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Essays on Investment Climate in Developing Countries

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Abstract

This thesis consists of three chapters on investment climate in developing countries. The first chapter examines the investment climate (IC) effects on the growth of developing countries. In contrast to past studies in the IC literature, which narrow their investigation to a subgroup of IC variables, I measure multiple dimensions of the investment climate in a single index. To construct an IC index, I use the methodology proposed by Escribano and Hacihasanoglu (2012 and 2013) to combine 87 firm-specific variables for 27,624 firms in 113 developing countries. This index overcomes multicollinearity and the dimensionality problems of the World Bank's enterprise survey database and makes it possible to compare different countries. I show both theoretically and empirically that IC as a whole does matter to explain cross-country income differences in developing countries. Once I control for the IC, trade or macroeconomic policy does not have any explanatory power on GDP per capita while geography has a weak effect on it. My results contribute to the institutions' literature by showing IC as a specific type of institution to achieve higher levels of income.

In chapter 2, joint with Alvaro Escribano, we develop an investment climate index (ICI) using enterprise surveys of the World Bank. We propose a simple methodology that allows us to combine a large set of continuous and binary IC variables into an index which proxy the good and the bad qualities of the investment climate. As a byproduct, we also construct IC sub-indices for five different blocks of IC variables: infrastructure; corruption and crime; finance; quality, innovation, and labor skills; and other control variables. When aggregating, we use two options, one with equal weights and the other with unequal weights of those IC variables. The unequal weights of ICI are obtained using principal component analysis (PCA), after transforming all IC variables to binary variables. We identify at least three important advantages of using our IC indices. First, they minimize the loss of information in regression analysis when compared with individual IC explanatory variables. We show, by using a probability of export equation with Turkish data, that our IC indices can proxy a large set of IC variables in regression analysis. Furthermore, we show that these IC indices make a regression analysis, with more than 100 explanatory IC variables, simpler and avoid a serious multicollinearity problem. Second, the ICI offers the possibility of making cross-country comparisons based on the description of the investment climate. For that purpose, we calculate the ICIs for 113 developing and transition countries, and then we show the cross correlation of the aggregate ICI with other aggregate indices like the World Economic Forum's Global Competitiveness Index (GCI), which is equal to 0.52, etc. Third, these IC indices allow us to incorporate the aggregate investment climate information of a country as an interesting determinant in macroeconomic models

analyzing the IC impact on economic growth, cross-country convergence, etc.

In chapter 3, I analyze the competitive restrictions of the exporters of Turkish manufacturing sector in terms of the IC variables. Although the Turkish economy experienced certain improvements after 2000, a poor investment climate of Turkey is one of the most important factors of the country's competitiveness with respect to its competitors. Improvements in IC may raise competitiveness by increasing firm-level performance, provide a sustainable growth perspective through higher productivity, and moderate the severe unemployment problem of Turkey by encouraging both domestic and foreign investment. The aim of this chapter is to investigate how IC constraints in Turkey affect exports by showing which components of IC have particular importance for the exporters. This analysis enables us to exactly determine the microeconomic structural reforms for the long-run prospect of Turkish manufacturing export. I estimate the model by using the Heckman model because of the nature of the data at hand.

Resumen

La presente tesis consta de tres capítulos sobre el "clima de inversión" en los países en vías de desarrollo. El primer capítulo examina los efectos del clima de inversión (CI) sobre el crecimiento de los países en desarrollo. A diferencia de estudios anteriores recogidos en la literatura especializada sobre CI que centran sus investigaciones en un subgrupo de variables del CI, en esta Tesis se tienen en cuenta las múltiples dimensiones del clima de inversión agregándolas en un único índice.

Dicho índice ICI solución en parte los problemas de multicolinearidad y dimensionalidad de la base de datos del Banco Mundial basada en encuestas de empresas y posibilita la comparación entre distintos países. Se muestra, tanto de forma teórica como empírica, que el CI en su conjunto es sin duda un factor de peso a la hora de explicar las diferencias de ingresos entre países en vías de desarrollo. Un resultado importante muestra como una vez que se controla por las variables del CI otras variables como las políticas comerciales o las macroeconómicas dejan de tener capacidad explicativa del PIB per-cápita, a la vez que la geografía tiene un débil efecto. Los resultados de esta Tesis representan una contribución novedosa sobre el importante papel que juega la calidad de las instituciones i el CI en el crecimiento de los países en vías de desarrollo.

El capítulo 2, desarrolla un índice del clima de inversión (ICI) a partir de las encuestas de empresas del Banco Mundial. Para la elaboración del índice del clima de inversión (ICI), se desarrolla una metodología que permite combinar 87 variables específicas de empresa para 27.624 empresas de 113 países en vías de desarrollo. Esta metodología permite combinar en un índice un amplio conjunto de variables continuas con binarias que representan los aspectos positivos y negativos del entorno de inversión. Como subproducto, desarrollan también subíndices del CI para cinco bloques distintos de variables CI: infraestructuras, corrupción y delincuencia, finanzas, calidad, innovación y trabajo cualificado; junto con otras variables de control. A la hora de agregar, ponderamos siguiendo dos alternativas, una con igual peso y otra con pesos desiguales para las mencionadas variables del CI. Los pesos desiguales de ICI se obtienen utilizando el análisis de componentes principales (ACP), después de transformar todas las variables del CI en variables binarias.

Identificamos al menos tres ventajas importantes en la utilización de estos índices del CI. En primer lugar, minimizan la pérdida de información en análisis de regresión si se compara con los resultados de utilizar variables explicativas del CI a nivel individual. Se muestra, mediante un cálculo de la probabilidad de exportar en Turquía, que nuestros índices ICI pueden resumen fielmente a un gran conjunto de variables de CI en un análisis de regresión. Además, mostramos que estos índices ICI hacen que

un análisis de regresión con más de 100 variables explicativas, sea mucho más sencillo, además de evitar un grave problema de multicolinearidad. En segundo lugar, el ICI ofrece la posibilidad de efectuar comparaciones entre países basadas en la descripción del clima de inversión. Con ese propósito, calculamos los ICI de 113 países en vías de desarrollo y en transición, para después mostrar la correlación del ICI agregado con otros índices agregados, tales como el índice de Competitividad Global del Foro Económico Mundial (GCI), con una correlación igual a 0,52, etc. En tercer lugar, estos índices ICI nos permiten incorporar la información agregada del clima de inversión de un país como un interesante factor determinante en los modelos macroeconómicos que analizan el impacto del CI sobre el crecimiento económico, la convergencia entre países, etc.

El capítulo 3, analiza las restricciones competitivas del sector manufacturero turco en términos de variables del CI. A pesar de que la economía turca experimentó cierta mejoría a partir del año 2000, el deficiente entorno de inversión en Turquía es unos de los factores que más afecta a la competitividad del país frente a la de sus competidores. La mejora deI CI puede incrementar la competitividad de la economía al aumentar el rendimiento de las empresas, proporcionar perspectivas de crecimiento sostenible gracias a la mayor productividad, y al mismo tiempo aliviar el grave problema del desempleo en Turquía fomentando las inversiones tanto nacionales como extranjeras. El propósito de este capítulo es investigar cómo las barreras causadas por el CI en Turquía afectan a las exportaciones, mostrando qué componentes del CI tienen especial importancia para los exportadores. Este análisis permite identificar algunas reformas microeconómicas estructurales a largo plazo para impulsar las exportaciones turcas. Para ello se utiliza el modelo Heckman teniendo en cuenta la naturaleza de los datos del CI disponibles a nivel de empresa.

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I have no knowledge except what You have taught us. All errors are mine.

Contents

Chapter 1

Investment Climate and Cross-Country Income Differences

1.1 Introduction

The World Bank (2005a) defines investment climate (IC) as "a set of location-specific factors shaping the opportunities and incentives for firms to invest productively, create jobs, and expand". Specifically, IC includes infrastructure, access to finance, the regulatory framework, corruption, and security (absence of crime) dimensions. Escribano and Hacihasanoglu (2012 and 2013) propose a methodology to construct indices of IC measures based on firm-level IC data. Figure 1 shows the GDP per capita of countries against their index of IC (average of firm-level IC of all firms within each country). The correlation between the two variables is 0.56, and the R^2 is 0.31. The objective of this paper is to investigate, theoretically and empirically, the relationship between IC and GDP per capita.

[FIGURE 1 ABOUT HERE]

The hypothesis of this paper is that differences in GDP per capita in developing countries are fundamentally related to differences in IC across countries. The IC of an economy may be bad and put constraints on producers or may be good and make it easier to operate. A good IC framework provides a hospitable environment for growth by encouraging domestic and foreign investments and by providing an efficient environment for existing producers. On the other hand, in case of a poor IC, which is not under the control of producers, some parts of resources of producers are devoted to compensate for unproductive activities, such as money spent on private security services or time spent on bureaucratic issues, making no positive contribution to output. Such an environment not only deteriorates the productivity of existing producers but it can also discourage new investments. Acemoglu (2009) emphasizes the importance of IC factors by writing, "Economic growth not only requires secure property rights and low taxes, but also complementary investments, often most efficiently undertaken by the government. Provision of law and order, investment in infrastructure and public goods are obvious examples."

Inadequacies of infrastructure and finance dimensions of IC create barriers to firm-level productivity and economic growth (Rajan and Zingales, 2003). For example, firms with access to modern infrastructure invest more, and their investments are more productive. Without credit constraints, productive firms can expand their businesses, and less productive firms can make the necessary investment to raise their productivity. While good infrastructure and a good financial system are beneficial for producers and country as a whole, the World Development Report (WDR) 2005 mentions that inadequacies in infrastructure and finance are large in developing countries. Figure 2 shows the share of firms that report access to finance and infrastructure (electricity, telecommunications, or transportation) as "major" or "severe" obstacles to the operation and growth of their business. Asian Development Bank (2007b) emphasizes that the region remains below the world infrastructure average in terms of both its quality and its quantity. A similar report from Inter-American Development Bank (IADB) (2013) explains Latin America and the Caribbean (LAC) region's deep infrastructure gaps as a constraint on economic growth.

[FIGURE 2 ABOUT HERE]

After the financial crisis of 2008, global foreign direct investment (FDI) flows decreased by 33% from 2008 to 2009 (Figure 3). In addition, there is limited space for traditional fiscal and monetary policies to foster economic growth and countries should consider more structural reforms. Improving IC is an example of structural reform, and we will show in this paper that it has an important effect on the growth of developing economies. Consequently, given a period of lower expected growth in the world economy, awareness of the necessity of having a good IC is increasing in developing countries to attract more FDI and to boost long-run growth.

[FIGURE 3 ABOUT HERE]

In this paper, we combine IC with the technology diffusion model of Nelson and Phelps (1966) in a simple Solow growth model. The empirical contribution of the paper is to show quantitatively how important IC is for success of developing countries using 2007 GDP per capita as a dependent variable. In the instrumental variable section, we show that IC is the leading determinant to explain cross-country income differences in developing countries, using the instruments from the institutions' literature that are not subject to reverse causality. With a large number of robustness checks, we show that IC overcomes the other theories of growth such as geography, policy, and integration. To the best of our knowledge, this is the first paper showing the causal aggregate relationship between IC and growth using the enterprise survey data of the World Bank. This has not been done before, because it is not possible to have an aggregate IC measure in the previous methodology of the IC literature. Moreover, our estimation results in the ordinary least squares section fits the cross-country data better than the Solow model and provides an implied capital share of 0.38, which is more similar to the conventional value of 0.33. The country-specific IC variable, which is calculated as an average of firm-level IC of all the firms within each country, is also a convenient control variable for country-specific IC status. In addition, this paper contributes to the macro institutions' literature by showing the importance of a specific type of institution in developing countries.

The next section reviews the IC literature. Section 1.3 shows the theoretical foundations of the IC effect on growth. Section 1.4 presents the data and Section 1.5 shows the ordinary least squares (OLS) results, whereas Section 1.6 provides the instrumental variable (IV) results. In Section 1.7, we analyze the robustness of our results. We conclude in Section 1.8.

1.2 Literature

In the IC literature, enterprise survey data of the World Bank are used to examine the effect of IC variables on different firm performance measures in developing countries. The main purpose of this literature is to provide policy prescriptions. The literature provides evidence that a good IC stimulates growth through higher productivity and investment by showing a significant effect of various IC variables.[1]

Hundreds of academic papers and policy reports use this data. However, most of them look at the effects of individual dimensions of the IC. For the ones who consider different dimensions, they only concentrate on a few IC variables in those dimensions. Because of restricting the analysis to a limited number of IC variables, they face the potential omitted variable bias. But do variables used by those studies provide a representative sample of the IC? Does the particular selection of variables affect the validity of the results? An IC index should consider as many IC variables as

[1] See survey paper by Dethier, Hirn and Straub (2008) for details of the empirical IC literature.

possible. This paper generates a composite indicator by using all of the IC variables. To measure country-level index of IC, we use the methodology developed by Escribano and Hacihasanoglu (2012 and 2013). For each country, we take the median value of their firm-level IC measure of all the firms within each country to represent the country-level quality of IC. We explain the details of this methodology in Appendix A.4.

Prescott (1998) argues that explaining productivity differences is necessary to understand large international income differences. Productivity differences across countries have been explained by barriers to technology adoption in Parente and Prescott (1994). Another approach developed by Nelson and Phelps (1966) emphasizes the importance of absorption capacity of countries. Two important parts of both models are the distance of the country to the world technology frontier and the ability of the country to catch up with the world technology frontier. In the first model, the catch-up-with ability is a function of technology adoption barriers like laws, regulations, and union power or monopoly rights of industry insiders. In the second model, it is a function of human capital, which determines the absorption capacity of the country. Both models explain the constraints on technology diffusion. We will use the second approach in our theoretical model.

Douglas North (1990) shows that technological change and institutional change are the basic keys to explain country-level income differences. We combine the technology diffusion model of Nelson and Phelps (1966) with an augmented Solow growth model with IC. Since our model has both technology and institution (IC) variables, we have the opportunity to check which one is the most important factor for developing countries.

Recent literature emphasizes the importance of different types of institutions. Some of the studies emphasize the importance of policies. Using endogenous growth models, Perotti (1993), Saint-Paul and Verdier (1993), Alesina and Rodrik (1994) and Persson and Tabellini (1994) analyze the effect of redistributive taxation on economic growth. They show that political mechanisms have an important impact on growth. Similarly, using political economy models, Alesina and Perotti (1996), Acemoglu and Robinson (2000), Bourguignon and Verdier (2000), and Gradstein (2007) show that redistribution of resources from the elite to the masses promotes growth and investment through alleviating socio-political inconsistency.

Another branch of the literature highlights property rights institutions. Knack and Keefer (1995) presented one of the first papers analyzing the relationship between property rights and economic development at the country level. Their study does not establish a causal effect because of endogeneity and simultaneity concerns. Mauro (1998) and Hall and Jones (1999) show the first instrumental variable estimates on the effect of institutions on economic development in the long run. Another influential instrumental-variables strategy is used by Acemoglu, Johnson, and Robinson (2001, 2002). These papers show the impact of institutions on growth with a large number of robustness checks. Once the effect of institutions is controlled for other factors such as religion and geography have little effects on growth. Rodrik, Subramanian, and Trebbi (2004) and Easterly and Levine (2003) obtained similar results. The consensus among these papers is the dominant effect of institutions in contrast to the geography hypothesis.

This paper contributes to the macro institutions' literature by showing the importance of a specific type of institution, which is IC. Having a better IC reduces the number for obstacles of firms, allows them to operate more efficiently, discourages them from using their scarce resources for unproductive or less productive purposes, while it allows them to use these resources for productivity-increasing activities such as innovation, and this stimulates economic growth.

1.3 An Augmented Solow Model with Investment Climate

In this section, we introduce a Solow model with Nelson and Phelps' (1966) technology dynamics. The model is an extension of the Acemoglu (2009) version with an IC index in the production function.

The world economy consists of J closed countries, $j = 1, ..., J$. Time is discrete. There is a unique final good that can be produced or invested. Prices are expressed in terms of the unique good.

$$Y_t^j = IC_t^j A_t^j \left(K_t^j\right)^{\alpha} \left(L_t^j\right)^{1-\alpha} \tag{1.1}$$

where Y_t^j is the output of the unique final good in country j at time t, $IC \in (0, 1]$ is the IC index, K_t^j and L_t^j are the capital stock and labor supply used for production, and A_t^j is the country-specific and time-varying technology of country j. The aggregate production function satisfies the standard neoclassical assumptions. We define $y = Y/AL$ and $k = K/AL$ to be the income and physical capital per effective unit of labor. In our model, IC represents the impact of an economy's IC. IC is measured by IC indicators, denoted by $IC_{I,t}$, such as quality of infrastructure, quality of financial system and level of corruption, etc. The index is $IC = IC_{I,t}^{\gamma}$ where γ shows the elasticity of GDP with respect to IC. In per capita terms,

$$y_t^j = IC_t^j \left(A_t^j\right)^{\alpha} \left(k_t^j\right)^{\alpha} \tag{1.2}$$

World technology frontier, A_t, is assumed to grow exogenously at a rate x so that

$$A_t = (1+x)A_{t-1} \tag{1.3}$$

with an initial condition $A_0 > 0$.

The technology of country j is governed by the following difference equation

$$A_t^j - A_{t-1}^j = \lambda_h^j (A_{t-1} - A_{t-1}^j) + \lambda^j A_{t-1}^j \tag{1.4}$$

where $\lambda_h^j \in (0, \infty)$, and $\lambda^j \in [0, x)$ for each j. Equation (1.4) denotes that each country j absorbs frontier technology at a constant exogenous rate λ_h^j using its skilled labor force, and each country innovates through $R\&D$ activities at some exogenous constant rate $\lambda^j(R\&D)$. We use the terms innovation activities and local technology advances interchangeably.

Country j's technology at time t grows endogenously and its growth rate is given by

$$A_t^j = (1 + x_t^j)A_{t-1}^j \tag{1.5}$$

with an initial condition $A_0^j > 0$. Since A_t represents the world technology frontier $A_t^j \leq A_t$ for all j and t. If $A_t^j = A_t$, country j is at the frontier technology and nothing can be absorbed from the frontier. But country j can still improve its technology through its local technology advances, which is represented by the parameter λ^j.

The capital accumulation equation for each country is given by

$$k_t^j = s^j f(k_{t-1}^j) - (n^j + x_{t-1}^j + \delta - 1)k_{t-1}^j \tag{1.6}$$

where k_t^j is effective capital labor ratio of country j at time t, n^j is the constant labor force growth rate of country j, $s^j \in (0,1)$ is the exogenous saving rate of country j, δ is the depreciation rate for capital, and x_{t-1}^j is the endogenously determined growth rate of technology of country j at time t. Exogenously given initial condition is k_0^j.

To solve the model, let us define

$$a_t^j \equiv \frac{A_t^j}{A_t} \tag{1.7}$$

as an inverse measure of technology distance of country j to the world technology frontier.

Equation (1.4) becomes

$$a_t^j(1+x) - a_{t-1}^j = \lambda_h^j - \lambda_h^j a_{t-1}^j + \lambda^j a_{t-1}^j \tag{1.8}$$

A world equilibrium is an allocation $\left\{[k_t, a_t, IC_t]_{t\geq 0}\right\}_{j=1}^{J}$ that satisfies equations (1.6) and (1.8) for each $j = 1, ..., J$ and for all t, with initial conditions $\{k_0, a_0, IC_0\}_{j=1}^{J}$. World equilibrium at the steady state is then an equilibrium with $k_t = k^*$, $a_t = a^*$, and $IC_t = IC^*$ for each $j = 1, ..., J$ and for all t. Given this model, there is a steady-state world equilibrium where a^{j*} and k^{j*} are determined by

$$a^{j*} = \frac{\lambda_h^j}{\lambda_h^j + x - \lambda^j} \tag{1.9}$$

and

$$k^{j*} = \left(\frac{s^j \left(IC_I^{j*}\right)^{\gamma} A^{\alpha}}{n^j + x + \delta}\right)^{\frac{1}{1-\alpha}}. \tag{1.10}$$

Putting into the production function

$$y^{j*} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}} \left(\frac{\lambda_h^j}{\lambda_h^j + x - \lambda^j}(1+x)^t A_0\right)^{\frac{1}{1-\alpha}} \left(\frac{s^j}{n^j + x + \delta}\right)^{\frac{\alpha}{1-\alpha}} \tag{1.11a}$$

In terms of logarithm

$$\begin{aligned} \ln y^{j*} \quad = \quad & \frac{\gamma}{1-\alpha} \ln\left(IC_I^{j*}\right) + \frac{1}{1-\alpha} \ln\left(\frac{\lambda_h^j}{\lambda_h^j + x - \lambda^j}\right) \\ & + \frac{1}{1-\alpha} \ln\left((1+x)^t A_0\right) + \frac{\alpha}{1-\alpha} \ln\left(\frac{s^j}{n^j + x + \delta}\right)^{\frac{\alpha}{1-\alpha}} \end{aligned} \tag{1.11b}$$

Proposition 1 *Steady-state income per capita is increasing in* $IC_I^{j*}, \lambda_h^j, \lambda^j$, *and* s^j *and decreasing in* n^j, δ, *and* x.

Proof. See Appendix A.2. ■

The central predictions of the model concerns the impact of IC, technological progress (absorption from the world technology frontier through stock of human capital and local technology advances), and savings and population growth on real income.

1.4 Data and Descriptive Statistics

The focus of our analysis is 113 developing and emerging-market countries. The logarithm of PPP-adjusted GDP per capita in 2007 will be our measure of economic performance. This data is from the Summers-Heston Penn World Tables (PWT). The standard deviation value 1.1 of this variable indicates the large GDP per capita differences in the sample. The average investment to GDP ratio over the 2000-2010 period (s) and the average population growth rate from 2000-2010 (n) are from the same PWT data set.

We construct composite indices using the World Bank's enterprise survey data to measure IC, IC_I^j, human capital, λ_h^j, and local technology variables, λ^j. The main advantage of this survey is the information collected directly from firms' managers on the characteristic of physical and social infrastructure. We use 87 firm-specific variables for 27624 firms to measure IC in 113 countries. Appendix A.5 presents the data by country and year. Following Escribano and Hacihasanoglu (2012 and 2013), we construct a firm-specific relative measure of IC, which ranks firms based on how much they are affected by IC. Later, we take the median value of the IC index in each country as a measure of the quality of IC in this country. IC index takes values between 0 and 1 for each country, with 0 corresponding to the poorest IC. We construct human capital and local technology variables as indices. The total number of firm-specific variables for the local technology and human capital indices are 7. Similar to IC index methodology, we construct firm-specific local technology and human capital variables and then we take the median value of these variables in each country. We provide a complete list of all the variables that we use for IC, human capital, and innovation indices in Appendix A.3. In addition, we also explain the details of the index methodology in Appendix A.4.

Table 1 provides descriptive statistics for the key variables of interest. Eastern European countries have the best IC. This continent is followed by Latin America, Asia, and Africa. The same ranking is valid for subdimensions of IC, human capital and local technology. We give the definition of additional variables used in the robustness analysis in Appendix A.3.

[TABLE 1 ABOUT HERE]

1.5 Ordinary Least Squares Effects of Investment Climate on Per Capita Income

To analyze the key hypothesis of the model – investment climate significantly affects GDP - we consider a linearized version of equation (1.11a) that relates the logarithm of GDP per capita to the logarithms of measures of investment climate, human capital and local technology, and savings and population growth. In particular, we have the following regression equation

$$\begin{aligned}\ln y_j^* \quad &= \quad \text{constant} + \beta \ln \left(IC_I^{j*} \right) + \frac{1}{1-\alpha} \ln \left(\frac{\lambda_{j,h}}{\lambda_{j,h} + x - \lambda_j} \right) \\ &\quad + \frac{\alpha}{1-\alpha} \ln (s_j) - \frac{\alpha}{1-\alpha} \ln (n_j + x + \delta) + \varepsilon_j \end{aligned} \qquad (1.12)$$

where y_j is GDP per capita in country j, IC_I^j is IC index, λ_h is human capital measure, λ is local technology measure, s_j is saving rate, n_j is population growth, x is world technology growth rate, δ is depretiation rate and ε_j is a random error term. Investment climate (IC) is on a scale from 0 to 1, where a higher score means better investment climate. We consider x is equal to 0.02 following Kim (2008). The investment (s) and population growth (n) rates are averages for the period 2000-2010. Following Mankiw, Romer, and Weil (1992) we assume that $x + \delta = 0.05$.

We include $(1 + x)^t A_0$ term in constant for $t = 2007$, and separate the terms $\ln (s_j)$ and $\ln (n_j + x + \delta)$. Separation of these two terms allows us to test the Solow model's restriction. The restriction implies that their coefficients are equal in terms of magnitude and have opposite signs. Specifically, because the share of capital in income is approximately one-third, the coefficient of $\ln (s_j)$ should be approximately 0.5 and the coefficient of $\ln (n_j + x + \delta)$ should be approximately -0.5.

Throughout the paper, our objective consists in testing the statistical significance of β, which is an evidence that IC matters to growth. Table 2 presents OLS regressions, with heteroskedasticity-consistent standard errors. Specification in column (1) includes only Solow variables, savings and population growth. Both variables are highly significant and have the expected signs. Column (2) reports results with only Nelson and Phelps variables, human capital and local technology. Two variables are important determinants of GDP per capita, with signs predicted in the theoretical model. On the other hand, while Nelson and Phelps variables explain 16% of the cross-country income per capita differences, Solow variables explain 44% of it. In column (4), we include Solow variables, Nelson and Phelps variables, and the IC variable in the model. After the inclusion of the IC variable, Nelson and Phelps variables lose their significance, but Solow variables are still significant. We see the same pattern if we combine Nelson and Phelps variables (column 5) and later on include the IC variable (column 6). Specification 6 is going to be our base specification. Although we do not have developed countries in our sample, there are still large cross-country income differences among sample countries. Our model can explain 54% of the overall variation in income per capita among these countries.

[TABLE 2 ABOUT HERE]

Three supporting sides of the results in Table 2 to the Solow model are worth mentioning. First, implied alfa for the main specification is close to one-third. The p-value for the test of alfa equal to one-third is 0.47 for the main specification in column 6. Second, savings and population growth variables have the expected signs, and they are highly significant for all of the specifications. Third, as the Solow model predicts, the coefficients of $\ln(s_j)$ and $\ln(n_j + x + \delta)$ are equal in absolute value and opposite in sign. The p-value for the test of equality of these variables in absolute value is 0.79 for the main specification in column 6.

In all specifications, the variable IC has a positive and significant impact on GDP per capita, which shows strong correlation between IC and economic performance. Countries with a better IC are likely to have higher levels of income as the model predicts. If we compare columns (3) and (4), the coefficient estimate on IC decreases from 6 to 3 when savings and population growth and human capital and local technology are added to the model, implying that the omission of these variables biases upward the impact of IC. To understand the comparative strength of the independent variables, we have calculated beta coefficients for our base specification (column 6). We report those coefficients in column (7). One-standard-deviation increase in IC would yield a 34 percent of a standard deviation increase in the logarithm of GDP per capita, which has the biggest positive effect among the explanatory variables. On the other hand, one-standard-deviation decline in population growth generates analogous changes in the logarithm of GDP, with an impact of 43 percent.

1.6 Instrumental Variable Effects of Investment Climate on Per Capita Income

Overall, OLS results strongly confirm the theoretical model's forecast between IC and economic performance. But is this relationship causal? IC affects growth. However, economic growth may increase the demand and supply of better quality IC. This is the potential endogeneity problem due to reverse causality. Instrumental variables is one way to deal with the endogeneity problem in the institution literature. In this section, we treat IC as endogenous and following the institution literature, we employ IV regressions with the instruments that can take into account the institutional variation.

Dollar, Hallward-Driemeier, and Mengistae (2006) write, "the concept of investment climate is closely related to what some authors in the macro literature have called high-quality institutions (Knack and Keefer 1995, Acemoglu; Johnson, and Robinson 2001) or 'social infrastructure' (Hall and Jones, 1999)." Four measures of institutions used in the current growth literature are protection against expropriation (Acemoglu, Johnson, and Robinson 2001), the rule of law (Kaufmann, Kraay, and Zoido-Lobaton 2002; Rodrik, Subramanian and Trebbi 2004), institutions index (Easterly and Levine, 2003) and social infrastructure (Hall and Jones, 1999). Table 3 shows high correlation between IC and these institution variables in the literature. Our IC index has the highest correlations with the social infrastructure variable in Hall and Jones (1999) and the institutions index in Easterly and Levine (2003), which are 0.45 and 0.4, respectively. In addition to this high correlation, the institution literature's emphasis on the role of institutions to encourage investment for economic prosperity makes IC a valid institution measure. For example, Acemoglu et al. (2001) use risk of expropriation as a measure of institution because this set of institutions is essential for investment.

[TABLE 3 ABOUT HERE]

One strategy to search for good instruments in institution literature depends on looking for different variables, which show Western European influence. Acemoglu et al. (2001) use a settler mortality measure to account for settlements of Europeans in the previous colonies as an instrument for institutions. Their idea is that the settlement of Europeans affects the following institutional development of the former colonies. On the other hand, Hall and Jones (1999) and Dollar and Kraay (2002) emphasize the legal origin of a colonizer as an instrument because the identity of the colonizer is what matters for current institutions. Other proposed instruments depend on the geographic locations of countries such as the distance from Equator (latitude) and being landlocked. Easterly and Levine's study (2003) is an example of this approach. In this section, we are going to use all these variables to instrument our IC variable and check whether the OLS results in the previous section are robust to IV estimation. Before concentrating on IV results, it is useful to look at the correlation of IC with proposed instruments in the literature in Tables 4, 5, and 6. Correlation of IC with instruments in Acemoglu et al. (2001) (Table 4) and Hall and Jones (1999) (Table 5) is bigger than the correlation of these papers' institution and instrument variables.

[TABLES 4, 5 & 6 ABOUT HERE]

The basic results are presented in Table 7, in which we consider IC as endogenous. The exclusion restriction requires that instruments for IC are not included in equation (1.12). 2SLS estimates with settler mortality as an instrument are reported in column (1) of Table 7. Since settler mortality data is available only for former colonies, the sample size for this specification is almost half of the original sample. However, even with this small sample size, IC is statistically significant. The IC coefficient in the IV estimation is higher than the OLS counterpart (3.7 vs 5.9). This coefficient implies that one-standard-deviation increase in IC causes a 0.54 of a standard deviation increase in the logarithm of GDP per capita. The first-stage regression with an R^2 of 0.32 indicates the significant impact of settler mortality on our measure of institutions (IC). This R^2 is higher than Acemoglu et al.'s counterpart (2001) of 0.27, which confirms the higher correlation of IC with settler mortality than the correlation between risk of expropriation and settler mortality. Moreover, when we restrict the sample of the main specification in Acemoglu et al. (2001) to the countries which have IC data, then not only settler mortality is a weak instrument for their institution measure of the risk of expropriation but the risk of expropriation also has no effect on GDP per capita (Table 8). The group of institutions that affect the performance of the economy is quite complex, and these results show that what matters for growth are not the property right institutions, but IC institutions for developing countries. The results in column (1) of Table 7 and columns (1) and (2) in Table 8 confirm that the effect of IC is robust to a smaller sample of colonial countries and even much smaller sample (only 48 countries) of developing former colonies. Hence, we believe that IC is a better measure for institutions than the risk of expropriation used by Acemoglu et al. (2001). On the other hand, population growth variable loses its significance when we run a 2SLS regression.

The second column in Table 7 represents the main equation for a larger sample of 113 countries that includes those that were not colonized. In this specification, following Hall and Jones (1999) and Dollar and Kraay (2002), we use the English-speaking population fraction and other European languages-speaking population fraction as instruments for IC. Since we have this information for all countries in the sample, we do not lose any observation for this specification. The IC estimate of 11.3 is significant at the 99% level with a standard error of 2.2 and, in fact, larger than the estimate for former colonies sample in column (1). Based on the IV-point estimate of 11.3, one percent increase in the IC index is associated with an 11.3% increase in GDP per capita. We can understand the quantitative meaning of this coefficient by comparing the index values of two countries, say Tanzania and Russia. The difference in the IC index is 0.12. Hence, the log GDPs of Tanzania and Russia differ by a factor of 1.36 in log-term based on our point estimate. This corresponds to an 8-fold difference

$(e^{1.36} - 1)$ in GDP per capita. In real data, GDP per capita of Tanzania and Russia has a 15-fold actual difference.

Finally, in column (3) of Table 7, following Easterly and Levine (2003), we use settler mortality, latitude, landlocked, and crops/mineral (10 variables) as instruments for IC. Once again, IC is highly significant with a coefficient close to our main specification in the OLS results of Table 2 in column (6). Exclusion of settler mortality from IV list does not change this result.

For a different set of instruments in columns (1)-(3) in Table 7, p-values of the first stage F-test confirms that instruments are highly correlated with IC and the Hansen test cannot reject the validity of the instruments, that is, the instruments are uncorrelated with the second-stage error term, and the instruments are correctly excluded from the regression in the second stage. Both tests show the appropriateness of the instrumental variables. The strong positive impact of IC on GDP per capita is robust to alternative instrumental variable groups. We choose Hall and Jones' instruments (1999) as our main specification because, for these instruments, we have the maximum number of observations in 2SLS estimation. For the rest of the paper, baseline column in any table corresponds to the specification in column (2) of Table 7. Overall, the robustness of IC to alternation in the instrumental variable set and different samples confirm that it has a causal effect on GDP per capita. In addition, out of the three specifications, population growth has a negative and significant effect in two of them; investment has a positive and significant effect in two of them. In the rest of the paper, we investigate further the robustness of these results.

[TABLES 7 & 8 ABOUT HERE]

1.7 Robustness of the Results

1.7.1 Geography, policy, and integration

The purpose of this section is to assess empirically different theories of growth. Specifically, geography, institutions (IC in our context), policy and integration influence economic development according to growth literature. We are going to show in this section that IC trumps the others.

Geography

As explained by Easterly and Levine (2003), geography has an effect on GDP per capita by influencing work effort (Machiavelli, 1519; Montesquieu, 1748, Landes 1998) and agricultural productivity (Myrdal, 1968; Kamarck, 1976; Diamond, 1997; Sachs, 2001). In this section, we concentrate on two different papers proposing two different sets of geography variables.

In Table 9, we use the geography variables suggested by Rodrik et al. (2004). These are distance from the equator, percentage of tropical land area, access to the sea, number of frost days per month in winter, the area covered by frost, and average temperature. Three out of six geography measures are significant individually in Table 9. However, when we use all the measures together, p-value is 12 percent for joint significance of all of them. Moreover, all the individual effects become insignificant with the exception of area under frost. Masters and McMillan (2001) argue that the key disadvantage of tropical climate is the absence of winter frost. Nevertheless, it seems that more frost area has a negative effect on GDP per capita, which is reasonable because probably there is less economic activity in those places. But more importantly, all of these geography variables do not qualitatively change our estimate of IC, which is robust in terms of the magnitude, sign, and significance.

[TABLE 9 ABOUT HERE]

In Table 10, we use the geography variables proposed by Acemoglu et al. (2001). These are humidity, soil quality, natural resources and whether the country is landlocked. Since there are a set of variables for temperature, humidity, soil quality and natural resources, we report the joint significance levels of these sets. Natural resources are highly significant both individually and in the larger pool. The components of natural resources that matter for growth are gold, iron, and oil reserves. Having those reserves has an additional explanatory power on GDP per capita. However, whether the country is landlocked has no effect on income. Again, with geography variables proposed by Acemoglu et al. (2001), there is almost no effect on the 2SLS estimate of IC on GDP per capita. The coefficient of IC is 11.49 with a standard error of 2.6 when we control all geography factors. This is very close to the baseline specification coefficient of 11.3.

[TABLE 10 ABOUT HERE]

McArthur and Sachs (2001) consider health characteristics of countries as geography. In particular, they propose life expectancy and infant mortality as health measures. Since health is endogenous, they use geographic variables such as latitude and mean temperature to instrument health variables. In Table 11, we investigate the effects of those health variables by replicating the regressions of McArthur and Sach (2001) with their dependent (GDP per capita in 1995) and health variables. We include our 2007 IC variable into their specifications. The lack of time correspondence between the variables is not a serious problem, because institution variables move slowly and show high persistence. Durlauf, Kourtellos, and Tan (2011) and Barro and McCleary (2003) face the same problem and argue that the usage of variables with lack of time correspondence is satisfactory if the variables are slow moving. In columns (1)-(3), we consider health as exogenous while in columns (4)-(6), we consider health as endogenous. Although McArthur and Sachs (2001) find that both institutions and health are significant, we find that only institutions, IC in our context, are significant with a smaller estimate than our baseline specification. None of the specifications in Table 11 provide a significant coefficient for health variables. Instrumenting health variables does not change this result. McArthur and Sachs (2001) use settler mortality as an instrument for their institution variable. Using the same instrument for IC does not materially affect our results.

[TABLE 11 ABOUT HERE]

Integration

A second group of explanations emphasize the role of integration. In this view, international trade drives growth by encouraging productivity. Some of the recent examples of this approach include studies by Frankel and Romer (1999) and Sacks and Wagner (1995). Following Rodrik et al. (2004), we use the ratio of nominal trade to nominal GDP as a measure of integration. Since trade is endogenous, we instrument trade variable with an instrument proposed by Frankel and Romer (1999). They suggest using the share of trade in GDP. This share is constructed by using a gravity equation for bilateral trade flows. Their methodology consists of two steps. First, they regress bilateral trade to PPP-GDP share on country mass, trade partners' distance, and some other geographical variables. Second, based on the coefficients estimated, they construct a predicted aggregate trade share for each country. Later on, they use this constructed trade share as an instrument for actual trade shares in a regression of income on trade. Rodrik et al. (2004) proposes a similar instrument by re-estimating the gravity equation in the first step of Frankel and Romer (1999) with nominal bilateral trade to nominal GDP as the dependent variable. We check the robustness of our results with the instrument proposed by Rodrik et al. (2004) as well.

In Table 12, we use Frankel and Romer' instruments (1999) in columns (1)-(3) and Rodrik et al.'s instruments (2004) in columns (4)-(6) for trade. To replicate the regression used by Rodrik et al. (2004), we use the same dependent variable, GDP per capita on a PPP basis for 1995, and the same right-hand side variables. The only difference of our regressions is IC as a measure of institutions. Integration or trade variable does not have additional explanatory power in the GDP per capita equation in columns (1) and (4), which is similar to the results obtained by Rodrik et al. (2004). However, in contrast to their result, the trade variable has a positive sign in our regressions, which is what is expected from economic theory. The coefficient of IC is slightly lower, but still significant at 1 percent.

Since smaller countries are more likely to trade, because less trade occurs within borders relative to across borders, Frankel and Romer (1999) argue to control for country size. The columns labeled (2) and (5) in Table 12 include area as a measure of country size. This variable is highly insignificant, and the coefficient on IC does not change quantitatively. As a final robustness check in this section, we use "real openness" measure proposed by Alcalá and Ciccone (2002), which is the ratio of trade to GDP on a PPP basis instead of previous trade to GDP measure proposed by Frankel and Romer (2001). Columns (3) and (6) show that the alternative measure of integration does not change previous results. Still integration has no effect on GDP per capita, and IC has a strong causal effect on GDP per capita. These results are independent of the measures of trade, choice of instrument for trade, or taking into account the size of the countries. Once again, the second integration measure has an expected positive sign in our results in contrast to the results obtained by Rodrik et al. (2004).

[TABLE 12 ABOUT HERE]

Macro policy

The policy hypothesis explains the current levels of economic development as a function of macroeconomic policies. Following Acemoglu and Johnson (2005), we control a number of macroeconomic variables (average inflation, government consumption, and exchange rate overvaluation) in Table 13. While IC continues to significantly account for international differences in the level of GDP per capita, none of the macroeconomic policy variables individually add additional explanatory power. Inclusion of these variables decreases the coefficient of IC. Coefficient of IC, 6.28 in column (4), implies that one-standard-deviation increase in IC causes a 0.64-standard-deviation increase in GDP per capita. Coefficient of exchange rate overvaluation of 0.003 in column (4) implies that one-standard-deviation increase in exchange rate overvaluation causes a 0.07-standard-deviation decrease in GDP per capita. As emphasized, for example, by the IADB report, there is no room for traditional fiscal and monetary macroeconomic policies and countries should consider more structural reforms like improving IC. It seems that this is not only true for Latin American countries but also for all developing countries. Although it is not presented to save space, when we estimate the same regressions with macro policy variable values before 2000, government consumption turns out to be significant, and both government consumption and exchange rate overvaluation have a negative effect on GDP per capita. It seems that fiscal policy is more limited now than it was before 2000. Moreover, the results also show that a somewhat looser monetary policy to counter exchange rate appreciation may have a positive effect on growth. However, this effect is limited and countries should consider more fundamental reforms to boost growth.

[TABLE 13 ABOUT HERE]

1.7.2 Other controls

To examine the further robustness of our baseline specification, in this section, we selected a set of additional controls used in the literature and consider a range of specifications. These alternative specifications are reported in Table 14.

The first specification adds religion variables to the baseline model. Specifically, these are the fractions of populations that are Catholic, Muslim and other religions with Protestants as the omitted groups. We report the joint significance level (p-value) in the table. The point estimate of IC does not change, and these variables do not enter significantly into the regression.

The second specification examines the ethnolinguistic fragmentation as another control. Now the coefficient of IC is 11.41 with a standard error of 2.8. It is almost the same with our baseline estimate. On the other hand, ethnolinguistic fragmentation is statistically insignificant.

Following Hall and Jones (1999) in specification three, we add an indicator variable taking the value of 1 for countries that are categorized as capitalist or mixed capitalist by Freedom House (1994). Contrary to Hall and Jones's odd result (1999), we get a positive coefficient for this variable. However, it is not significant and the inclusion of this variable has no effect on IC.

In column (4), we add continent dummies to our baseline specification to analyze whether the differences across continents are the driving force for the relationship. We report the joint significance level (p-value) in the table. Continent dummies lower the coefficient estimate on IC, but its significance level does not change. They are neither individually nor jointly significant.

The fifth and sixth specification of Table 14 checks whether our results are robust to the inclusion of dummies for the identity of the colonizer in column (5) and legal origin in column (6) using the colonial sample. As with the other specifications, the coefficient on IC is unchanged by the addition of legal origin and identity of colonizer variables.

[TABLE 14 ABOUT HERE]

Our theoretical model considers human capital as a factor used to absorb the frontier technology. Another approach put human capital into the production function and considers it as a factor of production. One example of the second method is Mankiw, Romer, and Weil's model (1992). To check the robustness of our results to different considerations of human capital, we solved Mankiw et al.'s model (1992) with IC and estimated the steady-state equation with a human capital variable which is similar to that used by Mankiw et al. (1992). Specifically, we use average years of schooling of the total population aged over 25 from 1960 through 2000. Results in column (1) of Table 15 show that the effect of IC on GDP per capita is independent of the specific functional forms of human capital in the theoretical model.

Our IC measure is a firm-level measure and to obtain the aggregate measure, we take the median value of the firm-specific IC within countries. As a final robustness analysis, in column (2) of Table 15, we take the mean of IC in each country. As in the previous robustness analysis, we have a highly significant IC.

[TABLE 15 ABOUT HERE]

1.8 Conclusion

What is the effect of IC on growth? To answer this question, we presented an extended Solow model with an IC index and Nelson and Phelps (1966) type of technology diffusion dynamics. We developed a new measure to account for the relative positions of countries in terms of the quality of the IC. We measured multiple dimension of IC using the IC index. Our index overcomes multicollinearity and the dimensionality problems of the World Bank's enterprise survey database. Since many IC variables are highly correlated, using all of them separately causes an identification problem because of multicollinearity in an econometric analysis. By incorporating as many IC variables as preferred for having a representative sample of IC, we use all of them to create an index.

In the empirical part, using the survey data from the World Bank, we show that IC dominates other potential determinants of growth like geography, trade, and macroeconomic policies. This result is robust to include alternative control variables, and to use different IC measures. In addition, the effect of local technology and human capital variables are not robust to those considerations. This strengthens the argument that better IC is even more important for developing countries, where local technology is far from the technology frontier. It seems that IC is more crucial than innovation and imitation activities if the country is at the early stages of development. The structure of today's global economy with rapid technology diffusion is consistent with this result.

The aggregate model and estimations in this paper show the causal relationship between IC and growth, and the importance of investment-based institutions. This is a good starting point that shows specific institutions that boost economic growth. As a mobile factor of production, whether capital is flowing to investment-friendly destinations remains an area for future research. Another important area for future research is the investigation of more specific questions with disaggregated models. Firm-level IC measure developed by Escribano and Hacihasanoglu (2012 and 2013) allows us to make those analyses.

Chapter 2

Investment Climate Indices: Methodology and Applications

2.1 Introduction

Corporations operating in an economy are influenced by conditions of the firms as well as the exterior environment of the economy. The specific rules of the economy which we call the investment climate (IC) may put constraints on firms or make it easier for them to operate. Although the World Bank's enterprise survey database covers around 130,000 firms in more than 100 countries, the IC comparison of those countries based on IC indices is an interesting open question. Considering a large number of IC variables for any particular country generates multicollinearity problems that make econometric analysis difficult. The objective of this paper is to solve the dimensionality problem while keeping as many IC variables as we can. We reduce the large set of IC variables into an IC index (ICI) which proxies the level of the investment climate of the aggregate economy. We show the usage of ICI in an econometric analysis of Turkish exports. We also calculate the ICI for 113 countries and show that it is correlated with other well-known cross-country level indices such as; the World Economic Forum's Global Competitiveness Index (GCI), the World Bank's the Ease of Doing Business Index (DBI), International Country Risk Guide's (ICRG) index, the Heritage Foundation's Index of Economic Freedom (IEF), and Transparency International's Corruption Perceptions Index (CPI), but at the same time add relevant new information.

We construct composite positive and negative IC indices as a proxy for the good and the bad quality of the investment climate for five IC groups: a) infrastructure, b) red tape, corruption, and crime, c) finance and corporate governance, d) quality, innovation, and labor skills, and e) other control variables. To the best of our knowledge, this is the first attempt to construct an IC index making use of all available IC variables, combining information from continuous and binary IC variables. For the aggregation of each individual IC variable into the index, we use equal and unequal weighting schemes. The weights in the unequally weighted ICI are derived from principal component analysis (PCA) on all IC variables after being transformed to binary information.

Creating IC indices has several advantages. First, one advantage of creating ICI is making the econometric analysis simpler without losing relevant IC information or explanatory power in a multiple regression context. Second, an ICI enables us to compare the country IC evolution from different years. Third, this ICI can be used in studies of cross-country differences based on the IC nature of the countries. The ICI and their corresponding IC sub-indices are useful tools to make cross country comparisons of the investment climate situation. Beyond its usage to estimate IC effects on firm-level performance measures, the ICI is also a convenient control variable for country-specific investment climate status for future research. Fourth, using ICI eliminates multicollinearity problems in the IC literature without a priori removing any of the IC variables. Fifth, the discretization method used in the construction of ICI helps us also to reduce the degree of endogeneity of the explanatory IC variables. The reason is clear: a binary version of a continuous IC explanatory variable is less correlated with the continuous error term of the regression model than with the proper continuous IC variable.

As an example, we use Turkish export data to show the advantages of ICI in a multiple regression context. There are three reasons for choosing data from Turkey to show the econometric applications of ICI. First, although similar data is available for 113 countries, the sample size in most of these countries is very small as compared to Turkey. Second, Turkish data has been analyzed extensively using individual IC variables, see Escribano, Guasch, de Orte, and Pena (2008a and 2008b) and Escribano, de Orte, and Pena (2008), which allow us to compare our index methodology with the previous literature. Finally, the aggregate and political stability of Turkey from the years 2000 to 2010 increase the relative importance of IC constraints on firm-level performance and make Turkey an interesting country to improve country competiveness based on micro fundamentals. Improvements of macroeconomic factors of Turkey after 2000 have raised the relative importance of microeconomic factors such as the investment climate.

Most of the IC literature has analyzed the effects of a few IC variables on different firm performance measures (TFP, employment, exports, etc.) to identify bottlenecks to economic growth and provide policy prescriptions in developing countries. The literature gives evidence that good IC stimulates growth through higher productivity and investment by showing the significant effect of several IC variables.[1] Although many academic papers and policy reports use IC data, most of them investigate the impacts of the individual blocks of the IC such as infrastructure, finance or corruption. For the ones who consider more than one IC block, they only concentrate on a few IC variables in those blocks. When restricting the analysis to a limited number of IC variables, they face a problem of omitted variables. On the other hand, do those few IC variables used present a relevant description of the IC? Are those empirical results because of the particular selection of the IC variables? To overcome these problems and to precisely represent the investment climate, in this paper we propose and IC index that uses the information on all IC variables allowing for a more microeconomic analysis of the obstacles to GDP growth than that provided by macro-institutions literature.

The macro literature has used aggregate variables to explain cross country GDP differences. Firm-level studies are superior to macro studies because of taking into account within-country heterogeneity and providing clear policy proposals. Durlauf et al. (2008), Straub (2008), Pande and Udry (2005) and Dethier et al. (2008) are some of the papers explaining the shortcomings of the macro literature. Hence, cross-country comparisons based on aggregation from firm-level data could provide interesting new hypotheses for the macro literature.

The structure of the rest of the paper is the following. In section 2.2, we present the details of the data based on IC surveys of the World Bank. In particular, the IC survey of Turkey provides 125 IC variables for approximately 903 firms in 2008. We divide the ICs into five groups and then construct "Negative and Positive IC indices" as a proxy for good and the bad investment climates. The details of the index construction are given in Section 2.3. Section 2.4 gives the main empirical relationships between IC indices and the probability of export. We compare the current IC methodology of the general to specific approach of Escribano and Guasch (2005 and 2008) with our new index methodology in Section 2.5. Section 2.6 gives the ranking results of the ICIs for 113 developing and transition countries and the comparison of those results with that of other economic indicators such as the Global Competitiveness Index (GCI) and explain the strengths of our ICI. Special attention is paid to the differential IC effects on firm size. Finally, in Section 2.7, the paper ends with the main conclusions.

2.2 Investment Climate Surveys (ICS)

Our data source is the World Bank's Investment Climate Surveys (ICS). In particular, for the investment climate assessment (ICA) based on investment climate indices (ICI),

[1] See survey paper by Dethier, Hirn and Straub (2008) for details of the empirical IC literature.

we use data from Turkey in 2008, previously analyzed in Escribano et al. (2008). ICS are very useful to identify bottlenecks to economic growth based on firms' information. The questions of the surveys are generally answered by top managers or the owners of the firm, sometimes with support of human resource managers and accountants of the firm, in face-to-face interviews. To reduce measurement errors and missing information in aspects such as corruption, confidentiality of answers is assured. In addition, to reduce coding and processing errors, quality control procedures are carried out. The data covers both firms' subjective impediments evaluations and also objective numerical values related to the cost of doing business and the competitive environment where firms operate.[2] Following previous literature, we divide the investment climate variables into five groups: a) infrastructure, b) red tape, corruption, and crime, c) finance and corporate governance, d) quality, innovation, and labor skills and e) other control variables such as exporting, importing, and FDI status; capacity utilization; size and age of the firm, etc. Appendix B.2 lists all IC variables by groups and gives their corresponding definitions.

The IC database is stratified by size, region, and industries. Our main emphasis, in this paper, is on the manufacturing sectors. There are nine different sectors according to their ISIC code: 1) food; 2) textiles; 3) garments; 4) chemicals; 5) plastics and rubbers; 6) non-metallic minerals products; 7) basic metals and fabricated metal products; 8) machinery and equipment; 9) other manufacturing including electronics.[3]

Despite a careful attention is placed when running the survey, missing observations and outliers are important problems regarding the data set. There are missing values both in firm performance and firm characteristics variables. Escribano and Guasch (2005 and 2008) and Escribano and Pena (2009) have developed a recent econometric methodology for the World Bank. Following their methodology, we use industry, region, and size averages to replace the missing values of the variables. This is the first stage of the cleaning process for the data base (imputation method).[4] We remove the outliers in the second stage of the cleaning process. We specify outliers as those firms with material to sales or labor cost to sales ratios are bigger than one. If all of the production function variables of a firm are missing, we delete this firm from the analysis.

Endogenous nature of some of the explanatory IC variables is another problem that we face while working with this data set. Existence of only one year data eliminates the possibility of using lag values of IC variables as instruments. Hence, we use

[2] Gelb et al. (2007) and Aterido et al. (2007) show that subjective responses and objective measures are highly correlated in the IC variables.

[3] Classification of regions: Marmara, Aegean, Central Anatolia, Black Sea and South and classification of firm sizes: small (<20 employees), medium (>=20 and <100), and large (>=100).

[4] The method is called the ICA method. See Escribano and Pena (2009) for details of this method.

the industry-region-size averages for the missing values of the plant-level IC variables as proxies to reduce the endogeneity of IC variables. Many papers in IC literature adopt this technique.[5] Average variables are important determinants of firm-level performances, but firm-level performances have only limited impact on averages. This moderates the degree of endogeneity because of reverse causality. When the response rate of the variables is neither too low nor large enough, we substitute the missing values of firm characteristics by industry-region-size imputation techniques, to keep as many observations and explanatory variables as possible in the regression. By doing that, we reduce the omitted variable problems and gain efficiency at the cost of some measurement errors; but the trade-off is worthwhile, as was shown by Escribano and Pena (2009).

2.3 Methodology to Construct an Investment Climate Index (ICI)

While it is of interest to have a large number of variables to measure the investment climate of a country, an abundance of the IC explanatory variables creates multicollinearity problems and makes the econometric analysis difficult. One way to overcome this problem is to create a composite index to measure the investment climate of a country. Thus, we propose new composite measures that proxy positive and negative investment climates based on the World Bank's Investment Climate Assessments (ICAs) of Turkey in 2008. The composite indices of positive and negative investment climates include the five previously defined IC sub-indices. The objective of the sub-indices is to provide a summary measure for the usual 5 main groups of investment climate variables.

The estimation of the composite index (ICI) and each IC sub-index requires the following four steps:

Step 1: imputation of the missing values of IC variables in the index;

Step 2: determination of the conditional and unconditional signs of the IC variables to be used in the index;

Step 3: discretization of continuous IC variables into binary 0-1 variables using the 95% (or 5%) threshold level, and

Step 4: determination of the weighting scheme to be used in the aggregation: equal weights or unequal weights.

In what follows of this section, we explain each step in detail.

[5] See, among others, Escribano and Guasch (2005 and 2008) and Escribano et al. (2008).

2.3.1 Step 1: Imputation of missing values of IC variables

Following the ICA method developed by Escribano and Guasch (2005 and 2008) and Escribano and Pena (2009), we replace the missing values of the IC variables by their industry, region, and size averages in the first stage. This technique also enables us to reduce the endogeneity of IC variables and the number of omitted variables.[6] We remove outliers that are specified as those firms with ratios of labor cost to sales or material to sales bigger than one in the second stage. After replacement and elimination of outliers, we end up with a sample size of 903 firms.

2.3.2 Step 2: Sign determination, (+) or (-), of each IC variable

In the construction of the IC index, we have to determine the sign of each IC variable; i.e, determine whether it provides a positive or a negative atmosphere in the economy for the operations of the firms. We used three complementary methods at this stage.

2.3.2.a: We use economic intuition and/or economic theory to carry out a preliminary determination of the unconditional signs of the IC variables.

2.3.2.b: We check the conditional signs of IC variables block by block based on multiple regression analysis. We have five blocks as explained in Section 2.1 and 2.2 and we analyze the conditional signs based for example on firm-level data on the probability of export regression based on a linear probability model (LPM).

2.3.2.c: We add each IC variable one by one to the preliminary probability of the export equation to check the conditional signs of IC variables.

From 2.3.2a we get the unconditional signs of the IC variables and from 2.3.2.b and 2.3.2.c we get the conditional signs. If two conditional signs (signs from 2.3.2.b and 2.3.2.c) of any IC variable are different from what is expected from economic theory (sign from 2.3.2.a), we list this IC variable in a contrary sign group of variables of the corresponding conditional index. Tables 1.1-1.5 list all of the variables with results of the signs of the three methods that we used. We show with two signs all the contrary sign IC variables.

In particular, for the sign consideration method of 2.3.2.b, we regress five different blocks of IC variables on the probability of export after controlling for TFP and region, industry and size dummies, and we take the sign of each IC variable in each IC block. That is, we run the following LPM regression for 5 different IC blocks from the 636 firms of the sample.

$$X_i = \alpha_0 + \alpha_1 \log TFP_i + \alpha_2' D_{I,i} + \alpha_3' D_{R,i} + \alpha_4' D_{S,i} + \beta IC_{j,i} + \varepsilon_i \tag{2.1}$$

[6] For a deeper analysis see Escribano and Pena (2009).

for $j = 1, 2 \ldots 5$ represents the different IC blocks; infrastructure; corruption and crime; finance; quality, innovation, and labor skills; and control. The dependent variable, X_i, in the linear probability model is a dummy variable that takes the value of 1 if exports are greater than 10% of sales and 0 otherwise. TFP is the total factor productivity (in logs) and $D_{I,i}, D_{R,i}$, and $D_{S,i}$ are the industry, region and size dummies. IC_1 for $j = 1$ is the vector of IC variables in the infrastructure group; IC_2 for $j = 2$ is the vector of IC variables in the red tape and corruption group; IC_3 for $j = 3$ is the vector of IC variables in the finance and corporate governance group; IC_4 for $j = 4$ is the vector of IC variables in the quality, innovation, and labor skills group; and IC_5 for $j = 5$ is the vector of variables in the control group. Specifically, we estimate equation (2.1) five times; one for each IC block. The coefficient of each IC variable in the IC block represents the conditional sign in method 2.3.2.b. Hence,

$$IC_{k,j} = \begin{cases} IC_{k,j}^{+} & \text{if } \widehat{\beta}_{k,j} > 0 \text{ in equation (2.1)} \\ IC_{k,j}^{-} & \text{if } \widehat{\beta}_{k,j} < 0 \text{ in equation (2.1)} \end{cases}$$

from each of the five IC blocks, $j = 1, 2 \ldots 5$; and for each IC variable, $k = 1, 2 \ldots 122$. In this equation, $\widehat{\beta}_{k,j}$ represents the estimated coefficient of kth IC variable in block j from equation (2.1), and $IC_{k,j}$ represents the sign of kth IC variable in block j.

Finally, in method 2.3.2.c, we obtain a preliminary linear probability model (LPM) for the probability of exporting equation by using the "general to specific" approach of Escribano and Guasch (2005 and 2008) and Escribano et al. (2008) and we add each IC variable one by one to this baseline LPM model to see its sign.

$$\begin{aligned} X_i = {} & \alpha_0 + \alpha_1 \log TFP_i + \alpha_2 internet_i + \alpha_3 inventory_i + \alpha_4 insp_i \\ & + \alpha_5 paygovctrct_i + \alpha_6 cerwait_i + \alpha_7 fxa\_equ_i + \alpha_8 clt\_land_i \\ & + \alpha_9 iso_i + \alpha_{10} newprd_i + \alpha_{11} priceup_i + \alpha_{12} \log age_i \\ & + \alpha'_{13} D_{I,i} + \alpha'_{14} D_{R,i} + \alpha'_{15} D_{S,i} + \beta_k IC_{k,i} + \varepsilon_i \end{aligned} \tag{2.2}$$

where the dependent variable X_i in the linear probability model is a dummy variable as defined before, TFP is the total factor productivity, *internet* is dummy for web page, *inventory* is days of inventory, *insp* is number of inspections, *paygovctrct* is dummy for payments to obtain a contract with the government, *cerwait* is days spent obtaining compulsory certificates, *fxa_equ* is new fixed assets financed by equity, *clt_land* is dummy for land and buildings as collateral, *iso* is dummy for quality certification, *newprd* is dummy for new product, *priceup* is dummy for increased prices, age is age of the firm, $D_{I,i}, D_{R,i}, D_{S,i}$ are the industry, region and size dummies, and $IC_{k,i}$ is the IC variable in the index. Because the total number of IC variables in the index is equal to 122 and we have 11 of them in the preliminary export equation, we include the remaining 111 IC variable one by one in equation (2.2). We also determine the signs of the initial 11 variables from equation (2.2). Hence,

$$IC_k = \begin{cases} IC_k^+ & \text{if } \widehat{\beta}_k > 0 \text{ in equation (2.2)} \\ IC_k^- & \text{if } \widehat{\beta}_k < 0 \text{ in equation (2.2)} \end{cases}$$

for $k = 1, 2 \dots 122$. In this equation, $\widehat{\beta}_k$ represents the estimated coefficient of kth IC variable from equation (2.2), and IC_k represents the sign of kth IC variable.

Finally, we differentiate between conditional and unconditional indices, and use conditional signs in the conditional index and unconditional signs in the unconditional index. If conditional and unconditional signs of an IC variable are equal, then the sign of that IC variable is the same in both conditional and unconditional indices. On the other hand, if the conditional sign of any IC variable is different from the economic theory, we include these variables in the contrary sign groups and they are not used in the conditional index and sub-index.

[TABLE 1.1, 1.2, 1.3, 1.4, and 1.5 ABOUT HERE]

2.3.3 Step 3: Discretization of IC variables into binary values (0,1)

In the third step, we assign 0 or 1 values for each IC variable, both in the positive and negative IC indices. For the binary IC variables, assignment of zeros and ones is automatic and immediate. If the binary variable has a value of 0 in one observation, it has also a 0 value in the index for that observation, and if it has a value 1, it takes a value of 1 in the index for that observation.

However, for the continuous IC variables, we use the 95% (5%) threshold level to assign 0 or 1 to a specific IC variable. For any firm which has a IC variable value that is less than the 95% threshold level, we assign the value 0, and any firm which has a value of the IC variable that is larger than the 95% threshold level, we assign the value 1. We use the 95% threshold level to measure the effect of extremely good and extremely bad IC. The results are robust to other threshold given by 75% and 90%.

[FIGURE 1 ABOUT HERE]

$$IC_{k,i}^+ = \begin{cases} 1 & \text{if } IC_{k,i}^+ \geq 0.95 * IC_k^+ \\ 0 & \text{otherwise} \end{cases}$$

$$IC_{k,i}^- = \begin{cases} 1 & \text{if } IC_{k,i}^- \geq 0.95 * IC_k^- \\ 0 & \text{otherwise} \end{cases}$$

2.3.4 Step 4: Aggregation to construct the IC sub-indices

Once we have transformed all the IC variables into binary variables, the sum of all the ones in any positive (negative) IC subgroup of the ith firm gives the number of positive (negative) IC values for that firm in the corresponding IC sub-index.

Aggregation to construct an IC index with equal weights

In order to normalize the IC indices to have values between 0 and 1, we divide each sub-index by the maximum number of IC variables in that group. Applying this procedure to our data set from Turkey, we ended up with 10 conditional and 10 unconditional sub-indices: positive ICI for infrastructure (ICI_{pos_1}), negative ICI for infrastructure (ICI_{neg_1}), positive ICI for red tape (ICI_{pos_2}), negative ICI for red tape (ICI_{neg_2}), positive ICI for finance (ICI_{pos_3}), negative ICI for finance (ICI_{neg_3}), positive ICI for quality and innovation (ICI_{pos_4}), negative ICI for quality and innovation (ICI_{neg_4}), positive ICI for controls (ICI_{pos_5}), and negative ICI for controls (ICI_{neg_5}) where for each of the 5 IC blocks we have:

$$ICI_{pos_{1,i}} = \frac{1}{n_{1,i,pos}} \left(\sum_{k=1}^{n_{1,i,pos}} IC^{+}_{1k,i} \right), ICI_{neg_{1,i}} = \frac{1}{n_{1,i,neg}} \left(\sum_{k=1}^{n_{1,i,neg}} IC^{-}_{1k,i} \right),$$

$$ICI_{pos_{2,i}} = \frac{1}{n_{2,i,pos}} \left(\sum_{k=1}^{n_{2,i,pos}} IC^{+}_{2k,i} \right), ICI_{neg_{2,i}} = \frac{1}{n_{2,i,neg}} \left(\sum_{k=1}^{n_{2,i,neg}} IC^{-}_{2k,i} \right),$$

$$ICI_{pos_{3,i}} = \frac{1}{n_{3,i,pos}} \left(\sum_{k=1}^{n_{3,i,pos}} IC^{+}_{3k,i} \right), ICI_{neg_{3,i}} = \frac{1}{n_{3,i,neg}} \left(\sum_{k=1}^{n_{3,i,neg}} IC^{-}_{3k,i} \right),$$

$$ICI_{pos_{4,i}} = \frac{1}{n_{4,i,pos}} \left(\sum_{k=1}^{n_{4,i,pos}} IC^{+}_{4k,i} \right), ICI_{neg_{4,i}} = \frac{1}{n_{4,i,neg}} \left(\sum_{k=1}^{n_{4,i,neg}} IC^{-}_{4k,i} \right),$$

$$ICI_{pos_{5,i}} = \frac{1}{n_{5,i,pos}} \left(\sum_{k=1}^{n_{5,i,pos}} IC^{+}_{5k,i} \right), ICI_{neg_{5,i}} = \frac{1}{n_{5,i,neg}} \left(\sum_{k=1}^{n_{5,i,neg}} IC^{-}_{5k,i} \right),$$

where for the positive ICI in block j we have that $k = 1....n_{j,i,pos}$ represents the number of IC variables in each of 5 IC positive blocks, and for the negative ICI in block j we have that $k = 1....n_{j,i,neg}$ represents the number of IC variables in each of 5 IC negative blocks. Note that although we have the above sub-indices at the firm-level, the numbers of IC variables used in each sub-index are the same for all firms.

If the conditional sign of any IC variable is different from the economic theory, we include these variables in the contrary sign groups and those IC variables are not used in the conditional sub-index. Because of these contrary sign groups, we have only 7 additional conditional sub-indices as opposed to 10 unconditional sub-indices. For example in Table 2 and 3, we have 17 (34-17) contrary sign IC variables that are not used in the conditional red tape, corruption, and crime group index as compared to the unconditional red tape, corruption, and crime index. Over all five groups, the total number of IC variables used in the unconditional index is 122, while this number is reduced to 83 in the conditional index of Tables 2 and 3.

[TABLE 2 & 3 ABOUT HERE]

The value of n in each sub-index shows the maximum possible value of the index for that IC block. For example, the maximum possible value of positive unconditional infrastructure index is 3 because we only have three positive infrastructure variables. The maximum possible value of negative unconditional infrastructure index is 19, etc. The objective of the sub-indices is to provide a summary measure for the five blocks of investment climate variables. Hence, an establishment which has a value of $n = 8$ in the ICI_{neg_1} is clearly more affected by the negative infrastructure than an establishment which has a value of 4 in ICI_{neg_1}.

We then combine the sub-indices into positive and negative multidimensional composite IC indices (ICI) as a single measure of positive and negative aspects of the investment climate. The multidimensional composite positive and negative ICIs are an equally weighted average of the sub-indices. Because we do not have any rationale to value one of the sub-indices more than the others, we use equal weights for the sub-indices of each of the 5 IC blocks.

$$ICI_{pos_i} = \frac{1}{5}\left(\sum_{j=1}^{5} ICI_{pos_{j,i}}\right) = \alpha_e' IC_{pos_i} \tag{2.3a}$$

where $\alpha_e' = \left(\frac{1}{5}, ...\frac{1}{5}\right)$

$$ICI_{neg_i} = \frac{1}{5}\left(\sum_{j=1}^{5} ICI_{neg_{j,i}}\right) = \alpha_e' IC_{neg_i} \tag{2.3b}$$

where $\alpha_e' = \left(\frac{1}{5}, ...\frac{1}{5}\right)$.

Aggregation to construct an IC index with unequal weights

We call the above index the equally weighted index, as the weights attached to each of the IC variables are identical and equal to $\frac{1}{n_{ji}}$. Alternatively, we use principal component analysis (PCA) to determine the weights for a sub-index of IC. This method reduces data dimensionality while keeping the maximum possible information. If we have IC data of correlated variables on 636 firms, then PCA looks for a transformation of the original indices of IC variables into new uncorrelated variables. As it is explained in Jolliffe (2002), PCA works as follows:

Step 1: being **IC** a vector of n IC variables for an IC sub-index and α_1 a vector of n constants $(\alpha_{11}\alpha_{12}....\alpha_{1n})$ of the same IC sub-index, first find a linear function $\alpha_1' IC$ of the elements of **IC** with maximum variance,

Step 2: find a linear function $\alpha_2' IC$, having no correlation with $\alpha_1' IC$ obtaining maximum variance, and so on,

Step 3: in the final kth step, a linear function $\alpha_k' IC$ (kth principal component) is found that obtain maximum variance and has no correlation with $\alpha_1' IC, \alpha_2' IC, ...\alpha_{k-1}' IC$.

Because the first principal component (FPC) is the weighted sum of the original variables that captures as much of the variances in the data as possible, we use the FPC as a proxy for ten sub-indices. The last row of Table 4 shows the percentage of variation explained by the first PC. We use the first PC to represent the highest variability that we can observe in the IC data.

[TABLE 4 ABOUT HERE]

2.4 The IC Indices and their Relationship with the Probability to Export

In this section, we will see the application of our IC indices in modeling the probability of export with a linear probability model (LPM). It is very well documented in trade literature that there are considerable productivity differences among domestic firms, exporters and multinational firms. Hence, we need to control for productivity differences among the firms in our sample. We use production function variables to calculate the productivity (TFP) of each establishment. Similar to the IC variable, we have the missing values problem in the production function variables as well. Following the missing values imputation method developed by Escribano and Guasch (2005 and 2008) and Escribano and Pena (2009), we replace the missing values of the production function variables by their industry, region, and size averages. If all of the production function variables of a firm are missing, we delete this firm from the analysis. Escribano and Guasch (2005 and 2008) and Escribano et al. (2008) empirically analyze robust results to 10 different productivity measures in the IC surveys. We adopt the same robust productivity methodology. The key point of this methodology is to find IC coefficients which are robust to different productivity measures, and then use the group of significant explanatory variables as instruments for productivity in other firm performance equations (exports, FDI, etc.) affected by TFP and other IC variables. Specifically, they apply standard IV estimators (2SLS) using as instruments the industry-region-size averages of IC variables, IC proxies with only missing values replaced by the industry-region-size averages and other exogenous IC variables.

We use nonparametric cost-shares approach from Hall (1990) to generate logarithm of Solow's residuals both for restricted and unrestricted versions. In the restricted version, we use input cost shares for the whole sample. In the unrestricted version, we use input cost shares for each manufacturing sector. This nonparametric approach does not require exogenous inputs and constant or homogeneous input-output elasticities. On the other hand, it has assumptions of competitive input markets and constant returns to scale.[7]

After getting our logTFP measures, we regress a binary variable of export, on logTFP and positive and negative conditional/unconditional ICI indices by using 2SLS.

$$\begin{aligned} X_i &= \alpha_0 + \alpha_1 \log TFP_i + \alpha_2 ICI_{pos_{1,i}} + \alpha_3 ICI_{neg_{1,i}} + \alpha_4 ICI_{pos_{2,i}} \\ &\quad + \alpha_5 ICI_{neg_{2,i}} + \alpha_6 ICI_{pos_{3,i}} + \alpha_7 ICI_{neg_{3,i}} + \alpha_8 ICI_{pos_{4,i}} \\ &\quad + \alpha_9 ICI_{neg_{4,i}} + \alpha'_{10} D_{I,i} + \alpha'_{11} D_{R,i} + \alpha'_{12} D_{S,i} + \varepsilon_i \end{aligned} \tag{2.4}$$

where X_i is a dummy variable that takes value 1 if exports are greater than 10% of sales and 0 otherwise, TFP is the total factor productivity, ICI_{pos_1} is conditional/unconditional positive infrastructure index, ICI_{neg_1} is conditional/unconditional negative infrastructure index, ICI_{pos_2} is conditional/unconditional positive corruption index, ICI_{neg_2} is conditional/unconditional negative corruption index, ICI_{pos_3} is conditional/unconditional positive finance index, ICI_{neg_3} is conditional/unconditional negative finance index, ICI_{pos_4} is conditional/unconditional positive quality and innovation index, and ICI_{neg_4} is conditional/unconditional negative quality and innovation index. Because the interpretation of the other control variables group is not clear in a probability of export regressions, we did not include this group in the regressions.

IC has complex effects and firms in different regions and industries are affected differently from the IC. We include industry and region dummies to control for industry and region specific effects. We do not report coefficients of these dummies to save space. We use robust cluster standard errors in the regression to control for different

[7] See Escribano and Guasch (2005 and 2008) for details.

forms of heteroskedasticity and cross-correlation within the different clusters. As it is more likely for larger and older firms to export, we put size dummies and also the age of the firm as additional control variables. Table 5 presents descriptive statistics for conditional and unconditional sub-indices as well as composite positive and negative indices.

[TABLE 5 ABOUT HERE]

First, we run the above equation for a LPM to see which groups of indices have a significant effect on the probability of export. Because the mean value of our dependent variable (0.48) is far from the extreme values of 0 or 1, LPM provides analogous results to Probit or Logit models. On the other hand, LPM has the advantages of easier coefficient interpretation and easier treatment of endogeneity by using, for example, 2SLS. In Table 6, column (1) and (2) show the results for conditional IC indices and column (3) and (4) show the results for unconditional IC indices. In column (1) and (3), we use the restricted Solow residuals and in column (2) and (4), we use unrestricted Solow residual as our TFP measure.

Out of eight IC groups, positive infrastructure; negative red tape, corruption, and crime; and positive innovation groups have a statistically significant effect on the probability of export in all specifications and they have the expected sign. The results are robust (in terms of the sign, significance and magnitude) to conditional or unconditional construction of the indices and usage of restricted or unrestricted Solow residual as the TFP measure. On the other hand, the coefficient of the corruption group is lower in the unconditional index as compared to conditional counterpart. There are 17 different IC variables in the conditional and unconditional corruption groups. This difference gives slightly different results for the corruption group between conditional and unconditional indices. Note that after controlling for the IC elements, medium size firms are 14% more likely to export than small firms and large firms are 25% more likely to export than small firms. Hence, there is a sorting pattern among the small, medium and large firms based on the probability to export. The probability of exporting decreases with firms' age after controlling productivity and IC. It seems that, in the Turkish context, younger firms are more likely to export than older ones. Finally, as expected, our results also confirm that the probability of exporting is increasing with productivity.

[TABLE 6 ABOUT HERE]

In Table 7 from column 1 to 4, we use the significant IC groups from previous results in the IV estimation. Because of the endogenous nature of the TFP (due to simultaneity), following Escribano (2005 and 2008), we trust more IV estimators than OLS. The instrumental variables (IV) considered are the IC exogenous variables and the excluded exogenous IC variables of the LPM. The list of IC variables used as excluded restrictions are domestic shipment losses and dummy for informal competitors. After determining valid instruments for baseline specification, we use the same set of instruments for all IV estimations. We only replace missing values from IC variables by the corresponding region-industry-size average to avoid facing an omitted variables problem. The results are quite similar to our OLS estimation in Table 6. P-values of the first-stage F-test show that instruments for TFP are highly correlated with TFP and the Hansen test (over-identifying restrictions) does not reject the null hypothesis that the instruments can be excluded from the second-stage regression. TFP is significant only at 10% in two specifications of IV estimations. The positive infrastructure group includes telecommunication variables such as having a web page and access to e-mail. Those properties increase probability of export by 30%. On the other hand, quality and innovation group includes variables such as R&D activities, quality certifications, and having an educated work-force. Our results show that firms having those activities and an educated work-force are 50% more likely to export. In addition, the probability of exporting decreases by 48% if firms are faced with security and corruption problems. This effect is greater when we consider conditional indices.

The instruments used for TFP are the IC exogenous variables and the excluded exogenous IC variables of the LPM with only IC missing values replaced by the industry-region-size averages. We report OLS estimation result in column (5)-(8) of Table 7. The magnitude of the coefficient of TFP is changes from IV estimation to OLS estimation. Instrumenting productivity is providing a bigger coefficient for TFP. However, the changes in the magnitude of the coefficient of the IC variables are relatively small between IV and OLS estimations.

Our objective in the remaining part of this section is to check the robustness of these results to different index construction techniques.

[TABLE 7 ABOUT HERE]

In the construction of the indices, we used the 95% threshold level to discretize the continuous variable into binary variables. What if we change this threshold level? Do our results depend on specific threshold level? To answer these questions and check whether the results are robust to different threshold considerations, we constructed the indices using the 90% and 75% threshold levels, and then we run the above regression. The results are presented in column (1)-(3) in Table 8 for conditional indices and in column (5)-(7) in Table 8 for unconditional indices. Our results confirm that previous conclusions are independent from the threshold level of our IC indices. In the next step, instead of doing discretization, we make a normalization to continuous variables by dividing one specific IC variable by the maximum value of that variable. In this way, we get all the individual IC variables between 0 and 1. Some of them are binary, and some are continuous. The results of these considerations are presented in column (4) and (8) of Table 8. Again, the results are similar. We see that once we decrease the threshold level, the values of coefficients are decreasing. This means that the probability of exporting changes more for the firms which are extremely positively and extremely negatively affected by the IC. Because the coefficients are very close in the continuous and 95% threshold level results, the 95% discretization level is working well, as expected. In Table 8, we use restricted Solow residuals as our TFP measure. However, our results are same if we switch to unrestricted productivity measure. To save space we did not report those results.

[TABLE 8 ABOUT HERE]

We use simple averaging in the construction of our IC indices. It is interesting to see whether the averaging technique of the IC indices has any effect on the results. To check the robustness of the results to the weighting scheme, we run the above regressions for the indices derived by using PCA. The results in Table 9 for PCA are nearly identical to those of simple averaging in the sense that we get the same ICI as significant and their signs are the same as in the equally weighted case. The simple averaging approach is therefore robust to alternative weighted averaging technique. On the other hand, there is a small difference in the values of coefficient in two models. We believe that equally weighted indices are better than unequally weighted indices based on PCA for two reasons. First, because Hadi and Ling (1998) show that for the regression purposes taking the first principal component of the IC variables directly is not a good idea even though in order to represent the variability of the data taking the weights from first PC is usually recommended. Second, Kolenikov and Angeles (2004) show that PCA is not the best procedure for discrete data as is the case for our IC indices.

[TABLE 9 ABOUT HERE]

As a final robustness check, without considering conditional signs of the IC variables, we combine four positive and four negative unconditional sub-indices in order to get composite positive and negative indices as a multidimensional measure of positive and negative IC. Multidimensional composite positive and negative indices are the equally weighted average of the positive and negative sub-indices. To evaluate the effects, we add these two indices into our regression of the LPM of exports and use IV estimation.

$$X_i = \alpha_0 + \alpha_1 \log TFP_i + \alpha_2 ICI_{pos_i} + \alpha_3 ICI_{neg_i} + \alpha_4' D_{I,i} + \alpha_5' D_{R,i} + \alpha_6' D_{S,i} + \varepsilon_i \quad (2.5)$$

where $ICI_{pos} = \sum_{j=1}^{4} ICI_{pos_j}/4$ and $ICI_{neg} = \sum_{j=1}^{4} ICI_{neg_j}/4$ are the multidimensional composite positive and the negative IC indices and $D_{I,i}$, $D_{R,i}$, and $D_{S,i}$ are the industry, region and size dummies. The results are presented in Table 10. Once again, we get highly significant positive and negative IC indices with expected signs in column (1) and (3).

We have seen that IC may affect firm performance in areas such as probability of export, but high firm performance may increase the demand and supply of better quality IC which might create endogeneity problems in several IC variables. Location choice of firms is another source of endogeneity. To see whether the quality of the IC affect the location choice of firms with better performance, we present the results with a sample of domestic, small, and medium firms. Those firms have less ability to move. The robust empirical results are included in column (2) and (4).

[TABLE 10 ABOUT HERE]

One interesting result in columns (2) and (4) is that the negative IC index has a higher value for small and medium firms which confirms that small and medium firms are more affected by the negative aspect of the IC. For example, it is more likely for smaller firms to give bribes and less likely for them to access finance. In addition, small and medium firms are affected more from power outages while large firms have alternative energy sources such as a generator.

2.5 Comparison of results with ICI versus individual IC variables

In the previous section, we evaluated the performance of our IC indices in a linear probability of export model. In this section, we estimate the same model but the selection of the relevant list of individual explanatory IC variables goes from general to specific to avoid omitted variable problems. Initially all IC variables are included in the model. Then, the most insignificant IC variables are eliminated in the first stage to avoid having a high degree of multicollinearity. In the second step, a further reduction in the number of insignificant IC variables is applied. The most insignificant IC variable from each of the 5 blocks is eliminated, one by one. Following this process, a final model is reached in which all IC variables are significant. Finally, each previously removed IC variable is added into the final model, one by one, to see if any of them is now significant. This method is called the general to specific process and was successfully applied by Escribano, Guasch, de Orte and Pena´s World Bank reports to more than 60 developing countries. Using this methodology, Table 11 presents the results of significant IC variables and their corresponding IC groups. Column (2) presents the percentage contribution of each IC variable relative to the sample mean of the dependent variable. All the IC contributions represent the relative importance of each IC factor for the exporting frequency. Finally, in column (3), we compute the percentage contributions in absolute value to obtain a measure of the relevance of the IC blocks.

The coefficient of TFP in IV estimation (column 1) is 5 times the coefficient of TFP in OLS estimation (column 3). This is again confirming that there is a considerable difference in terms of the magnitude of the TFP variable between IV and OLS estimations.

[TABLE 11 ABOUT HERE]

In the infrastructure group, we get two positive significant IC variables. Using our IC index, we have a similar and positive significant result. Similarly, we get a negative corruption index as significant in the index method. In the innovation group, the result of the two methods is again fully consistent. Finally, in the control group we have the age of firm, and the dummy for large firm variables as significant in both methods. The only difference between the two methods is that while there are few significant individual IC variables in finance, there is no significant finance index. Nevertheless, once we check the contribution of each group to the probability of export we have the following results comparing the two methods.

[TABLE 12 ABOUT HERE]

The contribution of the finance group, using individual IC variables, is very small relative to the average of the probability of export and it is not surprising that when using the index the contribution is not relevant either. The ranking of each IC group is the same in both methods and this is important for policy analysis. These results confirm that the ICI methodology we have developed provides empirical results similar to more technically demanding econometric techniques that use the long list of IC variables.

2.6 Cross-Country Comparisons with the IC Indices

Because we have firm-level IC indices, we can express the distribution of all IC indices. To do this, we first reverse the negative indices by subtracting them from the highest possible value of 1. And then we combine the positive and negative aspects of all the IC subgroups. Hence, for subgroup of IC index, the higher the score the better the investment climate. Second, to get an aggregate final number for all the IC subgroups, we take the median of each distribution. Rankings of all countries in four IC groups[8] are presented in Table 14. The objective of this section is to analyze these rankings and to check the credibility and the advantages of having investment climate indices.

2.6.1 Credibility of the ICI

Qualitative rankings have special importance for policy makers and private sector members. Some of those rankings include: i) the World Economic Forum's Global Competitiveness Index (GCI), ii) the World Bank's Ease of Doing Business Index (DBI), iii) the International Country Risk Guide's (ICRG) index, iv) the Heritage Foundation's Index of Economic Freedom (IEF), and v) Transparency International's Corruption Perceptions Index (CPI). In these rankings, GCI is the closest index to ICI in terms of coverage. Before proceeding to the analysis, we test the credibility of the ICI as an indicator of a friendly investment climate by looking at the rank correlation of ICI with these indices. The rank correlation of ICI, GCI and ICRG is very high. ICI is rank correlated at 0.52 with GCI, and 0.5 with ICRG. On the other hand, the rank correlation of ICI with DBI is relatively smaller (0.36) for the sample of countries for which all of these four indices are available. If we only concentrate on ICI and DBI, the sample size increases to 111 countries. For this sample, the rank correlation of ICI and DBI increases and becomes 0.44. Having a relatively lower rank correlation of ICI with DBI could be due to DBI's lower coverage as compared to ICI. DBI mostly measures formalities and regulations for business while ICI includes infrastructure and finance as well as other information on formalities.

[TABLE 13 ABOUT HERE]

The CPI ranks countries based on perception of corruption in the public sector. It captures information about the administrative and political aspects of corruption. The second group of ICI covers variables on red tape, and corruption. When we construct a corruption sub-index of this group, the rank correlation of this sub-index and CPI is 0.54. The Heritage Foundation's IEF has components on business regulations. The coverage of this index is similar to the red tape and corruption group of ICI. The rank correlation of these indices is 0.53. High rank correlation of ICI with that of other economic indices shows the reliability of ICI. Moreover, regression analysis of ICI with

[8] We exclude the control group of variables because the economic interpretation of this group is not clear.

previous indices shows that ICI is statistically significant at 1% in a simple bivariate linear regression. On the other hand, ICI is superior to other well-known cross-country level indices in that it provides additional information because of its availability at the firm-level.

With the ICI being a summary measure of the investment climate, we expect countries with a better ICI to have a higher level of GDP per capita. Figure 2 presents this relationship and confirms our hypothesis by showing a clear and significant positive association between ICI and GDP per capita. A simple regression of ICI on GDP per capita has an R-squared of 0.36, which confirms that the ICI by itself is able to explain 36% of the variability observed in cross-country incomes (or gross domestic product, GDP).

[FIGURE 2 ABOUT HERE]

2.6.2 Analysis of ICI in 113 Developing Countries

We continue with the analysis of ICI in developing countries by looking at the ranking of 113 countries based on the ICI of each country. Table 14 presents the ranking results for ICI and its four sub-indices. The countries with the highest levels of ICI are Guyana, Slovenia, Chile, and Czech Republic. In this list, Slovenia and Czech Republic were listed as developing countries until 2007 and 2009 respectively, and are now included in advanced economies by the IMF. Guyana's high ranking depends only on its top ranking in infrastructure. For the other three groups, its performance is quite poor; for the red tape and corruption, finance, and innovation and labor skills groups its positions are 66, 24, and 54 respectively. Among the 113 countries considered by ICI, Uganda, Burundi, Ghana, Gabon, and Mongolia have the lowest levels of quality of IC. The worst countries in terms of the ICI, except for Mongolia, are located in Africa.

[TABLE 14 ABOUT HERE]

Recall that we have shown in previous sections, based on regression analysis, that small and medium firms in Turkey were the most affected firms when facing a bad investment climate. In this section, we will further check whether these results are also true for other developing countries. For example, having problems in infrastructure and finance may affect small firms more since smaller firms less frequently adopt new technologies and usually carry out little labor training. On average, small firms do not use additional resources more productively than medium and large firms. While 54% of firms in the US have less than 10 employees, this ratio in Argentina and Mexico is 84% and 90% respectively (Pages, 2010). These features are normally drivers of low productivity and low growth in developing countries. For example, Pages (2010) considers too many resource allocations to too many small low-productivity firms is the root problem of productivity in the Latin American and Caribbean (LAC) region. Hence, rectification of this misallocation may have significant impact on productivity and growth.

Table 15 shows IC sub-indices by different firm sizes. Large firms have the biggest IC value and the smallest variance which clearly indicates that large firms are less affected by poor IC conditions. Medium firms have bigger mean as compared to small firms, which have less than 20 employees. If we consider the firms which have less than 10 employees as micro firms, the situation of micro firms is even worse with a mean value of 0.55 in IC. Figure 3 shows the cumulative distribution functions of IC and we observe different firm size patterns. Infrastructure component of IC has also similar patterns, indicating that large firms are less affected by infrastructure obstacles. Moreover, small firms have lowest mean IC values in finance and quality, innovation and labor skills. These results are equally robust across different continents and support the argument that "too many resource allocations to too many small firms decreases the productivity and growth" specially in developing countries where having a poor IC is a critical barrier to grow.

[TABLE 15 ABOUT HERE]
[FIGURE 3 ABOUT HERE]

2.6.3 Advantages of the ICI Relative to Previous Indices

Our IC index provides a broader coverage in terms of countries. We have the ICI for 113 developing countries. The most important characteristic of the ICI is that it is built on the firm-level information and this has important implications. For example, none of the previous indices used to compare with the ICI could be used to make a micro-econometric analysis to understand the main obstacles to a firm's growth.

Furthermore, we can use country-level ICI to compare countries and regions within each country (cross-country or cross-region analysis). Although using an aggregate measure of IC could mask the quality of IC in different regions of a given country, building our firm-level IC index by regions allows us to compare the IC of different regions as well.

Another important advantage of our ICI is that it can be decomposed into IC groups such as: infrastructure, red tape and corruption, finance, and innovation and labor skills. Moreover, these groups could also be decomposed into subgroups, etc. Therefore, for example, we could analyze the main IC bottlenecks of certain regions using the IC subgroups of firms. This would allow us to provide more precise and disaggregated policy proposals, contingent on the characteristics of the IC region and the characteristics of firms in that environment.

The ICI value of a firm represents how much the firm is affected by the investment climate. For example, one of the disadvantages of using a physical indicator is that it is not possible to measure government efficiency from any average physical indicator such as number of telephones per worker and supply of electricity per firm. Building a dam to meet the electricity needs of firms and households has a positive impact on the economy, but building one more dam may not have the same effect. A good example is the Itaipú and Yacyreta dams in Paraguay. Itaipú, the world's biggest hydroelectric dam in terms of annual energy generation, has 18 turbines. A total of 90% of all the electricity consumption in Paraguay is provided by only one turbine. When we consider average the electricity generating capacity of Paraguay, it seems that the country does not have a problem regarding electricity. However, a deeper analysis makes it clear that the network of energy infrastructure is not sufficient in Paraguay. Moreover, while the country can generate more than enough electricity from only one dam even with only few turbines, it is not equally beneficial to construct additional dams. If the resources used to construct a second dam are used to improve the energy infrastructure network, overall productivity of the country could obviously increase. The general message we take from this example is that sometimes having a proxy on qualitative measures of government investment is better than having a quantitative one. The ICI takes into account those qualitative aspects by measuring the IC impact on firms.

2.7 Conclusions

In this paper, we present a simple methodology to construct investment climate indices (ICI) based on a firm-level data. In previous literature, most of the research done on the investment climate used simplified versions of the general to specific approach suggested by Escribano and Guasch (2005 and 2008) but, from the econometric point of view, this approach is too demanding and time-consuming to be applied to more than 100 countries. Here, we propose an easier way to do an IC analysis based on firms' surveys done from many countries.

In most IC surveys, around 49% of the IC variables are binary variables and the rest are continuous, therefore there is no clear index methodology to be applied. In this paper we have proposed an IC index methodology and evaluated its effects using alternative econometric approaches.

Because positive IC effects may cancel out the negative IC effects, we start building the index by separating first the IC variables into two groups: variables with positive and negative IC impacts. Using a 95% threshold level, we suggest transforming all the continuous IC variables into binary. The reason to choose this threshold level is to measure the effect of extremely good and extremely bad investment climate; however, we show that the results are robust to the use of other thresholds such as those of 90% and 75%. Counting the zeros and the number ones of the firms in each IC group will gives us the IC index of that group. To evaluate if our IC indices give econometric results similar to previous firm-level methodologies, we use a probability of export model. The empirical results are qualitatively and quantitatively similar, showing that in the aggregation process of ICI we are able to keep the relevant information of the IC of each country. The empirical results are robust to the use of different thresholds, different estimation methods and also different weights in the aggregation process. Building conditional and unconditional processes in the construction of the indices does not change the results and, therefore, we suggest using the unconditional methodology, which is simpler. Furthermore, we show that our IC index based on firm-level data for each country is highly correlated with other international indices such as the GCI of World Economic Forum. However, we show that our ICI provides additional information as compared to GCI, because the ICI is based on richer firm-level information.

While most studies in IC literature restricted their analysis to a subgroup of IC variables, facing the possible omitted variable bias, in our index we use all of the IC variables and therefore minimize the omitted variable problem.

In summary, the index methodology that we have developed in this paper has several advantages over previous IC methodologies. First, it is simpler and can be implemented using basic econometric techniques. Second, it reduces the multicollinearity problem in the IC literature without removing any of the IC variables at hand. When we include all of the IC variables separately in a regression, many of them are dropped because of multicollinearity and here we suggest aggregating a number of specific IC variables into broader sub-indices such as: infrastructure, corruption and crime, finance and quality and innovation. Third, using all of the IC variables in an index, or in few sub-indices, eliminates the dimensionality problem. Fourth, putting as many IC variables as we can into the index and by doing the discretization procedure that we suggest to build the index, we decrease the degree of endogeneity of many of the IC variables. Finally, the fifth advantage is that having an aggregate ICI and the sub-indices at a country and regional level can help policy makers detect the main bottlenecks to economic growth, opening up opportunities to make interesting cross-country macroeconomic comparisons based on countries' investment climates.

Chapter 3

Barriers to Export Performance of Turkish Firms

3.1 Introduction

Turkish exports increased more than five-fold from 1996 to 2008. While the value of Turkish exports was 23 billion dollars in 1996, it reached 132 billion dollars in 2008. Average annual growth rate of Turkish exports was 16% in this period. Figure 1 presents total exports of Turkey for this period with only one year 1.4% decline in 1999. Sectoral composition of exports shows that manufacturing sector is the main driving force behind the export growth. Manufacturing exports share in total exports rose from 88% in 1996 to 95% in 2008.

[FIGURE 1 ABOUT HERE]

Although the Turkish economy has successful export growth performance for the recent years, the long term success of Turkish export will be associated with the competitiveness of the Turkish economy. Based on World Competitiveness Report of IMD and Doing Business Survey of the World Bank, Turkey is still far behind many of its competitors. Although Turkey's competitiveness ranking changed from 56 in 2003 to 48 in 2007, the ranking in 2007 is still the same as in the crisis year 2001. The positions of Czech Republic, Slovak Republic, Spain, Portugal, Hungary, Greece, and Poland are 28, 30, 33, 37, 38, 42, and 44 respectively. Moreover, ranking of Turkey is 57 out of 178 countries in Doing Business Survey. Investment climate (IC) factors could be microeconomic restrictions in front of the competitiveness of the Turkish economy, and our objective in this paper is to identify those restrictions for the exporters of the manufacturing sector.

World Development Report (2005) defines the IC as "the set of location-specific factors shaping the opportunities and incentives for firms to invest productively, create jobs and expand." IC constraints are competitive barriers for the firms; hence a good IC may raise country competitiveness by enhancing firm-level performance. The aim of this paper is to investigate how IC constraints in Turkey affect exports by showing which components of IC have a particular importance for the exporters. This analysis helps us to understand the basic obstacles faced by firms operating in Turkey.

The Turkish economy until early 2000s was not stable and suffering from hyperinflation. In addition, there was political instability because of continual formation of coalition governments, populist policies of coalitions, and rapid change of governments until 2002. Apart from the macroeconomic and political uncertainties, the country's IC was another important obstacles faced by both the domestic producers and exporters in Turkey. Poor IC of Turkey is one of the most important factors in the country's competitiveness with respect to its competitors. Enormous institutional and legal difficulties and entry barriers were discouraging investors away from the country. For example, opening a new business in Turkey is 70 times costly in comparison to the US.

As it is emphasized in OECD Economic Survey (2002) on Turkey, macroeconomic instability, a fragmented political system, cumbersome bureaucracy, and an unfriendly business environment are the major factors that keep Turkey from being an attractive place for investment compared to its competitors. Although macroeconomic and political instability could be the deterrent reasons for poor firm-level performance in Turkey with respect to other emerging countries until early 2000s, currently more stable period may increase the relative importance of IC constraints on the firm-level performance. The Turkish economy has improved in the last few years. Macroeconomic indicators such as an annual GDP growth rate of 9.9% in 2004, an inflation rate of 8%, and a debt to GNP ratio of 67% in 2005 provide confidence and stability. Thus, cumbersome bureaucracy, prevalent corruption, and heavy indirect taxation have been the main bottlenecks that preclude favorable IC.

The paper by Morisset and Neso (2002) show the unfriendly IC nature of Turkey in terms of administrative procedures among 32 developing countries. An excellent example of adverse effect of administrative procedures in FDI is Hyundai's decision to locate in the Czech Republic in 2004. Hyundai has announced that they would like to invest in Turkey and employ 3000 people. However, because of the delay in the allocation of building plot, the firm decided to invest in Czech Republic.

The similar result is also valid for corruption. Although Turkey was ranked 50th in the 2000 Corruption Perception Index by Transparency International, it decreased to 64 in 2007 behind to its competitors such as Czech Republic, Poland, and Hungary.

In terms of taxes, Tusiad and Yased (2004) report shows that Turkey has relatively higher taxes with respect to other emerging economies. Similar result was emphasized by Deik (2001): corporate taxes are the highest in Turkey compared to the other emerging countries. This high tax burden increases the cost of labor in Turkey. Because of extremely high burden of income and social security taxes on the employee and the employers, Turkey has higher gross minimum wage as compared to the minimum wages in the Central and Eastern European (CEEs) countries (see Yilmaz, 2007).

Moreover, Turkey is also lag behind its competitors in human capital investment. For instance, total expenditure on education as percentage of GDP in Turkey, Poland, Portugal, and Hungary are 3.91, 5.31, 5.69, and 5.15, respectively in 2004. Technically skilled worker supply in Turkey is considered as one of the serious problems in manufacturing sector because of the inadequacy of vocational training.

It is demonstrated in a recent paper by Escribano, de Orte and Pena (2008b) that the IC plays an important role on the productivity (TFP) of Turkey and preventing the efficient use of resources in the economy. Turkey is lag behind the countries such as South Africa, Brazil, and Chile based on the efficient use of resources by the firms because of worse IC. Finally, you can see the list of several infrastructural factors from IMD's World Competitiveness Yearbook that negatively affects Turkey's competitiveness with respect to its competitors in Table 1.

[TABLE 1 ABOUT HERE]

As is clear from the above discussion, although certain improvements after 2004 were mainly related to the implementation of macroeconomic policies and public finance reforms, all of the above mentioned factors deteriorate the IC and affect the firm-level performance. Thus, Turkey needs to implement microeconomic structural reforms to realize long run success and to transform today's positive dynamics into sustainable development (Hadjit and Moxon-Browne, 2005). Hence, the IC plays a crucial role in determining the country competitiveness and sustainable economic development. The aim of this paper is to evaluate and measure the export impacts of having poor quality IC.

We use firm-level data for the manufacturing sector based on the World Bank's Investment Climate survey (ICs) of Turkey in 2008. The econometric model to analyze the impact of IC variables on the export decision and the volume of export is the Heckman model. Since we have censored cross-sectional dependent variable, the OLS is not appropriate for this analysis. Other models such as the Tobit, the Poisson Pseudo-Maximum-Likelihood (PPML), and the Heckman are superior to OLS when the data are censored. Although the Tobit model is the standard econometric model used with the censored data, we choose the Heckman model. Similarly, although the

Poisson model is proposed to deal with the zero trade flows in the international trade literature, this model does not differentiate between the decision to trade and the level of trade. Hence, the Heckman model is the unique alternative to analyze not only the export decision but also the volume of it.

Our findings indicate that infrastructure and quality, innovation, and labor skills are the two most important factors for the export market entry decisions of the firms while productivity (TFP) and the export experience of the firms are the main determinants for the survival of the firms in international market. Turkish authorities need to implement policies to improve quality of infrastructure and quality and innovation in order for more firms to be exporter in the manufacturing sector. On the other hand, policies to improve the productivity of the exporters are the key for the success of Turkish exporters in the international market.

This paper quantitatively shows how important IC is for the export decisions of firms and for the success of exporters in Turkey, by using 2008 firm-level export as the dependent variable. Unlike the previous IC studies of Turkey, which use an LPM to analyze the probability of export, in this paper, we not only analyze probability of export but also the determinants of volume of it. Another important contribution of this paper is the methodology to deal with the endogeneity of the productivity in export equation. Although previous studies in the IC literature use industry-region-size IC variables to instrument productivity, we use lag value of sales to proxy productivity.

The remainder of this paper is organized as follows. The review of the current literature on trade and IC are given in Section 3.2. In section 3.3, the data for the analysis are presented. The models for this analysis are discussed in Section 3.4 and the results are given in Section 3.5. Finally, Section 3.6 concludes.

3.2 Literature Review

Current trade literature emphasizes the role of firm-level heterogeneity in terms of productivity to analyze export structure of firms. Today the sorting pattern of domestic firms, exporters, and multinational enterprises (MNEs) based on productivity levels is very well documented in the literature. First, a large empirical literature has analyzed the productivity differences between exporting and non-exporting firms, and has concluded that exporting firms are more productive than non-exporters. There is evidence now for the US (Bernard and Jensen 1999 and 2004), the UK (Girma, Greenaway, and Kneller 2004), Italy (Castellani 2002), Spain (Delgado, Fariñas, and Ruano 2002), Canada (Baldwin and Gu 2003), Germany (Fryges 2004, Bernard and Wagner 1997, Arnold and Hussinger 2005a), Japan (Kimura and Kiyota 2004), Colombia, Mexico, and Morocco (Clerides, Lach, and Tybout 1998), Korea (Hahn 2004), Taiwan

(Liu, Tsou, and Hammitt 1999), Indonesia (Blalock ang Gertler 2004), and Ethiopia (Bigsten and Gebreeyesus 2009).

Second, various studies have documented that MNEs are more productive than exporters. Support for the predicted order is available for the US (Doms and Jensen 1998, Yeaple 2005), the UK (Girma, Kneller, and Pisu 2005), Italy (Barba Navaretti and Castellani 2004, Castellani and Zanfei 2007), Indonesia (Arnold and Javorcik 2005), Japan (Kimura and Kiyota 2004), Ireland (Girma, Görg, and Strobl 2004), and Germany (Wagner 2005, Arnold and Hussinger 2005b).

[TABLE 2 ABOUT HERE]

The general message coming from the above studies is that MNEs are more productive than exporters, and exporters are more productive than non-exporters. Moran (1998) claims that friendly IC tends to attract more dynamic MNEs that use new technology, and are highly efficient.

The 2005 World Development Report indicates that a pleasant IC "drives growth by encouraging investment and higher productivity." It has been analyzed from firm-level studies that four components of IC (infrastructure; red tape, corruption, and crime; finance; and competition and regulation of factor markets) does indeed matter for explaining firm-level performance, see, among others, Escribano and Guasch (2005) for Guatemala, Honduras and Nicaragua; Hallward-Driemeier, Wallsten, and Xu's (2006) for China; Bastos and Nasir (2004) for Kyrgyz Republic, Moldova, Poland, Tajikistan, and Uzbekistan; Dollar et al. (2005) for Bangladesh, China, India, and Pakistan; Reinikka and Svensson (2002) for Uganda; and Aterido and Hallward-Driemeier (2007) for Africa. IC factors such as taxes, the regulatory burden, infrastructure quality, cost of finance, and corruption are more important in developing countries because of inducing high cost of doing business. For instance, poor infrastructure increases the cost of doing business by increasing logistic cost.

In conclusion, improvements in IC may raise competitiveness by increasing firm-level performance, provide a sustainable growth perspective through higher productivity (TFP), and moderate the severe unemployment problem of Turkey by encouraging both domestic and foreign investment. For this reason, the main goal of this paper is to determine the fundamental IC constraints that affect firm-level performance in manufacturing exports.

Because of the existence of within-country heterogeneity, firm-level studies are superior to macro-studies and provide more robust outcomes. In addition, firm-level studies enable one to propose clear policy recommendations.

At this point, it is necessary to represent three closely related empirical papers that analyze the effects of IC variables in Turkey. Working paper of Escribano, Guasch, de

Orte, and Pena (2008b) group the IC variables into four categories: a) infrastructure, b) red tape, corruption, and crime, c) finance, and corporate governance, d) quality, innovation, and labor skills. They use the World Bank's ICs data for Turkey in 2005 to measure the total factor productivity (TFP) effects of IC variables. They show that the most important IC constraints in Turkey are taxes and tax administration and security, and the most important groups are red tape, corruption, and crime from the analysis of firms' perception. The second severe obstacle is infrastructure block with the single element being the number of days to clear custom to import. They show that all these institutional factors have a negative effect on IC and business environment, which in turn decrease the competitive conditions and deteriorate the average productivity (TFP).

Employing the same data, the working paper of Escribano, Guasch, de Orte, and Pena (2008a) analyzes the impact of IC constraints on employment, real wage, export, and FDI by controlling for TFP using the simultaneous equations system. They conclude that red tape, corruption, and crime is the most important group for employment, real wage, and export. On the other hand, probability of receiving FDI is mostly affected by quality, innovation, and labor skill, while the second important group is infrastructure.

Using the methodology developed by Escribano and Guasch (2005 and 2008) and Escribano et al (2008b), Escribano, de Orte, and Pena (2008) estimated a structural system of equations, which is composed of productivity (TFP), employment, probability of exporting, and probability of receiving FDI for the 2008 IC dataset of Turkey. They conclude that the TFP of Turkish manufacturing sector is constrained by the IC. For other economics performance measures, the main IC blocks of variables to the sample average of employment is quality, innovation, and labor skills; to the probability of exporting is infrastructure; and to the probability of receiving FDI is finance and corporate governance. In addition, the individual contribution of TFP is higher than any IC group for the probabilities of exporting and receiving FDI. As a second objective, they also evaluate how the IC has changed from 2005 to 2008.

Unlike the above-mentioned IC studies of Turkey, which use an LPM to analyze the probability of export, in this paper, we not only analyze the probability of export but also the determinants of volume of it. We evaluate the IC determinants of both the probability of export and the volume of export. Another important difference of this paper is our methodology to deal with the endogeneity of the productivity in export equation. We use lag value of sales to proxy productivity. This is a common methodology employed in the literature. Our work goes beyond the above studies in exploring another potential source of endogeneity because of the location choice of firms. We control this endogeneity by excluding firms that are mobile, i.e. multinationals and larger domestic firms. Finally, we check the effect of IC barriers for different sizes of the firms, which is also different from the above three related studies.

3.3 Data: Investment Climate Survey (ICS) of Turkey

Investment climate assessments (ICAs) are very useful for analyzing the main obstacles based on the perception of the firms. They cover both subjective assessments of bottlenecks by firms and objective numerical evaluations related to cost and productivity. These surveys include firm-level data on: a) infrastructure, b) bureaucracy, informalities, corruption, and crime, c) accessibility and cost of finance, and auditing, d) quality, innovation, and labor skills, and d) other control variables such as exporting, importing, and FDI status, size and age of the firm, etc.[1]

Potential weaknesses of subjective indicators as opposed to quantitative data has been importantly debated area in the literature. Gelb et al. (2007) and Aterido et al. (2007) conclude that subjective responses are reasonably well correlated with objective measures related to the IC.[2]

We use manufacturing sector data based on the World Bank's ICs of Turkey in 2008. It contains a rich firm-level representative sample in terms of size, region, and sector. The database includes the IC, control (C), perception and production function variables of each firm.[3]

Because exports are the primary driving force of the manufacturing sector in Turkey in recent years, the main emphasis in this paper will be on the manufacturing sectors. Firms are categorized into nine different sectors based on their ISIC code: 1) food; 2) textiles; 3) garments; 4) chemicals; 5) plastics and rubber; 6) non-metallic mineral products; 7) basic metals and fabricated metal products; 8) machinery and equipment; 9) other manufactures including electronics. In addition, two other classifications of firms are based on their region and size.[4]

We use production function variables to calculate the productivity (TFP) of each firm. Because there is no unique measure of productivity, any empirical analysis of productivity in the context of IC might depend on the specific productivity measure chosen. Escribano and Guasch (2005 and 2008) investigate the empirical results which are robust to alternative productivity measures in the IC data. They evaluate the productivity impact of IC for 10 different productivity measures, and conclude that the results are robust to all these measures. We use the same robust productivity

[1] See Appendix C.2 for all the variables in each category.

[2] See Dethier, Hirn, and Straub (2008) for further discussion.

[3] See Appendix C.2 for description of all variables.

[4] Classification of regions: Marmara, Aegean, Central Anatolia, Black Sea, and South. Classification of sizes: small (<20 employees), medium (>=20 and <100), and large (>=100).

methodology developed by Escribano and Guasch (2005 and 2008) and Escribano et al. (2008b).

We estimate logarithm of Solow residuals for both the same cost shares of inputs for all firms in the country (restricted Solow residual) and different cost shares of inputs among industries in the country (unrestricted Solow residual) using the nonparametric approach of cost shares from Hall (1990). This approach eliminates the endogeneity problem of the inputs, and it does not require constant or homogeneous input-output elasticities. On the other hand, it makes constant returns to scale and competitive input market assumptions.[5] Specifically, for the restricted case, we first calculate the averages of the firm-level cost shares of each input across the whole sample in Turkey. Second, we get the restricted Solow residuals (Solow 1957; Hall 1990) from (3.1)

$$\log Y_i = s_L \log L_i + s_M \log M_i + s_K \log K_i + \log P_i \tag{3.1}$$

where s_r is the average cost share of input r, $r = K$ (capital), L (labor), M (material), and $logP$ is the restricted Solow residual.

In the unrestricted case, first we calculate the averages of the firm-level cost shares of each input for each manufacturing sector in Turkey. Second, we get the unrestricted Solow residuals from (3.2)

$$\log Y_i = s_{L,j} \log L_i + s_{M,j} \log M_i + s_{K,j} \log K_i + \log P_i \tag{3.2}$$

where $s_{r,j}$ is the average cost share of input r, $r = K, L, M$, in industry j and $logP$ is the unrestricted Solow residual.

Two important problems in the IC data set are missing observations and outliers. We have missing values both in the production function and IC variables. We have a total sample of 903 firms. Following the recently generated econometric methodology by Escribano and Guasch (2005 and 2008) and Escribano and Pena (2009) for the World Bank, we replace the missing values of the variables by their industry, region, and size averages, which is the first step of the cleaning process (imputation method).[6] In the second step, we remove the outliers that are characterized by the firms with labor cost to sales or material to sales ratios is bigger than one. We do not replace production function variables if all the production function variables are missing for a given firm. After replacement of production function and IC variables and eliminating outliers, we get a sample size of 640 firms.

Endogeneity of some of the IC variables is another problem that we should solve while estimating a model with IC variables. Because we have data for only one year,

[5] See Escribano and Guasch (2005) for details.
[6] The method is called ICA method. See Escribano and Pena (2009) for details of the method.

we cannot use own lag values as instruments. As another solution, replacing the missing values of the IC variables by their industry-region-size average of plant-level firm characteristics is accepted in the IC literature to reduce the degree of endogeneity of IC variables. Using averages also enables us to replace missing observations at the firm level.[7] If we have sufficiently large observations, we use industry-region-size imputation technique to preserve as many observations as possible in the regression. Here, we obtain observations at the cost of maybe some measurement error.

3.4 Empirical Model

To estimate the impact of IC and control variables on export, we use the following model;

$$\log X_i = \beta_0 + \beta_p \log P_i + \beta'_{IC} IC_i + \beta'_C C_i + \beta'_{DI} D_{I,i} + \beta'_{DR} D_{R,i} + \beta'_{DS} D_{S,i} + \varepsilon_i \quad (3.3)$$

where, $logX_i$ is log of export, $logP_i$ is the log of productivity, IC_i are the IC variables, C_i are the control variables and $D_{I,i}, D_{R,i}$, and $D_{S,i}$ are the industry, region, and size dummies. Although the Heckman model assumes that the errors are independent and identically distributed (i.i.d.), the endogeneity of some of the IC variables violates independence assumption, and heteroskedasticity violates identical distribution assumption. That is,

$$\begin{aligned} E(\varepsilon_i | P_i, IC_i, C_i, D_{I,i}, D_{R,i}, D_{S,i}) &\neq 0 \\ Var(\varepsilon_i | P_i, IC_i, C_i, D_{I,i}, D_{R,i}, D_{S,i}) &\neq \sigma_\varepsilon^2. \end{aligned}$$

Following the common methodology in the IC literature, we use the imputation technique of industry-region-size average of plant-level firm characteristics for missing values to reduce the degree of endogeneity of firm characteristics. Many papers in IC literature use this method to alleviate the degree of endogeneity.[8] The intuition is the following: industry-region-size averages are important determinants of change in firm performance, but individual performances have only limited effect on industry-region-size averages, alleviating, therefore, the degree of endogeneity. Regarding the heteroskedasticity problem, we use heteroskedasticity-robust-White standard errors. In addition, we use cluster standard errors by considering for correlation within industry, region, and size.

[7] For a deeper analysis see Escribano and Pena (2009).
[8] See, among others, Escribano and Guasch (2005 and 2008) and Escribano et al. (2008).

Zero trade flows are common in international trade studies. We have the same situation in our sample: 52% of the export values are equal to zero. This causes two problems. First, because $log(X)$ is not defined for $X = 0$, we lose 52% of observations if we take the logarithm of export. Second, the OLS estimation is not appropriate for this case. OLS estimates tend to bias because of the existence of zeros. Thus, OLS cannot be used both on full sample, and on positive subsample.

The recent trade literature proposes three main solutions to "zero trade problem": 1) Ad hoc solution, 2) the Poisson model, and 3) Heckman selection model.

Because $log(X)$ is not defined if $X = 0$, $log(X+1)$ is calculated in ad hoc solution. Although policy literature widely uses this solution, it does not have a theoretical basis and generally leads to inconsistent estimators. Poisson model (Santos Silva and Tenreyro, 2006) does not have a special consideration about zeros. They are only included in the estimation sample. One of the advantages of the Poisson maximum likelihood (ML) estimators is that they are unbiased even with heteroskedastic data. It also models both the decision to trade and the level of trade. Heckman selection model makes a differentiation between the decision to trade and the level of trade. A first group of IC variables identifies the probability of export, and a second group of variables identifies the intensity of export, given the existence of the export. Because our objective is to determine not only the IC barriers in front of the probability of export but also IC barriers in front of the volume of export, we choose Heckman model to deal with "zero trade problem."

3.4.1 The Probit Model

Before using Heckman model, we generate a binary random variable for export which takes value 1 if the share of export is greater than 10% and 0 otherwise to analyze the determinants of probability of export. We estimate this model by using the Probit model in order to be consistent with the normality assumption behind the identification of the Heckman model. Then, we use this set of IC variables in the first stage of the Heckman model.

3.4.2 The Heckman Sample Selection Model

We are investigating the export decision of Turkish firms. Because of fixed cost of exports, export decision can be considered as a two-stage process. First, firms decide whether to export or not, and second, they decide the volume of export. Because the two decisions are interdependent, Heckman model accounts for both decisions, and hence avoids any bias when they are treated separately. The omission of zeros in the sample because of the cost of export makes the sample non-random and OLS estimation in this case is biased. To overcome this problem, Heckman selection method should be used.

Another important advantage of the Heckman model is related to the missing observation problem of the data at hand. If the missing data mechanism is correlated with the dependent variable of the regression, the parameters are not consistent. Heckman model provide robust results in this case by taking into account the sample selection problem.[9]

Two equations that should be estimated are the following:

$$D^*_{X,i} = \gamma_0 + \gamma_p \log P_i + \gamma'_{IC} IC_i + \gamma'_C C_i + \gamma'_{DI} D_{I,i} + \gamma'_{DR} D_{R,i} + \gamma'_{DS} D_{S,i} + u_i \quad (3.4)$$

$$\log X^*_i = \beta_0 + \beta_p \log P_i + \beta'_{IC} IC_i + \beta'_C C_i + \beta'_{DI} D_{I,i} + \beta'_{DR} D_{R,i} + \beta'_{DS} D_{S,i} + \varepsilon_i \quad (3.5)$$

where the dependent variable is a binary variable for export in the first equation with

$$\begin{aligned} D_{X,i} &= 1 \qquad \text{if } D^*_{X,i} > 0 \\ D_{X,i} &= 0 \qquad \text{if } D^*_{X,i} \leq 0 \end{aligned}$$

and

$$\begin{aligned} X_i &= X^*_i \qquad \text{if } D_{X,i} = 1 \\ X_i &= 0 \qquad \text{if } D_{X,i} = 0 \end{aligned}$$

where the first regression shows the export participation decision and the second one is the export share regression. Observable export share (X_i) is positive if the firm decides to export ($D_{X,i} = 1$) and zero otherwise. We assume that the error terms (u_i, ε_i) have bivariate normal distribution with correlation ρ. If $\rho \neq 0$, two decisions of the firm (participation decision and volume decision) are correlated. If they are correlated, estimating only equation (3.5) causes sample selection bias in the estimators because the error term ε_i and the regressors in equation (3.5) will be correlated. We need to estimate both equations to overcome this problem. ML or two-step methods can be used for the estimation. We use ML estimation in one step, because this provides considerable efficiency gains.

[9] See Escribano and Pena (2009) for details.

3.4.3 Selection of the Relevant Models

The selection of significant IC variables in the models moves from the general to the specific. Full group of IC variables consist of 125 variables. To avoid the multicollinearity problem, we eliminate IC variables that present similar information. Then, we eliminate the most insignificant variable one by one in each step until we get a significant final set of IC variables. After obtaining a preliminary model, we check the significance of omitted variables by including previously dropped IC variables to the selected model.

In addition to robust standard errors, we use cluster standard errors to take into account the correlation within industries, regions, and sizes. To check the robustness of the results for different productivity (TFP) measures, we estimate the models both for the restricted and unrestricted Solow residuals. The results are given in the appendix.

3.5 Results

In our sample, 23% of the firms are small, 40% are medium, and 36% are large. Table 3 represents the percentage of exporting firms by different sizes. While only 22% of small firms export, this ratio increases to 48 and 63% for medium and large firms, respectively. A large portion of small firms in our sample do not export which means that what is important for this group is whether to export or not. On the other hand, most of the large firms export and what is important for this group is the volume of export.

[TABLE 3 ABOUT HERE]

Although Poisson ML model is one of the methods to deal with the "zero trade problem" in trade literature, it is not possible to differentiate the two-stage export decision of the firms in this model. Because our objective is to not only analyze the probability of export, but also its volume, we prefer the Heckman MLE approach. We conduct the Heckman MLE as follows: the first step is a Probit regression to determine the significant IC variables using the above-mentioned general-to-specific procedure. In the second step, we use these significant variables in the selection stage of the Heckman model. For the outcome stage, determination of the significant IC variables uses the same general-to-specific procedure. In both steps, after obtaining preliminary models, we test for the significance of omitted IC variables by including the previously dropped variables to the selected models in the selection and outcome stages.

In Table 4, we estimate the probability of export regression using Probit and Probit with marginal effect. Because current trade literature shows the importance of productivity to analyze export structure of firms, we control firm-level productivity in our estimations. To determine the robustness of our analysis for different productivity (TFP) calculations, we estimated the models using both the restricted Solow residuals and the unrestricted Solow residuals. We included region, industry, and size dummies for all the regressions. This is important to control for the effects of industry- and region-specific and different unobservable size-specific determinants. We also use robust cluster standard errors in the regression to control for different form of heteroskedasticity in different clusters. Columns (1) and (2) show the results for the restricted Solow residuals and columns (3) and (4) show the results for the unrestricted Solow residuals in Table 4. The results are robust (in terms of the magnitude, sign, and significance) to usage of restricted or unrestricted Solow residual as TFP measure.

Note that we have IC variables from all four groups. This is the key point of the econometric methodology developed by Escribano and Guasch (2005 and 2008). If we control multiple dimensions of the IC factors simultaneously, we have robust empirical results. If we do not control all of the IC groups, we may find different signs on some coefficients because of the omitted variables problem. After controlling IC factors, medium firms are 17% more likely to export than small firms and large firms are 28% more likely to export than small firms. Hence, there is a sorting pattern among the small, medium, and large firms based on the probability to export.

[TABLE 4 ABOUT HERE]

The regression results for Heckman model are contained in Table 5. To realize statistical identification, equation (3.4) should have an IC variable that is not included in equation (3.5). We choose ISO certification as the excluded variable from equation (3.5). As explained by Naudé and Matthee (2012) “ISO accreditation is more of an obstacle in deciding to enter export markets in the first place, than on the extent of subsequent exports.” Similarly, exporting experience more likely determine the subsequent exports and it does not have any effect on the firm’s decision to enter the export market. That is why exporting experience does not appear in equation (3.4).

[TABLE 5 ABOUT HERE]

One of the differences between the Probit model in Table 4 and the selection stage of Heckman model in Table 5 is the significant IC variable showing the percentage of staff using computer. Although this variable is not significant in the Probit model, it is significant in the selection stage of Heckman model. In the last stage of the selection of the relevant model, we check the significance of omitted variables by including the previously dropped IC variables to the selected model. In this stage, staff with computer variable turned out as significant. That is why we kept it in the Heckman model. The results are independent from the usage of different TFP measures. They are robust in terms of magnitude, sign, and significance. The significant rho in Table 5 proves that the Heckman MLE model is appropriate.

While productivity is a significant determinant of both probability of export and the volume of export, it has bigger impact on the volume of export. This result confirms that more productive firms export more and compete relatively easily in the international market. The coefficient of dummy for quality certification (0.56) in the selection part shows that firms with ISO accreditation are 56% more likely to export. This is the biggest coefficient in the individual IC variables in the selection part referring that quality certification matters for the firms to enter the export market in Turkey. In the control group, the dummy for importer variable is significant at 1% with a coefficient of 0.43. Importers are 43% more likely to export than would the non-importer. Waiting for an import license in the infrastructure group has a negative effect on the probability of export. This significant IC variable supports the important effect of being an importer in the exporting decision. In the infrastructure variables group, the dummy for web page has the biggest effect on probability of export. Firms that have a web page are 45% more likely to export. The other variable of this group with a significant association with the probability of export is days of inventory of main input. That is, those firms that are able to store a larger number of days in their main input are associated with higher probability of being exporters. In the block of red tape, corruption, and crime, what matters with exports are the IC variables associated with the relations between government and private sector. Dummy for conflict with a court involved and dummy for payments to obtain a contract with the government are negatively associated with the probability of export. In the finance and corporate governance block, the main contributor is the new fixed assets financed by equity. In addition, our estimation results indicate that both the probability of export and the volume of export increase significantly with firm size.

Export experience is the most important determinant of the volume of export. This variable is significant at 1% with a coefficient of 0.86. A 1% increase in exporting experience causes 0.86% increase in the mean volume of export. This coefficient is larger than all of the significant IC variables in the model. The other variable of interest in the control group is the dummy for more than 5 competitors. This variable could be an indicator of the degree of competitiveness in the domestic market. Having more than 5 competitors is associated with a 42% increase in the volume of export. The biggest contributor to volume of export in the IC variables is the dummy for external auditory in finance group. Having external auditory is associated with a 32% increase in the volume of export.

We obtain our TFP measures nonparametrically using Solow residuals. This nonparametric estimation method eliminates the endogeneity problem because of simultaneous determination of factor inputs and productivity. On the other hand, we still have the endogeneity problem of productivity variable in an export equation. Escribano and Guasch (2005 and 2008) methodology depends on instrumenting productivity because of its endogeneity. They use either the industry-region-size averages or exogenous IC variables as instruments. In this paper, we follow a different approach. We use sales to proxy productivity. This is a common methodology applied in the literature.[10] We have past values of sales in our data. Using a lag value of sales on the right-hand side of a regression eliminates the reverse causation problem. Obviously, while past sales should explain variation in firm performance, current performance of firm has no impact on past sales. This solves reverse causality problem.

In Table 6, we use logarithm of sales three years ago as a proxy for productivity. In column (1) we estimate the model with all of the firms in our sample. The results are similar to previous estimations in Table 5.

[TABLE 6 ABOUT HERE]

One reason for endogeneity is related to the choice of location of the firms. Firms with better performance choose their locations according to the quality of the IC. To see if this is significant, we present the results by restricting the sample to domestic, small, and medium firms that are less likely to move. Those firms are located at the place of birth or at the residence of the firm owner. Large and foreign firms are more likely to select their locations. The results are very robust in column (2).

Using firm-level data allow us to analyze the differential effects of IC across firm size. We estimate equations (3.4) and (3.5) on large firm size subsample. We report the results in column (3) of Table 6. First, note that the exporting experience is always significant at 1%. Second, small and medium firms are more credit constrained. Third, productivity is an important determinant in the volume of export which is independent from the firm size. Higher productivity is an indicator of domestic firms' ability to compete in the international market.

After analyzing the effects of individual IC variables, we go one step further and look at the joint relative importance of IC blocks on firms' export performance. This ranking can support policymakers to plan policies for expanding exports of firms. We evaluate the contribution of each IC groups by excluding the dummies, constant term and the residuals.

[FIGURE 2 ABOUT HERE]

[10] See, for example, Helpman et al. (2004) and Eaton et al. (2008).

Figure 2 presents the percentage contribution of each IC group relative to the sample mean of our dependent variable in the selection stage of Heckman model. All the contributions could be interpreted as the relative importance of each IC blocks. As it is clear from Figure 2, export market entry decisions of firms is mainly affected by infrastructure in Turkey. This block is followed by quality, innovation and labor skills; productivity and other control variables. Finance and red tape, corruption and crime have relatively small effects. Improving the quality of infrastructural factors is necessary to increase the number of Turkish firms in the international market. In addition, facilitating firms' technological progress can be considered as a complementary second step. On the other hand, relative importance of infrastructure and red tape, corruption, and crime decrease for the level of export as represented in Figure 3. We find that the manufacturing export intensity is first determined by productivity (32%), and then by export experience (23%), which is included in other control variables.

[FIGURE 3 ABOUT HERE]

3.6 Conclusion

In this study, we have employed Heckman model to measure the competitive restrictions of the exporters of Turkish manufacturing sector in terms of the IC variables. We use firm-level data for the manufacturing sector based on the World Bank's ICs of Turkey in 2008. The database includes the IC, control, perception, and production function variables of each firm.

Our findings indicate that infrastructure and quality, innovation and labor skills groups of IC are the two most important factors for the export market entry decisions of the firms while productivity (TFP) and the export experience of the firms are the main determinants for the survival of the firms in international market. Hence, Turkish authorities need to implement policies to improve the quality of IC in infrastructure and quality, innovation and labor skills in order for more firms to be exporters in the manufacturing sector. On the other hand, one can say that promoting productivity (TFP) is required to provide a sustainable export growth in the sector. Another interesting finding is that small and medium firms are more credit constrained.

Appendix A

Appendix to Chapter 1

A.1 Figures and Tables

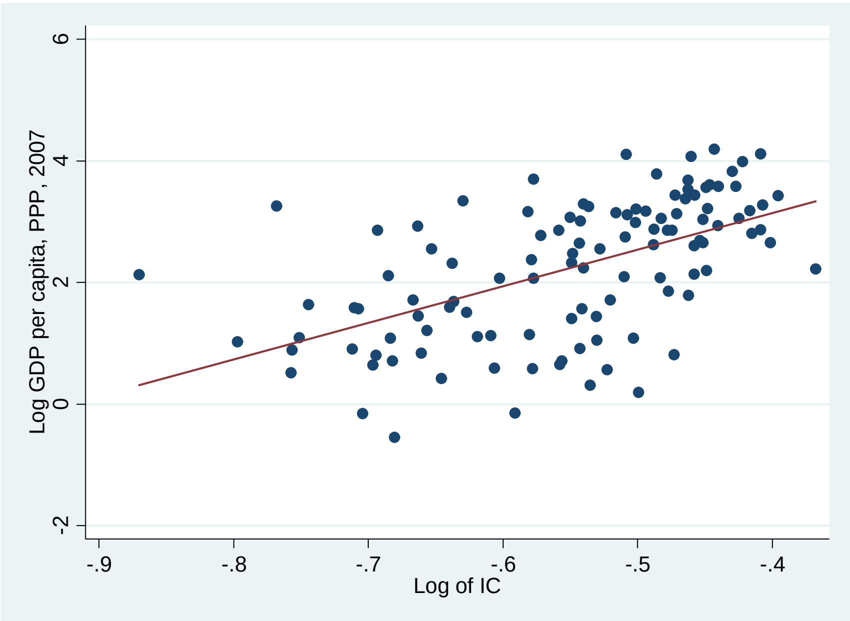

Figure 1: Income and Investment Climate (IC)

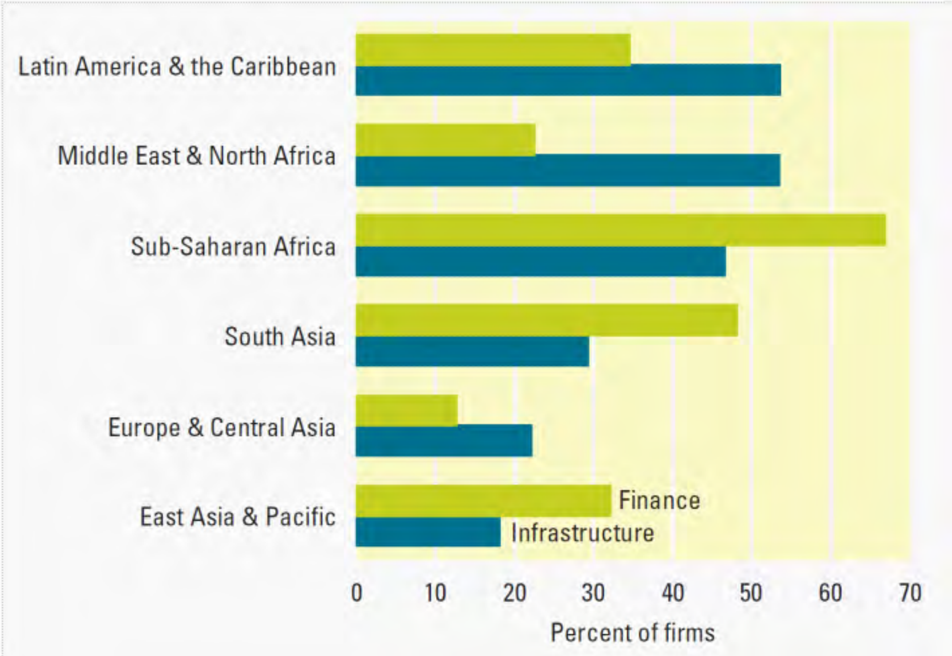

Figure 2: Severity of the Inadequacies of Finance and Infrastructure in Developing Countries (Source: World Bank Investment Climate Surveys)

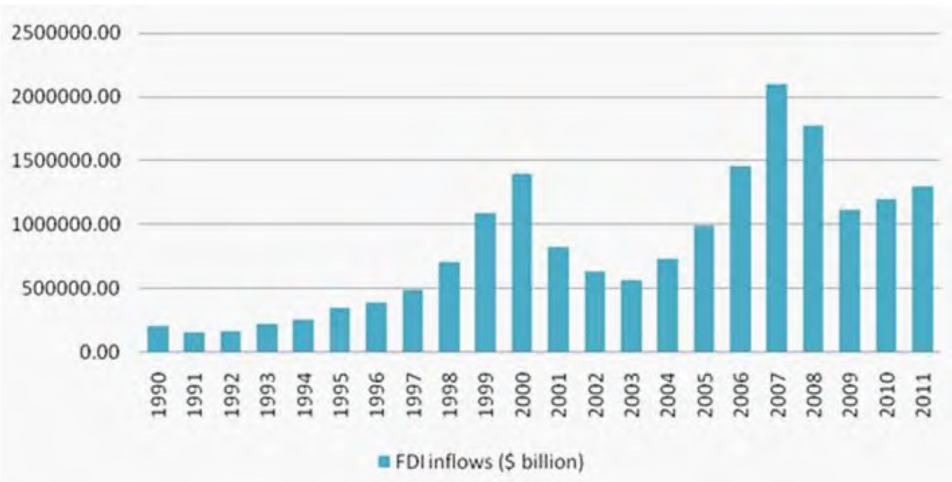

Figure 3: World FDI Inflows, 1990-2011

Table 1: Descriptive Statistics

	113 Countries		Africa		Asia		Latin America		Eastern Europe	
	Mean	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
Log GDP per capita in 2007	2.2379	1.1299	1.2807	0.9262	2.0689	0.7714	2.8979	.8785	3.2561	.5881
Investment climate	.57988	.05864	.5474	.05	.5553	.0593	.6141	.0452	.6187	.0382
Infrastructure	.5961	.0850	.5563	.0733	.5602	.0822	.6398	.0822	.6488	.04841
Red tape, corruption and crime	.9045	.0270	.8894	.0284	.9095	.0283	.9114	.0167	.9155	.0247
Finance	.5371	0642	.5069	.0531	.5164	.091	.5688	.034	.5708	.0355
Human capital	1.5624	.7161	1.2971	.6468	1.4476	.5292	1.6576	.8358	2.0566	.5985
Local technology	.0028	.0069	.0005	.0032	.0030	.0073	n/a	n/a	.0109	.0102
Average investment	22.9	9.07	20.6	8.55	22.9	9.03	26	10.94	22.24	4.98
Average population growth	1.34	1.21	2.48	.8244	1.14	.8469	1.106	.8281	-.2146	.5463

NOTES: Infrastructure, corruption and crime and finance are components of investment climate (IC). A higher score in IC, human capital and local technology means better IC, human capital and local technology respectively. The investment (s) and population growth (n) rates are averages for the period 2000-2010.

Table 2: OLS Regressions

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	Dependent variable is log GDP per capita in 2007						
ln(Investment climate)			6.028***	3.004***		3.730***	0.3464
			[0.893]	[0.880]		[0.813]	
ln(Human capital and local tech)					2.694*	0.615	0.0228
					[1.634]	[1.187]	
ln(Human capital)		10.14***		3.060			
		[2.133]		[1.909]			
ln(λ_h+x-λ)		-6.161***		-0.991			
		[1.792]		[1.351]			
ln(s)	0.768***			0.778***	0.785***	0.639***	0.2176
	[0.177]			[0.190]	[0.178]	[0.190]	
ln(n+x+δ)	-0.910***			-0.658***	-0.864***	-0.700***	-0.4374
	[0.126]			[0.112]	[0.127]	[0.114]	
Constant	0.510	1.446***	5.555***	1.549	-6.016	1.342	
	[0.555]	[0.314]	[0.481]	[0.985]	[4.031]	[3.187]	
R-squared	0.44	0.16	0.31	0.56	0.45	0.54	0.54
Implied α	0.43			0.43	0.43	0.38	0.38
Observations	113	113	113	113	113	113	113

NOTES: A higher score in IC, human capital and local technology means better IC, human capital and local technology respectively. The investment (s) and population growth (n) rates are averages for the period 2000-2010. Following Kim (2008), we take x=0.02. It is assumed that x+δ = 0.05 as in Mankiw et al. (1992). Column (7) shows beta coefficients. α is share of physical capital. All regressions are cross-sectional OLS with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance.

Table 3: Correlations of Measures of Institutions

	Investment Climate (IC)	Risk of Expropriation	The Rule of Law	Institutions Index	Social Infrastructure
Investment climate (IC)	1				
Risk of expropriation	0.1633**	1			
The rule of law	0.2347***	0.4842	1		
Institutions index	0.4012***	0.3671	0.8865	1	
Social infrastructure	0.4491***	0.4305	0.2475	0.4055	1

*** p<0.01, ** p<0.05, * p<0.1

Table 4: Correlations of Institutions and Instruments (Acemoglu et. al, 2001)

	Investment Climate (IC)	Average protection against expropriation risk	Settler Mortality
Investment climate (IC)	1		
Average protection against expropriation risk	0.2379	1	
Settler mortality-IV	-0.5752	-0.2191	1

Table 5: Correlations of Institutions of Instruments (Hall and Jones, 1999)

	Investment Climate (IC)	Social Infrastructure	Frac. of the Pop Speaking English	Frac. of the Pop Speaking other European Lang
Investment climate (IC)	1			
Social infrastructure	0.3296	1		
Pop speaking English-IV	0.5804	0.3541	1	
Pop speaking other European lang-IV	0.2307	0.2243	0.4226	1

Table 6: Correlations of Institutions and Instruments (Easterly and Levine, 2003)

	Investment Climate (IC)	Institutions Index	Landlocked	Latitude
Investment climate (IC)	1			
Institutions index	0.4043	1		
Landlocked-IV	-0.0318	-0.2406	1	
Latitude-IV	0.2525	0.4524	-0.014	1

Table 7: IV Regressions

	Ex-Colonies Sample (1)	Base Sample (2)	Easterly and Levine Sample (3)
	Dependent variable is log GDP per capita in 2007		
ln(Investment climate)	5.904**	11.30***	3.729***
	[2.952]	[2.233]	[1.363]
ln(Human capital and local tech)	-0.872	-3.605*	-0.233
	[1.504]	[2.053]	[1.644]
ln(s)	0.635*	0.343	0.659**
	[0.345]	[0.287]	[0.268]
ln(n+x+δ)	-1.03	-0.365***	-1.253**
	[0.686]	[0.132]	[0.548]
Constant	6.414	16.28***	3.981
	[4.791]	[6.132]	[3.999]
First Stage R-squared: IC	0.32	0.30	0.43
Partial R-squared: IC	0.0948	0.1616	0.4352
Partial R-squared F test (p-value): IC	0.0475	0	0
Hansen test (p-value)		0.3917	0.4918
Observations	60	113	53

NOTES: Instrumenting for investment climate (IC). Instrument in column (1) is log settler mortality. The regression is estimated using 60 countries (former colonies) out of 113 country "base" sample due to the availability of log settler mortality data. Instruments in column (2) are fraction of the population speaking English, and fraction of the population speaking other European languages. Instruments in column (3) are settler mortality, latitude, landlocked and crops/mineral (10 variables). Settler mortality is the logarithm of annualized deaths per thousand of European soldiers. "First Stage R-squared: IC" is the R-squared from the regression of IC on both the included and excluded instruments. The "partial R-squared: IC" measures the squared partial correlation between the excluded instruments and the IC. "Partial R-squared F test (p-value): IC" is the p-value of the F-test of joint significance of the excluded instruments that corresponds to the partial R-squared. "Hansen test (p-value)" shows the p-value of the Hansen test of overidentifying restrictions. The null hypothesis is that the instruments are valid instruments, that is, uncorrelated with the error term, and therefore the excluded instruments are correctly excluded from the estimated equation. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 8: IV Regressions (IC vs Average Protection against Expropriation Risk)

	(1)	(2)
	log GDP per capita in 1995	
ln(Investment climate)	8.059***	
	[1.546]	
Average protection against expropriation risk		2.523
		[1.657]
Constant	12.31***	-7.688
	[0.833]	[10.21]
First Stage R-squared: IC	0.31	0.0356
Partial R-squared: IC	0.3319	0.048
Partial R-squared F test (p-value): IC	0	0.1991
Hansen test (p-value)		
Observations	48	48

NOTES: Instrumenting for IC using log settler mortality. The regression is estimated using 48 countries (developing former colonies) out of 113 country "base" sample due to the availability of log settler mortality and IC data. Settler mortality is the logarithm of annualized deaths per thousand of European soldiers. Average protection against expropriation risk is the mean value (1985-1995) for the risk of expropriation of private foreign investment by government, from 0 to 10, where a higher score means less risk. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 9: Robustness to Geography (Rodrik et al., 2004)

	Baseline	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		IV Regressions: Dependent variable is log GDP per capita in 2007						
ln(Investment climate)	11.30***	13.19***	9.989***	8.210***	11.78***	9.314***	10.20***	9.058***
	[2.233]	[2.740]	[1.674]	[1.466]	[2.006]	[1.780]	[1.587]	[2.390]
ln(Human capital and local tech)	-3.605*	-4.551**	-1.569	-0.134	-4.913**	-2.585	-3.591**	-3.263
	[2.053]	[2.322]	[1.203]	[1.214]	[2.142]	[1.838]	[1.761]	[2.549]
ln(s)	0.343	0.31	0.654*	0.680**	0.407	0.285	0.249	0.51
	[0.287]	[0.335]	[0.335]	[0.285]	[0.321]	[0.316]	[0.460]	[0.497]
ln(n+x+δ)	-0.365***	0.0201	-0.31	-0.430**	0.022	-0.149	-0.283	-0.103
	[0.132]	[0.282]	[0.226]	[0.191]	[0.262]	[0.184]	[0.303]	[0.326]
Distance from the equator		0.0167						-0.0321
		[0.0133]						[0.0320]
Area under tropics			-0.294					-1.059
			[0.350]					[0.709]
Access to sea				-0.453*				-0.487
				[0.274]				[0.296]
Days under frost					0.0353*			0.193
					[0.0194]			[0.118]
Area under frost						0.673*		-2.735*
						[0.372]		[1.524]
Temperature							-0.0382	0.0196
							[0.0442]	[0.0721]
First Stage R-squared: IC	0.30	0.30	0.31	0.31	0.37	0.37	0.36	0.44
Partial R-squared: IC	0.1616	0.1547	0.2188	0.2224	0.189	0.2198	0.2834	0.2409
Partial R-squared F test (p-value): IC	0	0	0	0	0	0	0	0
Hansen test (p-value)	0.3917	0.1198	0.3789	0.6675	0.1532	0.2925	0.1342	0.3007
Observations	113	110	82	81	101	89	67	58

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Geography control variables (distance from the equator, area under tropics, access to sea, days under frost, area under frost and temperature) are from Rodrik et al. (2004). Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 10: Robustness to Geography (Acemoglu et al., 2001)

	Baseline	(1)	(2)	(3)	(4)	(5)	(6)
		IV Regressions: Dependent variable is log GDP per capita in 2007					
ln(Investment climate)	11.30***	13.68***	9.785***	10.48***	8.963***	9.755***	11.49***
	[2.233]	[3.006]	[1.808]	[1.929]	[1.439]	[1.585]	[2.649]
ln(Human capital and local tech)	-3.605*	-5.150*	0.22	-1.873	-1.196	-1.133	-3.179
	[2.053]	[2.907]	[1.612]	[1.847]	[1.263]	[1.370]	[2.845]
ln(s)	0.343	0.353	0.379	0.481	0.32	0.411	0.367
	[0.287]	[0.375]	[0.306]	[0.312]	[0.260]	[0.297]	[0.307]
ln(n+x+δ)	-0.365***	-0.012	-0.357***	-0.406***	-0.478***	-0.438***	0.162
	[0.132]	[0.315]	[0.126]	[0.145]	[0.139]	[0.110]	[0.277]
Temperature variables		(0.1321)					(0.1599)
Humidity variables			(0.1037)				(0.0587)
Soil quality				(0.5467)			80.5830)
Natural resources					(0.0044)		(0.0003)
Dummy for being landlocked						0.0229	-0.0837
						[0.248]	[0.236]
First Stage R-squared: IC	0.30	0.50	0.37	0.39	0.37	0.38	0.50
Partial R-squared: IC	0.1616	0.1439	0.2209	0.2297	0.2703	0.2392	0.1501
Partial R-squared F test (p-value): IC	0	0.0001	0	0	0	0	0.0015
Hansen test (p-value)	0.3917	0.2416	0.6521	0.3714	0.5008	0.4532	0.224
Observations	113	97	97	97	92	99	92

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Geography control variables are from Acemoglu et al. (2001). The temperature and humidity variables are average, minimum, and maximum monthly high temperatures, and minimum and maximum monthly low temperatures, and morning minimum and maximum humidity, and afternoon minimum and maximum humidity. Measures of soil quality/climate are steppe (low latitude), desert (low latitude), steppe (middle latitude), desert (middle latitude), dry steppe wasteland, desert dry winter, and highland. Measures of natural resources are percent of world gold reserves today, percent of world iron reserves today, percent of world zinc reserves today, number of minerals present in country, and oil resources (thousands of barrels per capita). Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance and p-values for joint significance tests are in parentheses. Detailed variable definitions and sources are given in the data appendix.

Table 11: Robustness to Health (McArthur and Sachs, 2001)

	Baseline	(1)	(2)	(3)	(4)	(5)	(6)
		IV Regressions: Dependent variable is log GDP per capita in 1995					
		Instrumenting only for IC			Instrumenting for IC and Health		
ln(Investment climate)	11.30***	7.345*	6.881**	7.386*	8.617**	7.303**	7.696**
	[2.233]	[3.796]	[3.413]	[4.044]	[3.422]	[3.407]	[3.443]
ln(Human capital and local tech)	-3.605*	1.309	1.629	1.444	2.186	2.344	-2.619
	[2.053]	[2.231]	[3.021]	[3.083]	[2.737]	[5.039]	[9.077]
ln(s)	0.343	0.326	0.275	0.324	0.434	0.292	0.513
	[0.287]	[0.471]	[0.443]	[0.484]	[0.607]	[0.498]	[0.601]
ln(n+x+δ)	-0.365***	-0.703**	-0.670**	-0.709**	-0.904*	-0.742	-0.649
	[0.132]	[0.341]	[0.323]	[0.348]	[0.522]	[0.492]	[0.538]
Life expectancy		-0.0127		-0.0115	-0.0315		-0.0734
		[0.0320]		[0.0336]	[0.0411]		[0.0923]
Infant mortality			0.00242	0.000544		0.00445	-0.0189
			[0.00849]	[0.00941]		[0.0133]	[0.0343]
First Stage R-squared: IC	0.30	0.44	0.45	0.44	0.44	0.44	0.44
Partial R-squared: IC	0.1616	0.1276	0.1406	0.1162	0.3769	0.3769	0.3769
Partial R-squared F test (p-value): IC	0	0.0178	0.0055	0.0193	0	0	0
Hansen test (p-value)	0.3917	0.6439	0.6173	0.6496	0.9448	0.8365	0.8884
Observations	113	45	45	45	45	45	45

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Health variables and instruments for health variables are from McArthur and Sachs (2001). Column (1)-(3) instrument only IC and consider health as exogenous. Column (4)-(6) consider health endogenous and include average temperature, amount of territory within 100 km of the coast, and latitude as instruments. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 12: Robustness to Integration

	Baseline	(1)	(2)	(3)	(4)	(5)	(6)
		IV Regressions: Dependent variable is log GDP per capita in 1995					
		Instrumenting with FR IV			Instrumenting with RST IV		
ln(Investment climate)	11.30***	9.636***	9.683***	7.983***	9.633***	9.672***	8.094***
	[2.233]	[1.931]	[1.920]	[1.427]	[1.932]	[1.918]	[1.455]
ln(Human capital and local tech)	-3.605*	-2.623	-2.5	-4.110**	-2.718	-2.614	-4.226**
	[2.053]	[1.752]	[1.781]	[1.870]	[1.778]	[1.812]	[1.943]
ln(s)	0.343	0.158	0.152	0.169	0.175	0.169	0.191
	[0.287]	[0.366]	[0.365]	[0.354]	[0.368]	[0.367]	[0.368]
ln(n+x+δ)	-0.365***	-0.129	-0.104	-0.255**	-0.14	-0.119	-0.261**
	[0.132]	[0.155]	[0.171]	[0.106]	[0.155]	[0.169]	[0.106]
Integration		0.357	0.404		0.317	0.357	
		[0.317]	[0.330]		[0.315]	[0.326]	
Land area			2.53E-08			2.04E-08	
			[4.85e-08]			[4.58e-08]	
Real openness				0.311			0.266
				[0.277]			[0.293]
First Stage R-squared: IC	0.30	0.33	0.32	0.36	0.33	0.32	0.36
Partial R-squared: IC	0.1616	0.2278	0.2269	0.2574	0.2242	0.2230	0.2554
Partial R-squared F test (p-value): IC	0	0	0	0	0	0	0
Hansen test (p-value)	0.3917	0.4855	0.4707	0.2494	0.5299	0.5148	0.2633
Observations	113	82	82	77	82	82	77

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Integration is trade to GDP and real openness is trade to GDP on a PPP basis. Land area is the area of the country. Integration is an endogenous variable. In columns (1)-(3) the instrument for integration is from Frankel and Romer (1999). In columns (4)-(6) the instrument for integration is from Rodrik et al. (2001) and derived by re-estimating the gravity equation in Frankel and Romer (1999) with the left-hand side variable defined as nominal bilateral trade to nominal GDP. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 13: Robustness to Macro Policy

	Baseline	(1)	(2)	(3)	(4)
		IV Regressions: Dependent variable is log GDP per capita in 2007			
ln(Investment climate)	11.30***	11.10***	11.40***	8.550***	6.289***
	[2.233]	[2.310]	[2.320]	[1.956]	[1.288]
ln(Human capital and local tech)	-3.605*	-3.574*	-3.577*	-3.178	-4.17
	[2.053]	[2.026]	[2.023]	[2.024]	[2.778]
ln(s)	0.343	0.38	0.329	0.371	0.555
	[0.287]	[0.290]	[0.306]	[0.396]	[0.358]
ln(n+x+δ)	-0.365***	-0.385***	-0.363***	-1.031**	-1.297***
	[0.132]	[0.129]	[0.133]	[0.456]	[0.310]
Inflation		-0.0159			-0.0682
		[0.147]			[0.233]
Government consumption			0.00244		-0.0123
			[0.0142]		[0.0126]
Exchange rate overvaluation				-0.00158	-0.00278**
				[0.00176]	[0.00121]
First Stage R-squared: IC	0.30	0.29	0.30	0.37	0.38
Partial R-squared: IC	0.1616	0.1513	0.1587	0.2885	0.3295
Partial R-squared F test (p-value): IC	0	0	0	0	0
Hansen test (p-value)	0.3917	0.4279	0.3875	0.1439	0.1913
Observations	113	109	113	56	56

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Macroeconomic policy variables are log average inflation, government consumption defined over 2000–2010, and exchange rate overvaluation defined over 1960-1997. They are taken from World Development Indicator, Penn World Tables (PWT) and Acemoglu and Johnson (2005) respectively. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions and sources are given in the data appendix.

Table 14: Robustness to Other Controls

	Baseline	(1)	(2)	(3)	(4)	(5)	(6)
		IV Regressions: Dependent variable is log GDP per capita in 2007					
ln(Investment climate)	11.30***	11.55***	11.41***	10.14***	9.810***	9.272***	11.82***
	[2.233]	[4.192]	[2.799]	[2.072]	[2.475]	[1.631]	[2.389]
ln(Human capital and local tech)	-3.605*	-2.497	-1.572	-0.99	-2.723	-1.328	-2.439
	[2.053]	[2.695]	[1.883]	[1.403]	[1.976]	[1.341]	[1.963]
ln(s)	0.343	0.369	0.622*	0.643**	0.332	0.435	0.347
	[0.287]	[0.342]	[0.357]	[0.309]	[0.264]	[0.305]	[0.361]
ln(n+x+δ)	-0.365***	-0.403	-0.356*	-0.405**	-0.322**	-0.415***	-0.129
	[0.132]	[0.261]	[0.203]	[0.192]	[0.157]	[0.111]	[0.189]
Religion		(0.8012)					
Ethnolinguistic fragmentation			0.364				
			[0.604]				
Capitalist system indicator				0.023			
				[0.0796]			
Continent dummies					(0.4464)		
British colonial dummy						-0.0346	
						[0.259]	
French colonial dummy						-0.304	
						[0.362]	
French legal origin							-0.600*
							[0.329]
First Stage R-squared: IC	0.30	0.39	0.36	0.28	0.33	0.37	0.39
Partial R-squared: IC	0.1616	0.0874	0.1844	0.1834	0.1450	0.2450	0.1892
Partial R-squared F test (p-value): IC	0	0.0015	0.0006	0	0.0005	0	0
Hansen test (p-value)	0.3917	0.6364	0.4174	0.8748	0.3370	0.3266	0.8238
Observations	113	97	78	84	113	99	99

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance and p-values for joint significance tests are in parentheses. Detailed variable definitions and sources are given in the data appendix.

Table 15: IV Regressions with Different Human Capital and ICI

	Baseline	(1)	(2)
	Dependent variable is log GDP per capita in 2007		
ln(Investment climate)	11.30***	10.08***	13.23***
	[2.233]	[1.988]	[2.674]
ln(Human capital and local tech)	-3.605*	0.137	-4.012*
	[2.053]	[0.0890]	[2.229]
ln(s)	0.343	0.596	0.379
	[0.287]	[0.446]	[0.269]
ln(n+x+δ)	-0.365***	-0.0864	-0.411***
	[0.132]	[0.511]	[0.137]
First Stage R-squared: IC	0.30	0.41	0.31
Partial R-squared: IC	0.1616	0.1839	0.171
Partial R-squared F test (p-value): IC	0	0	0
Hansen test (p-value)	0.3917	0.5518	0.454
Observations	113	56	113

NOTES: Instrumenting for investment climate (IC). Instruments are fraction of the population speaking English, and fraction of the population speaking other European languages. IC in column (2) is calculated from the mean value of each country. Instruments evaluation is the same for Table 7. All regressions are cross-sectional with one observation per country. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance and p-values for joint significance tests are in parentheses. Detailed variable definitions and sources are given in the data appendix.

A.2 Proof

Proof of Proposition 1:

- $\frac{\partial y^{j*}}{\partial IC_I^{j*}} = \frac{\gamma}{1-\alpha}\left(IC_I^{j*}\right)^{\frac{\gamma+\alpha-1}{1-\alpha}}\left(\frac{\lambda_h^j}{\lambda_h^j+x-\lambda^j}(1+x)^t A_0\right)^{\frac{1}{1-\alpha}}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{\alpha}{1-\alpha}} > 0$. Since $\alpha \in (0,1)$, $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial \lambda_h^j} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}}\left(\frac{1}{1-\alpha}\right)\left(\frac{x-\lambda^j}{\left(\lambda_h+x-\lambda^j\right)^2}\right)\left(\frac{\lambda_h}{\lambda_h+x-\lambda}\right)^{\frac{\alpha}{1-\alpha}}\left[(1+x)^t A_0\right]^{\frac{1}{1-\alpha}}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{\alpha}{1-\alpha}} > 0$. Since $\alpha \in (0,1)$, and $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial \lambda^j} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}}\left(\frac{1}{1-\alpha}\right)\left(\frac{\lambda_h}{\left(\lambda_h+x-\lambda^j\right)^2}\right)\left(\frac{\lambda_h}{\lambda_h+x-\lambda}\right)^{\frac{\alpha}{1-\alpha}}\left[(1+x)^t A_0\right]^{\frac{1}{1-\alpha}}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{\alpha}{1-\alpha}} > 0$. Since $\alpha \in (0,1)$, and $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial s^j} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}}\left(\frac{\lambda_h^j}{\lambda_h^j+x-\lambda^j}(1+x)^t A_0\right)^{\frac{1}{1-\alpha}}\frac{\alpha}{1-\alpha}\left(\frac{1}{n^j+x+\delta}\right)\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{2\alpha-1}{1-\alpha}} > 0$. Since $\alpha \in (0,1)$, $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial n^j} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}}\left(\frac{\lambda_h^j}{\lambda_h^j+x-\lambda^j}(1+x)^t A_0\right)^{\frac{1}{1-\alpha}}\frac{\alpha}{1-\alpha}\left(\frac{-s}{(n^j+x+\delta)^2}\right)\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{2\alpha-1}{1-\alpha}} < 0$. Since $\alpha \in (0,1)$, $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial \delta} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}} \left(\frac{\lambda_h^j}{\lambda_h^j+x-\lambda^j}(1+x)^t A_0\right)^{\frac{1}{1-\alpha}} \frac{\alpha}{1-\alpha}\left(\frac{-s}{(n^j+x+\delta)^2}\right)\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{2\alpha-1}{1-\alpha}} <$ 0. Since $\alpha \in (0,1)$, $\lambda^j \in [0,x)$.

- $\frac{\partial y^{j*}}{\partial x} = \left(IC_I^{j*}\right)^{\frac{\gamma}{1-\alpha}} \left\{ \begin{array}{c} \frac{1}{1-\alpha}\frac{-\lambda_h}{\left(\lambda_h+x-\lambda^j\right)^2}\left(\frac{\lambda_h}{\lambda_h+x-\lambda^j}\right)^{\frac{\alpha}{1-\alpha}}\left[(1+x)^t A_0\right]^{\frac{1}{1-\alpha}}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{\alpha}{1-\alpha}} \\ + \left[\begin{array}{c} \frac{1}{1-\alpha}t(1+x)^{t-1}A_0\left((1+x)^t A_0\right)^{\frac{\alpha}{1-\alpha}}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{\alpha}{1-\alpha}} \\ +\frac{\alpha}{1-\alpha}\frac{-s}{(n^j+x+\delta)^2}\left(\frac{s^j}{n^j+x+\delta}\right)^{\frac{2\alpha-1}{1-\alpha}} \end{array}\right]\left(\frac{\lambda_h^j}{\lambda_h^j+x-\lambda^j}\right)^{\frac{1}{1-\alpha}} \end{array} \right\} <$ 0. Since $\alpha \in (0,1)$, $\lambda^j \in [0,x)$.

A.3 Variables

A.3.1 IC variables

IC-Infrastructure Variables

Days to clear customs to export: Average number of days to clear customs to export (log).

Days to clear customs to import: Average number of days to clear customs to imports (log).

Dummy for power outages: Dummy variable that takes value 1 if the plant has suffered any power outages during last year.

Number of power outages: Number of power outages suffered by the plant in last year (log).

Average duration of power outages: Average duration of power outages suffered by the plant in hours (log).

Total duration of power outages by year: Total duration of power outages suffered by the plant by month, in hours, conditional on the plat reports having power outages.

Losses due to power outages: Value of the losses due to the power outages as a percentage of sales (conditional on the plant reporting power outages).

Wait for a power supply: Current delay to obtain a power supply in days (log).

Dummy for own generator: Dummy variable taking value 1 if the firm has its own power generator.

Electricity from a generator: Percent of the electricity used by the plat provided by a own generator.

Dummy for insufficient water supply: Dummy variable that takes value 1 if the firm has experienced insufficient water supply for production during last year.

Water outages: Number of water outages suffered by the plant in last year (log).

Average duration of water outages: Average duration of water outages suffered by the plant in hours (log).

Total duration of water outages by year: Total duration of water outages suffered by the plant by month in hours, conditional on the plant reports having water outages.

Wait for a water supply: Current delay to obtain a water connection in days (log).

Wait for a phone connection: Current delay to obtain a phone connection in days (log).

Dummy for webpage: Dummy variable that takes value 1 if the plant has a website.

Dummy for e-mail: Dummy variable that takes value 1 if the plant uses email.

Shipment losses, exports: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the international market.

Shipment losses, domestic: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the domestic market.

Days of inventory of main input: Number of days of inventory of the main input (log).

Wait for an import license: Current delay to obtain an import license related in days (log).

IC-Red Tape, Corruption and Crime Variables

Dummy for conflicts with clients with a court involved: Dummy variable that takes value 1 if the conflict of the firm with clients solved in courts were generally enforced.

Manager's time spent in bureaucratic issues: Percentage of managers' time spent in dealing with bureaucratic issues.

Weeks to bureaucracy: Managers' time spent in dealing with bureaucratic issues in weeks (log).

Number of inspections: In the last year, total number of inspections (log).

Number of working days spent with inspections: Number of working days spent with inspections (log).

Dummy for tax inspections: Dummy variable that takes value 1 if the firm has been visited by tax officials during last year.

Number of tax inspections: Total number of inspections of tax officials received by the plant in 2007 (log).

Number of working days spent with tax inspections: Number of working days spent with tax inspections (log).

Dummy for gifts in tax inspections: Gifts expected or requested in inspections with tax officials.

Dummy for payments to obtain a contract with the government: Dummy variable that takes value 1 if in plant's sector it is common to pay an extra amount of money in order to obtain a contract with the government.

Payments to obtain a contract with the government: Illegal payment in order to obtain a contract with the government. Related as percentage of contract value.

Dummy for payments to deal with bureaucratic issues: Dummy that takes value 1 if firms in the main sector occasionally need to give gifts or make informal payments to public officers in order to "get things done" with regard to customs, taxes, licenses, legislations, services, etc.

Wait for an operation license: Actual delay to obtain a main operating license in days (log).

Dummy for gifts to obtain an operating license: Gifts expected or requested to obtain an operating license, conditional on submit an operating license.

Dummy for security expenses: Dummy taking value 1 if the plant has security expenses.

Security expenses: Cost in security (equipment, staff, etc) (log).

Dummy for crime losses: Dummy variable that takes value 1 if the plant suffered any criminal attempt during last year.

Crime losses: Value of losses due to criminal activity (log).

Wait for a construction permit: Actual delay to obtain a construction related in days (log).

Dummy for gifts to obtain a construction permit: Gifts expected or requested to obtain a construction permit, conditional on submit a construction permit.

Number of permits: Number of permits obtained in last two years (log).

Validity of permits: Average validity, in months, of permits obtained (log).

Time spent with permits: Number of working days spent in obtaining all permits (log).

Wait for a permit: Days waiting for obtaining a permit (log).

Dummy for gift to obtain a permit: Gifts expected or requested to obtain a permit, conditional on submit a permit.

Dummy for compulsory certificate: Dummy variable that takes value 1 if the firm has to have any compulsory certificate to produce or sell any product.

Sales with compulsory certificates: Percentage of sales subject to compulsory certificates.

Number of compulsory certificates: Number of compulsory certificates obtained (log).

Time spent with compulsory certificates: Number of working days spent when obtaining compulsory certificates (log).

Wait for compulsory certificate: Days waiting for obtaining compulsory certificates (log).

Dummy for gift to obtain compulsory certificates: Gifts expected or requested to obtain a compulsory certificate, conditional on submit a compulsory certificate.

Dummy for gifts to obtain a power supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain an electrical connection, conditional on submit an electrical connection.

Dummy for gifts to obtain a water supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain a phone connection: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain an import license: Gifts expected or requested to obtain an import license, conditional on submit an import license.

IC-Finance Variables

Dummy for purchases paid after delivery: Dummy variable that takes value 1 if any percentage of annual purchases are paid for after the delivery.

Purchases paid after delivery: Percentage of annual purchases paid for after the delivery.

Sales paid before delivery: Percentage of annual sales paid for before the delivery.

Sales paid on delivery: Percentage of annual sales paid for before the delivery.

Sales paid after delivery: Percentage of annual sales paid for after the delivery.

Dummy for purchase fixed assets: Dummy variable that takes value 1 if the firm has purchaser fixed assets during last year.

New fixed assets financed by internal founds: Percentage of firm's working capital financed with funds from informal sources.

New fixed assets financed by equity: Percentage of firm's working capital financed with funds from equity.

New fixed assets financed by private banks: Percentage of investments in new fixed assets financed with funds from private commercial banks.

New fixed assets financed by state-owned banks: Percentage of investments in new fixed assets financed with funds state owned banks.

New fixed assets financed by trade credit: Percentage of investments in new fixed assets financed with credits from suppliers.

Dummy for checking or saving account: Dummy that takes value 1 if the firm has a saving account

Dummy for overdraft facility: Dummy that takes value 1 if the firm has access to an overdraft facility.

Dummy for loan: Dummy variable that takes value 1 if the plant reports that it has a bank loan.

Dummy for loan from state-owned banks: Dummy variable that takes value 1 if the firm has a loan from a state owned banks.

Dummy for loan from private banks: Dummy variable that takes value 1 if the firm has a loan from a domestic private commercial banks.

Dummy for loan from non-financial institutions: Dummy variable that takes value 1 if the firm has a loan from a non-financial institutions.

Dummy for loan with collateral: Dummy variable that takes value 1 if the loan is on collateral.

Value of the collateral: Value of the collateral as a percentage of the loan value (conditional on having a loan with collateral).

Dummy for land, buildings as collateral: Dummy that takes value 1 if the firm uses land or buildings as collateral (conditional on having a loan with collateral).

Dummy for machinery and equipment as collateral: Dummy that takes value 1 if the firm uses machinery or equipment as collateral (conditional on having a loan with collateral).

Dummy for accounts receivable and inventories as collateral: Dummy that takes value 1 if the firm uses accounts receivable or inventories as collateral (conditional on having a loan with collateral).

Dummy for personal assets as collateral: Dummy that takes value 1 if the firm uses personal assets as collateral (conditional on having a loan with collateral).

Dummy no loan because of complexity: Dummy that takes value 1 if the firm did not apply for loan because of its complexity.

Dummy no loan because of cost: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy no loan because of collateral: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy for rejected credit applications: Dummy variable that takes value 1 if a credit application has been rejected in the last year.

Dummy for external auditory: Dummy variable that takes value 1 if the plant uses an external auditory.

Largest shareholder: Percentage of firm's capital owned by the largest shareholder.

Dummy for subsidy: Dummy variable that takes value 1 if the firm receives any subsides from the national, regional and local government or EU.

IC-Innovation Variables

Dummy for quality certification: Dummy variable that takes value 1 if the plant has a quality certification.

Dummy for foreign technology: Dummy variable that takes value 1 if the firm used a licensed technology of a foreign company in the last year.

Dummy for new line of products: Dummy variable that takes value 1 if the plant has developed a new product or product line.

Sales of new products: Percentage of total sales corresponding with new products.

Dummy for product upgraded: Dummy variable that takes value 1 if the plant upgraded an existing product last year.

Dummy for R&D: Dummy that takes value 1 if the firm performed R&D activities during last year.

R&D expenditures as % of total sales: Total R&D expenditures as percentage of annual sales

IC-Human Capital Variables

Staff - nonproduction workers: Percentage of nonproduction workers in staff.

Staff - female workers: Percentage of female workers in firm's staff.

Staff - skilled workers: Percentage of skilled workers in firm's staff.

Staff - university education: Percentage of staff with at least one year of university.

Dummy for training: Dummy taking value one if the firm provides formal (beyond on the job) training to its employees.

Training to non-production workers: Percentage of non-production workers receiving formal (beyond on the job) training.

Experience of the manager: Number of years of experience of the manager in the establishment's sector (log).

A.3.2 Non IC variables and sources

1987 mean annual temperature in degrees Celsius. Source: McArthur and Sachs (2001).

Access to sea: Dummy variable taking value 1 for countries without access to the sea, 0 otherwise. Source: Rodrik, Subramanian and Trebbi (2004).

Africa continent dummy: Dummy variable taking value 1 if a country belongs to Africa, 0 otherwise.

Area under frost: Proportion of land with >5 frost-days per month in winter. Source: Masters and McMillan (2001).

Area under tropics: Percentage of tropical land area. Source: Gallup and Sachs (1998).

Asia continent dummy: Dummy variable taking value 1 if a country belongs to Asia, 0 otherwise.

Average protection against expropriation risk: Risk of expropriation of private foreign investment by government, from 0 to 10, where a higher score means less risk. Mean value for all years from 1985 to 1995. Source: This data was previously used by Knack and Keefer (1995) and was organized in electronic form by the IRIS Center (University of Maryland); originally Political Risk Services.

Capitalist System Indicator: Variable taking the value of 1 for countries that are categorized as capitalist or mixed-capitalist by the Freedom House (1994). Source: Hall and Jones (1999).

Crops/Minerals: A series of ten one-zero dummy variables of whether the country has ever had the following crops/minerals: bananas, coffee, copper, maize, millet,rice, rubber, silver, sugarcane, or wheat. Source: Easterly and Levine (2003).

Days under frost: Average number of frost-days per month in winter. Source: CID Harvard University (2002) from Masters and McMillan (2001).

Distance from the equator: Distance from Equator of capital city measured as abs(Latitude)/90. Source: World Bank (2002).

Dummy for landlocked: Dummy variable equal to 1 if country does not adjoin the sea. Source: Acemoglu, Johnson, and Robinson (2001).

British colonial dummy: Dummy variable indicating whether country was a British colony. Source: Acemoglu, Johnson, and Robinson (2001).

French colonial dummy: Dummy variable indicating whether country was a French colony. Source: Acemoglu, Johnson, and Robinson (2001).

Ethnolinguistic fractionalization (ELF): Average of five different indices of ethnolinguistic fragmentation. Source: Acemoglu, Johnson, and Robinson (2001).

Europe continent dummy: Dummy variable taking value 1 if a country belongs to Europe, 0 otherwise.

Exchange rate overvaluation defined over 1960-1997. Source: Acemoglu and Johnson (2005).

Fraction of the population speaking English. Source: Hall and Jones (1999).

Fraction of the population speaking one of the major languages of Western (English, French, German, Portuguese, or Spanish). Source: Hall and Jones (1999).

French legal origin dummy: Legal origin of the company law or commercial code of each country. Source: Acemoglu, Johnson, and Robinson (2001).

Government Consumption Share of PPP Converted GDP Per Capita at current prices. 2000-2010. Source: Penn World Tables (PWT).

Humidity Variables: Humidity variables are morning minimum, morning maximum, afternoon minimum, and afternoon maximum, all in percent. Source: Acemoglu, Johnson, and Robinson (2001).

Infant mortality rate (deahs per 1000 live births) in 1995. Source: McArthur and Sachs (2001).

Land area (thousands sq. mt.). Source: Frankel and Romer (1999).

Latin america and the carribean continent dummy: Dummy variable taking value 1 if a country belongs to LAC, 0 otherwise.

Latitude: Absolute value of the latitude of the country, scaled to take values between 0 and 1, where 0 is the equator. Source: La Porta et al (1999).

Life expectancy at birth in 1995. Source: McArthur and Sachs (2001).

Log of average inflation: 2000-2010. Source: World Development Indicator.

Natural logarithm of "real" openness: Real openness is given by the ratio of nominal imports plus exports to GDP in Purchasing-Power-Parity US dollars (PPP GDP). Source: Penn World Tables, Mark 5.6 and World Bank (2002).

Natural logarithm of openness: Openness is given by the ratio of (nominal) imports plus exports to GDP (in nominal US dollars). Source: Penn World Tables, Mark 6.

Natural logarithm of predicted trade shares: Computed as for natural logarithm of predicted trade shares except that the dependent variable in the bilateral trade (gravity) equation is nominal trade divided by nominal GDP (both in US dollars). Source: Rodrik, Subramanian and Trebbi (2004).

Natural logarithm of predicted trade shares: Computed following Frankel and Romer (1999) from a bilateral trade equation with "pure geography" variables. Source: Frankel and Romer (1999).

Natural Resources: Measures of natural resources are: percent of world gold reserves today, percent of world iron reserves today, percent of world zinc reserves today, number of minerals present in country, and oil resources (thousands of). Source: Acemoglu, Johnson, and Robinson (2001).

Proportion of land area withnin 100 km of the sea coast. Source: McArthur and Sachs (2001).

Religion Variables: Percentage of the population that belonged to the three most widely spread religions of the world in 1980 (or for 1990-95 for countries formed more recently). The four classifications are Roman Catholic, Protestant, Muslim, and "other". Source: Acemoglu, Johnson, and Robinson (2001).

Rule of Law index: Refers to 2001 and approximates for 1990's institutions. Source: Kaufmann, Kraay, and Zoido-Lobaton (2002).

Settler mortality: The logarithm of annualized deaths per thousand of European soldiers. Source: Acemoglu, Johnson, and Robinson (2001).

Social infrastructure: It is combination of two indexes. The first is an index of government anti-diversion policies (GADP) created from data assembled by a firm that specializes in providing assessments of risk to international investors, Political Risk Services. The second element of our measure of social infrastructure captures the extent to which a country is open to international trade. Source: Hall and Jones (1999).

Soil Quality: Measures of soil quality/climate are steppe (low latitude), desert (low latitude), steppe (middle latitude), desert (middle latitude), dry steppe wasteland, desert dry winter, and highland. Source: Acemoglu, Johnson, and Robinson (2001).

Temperature Variables: Temperature variables are average temperature, minimum monthly high, maximum monthly high, minimum monthly low, and maximum monthly low, all in centigrade. Source: Acemoglu, Johnson, and Robinson (2001).

Temperature: Average temperature (Celsius). Source: CID Harvard University (2002).

The institution index: Average of the six Kaufman, Kraay, and Zoido-Lobaton (1999) measures: (i) voice and accountability, (ii) political instability and violance, (iii) government effectiveness, (iv) regulatory burden, (v) rule of law, and (vi) graft, and (2) one of the three policy variables: inflation, trade openness, or real exchange rate overvaluation. Source: Easterly and Levine (2003).

Years of schooling: Years of schooling of the total population aged over 25. This variable is constructed as the average from 1960 through 2000; or for specific years as needed in the tables. Source: Barro, Robert J. and Jong-Wha Lee, International Data on Educational Attainment: Updates and Implications.

A.4 Construction of Investment Climate Index

A.4.1 Investment Climate Data

We use the World Bank's enterprise survey data of 113 developing and transition countries. The reason to use this data is because of its big coverage of firm characteristics and measures of firm performance. It is stratified by size, regions, and industries. Rich set of firm characteristics reduces the necessity of using panel data to solve the omitted variables problem. Specifically, the data set provides firm-level information on infrastructure, finance, red tape and corruption, human capital and innovation. This allows us to construct quality of IC, innovation and local technology variables in our model. There are both objective and subjective measures. We use objective measures because of the disadvantages of subjective measures like the effect of optimism and pessimism of respondents, different reference point of respondents, performance bias of the respondents, and differences in the willingness to report by the respondents. The survey questions are generally answered by top managers or owner of the firm sometimes in cooperation with accountant and human-resource manager of the company in face-to-face interviews. To reduce measurement error, particularly questions on corruption and accounting, confidentiality of answers are assured. In addition, to minimize coding and processing errors quality control procedures are developed.

Despite special attention is placed on the survey, missing observations and outliers are important problems regarding the data set. We have missing values both in performance and firm characteristics variables. Following the recent econometric methodology developed for the World Bank by Escribano and Guasch (2005, 2008), we replace the missing values of the variables by their industry, region, and size averages, which is the first step of the cleaning process (imputation method[1]). In the second step, we eliminate the outliers that are defined as those observations with ratios of material to sales and/or labor cost to sales larger than one. We are not replacing production function variables if all the production function variables are missing for a

[1] The method is called as ICA method. See Escribano and Pena (2009) for details of the method.

given firm. We deflate the nominal values using the appropriate year of the country's Producer Price Index (PPI).

Endogeneity of firm characteristics is another problem that we should solve while working with this data set. That is, the possibility of simultaneous determination of firm specific quality of IC, innovation, and local technology causes endogeneity in the estimation. Since we have data for just one year, we cannot use own lag values as instruments. That is why following the common methodology in this literature, we use the industry-region-size average of plant-level firm characteristics to reduce the degree of endogeneity of firm characteristics. On the other hand, using too many industry-region-size variables causes measurement errors and multicollinearity problem. Thus, we only substitute the missing values of firm characteristics. When the response rate of the variables is not large enough, we use industry-region-size imputation technique in order to keep as many observations as possible in the regression. Here, we gain efficiency maybe at the cost of some measurement errors.

A.4.2 Firm-Level Investment Climate Measure

We construct a relative measure, which ranks the firms based on the effect of IC. For example, as one dimension of infrastructure, we assign values to firms based on the insufficient provision of electricity. The one which is assigned the highest value in electricity dimension is the one which is affected most from the insufficient provision. We apply the same technique to all variables. The calculation of each firm-specific quality of IC variables requires the following three steps:

- Step 1: determination of the signs of each variable to be used in the variable calculation,
- Step 2: normalization of continuous variables into 0-1 variables,
- Step 3: combining the negative and positive series by taking the reverse of the negative series.

We apply the same steps to construct innovation and local technology variables in our model. See Escribano and Hacihasanoglu (2012) for details of these steps and the applications of the IC index.

A.5 Sample Countries and Years

Africa: Angola (2010), Benin (2009), Botswana (2010), Burkina Faso (2009), Burundi (2006), Cameroon (2009), Cape Verde (2009), Chad (2009), Congo (2009), Dominican Republic (2010), Eritrea (2009), Gabon (2009), Gambia (2006), Ghana (2007), Guinea (2006), Guinea Bissau (2006), Ivory Coast (2009), Kenya (2007), Lesotho (2009), Liberia (2009), Madagascar (2009), Malawi (2009), Mali (2010), Mauritius (2009), Mozambique (2007), Namibia (2006), Niger (2009), Nigeria (2007), Philippines (2009), Rwanda (2006), Senegal (2007), Sierra Leone (2009), South Africa (2007), Swaziland (2006), Tanzania (2006), Togo (2009), Uganda (2006), Zambia (2007).

Asia: Afghanistan (2008), Armenia (2009), Azerbaijan (2009), Bangladesh (2007), Bhutan (2009), Fiji (2009), Indonesia (2009), Kazakhstan (2009), Kyrgyz Republic (2009), LaoPDR (2009), Micronesia (2009), Mongolia (2009), Nepal (2009), Pakistan (2007), Russia (2009), Samoa (2009), Tajikistan (2008), Timor Leste (2009), Tonga

(2009), Turkey (2008), Uzbekistan (2008), Vanuatu (2009), Vietnam (2009), Yemen (2010).

Europe: Albania (2007), Belarus (2008), Bosnia and Herzegovina (2009), Bulgaria (2009), Croatia (2007), Czech Republic (2009), Estonia (2009), Fyr Macedonia (2009), Georgia (2008), Hungary (2009), Kosovo (2009), Latvia (2009), Lithuania (2009), Moldova (2009), Montenegro (2009), Poland (2009), Romania (2009), Serbia (2009), Slovak Republic (2009), Slovenia (2009), Ukraine (2008).

Latin America and the Caribbean: Antigua and Barbuda (2010), Argentina (2010), Bahamas (2010), Barbados (2010), Belize (2010), Bolivia (2010), Brazil (2009), Chile (2010), Colombia (2010), Costarica (2010), DRC (2010), Dominica (2010), Ecuador (2010), Elsalvador (2010), Grenada (2010), Guatemala (2010), Guyana (2010), Honduras (2010), Jamaica (2010), Mexico (2010), Nicaragua (2010), Panama (2010), Paraguay (2010), Peru (2010), St Kitts and Nevis (2010), St Lucia (2010), St Vincent and Grenadines (2010), Suriname (2010), Trinidad and Tobago (2010), Uruguay (2010), Venezuela (2010).

Appendix B

Appendix to Chapter 2

B.1 Figures and Tables

Figure 1: Discritization of Continuous Variables

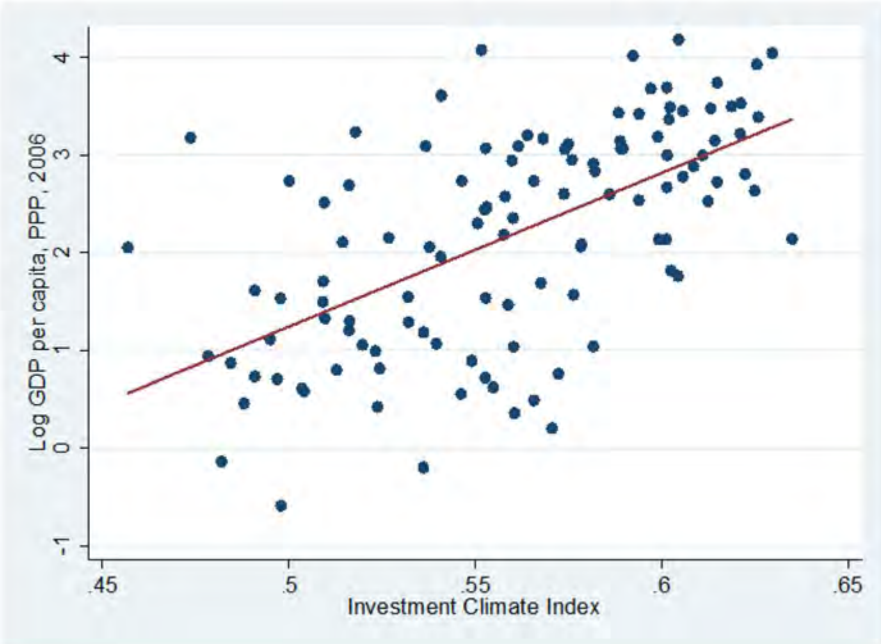

Figure 2: GDP Per Capita and Investment Climate (IC)

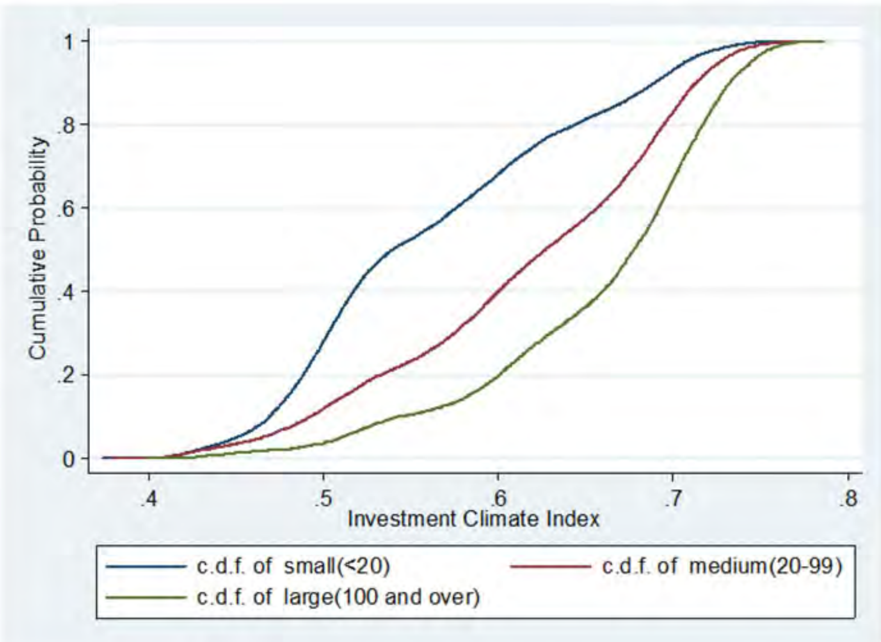

Figure 3: Cumulative Distribution Function of ICI for Different Sizes of the Firms

Table 1.1: Sign of the Investment Climate (IC) Variables: Infrastructures

#22 IC Variables	Expected Unconditional Sign	Sign in the Regressions: Block by Block Regression	Sign in the Regressions: Preliminary Export Equation	Sign in the Indices: Unconditional Index	Sign in the Indices: Conditional Index
Days to clear customs to export	--	++	++	-	+
Days to clear customs to import	-	-	-	-	-
Dummy for power outages	-	-	+	-	-
Number of power outages	--	++	++	-	+
Average duration of power outages	-	-	+	-	-
Total duration of power outages by year	-	-	+	-	-
Losses due to power outages	-	-	-	-	-
Wait for a power supply	--	++	++	-	+
Dummy for own generator	-	-	-	-	-
Electricity from a generator	-	-	-	-	-
Dummy for insufficient water supply	--	++	++	-	+
Number of water outages	-	-	+	-	-
Average duration of water outages	-	-	+	-	-
Total duration of water outages by year	--	++	++	-	+
Wait for a water supply	-	-	-	-	-
Wait for a phone connection	-	-	+	-	-
Dummy for webpage	+	+	+	+	+
Dummy for e-mail	+	+	+	+	+
Shipment losses, exports	--	++	++	-	+
Shipment losses, domestic	-	-	-	-	-
Days of inventory of main input	+	+	+	+	+
Wait for an import license	-	-	-	-	-

Table 1.2: Sign of the Investment Climate (IC) Variables: Red tape, Informality and Corruption

#35 IC Variables	Expected Unconditional Sign	Sign in the Regressions: Block by Block Regression	Sign in the Regressions: Preliminary Export Equation	Sign in the Indices: Unconditional Index	Sign in the Indices: Conditional Index
Dummy for conflicts with clients with a court involved	-	-	-	-	-
Manager's time spent in bureaucratic issues	-	dropped	-	-	-
Weeks to bureaucracy	-	-	-	-	-
Number of inspections	-	-	-	-	-
Number of working days spent with inspections	--	++	++	-	+
Dummy for tax inspections	--	++	++	-	+
Number of tax inspections	-	-	-	-	-
Number of working days spent with tax inspections	-	-	+	-	-
Dummy for gifts in tax inspections	-	-	-	-	-
Dummy for payments to obtain a contract with the government	-	-	-	-	-
Payments to obtain a contract with the government	-	-	-	-	-
Dummy for payments to deal with bureaucratic issues	-	+	-	-	-
Wait for an operation license	-	-	+	-	-
Dummy for gifts to obtain an operating license	-	-	-	-	-
Dummy for security expenses	--	++	++	-	+
Security expenses	--	++	++	-	+
Dummy for crime losses	--	++	++	-	+
Crime losses	--	++	++	-	+
Wait for a construction permit	--	++	++	-	+
Dummy for gifts to obtain a construction permit	--	++	++	-	+
Number of permits	-	-	-	-	-
Validity of permits	+	+	+	+	+
Time spent with permits	-	+	-	-	-
Wait for a permit	-	+	-	-	-
Dummy for gift to obtain a permit	--	++	++	-	+
Dummy for compulsory certificate	--	++	++	-	+
Sales with compulsory certificates	-	-	-	-	-
Number of compulsory certificates	-	-	-	-	-
Time spent with compulsory certificates	--	++	++	-	+
Wait for compulsory certificate	-	-	-	-	-
Dummy for gift to obtain compulsory certificates	-	-	-	-	-
Dummy for gifts to obtain a power supply	--	++	++	-	+
Dummy for gifts to obtain a water supply	-	+	-	-	-
Dummy for gifts to obtain a phone connection	--	++	++	-	+
Dummy for gifts to obtain an import license	-	-	-	-	-

Table 1.3: Sign of the Investment Climate (IC) Variables: Finance and Corporate Governance

#30 IC Variables	Expected Unconditional Sign	Sign in the Regressions: Block by Block Regression	Sign in the Regressions: Preliminary Export Equation	Sign in the Indices: Unconditional Index	Sign in the Indices: Conditional Index
Dummy for purchases paid after delivery	-	-	+	-	-
Purchases paid after delivery	-	-	-	-	-
Sales paid before delivery	+	+	+	+	+
Sales paid on delivery	+	+	-	+	+
Sales paid after delivery	+	+	+	+	+
Dummy for purchase fixed assets	+	+	-	+	+
New fixed assets financed by internal founds	+	+	-	+	+
New fixed assets financed by equity	+	+	+	+	+
New fixed assets financed by private banks	++	--	--	+	-
New fixed assets financed by state-owned banks	++	--	--	+	-
New fixed assets financed by trade credit	+	+	+	+	+
Dummy for checking or saving account	+	+	+	+	+
Dummy for overdraft facility	+	+	-	+	+
Dummy for loan	+	**dropped**	+	+	+
Dummy for loan from state-owned banks	+	+	-	+	+
Dummy for loan from private banks	+	+	+	+	+
Dummy for loan from non-financial institutions	+	+	+	+	+
Dummy for loan with collateral	++	--	--	+	-
Value of the collateral	+	-	+	+	+
Dummy for land, buildings as collateral	+	+	+	+	+
Dummy for machinery and equipment as collateral	+	-	-	+	-
Dummy for accounts receivable and inventories as collateral	+	+	+	+	+
Dummy for personal assets as collateral	++	--	--	+	-
Dummy no loan because of complexity	--	++	++	-	+
Dummy no loan because of cost	-	-	-	-	-
Dummy no loan because of collateral	-	-	-	-	-
Dummy for rejected credit applications	--	++	++	-	+
Dummy for external auditory	+	+	+	+	+
Largest shareholder	-	-	-	-	-
Dummy for subsidy	+	+	+	+	+

Table 1.4: Sign of the Investment Climate (IC) Variables: Quality, Innovation, and Labor Skills

#20 IC Variables	Expected Unconditional Sign	Sign in the Regressions: Block by Block Regression	Sign in the Regressions: Preliminary Export Equation	Sign in the Indices: Unconditional Index	Sign in the Indices: Conditional Index
Dummy for quality certification	+	+	+	+	+
Dummy for foreign technology	+	-	+	+	+
Dummy for new line of products	+	+	+	+	+
Sales of new products	++	--	--	+	-
Dummy for R&D	+	+	+	+	+
R&D expenditures as % of total sales	+	+	+	+	+
Staff with computer	+	+	+	+	+
Dummy for outsourcing	++	--	--	+	-
Dummy for discontinued	-	-	-	-	-
Dummy for product upgraded	+	+	+	+	+
Staff - production workers	+	-	+	+	+
Staff - nonproduction workers	++	--	--	+	-
Staff - female workers	+	+	+	+	+
Staff - skilled workers	+	+	+	+	+
Staff - unskilled workers	--	++	++	-	+
Staff - university education	++	--	--	+	-
Dummy for training	+	+	+	+	+
Training to production workers	+	-	+	+	+
Training to non-production workers	+	-	+	+	+
Experience of the manager	++	--	--	+	-

Table 1.5: Sign of the Investment Climate (IC) Variables: Other Control Variables

#15 IC Variables	Expected Unconditional Sign	Sign in the Regressions: Block by Block Regression	Sign in the Regressions: Preliminary Export Equation	Sign in the Indices: Unconditional Index	Sign in the Indices: Conditional Index
Dummy for incorporated company	++	--	--	+	-
Dummy for limited company	+	+	+	+	+
Dummy for FDI	+	+	+	+	+
Dummy for state-owned firm	-	-	+	-	-
Dummy for importer	+	+	+	+	+
Share of imports	+	+	+	+	+
Capacity utilization	+	+	+	+	+
Dummy for local monopoly	+	+	+	+	+
Dummy for less that 5 competitors	+	+	+	+	+
Dummy for more than 5 competitors	+	+	-	+	+
Dummy for increased sales	+	+	-	+	+
Dummy for decreased sales	-	+	-	-	-
Dummy for increased prices	-	+	-	-	-
Dummy for decreased prices	++	--	--	+	-
Dummy for informal competitors	-	-	-	-	-

Table 2: Number of IC Variables Used in Each Conditional Index

(1) Infrastructure		(2) Red tape and corruption		(3) Finance		(4) Quality		(5) Control	
Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
3	13	1	17	20	3	13	1	8	4

Table 3: Number of IC Variables Used in Each Unconditional Index

(1) Infrastructure		(2) Red tape and corruption		(3) Finance		(4) Quality		(5) Control	
Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
3	19	1	34	25	5	18	2	11	4

Table 4: Share of FPC

(1) Infrastructure		(2) Red tape and corruption		(3) Finance		(4) Quality		(5) Control	
Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative
n=3	n=14	n=2	n=21	n=16	n=12	n=13	n=7	n=10	n=6
48%	19%	53%	13%	13%	23%	19%	19%	14%	20%

Table 5: Descriptive Statistics

	Conditional ICI		Unconditional ICI	
IC Groups	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
Investment climate (positive)	.3102	.0959	.2877	.0913
Investment climate (negative)	.1447	.1047	.1318	.0781
Infrastructure (positive)	.5847	.2098	.5847	.2098
Infrastructure (negative)	.1076	.0942	.0948	.0901
Red tape, corruption and crime (positive)	.0598	.2372	.0598	.2372
Red tape, corruption and crime (negative)	.10442	.0857	.1351	.0904
Finance (positive)	.3476	.1231	.3282	.1319
Finance (negative)	.0361	.1049	.0401	.0838
Quality, innovation and labor skills (positive)	.2361	.1622	.1969	.1332
Quality, innovation and labor skills (negative)	.2236	.4169	.1373	.2341
Observations	903			

Notes: Investment climate (IC) is on a scale from 0 to 1, where a higher score means better investment climate. Infrastructure; corruption and crime; finance and quality, innovation and labor skills are components of IC. They are on a scale from 0 to 1, where a higher score means better corresponding index.

Table 6: ICI Coefficients with respect to the Probability of Exporting – OLS Estimation

Dependent Variable: Probability of Exporting	Conditional ICI		Unconditional ICI	
	Restricted TFP	Unrestricted TFP	Restricted TFP	Unrestricted TFP
	(1)	(2)	(3)	(4)
logTFP	0.0452**	0.0443**	0.0396*	0.0389*
	[0.0201]	[0.0197]	[0.0203]	[0.0200]
Infrastructure (positive)	0.333***	0.333***	0.310***	0.310***
	[0.0925]	[0.0926]	[0.0927]	[0.0928]
Infrastructure (negative)	-0.0636	-0.0624	0.136	0.137
	[0.192]	[0.192]	[0.217]	[0.217]
Red tape, corruption and crime (positive)	0.0988	0.0998	0.0887	0.0895
	[0.0713]	[0.0712]	[0.0733]	[0.0733]
Red tape, corruption and crime (negative)	-0.797***	-0.797***	-0.438*	-0.437*
	[0.254]	[0.255]	[0.252]	[0.252]
Finance (positive)	0.159	0.158	0.0934	0.0924
	[0.142]	[0.142]	[0.140]	[0.140]
Finance (negative)	-0.374*	-0.372*	-0.121	-0.121
	[0.198]	[0.198]	[0.226]	[0.226]
Quality, innovation and labor skills (positive)	0.508***	0.508***	0.505***	0.505***
	[0.127]	[0.127]	[0.152]	[0.152]
Quality, innovation and labor skills (negative)	-0.0482	-0.0485	-0.0755	-0.0754
	[0.0458]	[0.0458]	[0.0822]	[0.0822]
Age	-0.0439*	-0.0437*	-0.0449*	-0.0447*
	[0.0259]	[0.0259]	[0.0265]	[0.0265]
Dummy for medium-size firms	0.147***	0.148***	0.161***	0.162***
	[0.0453]	[0.0452]	[0.0451]	[0.0450]
Dummy for large-size firms	0.258***	0.259***	0.282***	0.283***
	[0.0531]	[0.0531]	[0.0512]	[0.0512]
R-squared	0.21	0.21	0.19	0.19
Observations	636	636	636	636

Notes: White's correction of heteroscedasticity is used. Each regression includes a set of industry and region dummies and a constant term. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions are given in the data appendix.

Table 7: ICI Coefficients with respect to the Probability of Exporting

	IV Estimation				OLS Estimation			
	Conditional ICI		Unconditional ICI		Conditional ICI		Unconditional ICI	
	Rest. TFP	Unrestr. TFP	Rest. TFP	Unrestr. TFP	Rest. TFP	Unrestr. TFP	Rest. TFP	Unrestr. TFP
Dependent variable: probability of exporting	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
logTFP	0.303*	0.305*	0.256	0.257	0.0415**	0.0406**	0.0390*	0.0382*
	[0.166]	[0.167]	[0.159]	[0.160]	[0.0202]	[0.0198]	[0.0204]	[0.0201]
Infrastructure (positive)	0.297***	0.300***	0.300***	0.303***	0.314***	0.314***	0.310***	0.310***
	[0.108]	[0.109]	[0.104]	[0.105]	[0.0912]	[0.0913]	[0.0916]	[0.0917]
Red tape, corruption and crime (negative)	-0.854***	-0.850***	-0.480*	-0.478*	-0.775***	-0.774***	-0.416*	-0.416*
	[0.263]	[0.264]	[0.247]	[0.248]	[0.248]	[0.248]	[0.239]	[0.239]
Quality, innovation and labor skills (positive)	0.533***	0.536***	0.494***	0.494***	0.529***	0.530***	0.538***	0.538***
	[0.132]	[0.133]	[0.160]	[0.161]	[0.126]	[0.126]	[0.150]	[0.150]
Age	-0.0690**	-0.0687**	-0.0665**	-0.0662**	-0.0446*	-0.0445*	-0.0468*	-0.0466*
	[0.0309]	[0.0312]	[0.0302]	[0.0304]	[0.0252]	[0.0252]	[0.0257]	[0.0257]
Dummy for medium-size firms	0.113*	0.117*	0.128**	0.132**	0.159***	0.159***	0.164***	0.165***
	[0.0622]	[0.0613]	[0.0577]	[0.0567]	[0.0441]	[0.0440]	[0.0442]	[0.0441]
Dummy for large-size firms	0.286***	0.290***	0.294***	0.298***	0.280***	0.280***	0.285***	0.285***
	[0.0591]	[0.0589]	[0.0544]	[0.0543]	[0.0517]	[0.0518]	[0.0505]	[0.0505]
Constant term	-0.32	-0.349	-0.201	-0.225	0.179	0.177	0.203	0.201
	[0.354]	[0.366]	[0.336]	[0.349]	[0.139]	[0.140]	[0.141]	[0.141]
First Stage R-squared: productivity	0.0284	0.0298	0.0306	0.032				
Partial R-squared: productivity	0.0167	0.0163	0.0178	0.0174				
First-stage F-statistics	10.7	10.12	10.98	10.48				
First-Stage F-test (p-value)	0.0001	0.0001	0.0001	0.0001				
Hansen test (p-value)	0.8748	0.878	0.9186	0.9208				
R-squared					0.2	0.2	0.18	0.18
Observations	636	636	636	636	636	636	636	636

Notes: Instrumenting for TFP using domestic shipment losses and dummy for informal competitors. Only missing values from these variables are replaced by the corresponding region-industry-size average to avoid facing an omitted variables problem. "First Stage R-squared: productivity" is the R-squared from the regression of productivity on both the included and excluded instruments. The "partial R-squared: productivity" measures the squared partial correlation between the excluded instruments and the productivity. "First-Stage F-test (p-value)" is the p-value of the F-test of joint significance of the excluded instruments that corresponds to the partial R-squared. "Hansen test (p-value)" shows the p-value of the Hansen test of overidentifying restrictions. The null hypothesis is that the instruments are valid instruments, that is, uncorrelated with the error term, and therefore the excluded instruments are correctly excluded from the estimated equation. Each regression includes a set of industry and region dummies. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions are given in the data appendix.

Table 8: ICI Coefficients with Different Threshold Levels – IV Estimation

Dependent Variable: Probability of Exporting	Conditional ICI				Unconditional ICI			
	95%	90%	75%	normalized	95%	90%	75%	normalized
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
logTFP	0.303*	0.310*	0.287*	0.314*	0.256	0.263*	0.265*	0.264*
	[0.166]	[0.166]	[0.166]	[0.164]	[0.159]	[0.160]	[0.161]	[0.155]
Infrastructure (positive)	0.297***	0.298***	0.214**	0.307***	0.300***	0.311***	0.222***	0.310***
	[0.108]	[0.0957]	[0.0837]	[0.108]	[0.104]	[0.0912]	[0.0820]	[0.103]
Red tape, corruption and crime (negative)	-0.854***	-0.603**	-0.351**	-1.221***	-0.480*	-0.481**	-0.332**	-0.753**
	[0.263]	[0.251]	[0.158]	[0.362]	[0.247]	[0.237]	[0.164]	[0.326]
Quality, innovation and labor skills (positive)	0.533***	0.461***	0.369***	0.430***	0.494***	0.394***	0.342***	0.418***
	[0.132]	[0.123]	[0.113]	[0.121]	[0.160]	[0.152]	[0.128]	[0.153]
Age	-0.0690**	-0.0726**	-0.0685**	-0.0660**	-0.0665**	-0.0688**	-0.0714**	-0.0654**
	[0.0309]	[0.0313]	[0.0309]	[0.0314]	[0.0302]	[0.0301]	[0.0306]	[0.0301]
Dummy for medium-size firms	0.113*	0.123*	0.133**	0.120*	0.128**	0.138**	0.146**	0.129**
	[0.0622]	[0.0644]	[0.0621]	[0.0622]	[0.0577]	[0.0592]	[0.0592]	[0.0582]
Dummy for large-size firms	0.286***	0.292***	0.303***	0.297***	0.294***	0.308***	0.321***	0.300***
	[0.0591]	[0.0603]	[0.0562]	[0.0591]	[0.0544]	[0.0549]	[0.0525]	[0.0542]
Constant term	-0.32	-0.319	-0.235	-0.313	-0.201	-0.184	-0.166	-0.215
	[0.354]	[0.346]	[0.348]	[0.346]	[0.336]	[0.333]	[0.337]	[0.326]
First Stage R-squared: productivity	0.0284	0.0294	0.0306	0.0319	0.0306	0.0311	0.0313	0.0332
Partial R-squared: productivity	0.0167	0.0176	0.0178	0.017	0.0178	0.0181	0.0182	0.0186
First-stage F-statistics	10.7	11.72	10.55	10.49	10.98	11.76	11.13	11.16
First-Stage F-test (p-value)	0.0001	0	0.0001	0.0001	0.0001	0	0	0
Hansen test (p-value)	0.8748	0.8626	0.7755	0.6208	0.9186	0.8999	0.7941	0.7657
Observations	636	636	636	636	636	636	636	636

Notes: Instrumenting for TFP using domestic shipment losses and dummy for informal competitors. Only missing values from these variables are replaced by the corresponding region-industry-size average to avoid facing an omitted variables problem. Instruments evaluation is the same for Table 7. Each regression includes a set of industry and region dummies. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions are given in the data appendix.

Table 9: ICI Coefficients with Equal and Unequal Weights

	IV Estimation			
	Conditional ICI		Unconditional ICI	
Dependent Variable: Probability of Exporting	**Equal**	**PCA**	**Equal**	**PCA**
	(1)	**(2)**	**(3)**	**(4)**
logTFP	0.303*	0.263	0.256	0.253
	[0.166]	[0.162]	[0.159]	[0.155]
Infrastructure (positive)	0.297***	0.148***	0.300***	0.151***
	[0.108]	[0.0560]	[0.104]	[0.0551]
Red tape, corruption and crime (negative)	-0.854***	-0.290***	-0.480*	-0.450***
	[0.263]	[0.101]	[0.247]	[0.174]
Quality, innovation and labor skills (positive)	0.533***	0.275***	0.494***	0.308***
	[0.132]	[0.0739]	[0.160]	[0.0874]
Age	-0.0690**	-0.0608**	-0.0665**	-0.0630**
	[0.0309]	[0.0305]	[0.0302]	[0.0298]
Dummy for medium-size firms	0.113*	0.116*	0.128**	0.120**
	[0.0622]	[0.0596]	[0.0577]	[0.0580]
Dummy for large-size firms	0.286***	0.275***	0.294***	0.285***
	[0.0591]	[0.0566]	[0.0544]	[0.0555]
Constant term	-0.32	-0.218	-0.201	-0.151
	[0.354]	[0.337]	[0.336]	[0.321]
First Stage R-squared: productivity	0.0284	0.0289	0.0306	0.0309
Partial R-squared: productivity	0.0167	0.017	0.0178	0.0177
First-stage F-statistics	10.7	11.07	10.98	11.23
First-Stage F-test (p-value)	0.0001	0	0.0001	0
Hansen test (p-value)	0.8748	0.9016	0.9186	0.8865
Observations	636	636	636	636

Notes: Instrumenting for TFP using domestic shipment losses and dummy for informal competitors. Only missing values from these variables are replaced by the corresponding region-industry-size average to avoid facing an omitted variables problem. Instruments evaluation is the same for Table 7. Each regression includes a set of industry and region dummies. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions are given in the data appendix.

Table 10: ICI Coefficients with Aggregate Indices

	IV Estimation			
	Conditional ICI		Unconditional ICI	
Dependent Variable: Probability of Exporting	**All Firms**	**Small & Medium**	**All Firms**	**Small & Medium**
	(1)	**(2)**	**(3)**	**(4)**
logTFP	0.131	0.128	0.0815	0.056
	[0.157]	[0.170]	[0.159]	[0.148]
Investment Climate (positive)	1.116***	1.167***	0.964***	1.032***
	[0.220]	[0.289]	[0.225]	[0.287]
Investment Climate (negative)	-0.576***	-0.726***	-0.700**	-0.881***
	[0.200]	[0.226]	[0.280]	[0.316]
Age	-0.0434	-0.0532	-0.0424	-0.0492
	[0.0308]	[0.0340]	[0.0307]	[0.0327]
Dummy for medium-size firms	0.125**	0.125**	0.149***	0.154***
	[0.0523]	[0.0557]	[0.0508]	[0.0531]
Dummy for large-size firms	0.254***		0.283***	
	[0.0547]		[0.0516]	
Constant term	0.0208	0.139	0.197	0.354
	[0.321]	[0.359]	[0.325]	[0.311]
First Stage R-squared: productivity	0.0305	0.0281	0.0309	0.0305
Partial R-squared: productivity	0.0168	0.0192	0.0152	0.0211
First-stage F-statistics	10.95	6.38	10.07	6.26
First-Stage F-test (p-value)	0.0001	0.0031	0.0001	0.0034
Hansen test (p-value)	0.6746	0.6929	0.7011	0.6527
Observations	636	395	636	395

Notes: Instrumenting for TFP using domestic shipment losses and dummy for informal competitors. Only missing values from these variables are replaced by the corresponding region-industry-size average to avoid facing an omitted variables problem. Instruments evaluation is the same for Table 7. Each regression includes a set of industry and region dummies. White's correction of heteroscedasticity is used. Standard errors are in brackets denoting *** 1%, ** 5%, * 10% significance. Detailed variable definitions are given in the data appendix.

Table 11: IC Linear Probability Model Coefficients with respect to the Probability of Exporting

Blocks	Explanatory IC variables	IV Estimation Coefficient (1)	% Contrib (2)	% Contrib of group (3)	OLS Estimation Coefficient (4)
logTFP		0.253	116.95	40.5	0.0513***
Infrastructure	Dummy for web page	0.133**	25.40	17.2	0.148***
	Days of inventory	0.0324*	24.36		0.0299**
Red tape, corruption and crime	Number of inspections	-0.0467**	-9.63	8.5	-0.0404*
	Dummy for payments to obtain a contract with the government	-0.221***	-8.48		-0.150***
	Days spent for obtaining compulsory certificates	-0.0265**	-6.53		-0.0266**
Finance and corporate governance	New fixed assets financed by equity	0.00229	1.83	2.7	0.00296**
	Dummy for land, buildings as collateral	0.106***	6.05		0.0687*
Quality, innovation and labor skills	Dummy for quality certification	0.204***	22.17	12	0.191***
	Dummy for new product	0.113***	12.56		0.0823**
Other control variables	Dummy for increased prices	-0.0818*	-5.41	15.8	-0.0949**
	Age of the firm	-0.0567*	-37.29		-0.0381
	Dummy for large firm	0.211***	12.00		0.216***
Constant term		-0.275			0.133
Instruments evaluation	First Stage R-squared: productivity	0.0499			
	Partial R-squared: productivity	0.0161			
	First-stage F-statistics	9.92			
	First-Stage F-test (p-value)	0.0001			
	Hansen test (p-value)	0.8518			
	R-squared				0.23
	Observations	636			636

Notes: Instrumenting for TFP using domestic shipment losses and dummy for informal competitors. Only missing values from these variables are replaced by the corresponding region-industry-size average to avoid facing an omitted variables problem. Instruments evaluation is the same for Table 7. Each regression includes a set of industry and region dummies. White's correction of heteroscedasticity is used. Stars are denoting *** 1%, ** 5%, * 10% significance levels. Detailed variable definitions are given in the data appendix.

Table 12: Percentage IC Contribution to the Exporting Frequency of IC Groups: A Comparison of the Two Approaches

IC Blocks	Individual IC Variables	ICI by Groups
Productivity	40.5	48.8
Infrastructure	17.2	17.2
Red tape, corruption and crime	8.5	6.3
Finance and corporate governance	2.7	0
Quality, innovation and labor skills	12	9.6
Other control variables	15.8	18

Table 13: Spearman Rank Correlation between Indices

	ICI	GCI	ICRG	DBI
ICI	1			
GCI	0.5217***	1		
ICRG	0.5001***	0.733	1	
DBI	0.3673***	0.6636	0.6012	1
Observations	62			

*** p<0.01, ** p<0.05, * p<0.1

Table 14: Rankings of Countries according to the ICI and its Subindices

Country	Infrastructure	Red tape and corruption	Finance	Innovation and labor skills	Total
Guyana	0.7894654	0.8990509	0.585	0.537037	0.634936
Slovenia	0.6792845	0.9351889	0.6224	0.5648887	0.62967
Chile	0.7296028	0.9261248	0.6015	0.5444712	0.625925
Czech Republic	0.6807972	0.9086287	0.5998	0.5787812	0.625482
Ecuador	0.7096545	0.9255832	0.622	0.5751119	0.624904
Colombia	0.7040558	0.9244803	0.6195714	0.5456553	0.622292
Croatia	0.7034525	0.94183	0.6	0.5640502	0.621168
Argentina	0.726241	0.9135035	0.588	0.5443362	0.621013
Poland	0.6869853	0.9152731	0.5670108	0.5947555	0.618747
Estonia	0.6667966	0.9225253	0.6173	0.5755953	0.614816
Peru	0.7057098	0.9231892	0.604	0.5452037	0.61479
Turkey	0.7112421	0.9351754	0.596	0.5364646	0.614316
Latvia	0.6701064	0.894661	0.6198	0.5804012	0.613104
Bosnia and Herzegovina	0.6809828	0.9238241	0.5695	0.5923182	0.612457
Dominican Republic	0.7016622	0.916857	0.604525	0.5228959	0.611011
Serbia	0.6858494	0.9143485	0.591	0.5633558	0.608454
Fyr Macedonia	0.6504564	0.9052032	0.5685	0.5842535	0.605597
Russia	0.711217	0.8962314	0.564	0.5643944	0.605593
Bahamas	0.6968975	0.9264665	0.5466175	0.5355556	0.604439
Vietnam	0.6857625	0.9304736	0.6	0.5646329	0.604287
Philippines	0.6961904	0.9272999	0.555	0.578018	0.602426
Lithuania	0.6759816	0.9237976	0.5984	0.547949	0.602248
Mexico	0.7031558	0.9341671	0.55	0.558547	0.601943
Brazil	0.7054408	0.9232257	0.570069	0.55589	0.601495
Slovak Republic	0.6590248	0.8946557	0.5709	0.5873179	0.601365
Elsalvador	0.6645083	0.9094743	0.60875	0.5419145	0.601325
Bolivia	0.6602454	0.9091331	0.6181543	0.5198613	0.601144
Paraguay	0.6844924	0.9026225	0.6	0.5281717	0.599207
Costarica	0.6916927	0.9275377	0.58	0.5195976	0.598879
Hungary	0.6656334	0.9197698	0.58	0.5300255	0.59696
St Kitts and Nevis	0.6711749	0.9083305	0.5715	0.5333334	0.59392
Albania	0.6693135	0.8950986	0.565	0.5324842	0.593845

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Barbados	0.6698538	0.9058695	0.5740161	0.5344445	0.592329
Romania	0.6537439	0.8989018	0.5773063	0.5675368	0.589511
Uruguay	0.6883852	0.919594	0.57	0.5296116	0.588971
Bulgaria	0.6631342	0.9022685	0.5526667	0.5726284	0.588842
Grenada	0.6621678	0.9046699	0.565	0.5361111	0.588377
Guatemala	0.6645053	0.9217215	0.5505385	0.5499458	0.585995
South Africa	0.6665528	0.920534	0.54	0.5303262	0.582017
Tonga	0.5995756	0.8687843	0.6283559	0.5369444	0.581633
Kenya	0.6322834	0.8767036	0.585	0.5630367	0.581599
Micronesia	0.5256476	0.8736711	0.5703503	0.5466667	0.578473
Honduras	0.650265	0.9193135	0.5675	0.5594358	0.578305
Nicaragua	0.5876336	0.9211655	0.5596795	0.5574405	0.576348
Mauritius	0.6112117	0.9439216	0.583	0.5237756	0.575865
Botswana	0.5894086	0.891585	0.61	0.5260261	0.574892
Jamaica	0.6391713	0.8913515	0.5666667	0.5115178	0.573986
St Vincent and Grenadines	0.5814285	0.9350739	0.5712758	0.5341667	0.573714
Rwanda	0.6234248	0.8822743	0.5965	0.4785543	0.572305
Niger	0.6370884	0.8794154	0.545	0.5197917	0.570611
Belarus	0.5967335	0.9182495	0.5481429	0.5693274	0.568182
Moldova	0.6009712	0.8962274	0.5491667	0.5577469	0.567534
Ukraine	0.6018839	0.9170547	0.51	0.5686193	0.565691
Afghanistan	0.651788	0.9185866	0.5215454	0.5282161	0.565667
Kazakhstan	0.5892674	0.9088655	0.515	0.559691	0.563999
Venezuela	0.600096	0.883818	0.565	0.5178818	0.561485
Malawi	0.5586425	0.8728513	0.547125	0.5302777	0.560521
Benin	0.6238601	0.8493648	0.5105	0.5208334	0.56029
Fiji	0.5686102	0.8919117	0.56	0.5416667	0.560097
Panama	0.6335775	0.9238169	0.5	0.5440623	0.559743
Cameroon	0.5831461	0.8749545	0.5402273	0.5130274	0.55875
Vanuatu	0.5653577	0.8644102	0.57625	0.5340278	0.557897
Bhutan	0.554928	0.9160115	0.5792063	0.5225225	0.557683
Togo	0.6207912	0.8870055	0.492	0.5305555	0.554715
Armenia	0.6312351	0.9121088	0.537	0.5262753	0.553016
Congo	0.6705996	0.8284926	0.5149	0.5412037	0.552765
Belize	0.5792751	0.8825079	0.5553375	0.5127924	0.552723
Burkina Faso	0.563612	0.8848812	0.53	0.513519	0.552624
Namibia	0.5939564	0.8946874	0.56	0.4765198	0.552533
Trinidad and Tobago	0.5871935	0.8880042	0.58	0.4658417	0.551668
Georgia	0.561684	0.9244187	0.5244445	0.5551606	0.550552
Kosovo	0.586853	0.8843137	0.51	0.5123618	0.54986
Nepal	0.5425733	0.9000008	0.615	0.4765889	0.549079
Samoa	0.5396569	0.8594653	0.59	0.5534722	0.546292

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Madagascar	0.5710714	0.9141715	0.4964118	0.5437328	0.546084
Antigua and Barbuda	0.4838628	0.8981389	0.557	0.5099207	0.540853
Cape Verde	0.5344235	0.9212963	0.515	0.5329458	0.540683
Lesotho	0.5302442	0.8861111	0.5398333	0.5333334	0.539499
Swaziland	0.5623612	0.8737578	0.5406333	0.4731153	0.537605
Suriname	0.5185884	0.8936105	0.5590395	0.5099207	0.536613
Liberia	0.5922636	0.8597817	0.5263333	0.5115741	0.536103
Chad	0.5876017	0.8500788	0.4719149	0.5366161	0.536009
Nigeria	0.5990841	0.8866508	0.4	0.5411335	0.532108
LaoPDR	0.5595679	0.8942685	0.4811364	0.5416667	0.531918
Angola	0.5457026	0.8818889	0.4815909	0.5348786	0.526683
Tanzania	0.5347067	0.8767864	0.48775	0.5397042	0.52428
Eritrea	0.4833598	0.963745	0.53	0.5106838	0.523726
Gambia	0.5293368	0.8709173	0.48835	0.5100729	0.523086
Bangladesh	0.5695032	0.896106	0.28	0.5972885	0.519693
St Lucia	0.4738749	0.9225607	0.5329286	0.5078347	0.517785
Zambia	0.5403762	0.9230805	0.4825	0.5144476	0.51627
Senegal	0.5431378	0.9221576	0.46	0.5236652	0.516113
Azerbaijan	0.5285008	0.8963866	0.4876667	0.5425601	0.516058
Indonesia	0.4827239	0.9647053	0.4762	0.5582711	0.514313
Mali	0.4865268	0.8908525	0.5012698	0.5567811	0.512866
Tajikistan	0.5278735	0.9137115	0.502	0.5298569	0.509582
Dominica	0.4621002	0.9234215	0.536	0.5069444	0.509462
Yemen	0.489736	0.9098639	0.5167824	0.5180225	0.509192
Uzbekistan	0.4423354	0.9269508	0.4856	0.5457069	0.509123
Guinea Bissau	0.6070178	0.8510936	0.4193333	0.4309685	0.504072
Sierra Leone	0.4965252	0.8865358	0.4505	0.5392361	0.503481
Montenegro	0.5	1	0.5	0.5	0.5
DRC	0.5100723	0.8685172	0.4582143	0.5053358	0.497848
Kyrgyz Republic	0.4638889	0.8996868	0.48	0.5375846	0.497714
Guinea	0.5380668	0.8778368	0.44	0.4948482	0.496792
Ivory Coast	0.4610129	0.9002581	0.435	0.5579947	0.494981
Timor Leste	0.4251139	0.9283362	0.5008333	0.5285714	0.490832
Pakistan	0.4504964	0.9036003	0.46	0.5227513	0.490828
Mozambique	0.474333	0.9261494	0.4185	0.5459922	0.487961
Uganda	0.412659	0.8953328	0.47	0.4953086	0.48429
Burundi	0.4706229	0.8597828	0.484	0.4385263	0.481839
Ghana	0.3800654	0.922259	0.46	0.5455524	0.478372
Gabon	0.4267196	0.8643359	0.4986282	0.5121212	0.4736
Mongolia	0.4911383	0.9863055	0.2265	0.5471094	0.456704

Table 15: Firm-Level Descriptive Statistics by IC Groups

	Small Firms		Medium Firms		Large Firms	
IC Groups	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**	**Mean**	**Std.Dev.**
Investment climate	.5609	.0822	.6156	.0838	.6573	.0722
Infrastructure	.6025	.2108	.7493	.2060	.8489	.1557
Red tape, corruption and crime	.9201	.0471	.9073	.0461	.8994	.0446
Finance	.5307	.0845	.5393	.0981	.5346	.1210
Quality, innovation and labor skills	.5265	.0705	.5321	.0759	.5573	.0792
Observations	11,091		9,662		6,871	

Notes: Small firms have less than 20 employees, medium firms have between 20 and 99 employees, and large firms have 100 or more employees. Investment climate (IC) is on a scale from 0 to 1, where a higher score means better investment climate. Infrastructure; corruption and crime; finance and quality, innovation and labor skills are components of IC. They are on a scale from 0 to 1, where a higher score means a better corresponding index.

B.2 Variables of the Investment climate (IC) Survey

B.2.1 Production Function Variables

Sales: Used as the measure of output for the production function estimation. Sales are defined as total annual sales. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

Employment: Total number of permanent and temporal workers.

Total hours worked per year: Total number of employees multiplied by the average hours worked per year.

Materials: Total costs of intermediate and raw materials used in production (excluding fuel). The series are deflated by using the Producer Price Indexes (PPI), base 2003.

Capital stock: Net book value of machinery and equipment. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

User cost of capital: The user cost of capital is defined in terms of the opportunity cost of using capital; it is defined as a 15% of the net book value of machinery and equipment.

Labor cost: Total expenditures on personnel. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

B.2.2 Infrastructures Variables

Days to clear customs to export: Average number of days to clear customs to export (log).

Days to clear customs to import: Average number of days to clear customs to imports (log).

Dummy for power outages: Dummy variable that takes value 1 if the plant has suffered any power outages during last year.

Number of power outages: Number of power outages suffered by the plant in last year (log).

Average duration of power outages: Average duration of power outages suffered by the plant in hours (log).

Total duration of power outages by year: Total duration of power outages suffered by the plant by month, in hours, conditional on the plat reports having power outages.

Losses due to power outages: Value of the losses due to the power outages as a percentage of sales (conditional on the plant reporting power outages).

Wait for a power supply: Current delay to obtain a power supply in days (log).

Dummy for own generator: Dummy variable taking value 1 if the firm has its own power generator.

Electricity from a generator: Percent of the electricity used by the plat provided by a own generator.

Dummy for insufficient water supply: Dummy variable that takes value 1 if the firm has experienced insufficient water supply for production during last year.

Water outages: Number of water outages suffered by the plant in last year (log).

Average duration of water outages: Average duration of water outages suffered by the plant in hours (log).

Total duration of water outages by year: Total duration of water outages suffered by the plant by month in hours, conditional on the plant reports having water outages.

Wait for a water supply: Current delay to obtain a water connection in days (log).

Wait for a phone connection: Current delay to obtain a phone connection in days (log).

Dummy for webpage: Dummy variable that takes value 1 if the plant has a website.

Dummy for e-mail: Dummy variable that takes value 1 if the plant uses email.

Shipment losses, exports: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the international market.

Shipment losses, domestic: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the domestic market.

Days of inventory of main input: Number of days of inventory of the main input (log).

Wait for an import license: Current delay to obtain an import license related in days (log).

B.2.3 Red tape, Corruption and Crime Variables

Dummy for conflicts with clients with a court involved: Dummy variable that takes value 1 if the conflict of the firm with clients solved in courts were generally enforced.

Manager's time spent in bureaucratic issues: Percentage of managers' time spent in dealing with bureaucratic issues.

Weeks to bureaucracy: Managers' time spent in dealing with bureaucratic issues in weeks (log).

Number of inspections: In the last year, total number of inspections (log).

Number of working days spent with inspections: Number of working days spent with inspections (log).

Dummy for tax inspections: Dummy variable that takes value 1 if the firm has been visited by tax officials during last year.

Number of tax inspections: Total number of inspections of tax officials received by the plant in 2007 (log).

Number of working days spent with tax inspections: Number of working days spent with tax inspections (log).

Dummy for gifts in tax inspections: Gifts expected or requested in inspections with tax officials.

Dummy for payments to obtain a contract with the government: Dummy variable that takes value 1 if in plant's sector it is common to pay an extra amount of money in order to obtain a contract with the government.

Payments to obtain a contract with the government: Illegal payment in order to obtain a contract with the government. Related as percentage of contract value.

Dummy for payments to deal with bureaucratic issues: Dummy that takes value 1 if firms in the main sector occasionally need to give gifts or make informal payments to public officers in order to "get things done" with regard to customs, taxes, licenses, legislations, services, etc.

Wait for an operation license: Actual delay to obtain a main operating license in days (log).

Dummy for gifts to obtain an operating license: Gifts expected or requested to obtain an operating license, conditional on submit an operating license.

Dummy for security expenses: Dummy taking value 1 if the plant has security expenses.

Security expenses: Cost in security (equipment, staff, etc) (log).

Dummy for crime losses: Dummy variable that takes value 1 if the plant suffered any criminal attempt during last year.

Crime losses: Value of losses due to criminal activity (log).

Wait for a construction permit: Actual delay to obtain a construction related in days (log).

Dummy for gifts to obtain a construction permit: Gifts expected or requested to obtain a construction permit, conditional on submit a construction permit.

Number of permits: Number of permits obtained in last two years (log).

Validity of permits: Average validity, in months, of permits obtained (log).

Time spent with permits: Number of working days spent in obtaining all permits (log).

Wait for a permit: Days waiting for obtaining a permit (log).

Dummy for gift to obtain a permit: Gifts expected or requested to obtain a permit, conditional on submit a permit.

Dummy for compulsory certificate: Dummy variable that takes value 1 if the firm has to have any compulsory certificate to produce or sell any product.

Sales with compulsory certificates: Percentage of sales subject to compulsory certificates.

Number of compulsory certificates: Number of compulsory certificates obtained (log).

Time spent with compulsory certificates: Number of working days spent when obtaining compulsory certificates (log).

Wait for compulsory certificate: Days waiting for obtaining compulsory certificates (log).

Dummy for gift to obtain compulsory certificates: Gifts expected or requested to obtain a compulsory certificate, conditional on submit a compulsory certificate.

Dummy for gifts to obtain a power supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain an electrical connection, conditional on submit an electrical connection.

Dummy for gifts to obtain a water supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain a phone connection: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain an import license: Gifts expected or requested to obtain an import license, conditional on submit an import license.

B.2.4 Finance and Corporate Governance Variables

Dummy for purchases paid after delivery: Dummy variable that takes value 1 if any percentage of annual purchases are paid for after the delivery.

Purchases paid after delivery: Percentage of annual purchases paid for after the delivery.

Sales paid before delivery: Percentage of annual sales paid for before the delivery.

Sales paid on delivery: Percentage of annual sales paid for before the delivery.

Sales paid after delivery: Percentage of annual sales paid for after the delivery.

Dummy for purchase fixed assets: Dummy variable that takes value 1 if the firm has purchaser fixed assets during last year.

New fixed assets financed by internal founds: Percentage of firm's working capital financed with funds from informal sources.

New fixed assets financed by equity: Percentage of firm's working capital financed with funds from equity.

New fixed assets financed by private banks: Percentage of investments in new fixed assets financed with funds from private commercial banks.

New fixed assets financed by state-owned banks: Percentage of investments in new fixed assets financed with funds state owned banks.

New fixed assets financed by trade credit: Percentage of investments in new fixed assets financed with credits from suppliers.

Dummy for checking or saving account: Dummy that takes value 1 if the firm has a saving account

Dummy for overdraft facility: Dummy that takes value 1 if the firm has access to an overdraft facility.

Dummy for loan: Dummy variable that takes value 1 if the plant reports that it has a bank loan.

Dummy for loan from state-owned banks: Dummy variable that takes value 1 if the firm has a loan from a state owned banks.

Dummy for loan from private banks: Dummy variable that takes value 1 if the firm has a loan from a domestic private commercial banks.

Dummy for loan from non-financial institutions: Dummy variable that takes value 1 if the firm has a loan from a non-financial institutions.

Dummy for loan with collateral: Dummy variable that takes value 1 if the loan is on collateral.

Value of the collateral: Value of the collateral as a percentage of the loan value (conditional on having a loan with collateral).

Dummy for land, buildings as collateral: Dummy that takes value 1 if the firm uses land or buildings as collateral (conditional on having a loan with collateral).

Dummy for machinery and equipment as collateral: Dummy that takes value 1 if the firm uses machinery or equipment as collateral (conditional on having a loan with collateral).

Dummy for accounts receivable and inventories as collateral: Dummy that takes value 1 if the firm uses accounts receivable or inventories as collateral (conditional on having a loan with collateral).

Dummy for personal assets as collateral: Dummy that takes value 1 if the firm uses personal assets as collateral (conditional on having a loan with collateral).

Dummy no loan because of complexity: Dummy that takes value 1 if the firm did not apply for loan because of its complexity.

Dummy no loan because of cost: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy no loan because of collateral: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy for rejected credit applications: Dummy variable that takes value 1 if a credit application has been rejected in the last year.

Dummy for external auditory: Dummy variable that takes value 1 if the plant uses an external auditory.

Largest shareholder: Percentage of firm's capital owned by the largest shareholder.

Dummy for subsidy: Dummy variable that takes value 1 if the firm receives any subsides from the national, regional and local government or EU.

B.2.5 Quality, Innovation, and Labor Skills

Dummy for quality certification: Dummy variable that takes value 1 if the plant has a quality certification.

Dummy for foreign technology: Dummy variable that takes value 1 if the firm used a licensed technology of a foreign company in the last year.

Dummy for new line of products: Dummy variable that takes value 1 if the plant has developed a new product or product line.

Sales of new products: Percentage of total sales corresponding with new products.

Dummy for R&D: Dummy that takes value 1 if the firm performed R&D activities during last year.

R&D expenditures as % of total sales: Total R&D expenditures as percentage of annual sales.

Staff with computer: Percentage of staff using computer at job.

Dummy for outsourcing: Dummy taking value 1 if the plant subcontracts any part of the activity.

Dummy for discontinued: Dummy taking value 1 if the plant has discontinued at least one product line.

Dummy for product upgraded: Dummy variable that takes value 1 if the plant upgraded an existing product last year.

Staff - production workers: Percentage of production workers in staff.

Staff - nonproduction workers: Percentage of nonproduction workers in staff.

Staff - female workers: Percentage of female workers in firm's staff.

Staff - skilled workers: Percentage of skilled workers in firm's staff.

Staff - unskilled workers: Percentage of unskilled workers in firm's staff.

Staff - university education: Percentage of staff with at least one year of university.

Dummy for training: Dummy taking value one if the firm provides formal (beyond on the job) training to its employees.

Training to production workers: Percentage of production workers receiving formal (beyond on the job) training.

Training to non-production workers: Percentage of non-production workers receiving formal (beyond on the job) training.

Experience of the manager: Number of years of experience of the manager in the establishment's sector (log).

B.2.6 Other Control Variables

Age: Difference between the year that the plant started operations and current year.

Dummy for incorporated company: Dummy variable that takes value 1 if the plant is an incorporated company.

Dummy for limited company: Dummy variable that takes value 1 if the plant is a limited company.

Dummy for FDI: Dummy variable that takes value 1 if any part of the capital of the firm is foreign.

Dummy for state-owned firm: Dummy variable that takes value 1 if the firm belongs to the government.

Dummy for importer: Dummy variable that takes value 1 if imports are greater than 10%.

Share of imports: Share of imported inputs over total purchases of intermediate materials.

Dummy for exporter: Dummy variable that takes value 1 if exports are greater than 10%.

Share of exports: Share of exports over total annual sales.

Exporting experience: Number of years of exporting experience (log).

Capacity utilization: Average percentage of capacity used during last year.

Dummy for local monopoly: Dummy taking value one if the firm is a local monopoly.

Dummy for less that 5 competitors: Dummy taking value one if the plant has more or equal than 5 competitors in the local market.

Dummy for more than 5 competitors: Dummy taking value one if the plant has less than 5 competitors in the local market.

Dummy for increased sales: Dummy taking value 1 if the plant has increased its sales.

Dummy for decreased sales: Dummy taking value 1 if the plant has decreased its sales.

Dummy for increased prices: Dummy taking value 1 if the plant has increased its prices.

Dummy for decreased prices: Dummy taking value 1 if the plant has decreased its prices.

Dummy for informal competition: Dummy variable that takes value 1 if the firm competes with informal (no registered) firms.

Appendix C

Appendix to Chapter 3

C.1 Figures and Tables

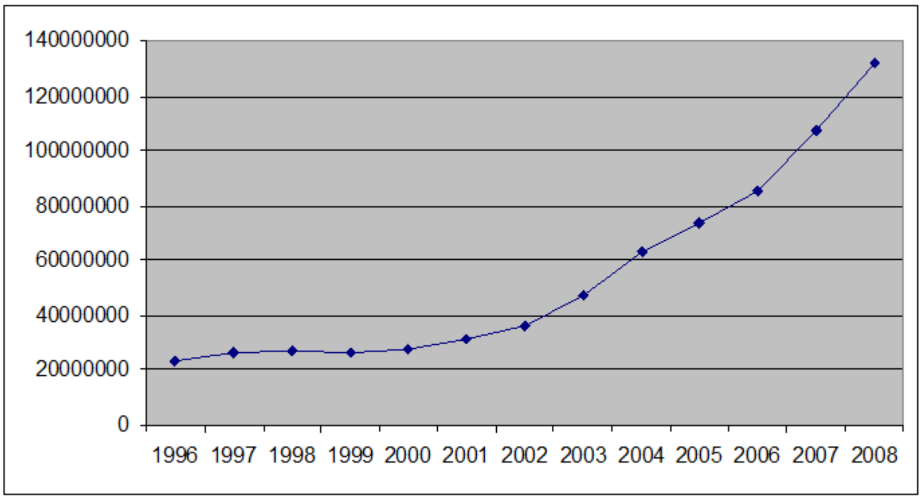

Figure 1: Turkey's Aggregate Export over Time

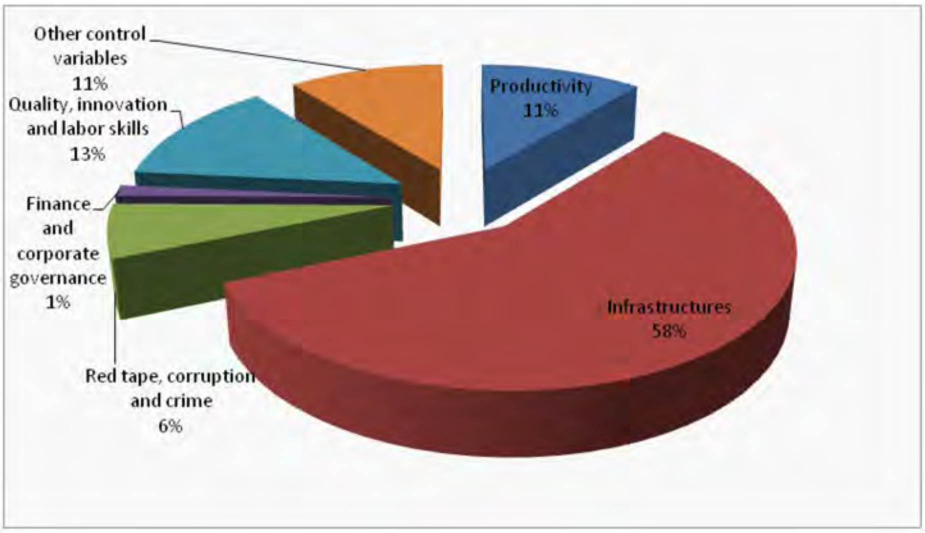

Figure 2: Percentage Contribution of IC Groups for Selection Part

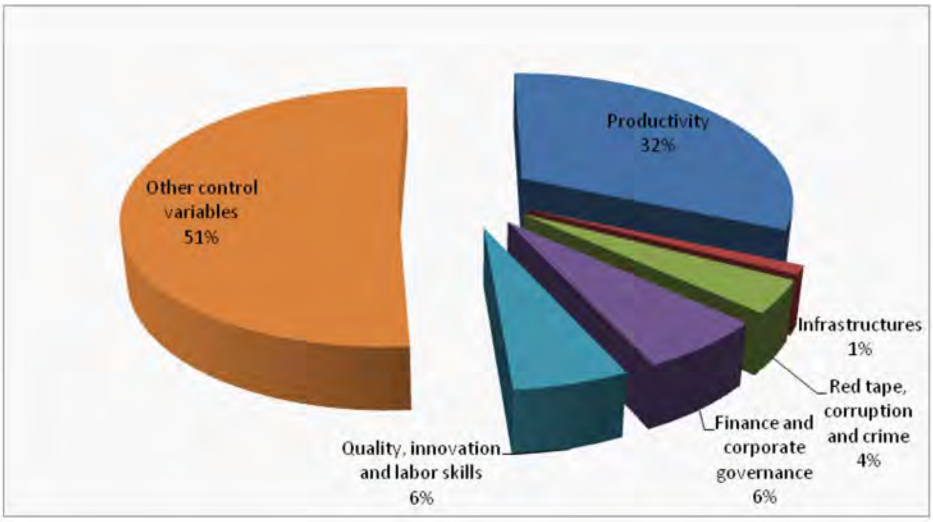

Figure 3: Percentage Contribution of Groups for Volume of Export

Table 1: Infrastructure-related Factors Adversely Effecting Turkey's Competitiveness

	Turkey	Poland	Czech Rep.	Hungary
Share of high technology export (%, 2006)	1.5	3.81	14.1	23.99
Ratio of illiterates (%, + 15 age, 2005)	12.6	1	1	1
Pupil/teacher ratio in primary education (%, 2005)	25.8	11.66	17.53	10.61
Telecommunication investments (ratio to GDP, 2006)	0.22	0.72	0.44	0.37
Number of internet users (per 1000 population, 2007)	241	413	587	443
Electricity cost in industry ($/kwh, 2006)	0.1	0.073	0.094	0.105
Human Development Index (2005)	0.78	0.87	0.89	0.87
Number of computers (per 1000 population, 2007)	83	260	375	306
Life expectancy at birth (2005)	71.5	75	76	73
R&D investments (USD per capita, 2006)	39.7	49.8	215.1	112.1

Source: Izmen and Yilmaz, 2009

Table 2: Evidence on Relative Productivity of Exporters and Multinationals

Authors	Sample	Methodology	Exporters vs. Non-exporters	MNEs vs. Exporters
Arnold and Hussinger (2005b)	Germany, 1996–2002	K-S tests of stochastic dominance	+	+
Castellani and Zanfei (2007)	Italy, 1994–96	OLS	0	+
Girma, Görg and Strobl (2004)	Ireland, 2000	K-S tests of stochastic dominance	0	+
Girma et al. (2005a)	UK, 1990–95	K-S tests of stochastic dominance	+	+
Head and Ries (2003)	Japan, 1989	OLS	0	0
Kimura and Kiyota (2004)	Japan, 1994–2000	OLS	+	+
Wagner (2005)	Germany,1995	K-S tests of stochastic dominance	+	+

Source: Greenaway and Kneller (2007)

Notes: + the effect is positive and significant, - the effect is negative and significant, 0 the effect is insignificant and/or changes sign and/or significance through the paper.

Table 3: Percentage of Firms that Export by Size in Turkey

Size	Small	Medium	Large	Total
Number of employees	(1-19)	(20-99)	(100+)	
	21.94	47.64	63.52	47.48

Table 4: Probit Estimation of Probability of Export

Dependent Variable: Probability of Exporting		Restricted Solow Residual: Probit	Restricted Solow Residual: Probit with Marginal Effect	Unrestricted Solow Residual: Probit	Unrestricted Solow Residual: Probit with Marginal Effect
Blocks	**Explanatory IC Variables**	**(1)**	**(2)**	**(3)**	**(4)**
Productivity		0.151**	0.0598**	0.150**	0.0593**
		[0.0624]	[0.0247]	[0.0612]	[0.0242]
Infrastructures	Dummy for webpage	0.449***	0.172***	0.449***	0.172***
		[0.169]	[0.0609]	[0.169]	[0.0610]
	Days of inventory of main input	0.104**	0.0414**	0.104**	0.0414**
		[0.0467]	[0.0186]	[0.0467]	[0.0186]
	Wait for an import license	-0.241***	-0.0955***	-0.241***	-0.0954***
		[0.0830]	[0.0330]	[0.0831]	[0.0331]
Red tape, corruption and crime	Dummy for conflicts with clients with a court involved	-0.204*	-0.0811*	-0.203*	-0.0806*
		[0.115]	[0.0456]	[0.115]	[0.0456]
	Dummy for payments to obtain a contract with the government	-0.436***	-0.167***	-0.439***	-0.168***
		[0.157]	[0.0565]	[0.157]	[0.0566]
Finance and corporate governance	New fixed assets financed by equity	0.0119**	0.00470**	0.0119**	0.00473**
		[0.00466]	[0.00185]	[0.00467]	[0.00185]
Quality, innovation and labor skills	Dummy for quality certification	0.521***	0.204***	0.522***	0.205***
		[0.129]	[0.0492]	[0.129]	[0.0491]
Other control variables	Dummy for importer	0.280**	0.111**	0.280**	0.111**
		[0.137]	[0.0542]	[0.137]	[0.0542]
	Dummy for increased prices	-0.298**	-0.117**	-0.299**	-0.117**
		[0.139]	[0.0535]	[0.139]	[0.0534]
	Dummy for medium-size firms	0.424***	0.168***	0.426***	0.168***
		[0.140]	[0.0545]	[0.140]	[0.0545]
	Dummy for large-size firms	0.705***	0.276***	0.706***	0.276***
		[0.167]	[0.0627]	[0.167]	[0.0627]
	R-squared	0.19	0.19	0.19	0.19
	Observations	640	640	640	640

Notes: Robust standard errors in brackets. Region and industry dummies and the constant term are not reported. *** p<0.01, ** p<0.05, * p<0.1.

Table 5: Heckman MLE Estimation of Export Equation

Outcome Stage: Export Share		Restricted Solow Residual (1)	Unrestricted Solow Residual (2)
Blocks	**Explanatory IC variables**		
Productivity		0.650***	0.665***
		[0.0888]	[0.0877]
Infrastructures	Total duration of water outages by year	-0.0684	-0.0667
		[0.0457]	[0.0451]
Red tape, corruption and crime	Weeks to bureaucracy	-0.000110**	-0.000112**
		[4.57e-05]	[4.58e-05]
Finance and corporate governance	New fixed assets financed by private banks	0.00399*	0.00402*
		[0.00211]	[0.00212]
	Dummy for external auditory	0.320***	0.323***
		[0.124]	[0.123]
Quality, innovation and labor skills	Dummy for outsourcing	0.319***	0.315***
		[0.121]	[0.120]
	Staff - female workers	-0.00608**	-0.00576*
		[0.00308]	[0.00308]
Other control variables	Exporting experience	0.862***	0.858***
		[0.0727]	[0.0725]
	Capacity utilization	0.0102***	0.0101***
		[0.00298]	[0.00296]
	Dummy for more than 5 competitors	0.420***	0.420***
		[0.141]	[0.140]
	Dummy for decreased sales	-0.760***	-0.759***
		[0.179]	[0.177]
	Dummy for medium-size firms	0.989***	0.980***
		[0.227]	[0.225]
	Dummy for large-size firms	2.035***	2.039***
		[0.284]	[0.278]

Table continues to next page.

Selection Stage: Export Decision

Blocks	Explanatory IC variables		
Productivity		0.0991*	0.099*
		[0.0601]	[0.0616]
Infrastructures	Dummy for webpage	0.448***	0.452***
		[0.151]	[0.150]
	Days of inventory of main input	0.133***	0.133***
		[0.0419]	[0.0418]
	Wait for an import license	-0.201***	-0.199***
		[0.0717]	[0.0713]
Red tape, corruption and crime	Dummy for conflicts with clients with a court involved	-0.250**	-0.253**
		[0.115]	[0.114]
	Dummy for payments to obtain a contract with the government	-0.458***	-0.451***
		[0.151]	[0.151]
Finance and corporate governance	New fixed assets financed by equity	0.00974**	0.00958**
		[0.00424]	[0.00422]
Quality, innovation and labor skills	Dummy for quality certification	0.566***	0.566***
		[0.128]	[0.127]
	Staff with computer	0.00652***	0.00644***
		[0.00240]	[0.00240]
Other control variables	Dummy for importer	0.435***	0.432***
		[0.126]	[0.126]
	Dummy for increased prices	-0.314***	-0.311***
		[0.120]	[0.120]
	Dummy for medium-size firms	0.555***	0.553***
		[0.131]	[0.131]
	Dummy for large-size firms	0.970***	0.970***
		[0.149]	[0.149]
	ρ	-0.682***	-0.688***
		[0.139]	[0.136]
	λ	-0.872***	-0.878***
		[0.238]	[0.234]
	Observations	640	640
	Censored observations	269	269
	Uncensored observations	371	371

Notes: Robust standard errors in brackets. Region and industry dummies and the constant term are not reported. *** p<0.01, ** p<0.05, * p<0.1.

Table 6: Heckman MLE Estimation of Export Equation

Outcome Stage: Export Share		All Firms (1)	Small & Medium (2)	Large Firms (3)
Blocks	**Explanatory IC variables**			
Productivity		0.311***	0.223*	0.302***
		[0.0779]	[0.119]	[0.110]
Infrastructures	Total duration of water outages by year	-0.102***	-0.0738	-0.129***
		[0.0367]	[0.0479]	[0.0416]
Red tape, corruption and crime	Weeks to bureaucracy	-7.75e-05*	-0.0000771	-0.0000605
		[4.12e-05]	[5.90e-05]	[5.14e-05]
Finance and corporate governance	New fixed assets financed by private banks	0.00189	0.00472**	-0.00196
		[0.00203]	[0.00238]	[0.00281]
	Dummy for external auditory	0.295**	0.625***	-0.0291
		[0.144]	[0.188]	[0.138]
Quality, innovation and labor skills	Dummy for outsourcing	0.403***	0.341*	0.225
		[0.148]	[0.191]	[0.170]
	Staff - female workers	-0.00484	-0.00308	-0.0063
		[0.00337]	[0.00463]	[0.00399]
Other control variables	Exporting experience	0.842***	0.692***	0.986***
		[0.0690]	[0.102]	[0.0807]
	Capacity utilization	0.00804**	0.00485	0.0173***
		[0.00341]	[0.00442]	[0.00419]
	Dummy for more than 5 competitors	0.330**	0.239	0.373**
		[0.158]	[0.204]	[0.189]
	Dummy for decreased sales	-0.931***	-0.880***	-0.824***
		[0.172]	[0.246]	[0.253]
	Dummy for medium-size firms	0.844***	0.809***	
		[0.253]	[0.266]	
	Dummy for large-size firms	1.397***		
		[0.324]		

Table continues to next page.

Selection Stage: Export Decision				
Blocks	**Explanatory IC variables**			
Productivity		0.105**	0.166***	0.00799
		[0.0414]	[0.0613]	[0.108]
Infrastructures	Dummy for webpage	0.441***	0.338**	1.183***
		[0.168]	[0.170]	[0.378]
	Days of inventory of main input	0.0968**	0.108*	0.0894
		[0.0487]	[0.0562]	[0.0937]
	Wait for an import license	-0.222***	-0.186*	-0.493***
		[0.0780]	[0.0994]	[0.116]
Red tape, corruption and crime	Dummy for conflicts with clients with a court involved	-0.274**	-0.250*	-0.0319
		[0.123]	[0.145]	[0.214]
	Dummy for payments to obtain a contract with the government	-0.267	-0.263	-0.662***
		[0.170]	[0.195]	[0.247]
Finance and corporate governance	New fixed assets financed by equity	0.00913**	0.00868*	0.013
		[0.00418]	[0.00477]	[0.00957]
Quality, innovation and labor skills	Dummy for quality certification	0.498***	0.564***	0.0478
		[0.136]	[0.155]	[0.233]
	Staff with computer	0.00790***	0.00729*	0.0133**
		[0.00284]	[0.00437]	[0.00649]
Other control variables	Dummy for importer	0.405***	0.465**	0.289
		[0.136]	[0.189]	[0.215]
	Dummy for increased prices	-0.393***	-0.408**	-0.602**
		[0.147]	[0.164]	[0.303]
	Dummy for medium-size firms	0.561***	0.485***	
		[0.151]	[0.162]	
	Dummy for large-size firms	0.756***		
		[0.210]		
	ρ	-0.304	-0.528**	-0.658**
		[0.235]	[0.223]	[0.249]
	λ	-0.381	-0.695**	-0.769***
		[0.282]	[0.361]	[0.377]
	Observations	640	411	229
	Censored observations	268	216	52
	Uncensored observations	372	195	177

Notes: Robust standard errors in brackets. Region and industry dummies and the constant term are not reported. *** p<0.01, ** p<0.05, * p<0.1.

C.2 Variables of the Investment climate (IC) Survey

C.2.1 Production Function Variables

Sales: Used as the measure of output for the production function estimation. Sales are defined as total annual sales. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

Employment: Total number of permanent and temporal workers.

Total hours worked per year: Total number of employees multiplied by the average hours worked per year.

Materials: Total costs of intermediate and raw materials used in production (excluding fuel). The series are deflated by using the Producer Price Indexes (PPI), base

2003.

Capital stock: Net book value of machinery and equipment. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

User cost of capital: The user cost of capital is defined in terms of the opportunity cost of using capital; it is defined as a 15% of the net book value of machinery and equipment.

Labor cost: Total expenditures on personnel. The series are deflated by using the Producer Price Indexes (PPI), base 2003.

C.2.2 Infrastructures Variables

Days to clear customs to export: Average number of days to clear customs to export (log).

Days to clear customs to import: Average number of days to clear customs to imports (log).

Dummy for power outages: Dummy variable that takes value 1 if the plant has suffered any power outages during last year.

Number of power outages: Number of power outages suffered by the plant in last year (log).

Average duration of power outages: Average duration of power outages suffered by the plant in hours (log).

Total duration of power outages by year: Total duration of power outages suffered by the plant by month, in hours, conditional on the plat reports having power outages.

Losses due to power outages: Value of the losses due to the power outages as a percentage of sales (conditional on the plant reporting power outages).

Wait for a power supply: Current delay to obtain a power supply in days (log).

Dummy for own generator: Dummy variable taking value 1 if the firm has its own power generator.

Electricity from a generator: Percent of the electricity used by the plat provided by a own generator.

Dummy for insufficient water supply: Dummy variable that takes value 1 if the firm has experienced insufficient water supply for production during last year.

Water outages: Number of water outages suffered by the plant in last year (log).

Average duration of water outages: Average duration of water outages suffered by the plant in hours (log).

Total duration of water outages by year: Total duration of water outages suffered by the plant by month in hours, conditional on the plant reports having water outages.

Wait for a water supply: Current delay to obtain a water connection in days (log).

Wait for a phone connection: Current delay to obtain a phone connection in days (log).

Dummy for webpage: Dummy variable that takes value 1 if the plant has a website.

Dummy for e-mail: Dummy variable that takes value 1 if the plant uses email.

Shipment losses, exports: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the international market.

Shipment losses, domestic: Fraction of the value of the plant's average cargo consignment that was lost in transit due to breakage, theft or spoilage in the domestic market.

Days of inventory of main input: Number of days of inventory of the main input (log).

Wait for an import license: Current delay to obtain an import license related in days (log).

C.2.3 Red tape, Corruption and Crime Variables

Dummy for conflicts with clients with a court involved: Dummy variable that takes value 1 if the conflict of the firm with clients solved in courts were generally enforced.

Manager's time spent in bureaucratic issues: Percentage of managers' time spent in dealing with bureaucratic issues.

Weeks to bureaucracy: Managers' time spent in dealing with bureaucratic issues in weeks (log).

Number of inspections: In the last year, total number of inspections (log).

Number of working days spent with inspections: Number of working days spent with inspections (log).

Dummy for tax inspections: Dummy variable that takes value 1 if the firm has been visited by tax officials during last year.

Number of tax inspections: Total number of inspections of tax officials received by the plant in 2007 (log).

Number of working days spent with tax inspections: Number of working days spent with tax inspections (log).

Dummy for gifts in tax inspections: Gifts expected or requested in inspections with tax officials.

Dummy for payments to obtain a contract with the government: Dummy variable that takes value 1 if in plant's sector it is common to pay an extra amount of money in order to obtain a contract with the government.

Payments to obtain a contract with the government: Illegal payment in order to obtain a contract with the government. Related as percentage of contract value.

Dummy for payments to deal with bureaucratic issues: Dummy that takes value 1 if firms in the main sector occasionally need to give gifts or make informal payments to public officers in order to "get things done" with regard to customs, taxes, licenses, legislations, services, etc.

Wait for an operation license: Actual delay to obtain a main operating license in days (log).

Dummy for gifts to obtain an operating license: Gifts expected or requested to obtain an operating license, conditional on submit an operating license.

Dummy for security expenses: Dummy taking value 1 if the plant has security expenses.

Security expenses: Cost in security (equipment, staff, etc) (log).

Dummy for crime losses: Dummy variable that takes value 1 if the plant suffered any criminal attempt during last year.

Crime losses: Value of losses due to criminal activity (log).

Wait for a construction permit: Actual delay to obtain a construction related in days (log).

Dummy for gifts to obtain a construction permit: Gifts expected or requested to obtain a construction permit, conditional on submit a construction permit.

Number of permits: Number of permits obtained in last two years (log).

Validity of permits: Average validity, in months, of permits obtained (log).

Time spent with permits: Number of working days spent in obtaining all permits (log).

Wait for a permit: Days waiting for obtaining a permit (log).

Dummy for gift to obtain a permit: Gifts expected or requested to obtain a permit, conditional on submit a permit.

Dummy for compulsory certificate: Dummy variable that takes value 1 if the firm has to have any compulsory certificate to produce or sell any product.

Sales with compulsory certificates: Percentage of sales subject to compulsory certificates.

Number of compulsory certificates: Number of compulsory certificates obtained (log).

Time spent with compulsory certificates: Number of working days spent when obtaining compulsory certificates (log).

Wait for compulsory certificate: Days waiting for obtaining compulsory certificates (log).

Dummy for gift to obtain compulsory certificates: Gifts expected or requested to obtain a compulsory certificate, conditional on submit a compulsory certificate.

Dummy for gifts to obtain a power supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain an electrical connection, conditional on submit an electrical connection.

Dummy for gifts to obtain a water supply: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain a phone connection: Dummy variable that takes value 1 if gifts are expected or requested to obtain a phone supply, conditional on submit a phone connection.

Dummy for gifts to obtain an import license: Gifts expected or requested to obtain an import license, conditional on submit an import license.

C.2.4 Finance and Corporate Governance Variables

Dummy for purchases paid after delivery: Dummy variable that takes value 1 if any percentage of annual purchases are paid for after the delivery.

Purchases paid after delivery: Percentage of annual purchases paid for after the delivery.

Sales paid before delivery: Percentage of annual sales paid for before the delivery.

Sales paid on delivery: Percentage of annual sales paid for before the delivery.

Sales paid after delivery: Percentage of annual sales paid for after the delivery.

Dummy for purchase fixed assets: Dummy variable that takes value 1 if the firm has purchaser fixed assets during last year.

New fixed assets financed by internal founds: Percentage of firm's working capital financed with funds from informal sources.

New fixed assets financed by equity: Percentage of firm's working capital financed with funds from equity.

New fixed assets financed by private banks: Percentage of investments in new fixed assets financed with funds from private commercial banks.

New fixed assets financed by state-owned banks: Percentage of investments in new fixed assets financed with funds state owned banks.

New fixed assets financed by trade credit: Percentage of investments in new fixed assets financed with credits from suppliers.

Dummy for checking or saving account: Dummy that takes value 1 if the firm has a saving account

Dummy for overdraft facility: Dummy that takes value 1 if the firm has access to an overdraft facility.

Dummy for loan: Dummy variable that takes value 1 if the plant reports that it has a bank loan.

Dummy for loan from state-owned banks: Dummy variable that takes value 1 if the firm has a loan from a state owned banks.

Dummy for loan from private banks: Dummy variable that takes value 1 if the firm has a loan from a domestic private commercial banks.

Dummy for loan from non-financial institutions: Dummy variable that takes value 1 if the firm has a loan from a non-financial institutions.

Dummy for loan with collateral: Dummy variable that takes value 1 if the loan is on collateral.

Value of the collateral: Value of the collateral as a percentage of the loan value (conditional on having a loan with collateral).

Dummy for land, buildings as collateral: Dummy that takes value 1 if the firm uses land or buildings as collateral (conditional on having a loan with collateral).

Dummy for machinery and equipment as collateral: Dummy that takes value 1 if the firm uses machinery or equipment as collateral (conditional on having a loan with collateral).

Dummy for accounts receivable and inventories as collateral: Dummy that takes value 1 if the firm uses accounts receivable or inventories as collateral (conditional on having a loan with collateral).

Dummy for personal assets as collateral: Dummy that takes value 1 if the firm uses personal assets as collateral (conditional on having a loan with collateral).

Dummy no loan because of complexity: Dummy that takes value 1 if the firm did not apply for loan because of its complexity.

Dummy no loan because of cost: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy no loan because of collateral: Dummy that takes value 1 if the firm did not apply for loan because of its cost.

Dummy for rejected credit applications: Dummy variable that takes value 1 if a credit application has been rejected in the last year.

Dummy for external auditory: Dummy variable that takes value 1 if the plant uses an external auditory.

Largest shareholder: Percentage of firm's capital owned by the largest shareholder.

Dummy for subsidy: Dummy variable that takes value 1 if the firm receives any subsides from the national, regional and local government or EU.

C.2.5 Quality, Innovation, and Labor Skills

Dummy for quality certification: Dummy variable that takes value 1 if the plant has a quality certification.

Dummy for foreign technology: Dummy variable that takes value 1 if the firm used a licensed technology of a foreign company in the last year.

Dummy for new line of products: Dummy variable that takes value 1 if the plant has developed a new product or product line.

Sales of new products: Percentage of total sales corresponding with new products.

Dummy for R&D: Dummy that takes value 1 if the firm performed R&D activities during last year.

R&D expenditures as % of total sales: Total R&D expenditures as percentage of annual sales.

Staff with computer: Percentage of staff using computer at job.

Dummy for outsourcing: Dummy taking value 1 if the plant subcontracts any part of the activity.

Dummy for discontinued: Dummy taking value 1 if the plant has discontinued at least one product line.

Dummy for product upgraded: Dummy variable that takes value 1 if the plant upgraded an existing product last year.

Staff - production workers: Percentage of production workers in staff.

Staff - nonproduction workers: Percentage of nonproduction workers in staff.

Staff - female workers: Percentage of female workers in firm's staff.

Staff - skilled workers: Percentage of skilled workers in firm's staff.

Staff - unskilled workers: Percentage of unskilled workers in firm's staff.

Staff - university education: Percentage of staff with at least one year of university.

Dummy for training: Dummy taking value one if the firm provides formal (beyond on the job) training to its employees.

Training to production workers: Percentage of production workers receiving formal (beyond on the job) training.

Training to non-production workers: Percentage of non-production workers receiving formal (beyond on the job) training.

Experience of the manager: Number of years of experience of the manager in the establishment's sector (log).

C.2.6 Other Control Variables

Age: Difference between the year that the plant started operations and current year.

Dummy for incorporated company: Dummy variable that takes value 1 if the plant is an incorporated company.

Dummy for limited company: Dummy variable that takes value 1 if the plant is a limited company.

Dummy for FDI: Dummy variable that takes value 1 if any part of the capital of the firm is foreign.

Dummy for state-owned firm: Dummy variable that takes value 1 if the firm belongs to the government.

Dummy for importer: Dummy variable that takes value 1 if imports are greater than 10%.

Share of imports: Share of imported inputs over total purchases of intermediate materials.

Dummy for exporter: Dummy variable that takes value 1 if exports are greater than 10%.

Share of exports: Share of exports over total annual sales.

Exporting experience: Number of years of exporting experience (log).

Capacity utilization: Average percentage of capacity used during last year.

Dummy for local monopoly: Dummy taking value one if the firm is a local monopoly.

Dummy for less that 5 competitors: Dummy taking value one if the plant has more or equal than 5 competitors in the local market.

Dummy for more than 5 competitors: Dummy taking value one if the plant has less than 5 competitors in the local market.

Dummy for increased sales: Dummy taking value 1 if the plant has increased its sales.

Dummy for decreased sales: Dummy taking value 1 if the plant has decreased its sales.

Dummy for increased prices: Dummy taking value 1 if the plant has increased its prices.

Dummy for decreased prices: Dummy taking value 1 if the plant has decreased its prices.

Dummy for informal competition: Dummy variable that takes value 1 if the firm competes with informal (no registered) firms.

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