upon firm characteristics or outside the control domain of firms (Syverson, 2011). Among these outside factors, investment climate[1](IC) is associated with productivity differences among firms across locations and is particularly significant as policy measures can be developed to lower these productivity differences (Dollar et al., 2005).

Investment climate is a broad term used to describe the policy, institutional and regulatory environments that firms face when conducting their day-to-day operations (Stern, 2002b; World Bank, 2004). It encompasses many categories ranging from the provision of hard infrastructure such as power, telecommunications, and the internet to bureaucratic procedures required to start and run a business. Even though it is very closely related with institutional quality measures, investment climate is wider in its range and more specific with its policy implications (Dollar et al., 2005).

This study investigates the effects of a subgroup of investment climate variables, namely access to finance, regulatory environment, and infrastructure on firm productivity by focusing on firm ownership for a large number of countries. To this end, it uses firm-level data from the fifth Business Environment and Enterprise Performance Survey (BEEPS V) which covers countries in Central and Eastern Europe and Central Asia, and a similar survey done in the Middle East and

1 'Investment climate' is interchangeably used with 'business environment' and 'business climate' and represents the same idea. The author prefers the term 'investment climate' here as it is the standard in the literature and policy discussions (Dollar et al.,2005; Gogokhia and Berulava, 2020).

North Africa (MENA region) for the period 2011-2016 totaling 41 countries[2]. These group of countries are particularly interesting for such study as they considerably vary in their business environments. Georgia, Lithuania, and Estonia were ranked in the top quartile while Lebanon, Yemen, and West Bank and Gaza were ranked among the lowest performing countries in the most recent ease of doing business ranking (World Bank,2020).

The study is related to the strand of literature on investment climate's effect on firm performance and its role in explaining productivity differences among firms across countries (Dollar et al., 2005; Aterido et al., 2011). Good investment climate facilitates business activities by reducing the risks and costs associated with running businesses (North, 1991). For example, reliable infrastructure makes costly backup capacities redundant, whereas transparent and clear regulatory environment coupled with property rights protection incentivizes investment. Moreover, access to finance can make investments in productive endeavors easier, while financial constraints may exacerbate the adverse effects of these business climate bottlenecks.

Many studies investigating the effect of investment climate for firm performance have confirmed this view. These studies generally focus on certain categories to capture the overall business environment including access to finance, infrastructure availability and reliability, government-business relations, crime, and labor regulations. In this vein, lack of access to finance is found to constrain firm growth and profitability (Aterido et al., 2011; Escribano and Luis Guasch 2005;

[2] The countries are Albania, Armenia, Azerbaijan, Belarus, Bosnia-Herzegovina, Bulgaria, Croatia, Cyprus, Czech Republic, Djibouti, Egypt, Estonia, FYR Macedonia, Georgia, Greece, Hungary, Israel, Jordan, Kazakhstan, Kosovo, Kyrgyzstan, Latvia, Lebanon, Lithuania, Moldova, Mongolia, Montenegro Morocco, Poland, Romania, Russia, Serbia, Slovak Republic, Slovenia, Tajikistan, Tunisia, Turkey, Ukraine, Uzbekistan, West Bank and Gaza, and Yemen.

Beck et al. 2005); unreliable infrastructure is associated with lower productivity of firms (Bastos and Nasir 2004; Escribano and Luis Guasch, 2005; Gelb et al., 2007; Kinda et al., 2011); effective regulatory environment is positively associated with firm development (Aterido et al., 2011; Hallward-Driemeier et al., 2006); and finally, labor market flexibility and less crime are weakly associated with increased investment by firms (Hallward-Driemeier et al., 2006; Escribano and Luis Guasch, 2005).

The extent and scale of these effects, however, can be heterogenous as firms differ in characteristics. Some firms might have better resources, experience, or financing to overcome the constraints owing to their characteristics. For instance, small firms can be more severely affected from lack of finance when compared to bigger firms even when they face the same overall investment climate (Aterido et al., 2011) or new firms can find it difficult to navigate regulatory burdens in contrast to older firms as they have less experience in dealing with bureaucracies (Escribano and Luis Guasch, 2005).

One other source of such different effects can be the foreign or domestic ownership of firms. Foreign owned firms make decisions on investment destinations after having considered their strategic advantage, so it is likely that the adverse effect of investment climate is more pronounced on domestically owned firms which are generally locally set up (Nielsen et al., 2017). They can also tap into the managerial and technical expertise of their parent companies to overcome challenges to their business (Caves, 1971; Dunning, 1977; Javorcik, 2004). Lastly, they have access to finance from parent companies and make investment decisions to maximize profit on a global basis (Graham and Wada, 2001; Lee and Lee, 2018). This makes it easy for them to carry

out important activities such as innovation and research and development (R & D) in places with better business environments, unconstrained by the location of their operations.

Indeed, some authors have found that environments with weak institutions are more detrimental to domestically owned firms (Lee and Lee, 2018; Kafouros and Aliyev, 2016; Driffield et al., 2016). Yet some other studies have argued the negative effects of bad investment climates to be more harmful for foreign owned firms when using labor productivity as a measure of firm performance (Ashyrov and Masso, 2019; Kresic et al., 2017). Nevertheless, these studies either focus on one country, study only one dimension of productivity measure or use country-level indices of institutional indicators and may not fully explore the productivity differential resulting from specific investment climate variables. A more nuanced analysis that uses firm-level data can partly help explain this seemingly contradicting results.

This study contributes to the existent literature by analyzing ownership's role in explaining productivity differences among firms in different business environments. Hence, the activities affected by investment climate and their effect on firms given their ownership is the main questioned addressed in this study. Methodologically, it measures firm performance by four different measures consisting of three distinct TFP measures and a measure of labor productivity of firms. The use of different measures for TFP ensures the results are robust regardless of the econometric methodology of specification and estimation for each of the measures. Furthermore, individual firms' responses for measures of investment climate variables are substituted by country-location-ownership means (excluding each firms' values) to alleviate concerns of endogeneity to some degree.

Furthermore, Principal Component Analysis (PCA) was employed in constructing composite indicators used in the regressions. This approach is good for reducing the problems of omitted variables and multicollinearity prevalent in other studies that either analyze individual investment climate variables separately (Commandor and Svenjar, 2007; Nguyen and Jaramillo, 2004) or estimate general models including all relevant variables (Dollar et al., 2005; Aterido et al., 2011).

This study's empirical results suggest that regulatory burden matters for all measures of firm productivity while access to finance is only positively associated with labor productivity for the sample of all firms. Looking at the effects of investment climate variables by ownership of firms, it shows the effects are different for foreign and domestically owned firms. Particularly, domestically owned firms incur total factor productivity loss resulting from regulatory burden and lack of finance, whereas foreign owned firms experience loss only in labor productivity due to regulatory burden. This asymmetry can be partly explained by analyzing the different firm activities affected by business climate.

The rest of the study is organized as follows: the following section reviews the literature on investment climate and firm productivity. The third section presents the empirical methodology, the fourth discusses the data, and the fifth section discusses the results. Lastly, it presents the conclusion in the sixth section.

2. Literature Review

The literature covering the role of overall business environment on economic performance of countries as well as firm performance is quite extensive. The early studies carried out studying the productivity effect of investment climates generally followed North (1990) who acknowledged the significance of institutions in reducing uncertainty and determining the profitability and feasibility of economic activities. These studies used macroeconomic level indicators of institutions to investigate the impact of good institutions on cross-country income differences (Acemoglu et al., 2001; Easterly and Levine, 2003; Rodrik et al., 2004; Kaufmann et al., 2011). For example, Hall and Jones (1999) emphasized the role of social infrastructures in income differences across countries and classified institutions as either facilitating or hindering productive activities. In comparison, other authors highlighted the importance of institutions in investments that lead to physical and human capital accumulation (Mankiw et al., 1992; Rodrik et al., 2004).

Even though these studies were successful in emphasizing the influence of institutional quality and policy on economic performance, they had several limitations. For one, these studies were cross-country level analysis, so the sample size was limited which made the results' robustness questionable (Dollar et al., 2005; Aterido et al., 2011). In addition, they obscured the heterogeneity of these effects across regions within countries as well as among different types of firms (Dethier et al., 2011).

To overcome these limitations, the adoption of a different analysis using disaggregated data (firm or industry level) proved to be useful. Hence, later studies used firm-level surveys covering investment climate to examine the productivity gain or loss associated with business environments. In this vein, Dollar et al. (2005) found that investment climate indicators are important for productivity, profit, and growth at firm level by comparing firms across the garment sector in

China, India, Pakistan, and Bangladesh. Hallward-Driemeier et al. (2006) examined the role of investment climate on measures such as TFP, employment growth, investment rate, and sales growth for China and found these measures to be influenced by the business environment of firms.

Bastos and Nasir (2004) reached the same conclusion by looking at regulatory burden, infrastructure, and competition's effect on TFP measures of firms in the five post-soviet economies of Kyrgyz Republic, Moldova, Poland, Tajikistan, and Uzbekistan. Similar studies for the Balkans (Kresic et al., 2017), Latin America (Escribano and Luis Guasch, 2005), Middle East and Africa (Kinda et al., 2011), South Asia (Carlin and Schaffer, 2012), Nigeria (Igwe et al., 2018), Vietnam (Ba Trung and Kaizoji, 2017), and Aterido et al. (2011) for many developing countries reached the same conclusion on the effect of the investment climate on firm performance.

As the productivity of firms is associated with various firm activities such as exporting, innovation, R & D, many studies have looked at these channels and their relationship with the investment climate. These studies have pointed out that exporting is positively associated with efficient government services, reliable provision of power, and access to finance for countries in Latin America and Asia (Dollar et al., 2006), India (Véganzonès-Varoudakis and Plane, 2019), and Africa (Manole and Spatareanu, 2015). These same factors have been shown to matter for both innovation and R & D activity among firms (Gogokhia and Berulava, 2020; Véganzonès-Varoudakis and Plane, 2019; Gorodnichenko and Schnitzer, 2013)

The categories and specific investment climate variables covered in these studies vary considerably. Some studies incorporate many dimensions of the investment climate (Kresic et al., 2017; Carlin and Schaffer, 2012; Kinda et al., 2011), while others focus on subgroups of investment climate measures (Escribano and Luis Guasch, 2005; Bastos and Nasir, 2004; Ba Trung and Kaizoji, 2017). Overall, the dimensions that have received prominence in the literature and

which are covered in this study are (1) Infrastructure (2) Access to finance and (3) regulatory burden. A brief survey of the literature on each of these dimensions is outlined below.

2.1 Infrastructure

The availability and reliability of infrastructure is critical for firms in terms of the production technologies and the distribution systems they set up. Consequently, the lack of reliable infrastructure along with transportation issues can render competitive products costly and limit economic activity (Guasch, 2004).

Many empirical studies have confirmed the adverse effects of poor infrastructure on firm activities. Dollar et al. (2005) found power outages and custom delays to be the most serious bottlenecks for firm productivity and profitability for firms in the garment sector of China, India, Pakistan, and Bangladesh, whereas Aterido et al. (2011) concluded that infrastructure bottlenecks measured by power outages limit firm growth in the case of medium and large firms across many developing countries. Another group of authors also found similar results of productivity losses associated with poor infrastructure in other geographies (Escribano and Luis Guasch, 2005; Bastos and Nasir, 2004; Kinda et al., 2011). One exception is the study by Hallward-Driemeier et al. (2006) which argued physical infrastructure to be less of a binding constraint in the case of Chinese firms' productivity. Nonetheless, Lee and Lee (2018) showed that the quality physical infrastructure is positively associated with labor productivity across Chinese firms by using a panel data for the period 1998-2009.

2.2 Access to finance

Countries with developed financial markets experience comparatively higher economic growth than countries with underdeveloped financial markets (Cull and Xu, 2005). Firms benefit from

well-established financial markets to finance their capital investments (Boyd and Prescott 1985; Greenwood and Jovanovic 1990; Levine, 2005), R & D expenditures (Bencivenga and Smith, 1993; Levine, 2005), and to enforce better evaluation mechanism for corporate governance (Levine, 2005).

Activities such as exporting and innovation which are highly associated with productivity of firms are also adversely affected by financial constraints. The literature on the relationship between propensity to export and credit constraint establishes the importance of access to finance for firms to become exporters (Greenaway et al., 2007, Dollar et al.,2005; Gorodnichenko and Schnitzer, 2013). Innovation performance is also hampered in financially constrained firms (Efthyvoulou and Vahter, 2016; Gorodnichenko and Schnitzer, 2013)

Indeed, financial obstacles are generally ranked to be the worst constraints faced by enterprises, hindering growth, profitability, and productivity (Carlin et al., 2006; Beck et al., 2005). However, not all firms are similarly affected as firm characteristics play a factor in access to finance. Aterido et al. (2011) found that medium and large firms' growth is reduced by financial constraints after controlling for other relevant variables highlighting the importance of enterprise size.

In contrast, Commandor and Svenjar (2007) find no significant relationship between subjective measures of financials obstacle and firm revenue after controlling for countries in the case of Eastern Europe and Central Asia. Similarly, Hallward-Driemeier et al. (2006) reach the same conclusion in the case of Chinese firms.

2.3 Regulatory Environment

The policy and behavior of governments is an important aspect of the business climate firms operate in. Starting from getting permits to paying taxes, firms deal with administrative authorities

regularly for many reasons (Hallward-Driemeier et al., 2006). These interactions, as a result, determine firm decisions and performance. Although regulations are needed to organize business activities, their excessive implementation can stifle entrepreneurial activity and firm growth (Kasper, 2002; Aterido et al., 2011). Hence, obtrusive regulatory environments are closely associated with red tapes and corruption as they give government officials unchecked power to extort benefits from firms (Shleifer and Vishny, 1993).

The empirical studies investigating overregulation find that firms resort to the unofficial economy and corruption incidences are high in such environments (Friedman et al., 2000; Hallward-Driemeier et al., 2006). These results are particularly significant in countries that have weak institutions in terms of enforcing contracts and property rights protection (Djankov et al. 2006; Acemoglu and Verdier, 1998). Others find that low administrative capacity becomes a major problem for firms once other more fundamental capacities such as physical infrastructure and access to finance are overcome (Gelb et al., 2007).

Corruption's role in helping or exacerbating firms' efforts of overcoming excessive regulation is also extensively covered in the literature. Unfortunately, the literature on the effects of corruption on firm performance in relation to regulatory environments is not conclusive. Among these studies, some found corruption to have "greasing the wheel" effect through the circumvention of regulatory red tapes (Shleifer and Vishny, 1993; Fisman and Svensson, 2007; Aterido et al., 2011) while others found "sand in the wheel" effect associated with corruption through the diversion of efforts from entrepreneurial activities to dealing with regulatory burdens (Acemoglu and Verdier, 1998; Rand and Tarp, 2012; Dreher and Gassebner, 2013).

2.4 Firm ownership, productivity, and investment climate

It has long been recognized that the environment that firms operate in can lead to different performance outcomes contingent upon firm characteristics. In this regard, dealing with a business environment can be different among firms with different ownership structures (Lee and Lee, 2018; Kafouros and Aliyev, 2016).

Foreign owned firms generally make locational choices after considering the investment climate of these destinations in relation to their resources and previous experiences (Dunning, 1977). Moreover, they can outsource any of their activities to their geographically distributed networks and are not location-bound in the activities they can pursue (Rugman and Verbeke, 2001). This makes it easy for them to carry out important activities such as innovation and R&D in places with better business environments. At the same time, domestically owned firms are generally locally setup and may not have the resources to deal with stifling business environment (Nielsen et al., 2017).

Foreign owned firms can also tap into the managerial and technical expertise of their parent companies to overcome challenges to their business activities (Caves, 1971; Dunning, 1977; Javorcik, 2004). In addition, they have access to finance from parent companies and make investment decisions to maximize profit on a global basis (Graham and Wada, 2001; Lee and Lee, 2018). These resources coupled with their experiences in other locations makes them better positioned to deal with the challenges they face (Nielsen et al., 2017).

The few empirical studies that investigate the joint effect of ownership and investment climate on firm performance are generally aligned in their results. They found that the returns of good

investment climate on firm performance is higher for domestically owned firms than their foreign counterparts (Kafouros and Aliyev, 2016; Lee and Lee, 2018; Dollar et al., 2005). Other authors have pointed out specific investment climate measures such as financial constraint to be detrimental to domestically owned firms' propensity to either export or innovate (Gorodnichenko and Schnitzer, 2013; Chen and Guariglia, 2013).

Nevertheless, some studies have argued that bad investment climates, particularly corruption and crimes, to have a higher cost on foreign owned firms when using labor productivity as a measure of firm performance when using labor productivity as a measure of firm performance (Ashyrov and Masso, 2019; Kresic et al., 2017). This study presents one possible explanation to these seemingly contradicting results.

3. Empirical Model

3.1 Firm Productivity and Investment climate Empirical Methodology

In studying the effects of investment climate on firm performance, the productivity measures used and the assumptions about the model specified can lead to divergent results (Escribano and Luis Guasch, 2005). Hence, this paper intends to use a number of productivity measures with plausible assumptions to provide a realistic analysis with robust and consistent results regardless of the econometric methodology of specification and estimation for each of the measures. For this purpose, it measures firm productivity by four different measures consisting of three distinct TFP measures and a measure of labor productivity of firms.

Productivity is broadly defined as the efficiency of turning inputs into output, typically expressed as an output–input ratio (Syverson, 2011). A common measure of firm-level productivity used in the literature at firm-level is total factor productivity (TFP) (Syverson, 2011; Escribano and Luis

Guasch, 2005). TFP captures the effect of variables other than Labor (L), Intermediate materials (M) and Capital (K) that determine the production process. There are many ways of calculating TFP depending on the data available on firms, this study uses Solow's residuals and an extended Cobb-Douglas production function for the analysis (see Appendix B for a detailed discussion on TFP measures).

The Solow's residual method employed for calculating TFP uses cost-shares and does not require direct inputs to be exogenous and elasticities to be constant in the model (Escribano and Luis Guasch, 2005). As the elasticities of inputs are not estimated but calculated based on observed data, this approach is useful in alleviating endogeneity which is observed in other studies which assume direct inputs to be exogenous (Lee and Lee, 2018; Ba Trung and Kaizoji, 2017).

There are two measures of TFP derived from this method based on cost-shares. For the first measure, the elasticities of inputs are assumed to be similar for all firms (unrestricted model henceforth). Alternatively, the second measure based on cost-shares is calculated for each 2-digit industry and assumes elasticities to be the same for firms within the same sector (restricted model henceforth). These TFP measures are calculated as follows:

$$logTFP_i = logY_i - s_{L,i}logL_i - s_{M,i}logM_i - s_{K,i}logK_i \quad (1)$$

Where Y_i is the output, measured as sales of firm i, and L_i, M_i and K_i are the original inputs of labor, intermediate materials, and capital, whereas $s_{L,i}$, $s_{M,i}$,$s_{K,i}$ are their cost shares for firm i respectively.

The cost shares of the inputs are calculated with the assumption of constant returns to scale (CRS), and are obtained as follows:

$$s_{L,i} = \frac{wL_i}{wL_i+cM_i+rK_i}, s_{M,i} = \frac{cM_i}{wL_i+cM_i+rK_i} s_{K,i} = 1 - s_{L,i} - s_{M,it} \quad (2)$$

Where w and c are the market prices of labor and intermediate goods respectively.

Another measure of productivity used in the study is labor productivity (LP) and is calculated as the ratio of sales (Y) to the total number of permanent employees (L):

$$LP = \frac{Y_i}{L_i} \quad (3)$$

In the second step, the effect of investment climate variables on productivity is estimated by the model:

$$\log(Productivity_i) = \beta_0 + \sum_{i=1}^{k} \beta_k IC_i + \sum_{i=1}^{m} \beta_m X_i + u_i \quad (4)$$

Where IC is a vector of k investment climate indicators, X is a vector of m firm characteristics, and u_i is an error term.

Primarily due to the large number of variables used to measure aspects of the investment climate, econometric methods such as Instrumental variables, which are normally employed to overcome endogeneity, are infeasible in these kinds of studies (Hallward-Driemeier et al., 2006).

Consequently, this study alleviates endogeneity at the firm level by substituting all firm-level measures of investment climate variables with country-location-ownership means[3] (excluding firms' own values) following the literature (Aterido et al., 2011; Escribano and Luis Guasch, 2005; Hallward-Driemeier et al., 2006). Following Aterido et al. (2011) locations are aggregated by city size with capital cities and cities with over 1 million inhabitants as one group for location, and

3 Even though country-location-industry-ownership would have been more preferable, this aggregation leaves many cells with 0 observations. Country-location-ownership cells are then used as they provide cells with at least 4-10 observations. The same reasoning was applied for classifying localities as dividing localities into more categories would have left many cells empty.

other cities with less than 1 million inhabitants as another. Consequently, the average values are constructed for firms in the same country, location and type of ownership while excluding the observation of each firms' own value.

This way, by controlling for industry dummies and country information, it is possible to obtain the average values for investment climate measure which are unlikely correlated with firm-specific determinants of productivity (i.e., individual firm performance has no impact on the average indictor). Even though some studies use such mean values as instruments for firms' individual values (Nguyen and Véganzonès-Varoudakis, 2018), this study employs these values as substitutes for values of each firm. This was appropriate as there were many missing observations for the investment climate variables and this approach helps keep firms with missing observations.

Nevertheless, there are many proxy variables capturing investment climate variables causing multicollinearity among the variables (Dethier et al., 2011). To overcome this issue, this study constructs a composite indicator by using Principal Component Analysis (PCA) from specific indicators[4] for each subgroup of investment climate variables following the literature (Bastos and Nasir 2004; Ba Trung and Kaizoji, 2017). The PCA methodology is a common technique used to aggregate variables into components by reducing their dimensions while accounting for the variance observed in the data (Nguyen and Véganzonès-Varoudakis, 2018). Usually, only the first components are chosen, as they explain most of the variance in the dataset.

4 The relevant variables for the investment climate dimensions are selected by following the literature (Dollar et al., 2005; Aterido et al., 2011; Escribano and Luis Guasch, 2005; Hallward-Driemeier et al., 2006), the only additional requirement was the number of non-missing values in the used data for the variables of interest.

Additionally, this approach alleviates the omitted variable bias to a certain extent which has been associated with results of studies on effects of investment climate variables resulting from ad-hoc selection of individual variables (Dethier, Hirn and Straub, 2011).

Lastly, an extended Cobb-Douglas production function is estimated in one step by the following model:

$$logY_i = \alpha_{L_i} logL_i + \alpha_{M_i} logM_i + \alpha_{K_i} logK_i + \sum_{i=1}^{k} \beta_k IC_i + \sum_{i=1}^{m} \beta_m X_i + v_i \qquad (5)$$

Where $\alpha_{j,i}$ represent the elasticities of direct inputs ($j = L, M, K$) and v_i is an error term. As a two-step estimation procedure of TFP from a Cobb-Douglas production function is likely to create simultaneous equation bias due to inputs being affected by investment climate variables, a one-step procedure addresses this concern (Escribano and Luis Guasch, 2005).

3.2 Productivity Channels and Investment Climate Empirical Methodology

The productivity of firms is generally associated with business activities such as exporting, innovation and R & D (Syverson, 2011; Gorodnichenko and Schnitzer, 2013). In order to have a better understanding of investment climates' effect, it is useful to additionally examine how these channels might help explain the results from productivity analysis.

As in Dollar et al. (2006), this study investigates the propensity of a firm to be an exporter, to innovate and to engage in R & D by the following probit model:

$$P(Y_i = 1) = \phi(\beta_0 + \sum_{i=1}^{k} \beta_k IC_i + \sum_{i=1}^{m} \beta_m X_i + \epsilon_i) \qquad (6)$$

Where $\phi(.)$ is a non-linear function, P is the probability that event Y occurs, Y is a binary dependent variable (Y= 1 if the activity is undertaken; Y=0 otherwise) and all other variables are as defined before.

Lastly, the effect of investment climate on sales and capital per worker is examined. Sales is measured as the revenue generated by firms (log), while capital per worker is measured as capital per full time employees (log) (Hallward-Driemeier et al., 2006; Lee and Lee, 2018). The model used to estimate this relationship is similar to equation (4) used for productivity measures.

4. Data

This study uses firm-level data from the fifth Business Environment and Enterprise Performance Survey (BEEPS V) in combination with a similar survey for the MENA region covering 41 countries in total from 2011-2016. The survey is cross sectional and provides information about the characteristics and performance of firms as well as the objective and subjective measures of the business environment they face[5]. Although the newest round of this survey (BEEPS VI) is available, the lack of balance sheet and other financial information on firms makes it unsuitable for the analysis employed in this study.

The initial dataset contains information on slightly more than 23,000 firms from 41 countries, with firms in each country stratified by size, sector, and location. However, the number of firms used for the empirical analysis are much smaller at close to 4,500 for TFP analysis and 7,000 for labor productivity analysis[6].

The variables of interest for the models developed in this study are listed as follows:

5 It is conducted by having a series of interviews with senior managers or executives about the business environments they operate in, and the questionnaire encompasses wide variety of areas ranging from financial conditions to business-government relations

6 The study uses labor productivity for two purposes. One, it is one way of measuring firm performance employed by other similar studies. Two, the sample size is comparatively larger for the analysis making the results more robust

Dependent variables – measures of Total Factor productivity (TFP) and labor productivity in logs are the dependent variables examined in this study. In order to calculate these variables, capital measured as the replacement cost of machinery[7], labor measured as the total cost of labor, intermediate materials measured as the total cost of raw materials and intermediate goods used in production, and lastly, output measured as total annual sales of firms are used (Syverson, 2011; Escribano and Luis Guasch, 2005).

Independent variables – There are two sets of independent variables present in this study. The first set is the primary concern for analysis and consists of proxy variables for investment climate measures of finance, infrastructure and regulatory environment, while the second set includes firm related control variables used in similar studies on firm productivity (Aterido et al., 2011; Ba Trung and Kaizoji, 2017). These subcategories of the investment climate are chosen based on the availability of adequate non-missing observations as well as their prevalence in other studies[8].

4.1 Investment Climate Measures – Finance

Three proxy variables are used to measure access to finance. Credit, a dummy variable indicating a firm's line of credit or loan from a financial institution; Overdraft facility, a dummy variable indicating a firm's overdraft facility; and lastly, the share of working capital financed externally, a percentage measure for the share of working capital financed either by bank or non-bank financial institutions.

7 All the costs associated with direct inputs are in their local currency unit in the dataset. Average IMF exchange rates are used to change them to dollar values following previous literature.

8 The notable missing categories examined in other similar studies are customs and crime. However, only a limited number of observations (around 1,440) were available in the data for customs, and even less for crime.

4.2 Investment Climate Measures – Infrastructure

The proxy variables used to measure the availability and reliability of infrastructure are as follows: Internet access, a dummy variable indicating whether or not a firm has access to internet; Power outage, the total duration of power outages in hours[9]; Water insufficiency, a dummy indicating whether or not firms faced production issues due to water supply.

4.3 Investment Climate Measures – Regulatory Environment

This study measures business regulatory conditions by four variables; percentage of time senior managers spend dealing with government (Management Time); the number of inspections/meetings with tax officials (Tax inspection); percentage of total annual sales paid as informal payment/gift (Sales bribe); a dummy indicating if firms face competition from unregistered firms/ informal economy (Informal competition).

The firm-related control variables are selected by benchmarking the literature (Aterido et al., 2011; Ba Trung and Kaizoji, 2017; Escribano and Luis Guasch, 2005) and include; the age of the firm (Age), the size of the firm[10] (Size), the average number of years of education of permanent employees (Schooling), a dummy if the firm arranges formal training to its permanent employees (Training), a dummy variable for whether or not the firm has an internationally recognized certificate (Quality certificate); a dummy if the firm has invested in research and development (R & D); and last, a dummy indicating if the firm is an exporting firm. Table 1 presents the summary statistics of the key variables on firm characteristics and investment climate measures used in this study (See Table A1 for detailed definition of each measure).

9 This variable is calculated by multiplying the average duration of power outages with their frequency per annum.

10 There are three categories for the sizes of firms; small (less than 19 fulltime employees), medium (20-100 fulltime employees), and large (greater than 100 fulltime employees)

Overall, foreign owned firms are more productive (12% & 40% higher TFP and LP levels, respectively), have more capital per worker, have more revenue in sales than domestically owned firms and are also younger. They are also large in their size and almost half of them own an internationally recognized quality certificate. Domestically owned firms are less engaged in R & D activities, innovation, and export smaller fraction of their goods or services directly to international markets when compared to foreign owned ones.

Looking at infrastructure measures, more than three quarters of firms have internet access, less than one fifth of the firms reported water problems, and on average 48 hours of power outage was experienced in a given fiscal year across all groups of firms. Access to finance measures indicate a slightly better condition for foreign owned firms with an average of 40 % credit and overdraft facilities, whereas locally owned firms reporting slightly less access to credit and overdraft facility at 33% and 36%. The share of external working capital for all groups is around 12%. Finally, the measures for the regulatory environment indicate more management time spent dealing with government officials, more frequent tax inspections and marginally higher bribe rates in foreign owned firms.

Table 1: Summary statistics of the key variables.

	All firms		Domestic		Foreign	
Variable	Mean	SD	Mean	SD	Mean	SD
TFP (log)	1.43	1.10	1.42	1.09	1.54	1.24
LP (log)	9.72	1.63	9.69	1.60	10.03	1.82
Age	18.97	15.50	19.19	15.65	16.66	13.55
Size	1.77	.74	1.72	.73	2.24	.77
Schooling	10.03	3.84	10.02	3.84	10.11	3.80
Training	0.24	0.43	0.23	0.42	0.34	0.48
Quality Certificate	0.28	0.45	0.28	0.45	0.47	0.50
R & D	0.15	0.35	0.14	0.35	0.24	0.43
Innovation	0.25	0.43	0.24	0.43	0.37	0.48
Capital per worker(log)	9.71	1.63	9.69	1.60	10.03	1.82
Sales(log)	13.13	2.17	13.00	2.10	14.47	2.44

Table 1: Summary statistics of the key variables… cont'd

	All firms		Domestic		Foreign	
Variable	Mean	SD	Mean	SD	Mean	SD
Export	13.97	28.87	11.49	25.89	13.97	28.87
Foreign Ownership	6.71	22.77	0.04	0.55	73.58	28.15
Power loss (log)	2.93	5.83	2.98	5.8	2.35	6.16
Water insufficiency	0.13	0.33	0.12	0.33	0.17	0.38
Internet Access	0.83	0.37	0.82	0.38	0.94	0.24
Credit	0.33	0.47	0.33	0.48	0.36	0.48
Overdraft Facility	0.37	0.48	0.36	0.48	0.42	0.50
Working Capital	11.90	23.02	11.81	23.03	12.60	22.92
Management time	12.46	21.38	12.13	20.98	15.80	24.89
Tax Inspection	2.86	8.47	2.77	8.42	3.80	9.04
Sales bribe	0.61	3.30	0.61	3.25	0.64	3.72
Informal competition	0.45	0.50	0.46	0.50	0.28	0.45

Before carrying out formal analysis of the relationship that exists between investment climate and productivity of firms, it would be useful to see how firms are affected in these environments. As such, Figure 1 presents the differences in the productivity distribution of foreign and domestically owned firms in good and bad investment climates. Even though the difference in the distribution for TFP is ambiguous, the difference in the distribution of labor productivity is quite striking. As shown, firms are more productive in a good investment climate for both ownership types.

To formally test the differences in the distributions of productivity measures across these groups of firms, this study employs the two-sample Kolmogorov-Smirnov test. For each measure and ownership type, the groups are divided between those that operate in a good investment climate (with a composite indicator above the mean) and those that do not. The results are presented in Table 2.

The P values are statistically significant for the combined K-S distribution differences across these groups except among foreign owned firms for TFP levels which indicates productivity differences exist among firms, especially among domestically owned firms.

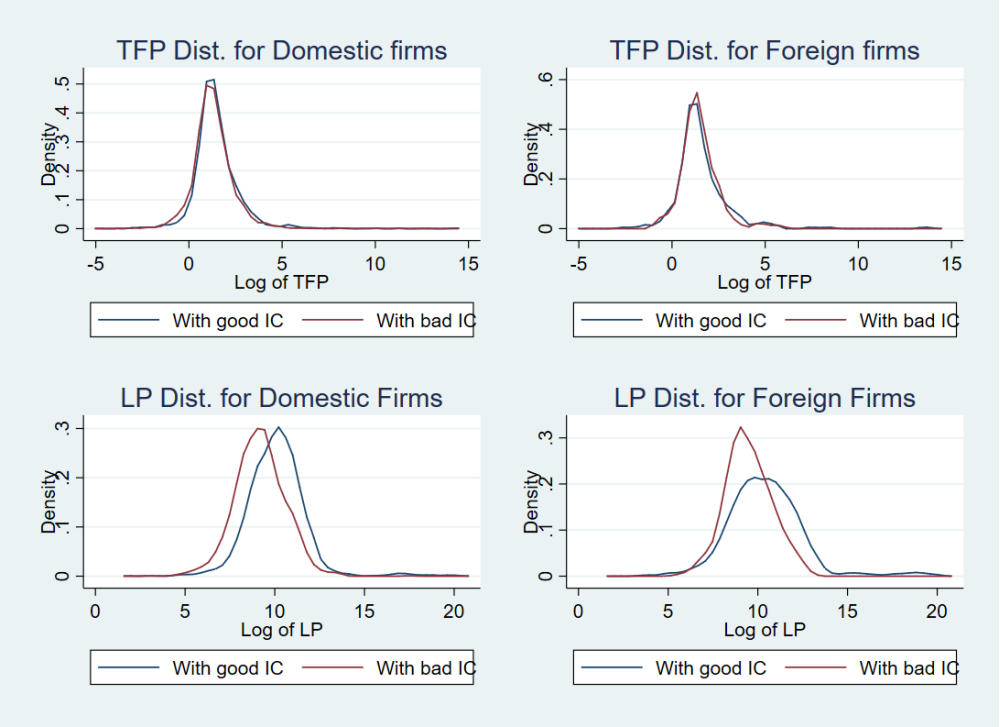

Figure 1: Differences in productivity levels among firms in bad and good investment climates
Source: Authors' own calculations. Good investment climate represents above the mean composite indicator for investment climate variables.

Table 2: Kolmogorov-Smirnov Test for the difference in productivity levels in bad and good investment climates

Measure - Ownership groups	Combined K-S Distribution difference	P Value
TFP - Domestic	0.0747	0.000
TFP - Foreign	0.0650	0.815
LP - Domestic	0.2900	0.000
LP - Foreign	0.2629	0.000

As mentioned in the econometric limitations of studies on investment climate variables, multicollinearity among the variables of interest can produce inconsistent and spurious results in these kinds of studies (Ba Trung and Kaizoji, 2017; Escribano and Luis Guasch, 2005). To

overcome this problem, composite indicators are constructed using Principal Component Analysis (PCA). PCA was conducted separately for each group of investment climate variables of interest, and components were selected if their eigenvalue exceed 1 by following the conventional method (see table A3 in appendix for the eigenvalues of the components).

Table 3 presents the components and the weights of each variable in the PCA analysis. The first component for finance explained 80% of the variation observed in proxy variables for access to finance, and all the weights are positive indicating a higher value for this indicator to mean better access to finance by firms. The component for the availability and reliability of infrastructure explains 60% percent of the variation observed in the proxy variables and higher values for this component indicate infrastructure deficiency. In the case of regulatory burden, the first two components are both significant with eigenvalues exceeding unit values and together capture 63% of the variation in regulatory burden measures. While the first component can be taken to highlight good business-government relationship with less intrusion by tax officials and more formal engagements reducing chances of illicit behaviors, the second component identifies the negative costs of informal payments/gifts and competition with underground economy. (see Table A4 in appendix for the correlation between components and their respective variables).

Table 3: PCA loadings of the investment climate variables for each subcategory

IC indicator	PC Finance	PC Infrastructure	PC Reg. 1	PC Reg. 2
Credit	0.5916			
Overdraft	0.5590			
Share of work	0.5809			
Power Outage		0.6345		
Internet Access		-0.6277		
Water		0.4510		

Table 3: PCA loadings of the investment climate variables for each subcategory…cont'd

IC indicator	PC Finance	PC Infrastructure	PC Reg. 1	PC Reg. 2
Management			0.6336	-0.3630
Tax Inspection			-0.7102	0.0561
Sales Bribe			0.1237	0.6328
Informal			0.2810	0.6817

5. Results

This section presents the results of the empirical analysis examining the relationship between investment climate variables and firm productivity. As discussed, this study estimates this relationship by using various measures of productivity to obtain consistent and robust results. All the models are estimated by ordinary least squares (OLS) with robust standard errors and include country, industry, and year dummies. As the study focuses on the difference in effects of investment climate variables on firms by their ownership, all estimations are done for samples consisting of all firms, and separately for samples of foreign and domestic firms.

The results of the analysis are presented in Table 4 and 5. Table 4 presents models estimated using three distinct TFP measures on three sets of the sample data (all firms, domestic firms, and foreign firms), while Table 5 presents the results for these three samples using labor productivity measures.

The columns 1, 4, 7 of Table 4 and column 1 of Table 5 show the results for the analysis on the sample of all firms. The main result is that regardless of the method of estimation employed, regulatory burden is significant and associated with firm productivity in the sample of all firms, whereas finance is only associated with labor productivity. In both models based on Solow's residual, good government-business relation that is unintrusive and formal is significant at 10%

confidence level (0.06; p<0.1 and 0.08; p<0.1 for unrestricted and restricted models, respectively) and is associated with productivity positively for firms. At the same time in the model based on Cobb-Douglas production function and labor productivity, regulatory environment with informal payments/gifts is significant (-0.05; p <0.1 for Cobb-Douglas and -0.09; p< 0.01 for LP) and negatively associated with productivity. Other studies in the literature on the effects of investment climate variables on firm activity have found similar effects of regulatory burden (Aterido et al., 2011; Hallward-Driemeier et al., 2006; Kinda et al., 2011; Nguyen and Véganzonès-Varoudakis, 2018).

It is worth noting that even though Infrastructure availability and reliability is positively associated with productivity, it is insignificant in all the models specified. This can be ascribed to two possible reasons. One, the provision of physical infrastructure in this part of the world seems reliable from the measures used suggesting less variation among observations for firms. This is supported by another study by Hallward-Driemeier et al. (2006) where they find infrastructure to be insignificant for Chinese firms due to the developed physical infrastructure prevalent in China.

The results for the sample of domestically owned firms are presented in columns 2,5,8 in Table 4 and column 2 of Table 5. As can be seen, both finance and regulation are significant for productivity measures of TFP for domestically owned firms. More specifically, access to finance is significant and positively associated with productivity in all three models (0.28; p<0.05 for Solow (Unrestricted), 0.24; p<0.1 for Solow (Restricted) and 0.23; p < 0.01 for Cobb-Douglas). In addition, regulatory environment with conducive government-business relation is also significant and positively associated with productivity measures of TFP for domestically owned firms in two of the models (0.09; p<0.1 in Solow (Unrestricted), 0.1; p<0.05 in Solow (Restricted)).

In contrast, the investment climate variables are insignificant in all the regressions for foreign owned firms based on TFP measures as presented in columns 3,6,9 of Table 4.

The results of the same analysis on domestically owned and foreign owned firms, using labor productivity as a measure, paint a different picture for this relationship between investment climate and productivity when compared to TFP measures as presented in Table 5. In this regard, all investment climate variables are insignificant for domestically owned firms (column 2) while regulatory environment with informal payments/gifts is significant (-0.38; $p< 0.1$) and negatively associated with productivity for foreign owned firms.

When looking at TFP measures, as a thought experiment[11], these results indicate that a one standard deviation improvement in the regulatory environment (or if the West Bank and Gaza had the regulatory environment of Slovenia for this sample) is associated with a 4.8% higher productivity for the sample of all firms and a 7.3% higher productivity for the sample with domestically owned firms.

In comparison, a one standard deviation increase in regulatory bottlenecks is associated with 1% and 6.4 % lower labor productivity for the sample of all firms and foreign owned firms, respectively. Additionally, a one standard deviation improvement in access to finance is associated with 23.3% higher TFP for domestically owned firms and 1.3% higher labor productivity for foreign owned firms.

[11] The percentage changes are computed as $\beta_{k*} \Delta IC_k/\text{mean}(Y)$, where ΔIC_k is a 1 SD change in IC_k (Hallward-Driemeier et al., 2006). The means of Y are the same as in Table 1. The standard deviations of the components are presented in Table A2 of the Appendix. For example, for regulatory burden (1) in the sample of all firms: β=0.058, Mean TFP =1.43 & 1 SD = 1.19, so the percentage point is calculated as 0.058*(1.19/1.43) =0.0483.

Table 4: The relationship between investment climate and TFP

	Solow's residual Unrestricted			Solow's residual Restricted			Cobb-Douglas One Step		
	(1) TFP	(2) TFP	(3) TFP	(4) TFP	(5) TFP	(6) TFP	(7) TFP	(8) TFP	(9) TFP
	ALL	Domestic	Foreign	ALL	Domestic	Foreign	ALL	Domestic	Foreign
Finance	0.00218	0.279*	0.194	0.0336	0.244+	0.236	0.0148	0.227**	0.143
	(0.0413)	(0.118)	(0.198)	(0.0468)	(0.136)	(0.214)	(0.0298)	(0.0847)	(0.158)
Infrastructure	0.00997	0.0478	0.0770	0.00241	-0.00521	-0.0293	0.0370	0.0174	0.172
	(0.0506)	(0.0900)	(0.317)	(0.0574)	(0.103)	(0.343)	(0.0366)	(0.0645)	(0.253)
Reg. Burden 1	0.0582+	0.0871+	0.0234	0.0819*	0.107*	0.125	0.0344	0.0466	-0.0916
	(0.0343)	(0.0453)	(0.337)	(0.0389)	(0.0519)	(0.364)	(0.0248)	(0.0325)	(0.268)
Reg. Burden 2	-0.0112	-0.0746	-0.0208	-0.0181	-0.0427	-0.1000	-0.0452+	-0.0532	0.0440
	(0.0366)	(0.0648)	(0.229)	(0.0415)	(0.0743)	(0.247)	(0.0265)	(0.0465)	(0.182)
Age	-0.00222**	-0.00184*	-0.00781	-0.00236*	-0.00191+	-0.00730	-0.00217***	-0.00193**	-0.00652+
	(0.00084)	(0.00087)	(0.00491)	(0.00098)	(0.00099)	(0.00531)	(0.000610)	(0.00062)	(0.0039)
Size: Medium	0.0657*	0.0736*	0.0567	0.0674*	0.0784*	0.00437	0.163***	0.162***	0.402**
	(0.0284)	(0.0292)	(0.161)	(0.0321)	(0.0334)	(0.174)	(0.0233)	(0.0238)	(0.139)
Size: Large	0.135***	0.112*	0.312+	0.127**	0.107*	0.222	0.342***	0.324***	0.627***
	(0.0410)	(0.0437)	(0.176)	(0.0464)	(0.0500)	(0.190)	(0.0378)	(0.0397)	(0.175)
Quality Certificate	-0.0461	-0.0366	-0.123	-0.0445	-0.0334	-0.0180	0.0678**	0.0635**	0.134
	(0.0321)	(0.0338)	(0.133)	(0.0364)	(0.0387)	(0.144)	(0.0234)	(0.0244)	(0.109)
R & D	0.0113	0.0130	-0.0553	0.0426	0.0553	-0.232	0.00689	-0.00208	0.0372
	(0.0373)	(0.0396)	(0.143)	(0.0422)	(0.0453)	(0.155)	(0.0270)	(0.0284)	(0.116)
Training	-0.0133	-0.0175	-0.00932	-0.0194	-0.0276	0.00937	0.0394+	0.0332	0.0595
	(0.0327)	(0.0344)	(0.137)	(0.0370)	(0.0394)	(0.148)	(0.0237)	(0.0247)	(0.110)
Schooling	0.0107**	0.0110**	-0.00169	0.0131**	0.0140***	0.00466	0.00651*	0.00785**	-0.0179
	(0.00353)	(0.00369)	(0.0158)	(0.00401)	(0.00422)	(0.0171)	(0.00255)	(0.00264)	(0.0127)
Export	0.0199	0.0221	0.0188	0.0312	0.0240	0.0644	0.0516*	0.0634*	0.0491
	(0.0351)	(0.0378)	(0.126)	(0.0397)	(0.0432)	(0.136)	(0.0254)	(0.0272)	(0.102)
Labor							0.285***	0.284***	0.329***
							(0.00918)	(0.00956)	(0.0420)
Capital							0.0607***	0.0588***	0.0814**
							(0.00522)	(0.00537)	(0.0275)
Raw Materials							0.562***	0.566***	0.475***
							(0.00653)	(0.00677)	(0.0305)

Table 4: The relationship between investment climate and TFP…cont'd

	Solow's residual Unrestricted			Solow's residual Restricted			Cobb-Douglas One Step		
	(1) TFP ALL	(2) TFP Domestic	(3) TFP Foreign	(4) TFP ALL	(5) TFP Domestic	(6) TFP Foreign	(7) TFP ALL	(8) TFP Domestic	(9) TFP Foreign
Constant	3.520***	2.037***	1.976	3.523***	1.969***	2.628+	2.408***	2.670***	3.106**
	(0.800)	(0.319)	(1.340)	(0.906)	(0.365)	(1.448)	(0.226)	(0.243)	(1.113)
Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	3707	3392	312	3707	3392	312	3706	3392	312
F	5.405	5.271	1.299	6.142	5.182	1.481	639.0	579.2	56.24
r2	0.121	0.124	0.267	0.135	0.123	0.293	0.943	0.942	0.943

Robust standard errors in parentheses. The control variables are country, industry, and year.
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: The relationship between investment climate and labor productivity

	(1) Labor Productivity All	(2) Labor Productivity Domestic	(3) Labor Productivity Foreign
Finance	0.119**	-0.0916	0.0834
	(0.0418)	(0.106)	(0.170)
Infrastructure	0.00405	-0.128	-0.329
	(0.0521)	(0.0900)	(0.275)
Reg. Burden 1	-0.0489	-0.0218	0.157
	(0.0378)	(0.0543)	(0.215)
Reg. Burden 2	-0.0925**	-0.00890	-0.383+
	(0.0344)	(0.0566)	(0.220)
Age	-0.00461***	-0.00492***	-0.00224
	(0.000961)	(0.000996)	(0.00434)
Size: Medium	0.0763*	0.0715*	0.173
	(0.0314)	(0.0321)	(0.169)
Size: Large	0.0670	0.0711	-0.000945
	(0.0449)	(0.0474)	(0.184)
Schooling	0.0122**	0.0136**	-0.00532
	(0.00401)	(0.00415)	(0.0170)
Training	0.157***	0.133***	0.219+
	(0.0346)	(0.0362)	(0.132)
Quality certificate	0.290***	0.244***	0.680***
	(0.0352)	(0.0367)	(0.131)
Export	0.146***	0.142***	0.0579
	(0.0390)	(0.0416)	(0.133)
R & D	0.285***	0.283***	0.138
	(0.0592)	(0.0623)	(0.209)
Constant	10.42***	10.35***	10.44***
	(0.847)	(0.857)	(1.527)
Controls	Yes	Yes	Yes
N	6507	5982	521
F	89.46	79.70	12.93
r2	0.570	0.560	0.689

Robust standard errors in parentheses. The control variables are country, industry, and year.
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

This suggests that investment climate variables have different effects on firm productivity by ownership but also that these effects may be misleading if only singular dimensions of productivity measures are examined. For instance, many studies have pointed out the importance of institutional development on the competitive advantage of domestically owned firms to the disadvantage of foreign owned ones (Driffield et al., 2016; Kafouros and Aliyev, 2016; Lee and Lee, 2018), and yet other studies have pointed out the higher cost of regulatory burden on foreign owned firms

when using labor productivity as a measure of firm performance (Ashyrov and Masso, 2019; Kresic et al., 2017).

Exploring the channels through which productivity of firms can be affected by the investment climate can help partly explain these contradicting results. Table 6 presents the analysis for several business activities associated with productivity. The models estimated for export, R & D, and innovation are probit models (see Table A5 in appendix for the marginal effects of the variables), while sales and capital per worker are estimated by OLS models with robust standard errors. Moreover, the models are estimated for all firms with interaction terms added between ownership and investment climate indicators to capture any joint effect that might be present.

The results indicate that propensity to export is not associated with any of the investment climate variables. This might be due to the lack of measures for customs regulation as other studies have found that customs and trade regulation matters for the propensity of firms to export (Kresic et al., 2017; Dollar et al., 2006).

R & D activity is associated with firms operating in good government-business relations. However, it is also associated with more bribes and informal competition which seems more of a problem of reverse causality suggesting firms engaged in R&D are likely to pay higher bribes. The interaction term between foreign ownership and regulatory burden is significant and indicates foreign owned firms are more likely to avoid R & D activity in an environment with regulatory burden. As technology spillovers from foreign to domestically owned firms are a source of productivity improvement in domestically owned firms, the lack of R & D activity by foreign firms can deprive domestically owned firms of long-term productivity gains (Wei and Liu, 2006; Meyer and Sinani, 2009).

Innovation (introducing new product or service) is positively associated with finance availability and good government-business relationship. Sales is positively associated with finance and negatively associated with regulatory bottlenecks higher bribes/informal competition. Finally, capital per worker is positively associated with finance availability.

Table 6: The relationship between Investment climate and channels of productivity

	(1) Export	(2) R&D	(3) Innovation	(4) Sales	(5) K/L
Foreign	0.593***	0.154+	0.146*	0.459***	0.101
	(0.0725)	(0.0792)	(0.0670)	(0.0675)	(0.115)
Finance	-0.0429	-0.0512	0.166**	0.0965+	0.193+
	(0.0602)	(0.0667)	(0.0578)	(0.0556)	(0.107)
Foreign*Finance	0.0146	-0.0419	-0.0161	-0.0827	-0.130
	(0.0576)	(0.0614)	(0.0556)	(0.0538)	(0.107)
Infrastructure	0.0911	-0.151	-0.0630	0.0467	-0.0130
	(0.0968)	(0.100)	(0.0814)	(0.0784)	(0.139)
Foreign*Infrastructure	-0.0440	0.0826	0.0484	-0.0261	-0.00574
	(0.0538)	(0.0574)	(0.0481)	(0.0474)	(0.0881)
Reg. Burden 1	0.00356	0.102+	0.128**	-0.00657	-0.0561
	(0.0536)	(0.0546)	(0.0477)	(0.0469)	(0.0741)
Foreign*Reg. Burden 1	-0.0105	-0.0879	0.0199	-0.00395	0.120
	(0.0527)	(0.0565)	(0.0510)	(0.0480)	(0.0887)
Reg. Burden 2	-0.0322	0.125*	-0.0803	-0.135**	-0.161
	(0.0602)	(0.0573)	(0.0500)	(0.0505)	(0.101)
Foreign*Reg. Burden 2	0.0742	-0.113+	-0.0875	0.0541	-0.0108
	(0.0569)	(0.0613)	(0.0538)	(0.0509)	(0.0933)
Age	-0.00108	-0.000281	0.00213+	-0.00135	-0.00202
	(0.00131)	(0.00132)	(0.00110)	(0.00110)	(0.00174)
Size: Medium	0.546***	0.171***	0.0509	1.480***	0.0748
	(0.0480)	(0.0477)	(0.0370)	(0.0357)	(0.0580)
Size: Large	1.054***	0.426***	0.177***	3.186***	-0.133
	(0.0595)	(0.0606)	(0.0507)	(0.0502)	(0.0819)
Quality Certificate	0.532***	0.398***	0.263***	0.505***	0.417***
	(0.0442)	(0.0464)	(0.0394)	(0.0394)	(0.0647)
Training	0.0914*	0.568***	0.430***	0.326***	0.203**
	(0.0456)	(0.0443)	(0.0385)	(0.0391)	(0.0659)
Schooling	0.00837	-0.00271	0.00976*	0.0145**	0.00406
	(0.00543)	(0.00572)	(0.00451)	(0.00458)	(0.00726)

Table 6: The relationship between Investment climate and channels of productivity ...cont'd

	(1) Export	(2) R&D	(3) Innovation	(4) Sales	(5) K/L
Constant	-0.611	-0.177	-0.284	12.34***	7.440***
	(0.949)	(1.051)	(0.695)	(0.972)	(0.583)
N	7518	7433	7662	6548	3776
F				148.5	19.61
r2				0.693	0.334

Robust standard errors in parentheses. The control variables are country, industry, and year.
$^{+}$ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Relating these results with the analysis for productivity, it can be argued that firms without proper access to financing and facilitative business environments can find it difficult to be productive. As foreign owned firms have the possibility to make use of various destinations to pursue these activities and utilize parent company resources, the negative effects of regulatory burden and financing problem can be more pronounced in domestically owned firms (Gorodnichenko and Schnitzer, 2013; Nielsen et al., 2017). In other words, domestically owned firms face many obstacles with limited resources to accumulate capital, to innovate, and to engage in R & D which are very essential for efficient allocative capability of firms. Moreover, the positive technology spillover effects associated with the presence of foreign owned firms might not be fully realized in locations with regulatory bottlenecks to the disadvantage of domestically owned firms. These productivity losses are best captured when examining measures of productivity such as TFP. Labor productivity, however, depends on the sales revenue and the negative effects of regulatory red tapes may be more pronounced for foreign firms as they incur higher cost per revenue to overcome these obstacles (Ashyrov and Masso, 2019).

6. Conclusion

Investment climate variables are one of the important determinants of firm productivity across locations. By looking at subgroups of investment climate variables, namely access to finance, regulatory environment, and infrastructure with a focus on ownership, this study examined the productivity differential explained by differences in business environments. For this purpose, it analyzed data from the fifth Business Environment and Enterprise Performance Survey (BEEPS V) in combination with a similar survey for the MENA region covering 41 countries in total from 2011-2016.

Methodologically, the study used four distinct measures of productivity consisting of three distinct TFP measures and a measure of labor productivity for firms to get robust results. In addition, it utilized a composite indicator by using Principal Component Analysis (PCA) from the relevant investment climate variables of finance, infrastructure, and regulatory environment to tackle multicollinearity concerns.

The empirical results indicate that regulatory environment matters for all measures of firm productivity while access to finance is only positively associated with labor productivity for the sample of all firms. It also shows the asymmetric productivity differential associated with different ownerships from investment climate variables. Particularly, domestically owned firms incur total factor productivity loss resulting from regulatory burden and lack of finance, whereas foreign owned firms experience loss only in labor productivity due to regulatory burden.

This asymmetry can be partly explained by examining the relationship between investment climate and different channels associated with productivity. To this end, the analysis of the study indicates

that innovation and sales are associated with conducive regulatory environment as well as access to finance, while R & D is associated only with good business-government relationship and capital per worker is associated with financing. As foreign owned firms can outsource any of their activities to their geographically distributed networks or tap into their considerable resources, the negative effects of investment climate on these channels may be more pronounced for domestically owned firms (Nielsen et al., 2017; Lee and Lee, 2018).

These results confirm the view in the literature that business environment obstacles result in productivity losses in firms, and this can depend on firm characteristics such as ownership (Lee and Lee, 2018; Ashyrov and Masso, 2019). Moreover, it supports the argument that institutional developments are more beneficial for domestically owned firms as they suffer more from underdeveloped financial markets and obtrusive and excessive regulation (Driffield et al., 2016; Kafouros and Aliyev, 2016; Lee and Lee, 2018).

Future research in this area can proceed along two paths. As all previous studies were cross-sectional, it would be a methodological advantage to utilize a longitudinal firm-level dataset to see how improvements in the investment climate has affected firm productivity over time by focusing ownership. Secondly, it would be worthwhile to explore if there are negative complementarities among various aspects of the investment climate to see what the joint effect of business obstacles implies in terms of productivity loss.

In conclusion, the study recommends policymakers to prioritize improvements in business environments and access to finance to boost the productivity of domestically owned firms so they can be competitive both domestically and globally.

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Appendices

Appendix A

Table A1: Definition of key variables

Variable	Definition
TFP	Log of total factor productivity
Age	The number of years since the firm started operations
Size	Size of firms, 1= small, 2=medium, 3=large
Schooling	Average number of schooling of employees
Training	Formal training provided for employees(dummy)
Quality Certificate	Internationally recognized quality certificate(dummy)
R & D	Expenditure on R& D(dummy)
Innovation	Introduction of new products or services(dummy)
Capital per worker	Log of capital per full time employees
Sales(log)	Log of revenue generated in the last fiscal year
Export	Direct export, as percentage of goods and services exported
Foreign	Foreign ownership, as percentage of ownership
Power loss	Log of total duration in hours of power outage in a year
Water Supply	Water supply issue(dummy)
Internet Access	Access to broadband internet(dummy)
Credit	Credit line availability(dummy)
Overdraft Facility	Overdraft facility availability (dummy)
Work Cap	Working capital financed externally (%)
Management time	Time of senior management spent dealing with regulations (%)
Tax Inspection	Frequency of tax inspection(days)
Sales bribe	Percentage of sales given as bribe payments (%)
Informal competition	Competition against unregistered or informal firms(dummy)

Table A2: Summary statistics for the Principal Components by country

	Finance		Infrastructure		Reg. Burden 1		Reg. Burden 2	
Country	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Albania	.236	0.047	-.872	0.105	-2.459	0.189	.134	0.875
Armenia	1.467	0.031	-2.091	0.009	-.65	0.015	-2.207	0.052
Azerbaijan	-1.552	0.008	-1.615	0.002	-1.304	0.006	-1.325	0.006
Belarus	-.098	0.456	-1.836	0.060	.656	0.074	-.491	0.336
Bosnia-Herzegovina	1.991	0.107	-1.563	0.237	.198	0.197	-.029	0.347
Bulgaria	1.207	0.204	-1.605	0.045	.352	0.487	.361	0.126
Croatia	1.124	0.303	-1.805	0.054	.896	0.135	.239	0.400
Cyprus	2.452	0.015	-1.758	0.005	.636	0.006	.515	0.011
Czech Republic	1.794	0.327	-1.718	0.064	.467	0.231	.665	0.200
Djibouti	.428	0.037	.694	0.023	-.495	0.008	-1.253	0.003
Egypt	-1.594	0.231	1.229	0.249	-.403	0.183	.514	0.371
Estonia	.922	0.074	-1.926	0.076	-.309	0.261	-1.509	0.388
FYR Macedonia	.896	0.284	-1.459	0.027	-.17	0.163	1.865	0.314
Georgia	.775	0.155	-1.361	0.093	-.244	0.163	-.266	0.142
Greece	.808	0.224	-1.719	0.033	1.516	0.238	1.093	0.850
Hungary	.307	0.211	-1.986	0.037	-.47	0.242	-1.676	0.211
Israel	2.725	0.580	-.582	0.068	-3.734	1.584	-1.433	0.302
Jordan	-.499	0.316	.559	0.768	-1.106	0.267	-1.63	0.338
Kazakhstan	-1.244	0.150	-1.545	0.219	-.151	0.154	-.257	0.126
Kosovo	3.094	0.017	-.345	0.014	.444	0.014	2.775	0.036
Kyrgyzstan	-1.185	0.026	-.603	0.039	.743	0.124	2.019	0.716
Latvia	-1.176	0.150	-1.588	0.103	-.526	0.019	-1.135	0.326
Lebanon	2.011	0.272	2.515	0.251	.127	0.209	1.56	0.441
Lithuania	-.599	0.111	-1.851	0.052	.246	0.029	.09	0.247
Moldova	.53	0.307	-1.43	0.091	-.887	0.041	-1.155	0.325
Mongolia	.832	0.781	-.974	0.187	.249	0.219	-.357	0.311
Montenegro	1.153	0.031	-.811	0.016	-1.148	0.036	.315	0.028
Morocco	2.065	0.427	-.354	0.055	.257	0.406	-.214	0.365
Poland	.182	0.071	-1.854	0.038	.697	0.097	-1.2	0.055
Romania	.681	0.082	-1.429	0.020	-.287	0.724	-1.198	0.218
Russia	-.735	0.097	-1.49	0.075	.241	0.210	-.47	0.349
Serbia	1.722	0.564	-1.514	0.113	.089	0.083	-.266	0.723
Slovak Republic	.657	0.562	-1.991	0.053	.266	0.121	-.15	0.697
Slovenia	2.281	0.246	-2.015	0.044	.428	0.344	-.373	0.314
Tajikistan	-1.167	0.139	-.165	0.311	.075	0.192	.438	0.670
Tunisia	2.447	0.931	-.467	0.121	2.506	0.222	-1.525	0.842
Turkey	1.789	0.373	.07	0.234	1.23	0.048	.368	0.496
Ukraine	-.806	0.553	-1.141	0.196	.449	0.490	.446	0.373
Uzbekistan	-.761	0.108	-.448	0.040	1.375	0.213	-1.897	0.518
West Bank and Gaza	-1.083	0.311	1.013	0.487	-.744	0.435	.436	0.095
Yemen	-1.633	0.092	2.399	0.263	-1.142	0.399	1.684	0.791
Total: 4586 Obs.	-2.64e-09	1.622	-4.14e-09	1.303	1.64e-09	1.187	1.68e-09	1.049

Table A3: Principal Component Analysis: Eigenvalues and cumulative variance

Finance	Eigenvalue	Difference	Proportion	Cumulative
Comp1	2.63236	2.36877	0.8775	0.8775
Comp2	.263588	.159536	0.0879	0.9653
Comp3	.104052		0.0347	1.0000
Infrastructure				
Comp1	1.69983	.878112	0.5666	0.5666
Comp2	.821715	.343257	0.2739	0.8405
Comp3	.478458	.	0.1595	1.0000
Regulatory Burden				
Comp1	1.40928	.308697	0.3523	0.3523
Comp2	1.10059	.176399	0.2751	0.6275
Comp3	.924187	.358243	0.2310	0.8585
Comp4	.565944	.	0.1415	1.0000

Table A4: Correlation table for principal components and their respective variables

Finance		Infrastructure		Regulatory Burden		
Underlying variables	Correlation	Underlying variables	Correlation	Underlying variables	Correlation (1st comp)	Correlation (2nd comp)
Credit	0.9599	Power outage	0.8272	Management time	0.7521	-0.3809
Overdraft facility	0.9070	Internet Access	-0.8184	Tax Inspection	-0.8430	0.0589
Work cap	0.9425	Water Insufficiency	0.5881	Sales bribe	0.1469	0.6638
				Informal Competition	0.3336	0.7151

Table A5: Marginal effects of the variables for the probit models

	(1) Export	(2) R&D	(3) Innovation
Foreign	0.160***	0.0338+	0.0542*
	(0.0251)	(0.0173)	(0.0239)
Finance	-0.00896	-0.0101	0.0557**
	(0.0127)	(0.0120)	(0.0191)
Infrastructure	0.0188	-0.0266	-0.0200
	(0.0203)	(0.0179)	(0.0267)
Reg. Burden 1	0.000583	0.0176+	0.0437**
	(0.0113)	(0.00991)	(0.0158)
Reg. Burden 2	-0.00565	0.0214*	-0.0294+
	(0.0124)	(0.0101)	(0.0161)
Age	-0.000231	-0.0000518	0.000717+
	(0.000282)	(0.000243)	(0.000372)
Size: Medium	0.101***	0.0293***	0.0169
	(0.0120)	(0.00813)	(0.0123)
Size: Large	0.256***	0.0855***	0.0610***
	(0.0226)	(0.0132)	(0.0177)
Quality Certificate	0.128***	0.0808***	0.0912***
	(0.0144)	(0.0103)	(0.0140)
Training	0.0201+	0.122***	0.152***
	(0.0103)	(0.0108)	(0.0140)
Schooling	0.00180	-0.000499	0.00329*
	(0.00117)	(0.00105)	(0.00152)
N	7518	7433	7662
F			
r2			

Robust standard errors in parentheses. The control variables are country, industry, and year..
+ $p < 0.1$, * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Appendix B

The calculation of Total Factor Productivity (TFP)

When investigating the effect of investment climate variables on firm productivity, it is possible to start out with a general production function as follows:

$$Y_{it} = F(L_{it}, M_{it}, K_{it})P_{it} \quad (1a)$$

$$P_{it} = G(IC_{it}, C_{it})\exp(u_{it}) \quad (1b)$$

Where Y_{it} is the sales of firm i at time t, L_{it} is the labor of firm i at time t, M_{it} is the intermediate materials of firm i at time t, K_{it} is the capital of firm i at time t, P_{it} is the productivity of firm i at time t, and lastly, $IC_{it}, C_{it}, and\ u_{it}$ are investment climate variable of firm i at time t, characteristics of firm i at time t, and unexplained other factors affecting firm i at time t respectively.

In this specification, output depends on inputs and productivity of firms (1a), whereas productivity depends on firm characteristics and the business environment (1b).

Taking logarithms of (1a) and (1b),

$$\log Y_{it} = \log F_{it} + \log P_{it} \quad (2a)$$

$$\log P_{it} = \log G_{it} + u_{it} \quad (2b)$$

From this form, productivity can be measured in growth rates or level depending on the data. As the data available in this study allows for a level-based analysis, a functional form of F needs to be specified which is usually Cobb-Douglas (Escribano and Luis Guasch, 2005).

$$Y_{it} = \left(L_{L_{it}}^{\alpha_{L,it}} M_{M_{it}}^{\alpha_{M,it}} K_{K_{it}}^{\alpha_{K,it}}\right) P_{it} \qquad (3a)$$

$$P_{it} = \left(A_p IC_{IC_{it}}^{\alpha_{IC,it}} C_{C_{it}}^{\alpha_{C,it}}\right) \exp(u_{it}) \qquad (3b)$$

Taking logarithms 3a and 3b become:

$$logY_{it} = \alpha_{L_{it}} logL_{it} + \alpha_{M_{it}} logM_{it} + \alpha_{K_{it}} logK_{it} + \log P_{it} \qquad (4a)$$

$$logP_{it} = \alpha_{IC_{it}} logIC_{it} + \alpha_{C_{it}} logC_{it} + \alpha_p + u_{it} \qquad (4b)$$

Where α_p is $logA_p$.

From specifications 4a and 4b productivity($logP_{it}$) is measured as the residual from the regression estimation of the first equation and the effects of investment climate variables are, then, regressed in the second equation to get their elasticities. This procedure suffers from simultaneity bias as input choices of firms may depend on firm characteristics as well as investment climate variables or their perceptions of them.

In estimating these equations, certain assumptions are made including constant elasticity of inputs (same country, same industry...) and the exogeneity of regressors in the specifications.

This study considers inputs to be endogenously determined by investment climate variables and as such tries to address this issue by using two distinct approaches.

1) It uses Solow residuals based on cost shares which doesn't require the input to be exogenous and input elasticities to be constant.

2) It uses a one-step estimation strategy by taking country-location-ownership values for investment climate as a two-step estimation has a simultaneity bias.

Solow's Residual based on cost shares

The model estimated following Solow's residual using cost shares is as follows:

$$logTFP_{it} = logY_{it} - s_{L,it}logL_{it} - s_{M,it}logM_{it} - s_{K,it}logK_{it} \quad (5)$$

Where $s_{L,it} = \frac{w_t L_{it}}{w_t L_{it} + c_t M_{it} + r_t K_{it}}$, $s_{M,it} = \frac{c_t M_{it}}{w_t L_{it} + c_t M_{it} + r_t K_{it}}$, $s_{K,it} = \frac{r_t K_{it}}{w_t L_{it} + c_t M_{it} + r_t K_{it}}$

Cobb-Douglas Extended Production Function (one-step estimation)

A two-step estimation of equations 4a and 4b has two issues with it. First, it assumes constant input elasticities across all firms -aggregating firms over countries, industries or regions can overcome this problem. Two, it assumes the regressors are endogenous in both equations. This is unlikely as input choices may depend both on firm characteristics and investment climate variables.

Modelling the demand of each of the inputs (L, M, K) to be determined by their prices (w_{it}), firm characteristics and investment prices as below:

$$input_{it} = \sum_{r=1}^{q} \gamma_{IC,rj} logIC_{r,it} + \sum_{r=1}^{q} \gamma_{C,rj} logIC_{r,it} + \gamma_{w,j} logW_{it} + v_{it} \quad (6a)$$

Where q is the number of investment variables and firm characteristics.

Assuming Productivity is affected by these same factors, but also additional investment climate variables and firm characteristics, it can be modelled as follows:

$$logP_{it} = \sum_{r=1}^{n} \gamma_{IC,rj} logIC_{r,it} + \sum_{r=1}^{n} \gamma_{C,rj} logIC_{r,it} + \alpha_p + u_{it} \quad (6b)$$

Equation 6b is a generalization of 6a as far as investment climate variables and firm characteristics are concerned (n > q). Assuming that the errors v_{it} and u_{it} are mutually independent and uncorrelated with the explanatory variables in (6a) and (6b) and that all the

correlation between inputs (L, M and K) and productivity comes from the investment climate variables and the C characteristic of (6a), and not from the competitive input prices (w), a one-step estimation problem can be estimated following this extended production function:

$$logY_{it} = \alpha_{L_{it}} logL_{it} + \alpha_{M_{it}} logM_{it} + \alpha_{K_{it}} logK_{it} + \sum_{r=1}^{n} \gamma_{IC,rj} logIC_{r,it} + \sum_{r=1}^{n} \gamma_{C,rj} logIC_{r,it} + \alpha_p + u_{it}$$

Kas investeerimiskliima mõjutab kodumaises omanduses ja välismaises omanduses olevaid firmasid erinevalt?

Kokkuvõte

Erinevused investeerimiskliima osas on üks keskne ettevõtete tegevuskeskkonda iseloomustav tegur, mis aitab selgitada ettevõtete tootlikkuse erinevusi. Käesolev magistritöö uurib seost ettevõtte tootlikkuse ja investeerimiskliima muutujate erinevate põhikategooriate vahel, sh ettevõtete regulatiivne tegevuskeskkond, juurdepääs ettevõtete tegevuse rahastusele, juurdepääs infrastruktuurile. Töö keskendub antud investeerimiskliima näitajate seostele tootlikkusega eraldi välis- ja kodumaisele kapitalile kuuluvate ettevõtete puhul. Sel eesmärgil kasutab magistritöö ettevõttetasandi ristandmeid Kesk- ja Ida-Euroopa ning Lähis-Ida ja Põhja-Aafrika riikidest. Uurides tootlikkuse näitajatest tööviljakust ja kogutootlikkust, toob uuring esile, kuidas investeerimiskliima ja tootlikkuse vaheline seos võib varieeruda sõltuvalt ettevõtte omandivormist. Uurimistöö tulemused viitavad sellele, et kodumaiste ettevõtete puhul väheneb nende kogutootlikkus kõrgema regulatiivse koormuse ja kohalike finantspiirangute tõttu, samas kui välisomandis olevad ettevõtted kogevad kõrgema regulatiivse koormuse tõttu tööjõu tootlikkuse langust. Lisaks uuritakse magistritöös erinevaid kanaleid, mille kaudu investeerimiskliima ettevõtete tootlikkust võib mõjutada ja tootlikkuse osas leitud heterogeenseid tulemusi selgitada.

Märksõnad: ettevõtete tootlikkus, investeerimiskliima, omandivorm

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