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Where should governments invest? The impact of economic, political, social and technological factors on the formation of new firms

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Where Should Governments Invest? The Impact of Economic, Political, Social and Technological Factors on the Formation of New Firms

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ABSTRACT

The purpose of this paper is to identify the factors that affect the creation of new firms. We take into consideration economic, political, social and technological factors which should also help governments realize the areas that we found to have the greatest impact.

The study relies on data from international organizations from which we construct an ordered probit statistical analysis. The results indicate that investments in both ICT and education enhance the probability of generating new business.

Keywords

New business, ICTs, governance, income, credit, education, trade,

INTRODUCTION

Economic activity in the private sector is the lifeblood of a nation. It is through companies' efforts that employment is created, capital investment happens and innovation improves the socioeconomic circumstances of a country. In the past, governments have relied on large corporations to generate growth and employment. However, it is often smaller companies that create greater employment opportunities and contribute to economic growth.

The scholarly community is in disagreement regarding the benefits of new business to an economy. Research in the 1970s found that small firms contribute a disproportionate amount of new jobs (Evans et al. 1989c). Similarly, Haitwanger, Jarmin Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

and Miranda (Haltiwanger et al. 2008) found that start-ups and young businesses were critical for job creation and contributed significantly to a country's net growth. In contrast, authors like Shane (Shane 2009) have argued that start-ups are not innovative, create few jobs and generate little wealth. He believes that governments should focus instead on businesses with high growth potential. Likewise, a World Bank report (Ayyagari et al. 2011), while recognizing the economic benefits of new firms and indicating that young firms contributed to employment, noted that they were not as productive as their larger counterparts. The same report, nonetheless, found that small, young firms contributed a greater amount of jobs than larger and more established firms.

In spite of the contradictory evidence, governments have put forth significant efforts to support small and medium businesses (SMEs). In the United States, for example, the Small Business Act of 1953 mandated the establishment of government-sponsored programs to take care of SMEs' concerns and improve managerial skills (Lowrey 2004). For other nations, SMEs in general, and new businesses in particular, are relatively new policy priorities.

It is well known among the general public that new businesses have a high failure rate; however, a fraction of them will succeed and grow into companies that will positively affect an economy. We thus believe that establishing conditions that foster the entry of new business can benefit a country. In addition, as we will argue in this paper, the introduction of ICTs has reduced the barriers to entry, making it possible for more people to become entrepreneurs.

Starting a new business is not easy. Companies need to overcome many challenges, such as access to credit, access to skills, logistical issues, and governmental hurdles, in addition to making sure that there is enough demand for their products or services.

In this paper, we wish to determine the impact that political, economic, social and technological factors have on the development of new businesses.

DEFINING NEW BUSINESSES

Baumol (Baumol 1990) argues that different types of businesses emerge, depending on the institutional constraints facing would-be entrepreneurs. He believes that new business can be productive, unproductive or even destructive.

Productive businesses include those that engage in innovation; unproductive businesses are those that engage, through lobbying, in rent-seeking activities aimed to attract benefits to them at the expense of others; and destructive businesses are those that engage in organized crime. In his categorization of companies, Baumol fails to include the informal sector as an unproductive business type. Given the limited benefits that the informal sector brings to an economy, we, too, do not take it into consideration. This sector does not contribute to the tax or knowledge base, employs a minimal number of people, and negatively impacts the formal sector because, by having lower operational expenses, it competes unfairly with formally established businesses.

We set out to determine the extent to which countries are able to generate new firms. Given the purpose of this study, we use as our dependent variable the new business registered variable, adjusted by population size. This is what is normally known in the literature as business density.

FACTORS THAT AFFECT NEW BUSINESS CREATION

The way new firms affect an economy depends on the socioeconomic and political circumstances they face. These, which altogether we call institutions, determine where individuals put their resources. These can be productive, unproductive or destructive activities, depending on the incentives they face (North 1990).

The term institutional risks, for the purpose of this paper, refers to the "rules of the game," the laws and regulations that govern economic activity, along with political and social relationships (North 1990; Scott 2001). These regulations provide incentives as well as constraints to investment. They affect transactions costs and information flows (Chan et al. 2008). There is evidence of the positive and negative impacts that differences in attributes such as access to inputs of production, competitive advantage, technology and the country's institutions can have on the private sector (Chan et al. 2008).

There are four factors that can affect the capabilities of entrepreneurs to engage in innovation. These are a country's political institutions, its economic circumstances, its social fabric and its technological infrastructure.

The following section presents factors that scholars have identified as having an effect on the creation of new businesses.

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Governance Factors

Political institutions include laws and regulations, the processes that governments adopt to regulate economic activity and the enforcement of these laws. Kaufmann, Kraay and Mastruzzi (Kaufmann et al. 2010) define governance as “the traditions and institutions by which authority in a country is exercised. This includes (a) the process by which governments are selected, monitored and replaced; (b) the capacity of the government to effectively formulate and implement sound policies; and (c) the respect of citizens and the state for the institutions that govern economic and social interactions among them” (p. 4).

Political institutions are deemed to be weak when they lack transparency and predictability, when they are perceived to be unfair and when their laws are poorly enforced (Kaufmann et al. 2010).

Government actions can positively or negatively affect the creation of new businesses. In many countries, governments have recognized the benefits of entrepreneurship and have set up programs that will support the creation of new enterprises. These programs include what we would term “getting out of the way” policies; these include industry privatization and liberalization, as well as simplification of regulatory requirements (Audretsch 2001), but there are also “helping hand” policies that include more targeted efforts to support entrepreneurial activity. These include, for example, favorable lending, favorable taxation, subsidies, and training. In this paper, we focus only on general governance factors—as opposed to targeted initiatives—that can affect companies’ incentives to enter the market.

According to Puia (Puia et al. 2007) and Jacobides (Jacobides et al. 2006), the policies that have had more favorable effects on entrepreneurship are general policies that reduce barriers to entry for both national and international players and policies that dedicate significant expenditures to research and development, as well as to education and ties with universities.

For the purpose of this paper, we focus on two functions of government identified by the World Bank: (a) the capacity of a government to effectively formulate and implement sound policies, and (b) the respect of citizens and the state for the institutions that govern economic and social interactions among them.

When governments have convoluted or contradictory laws and regulations, these negatively affect the entry of new companies because of the time and effort required to register a business. Complexity in government processes delays licenses, registrations, and permissions that the private sector needs, and poor implementation of these regulations can lead to arbitrary decisions that further contribute to uncertainty. Moreover, when policies are translated into laws and regulations, they need to be enforced. Without adequate enforcement, a law is ineffectual, which also contributes to uncertainty.

To capture these governance factors and their effect on new businesses, we used the World Bank’s governance indicators, specifically Regulatory Quality, Government Effectiveness, and Rule of Law. We also tried to capture general governance factors through metrics that give some indication of the level of bureaucracy that exists in the country. For this, we introduced proxies with data from the World Bank on the number of procedures and the time required to build a warehouse or register property. Specifically, the relevant data that are available on this issue are: the number of procedures needed to build a warehouse, the time (in days) it takes to build one, the number of procedures needed to register property, and the time (in days) it takes to register property. We also included the World Bank’s “ease-of-doing-business index,” which rates countries from 1 (easiest) to 183 (most difficult).

Sometimes procedures set up by governments are created to serve a particular need, to solve a problem or to achieve a particular economic objective. However, as time passes, some of these procedures become obsolete but are never eliminated. This can result in a series of complex forms, permits, approvals, and so forth, which can take time and jeopardize the capital that a company may have secured to set up a business. It is because of the negative impact of these slow, and often unpredictable, bureaucratic procedures that new business and innovation fail to happen in some countries (Garcia-Murillo 2011).

Economic Factors

Companies operate in the market, and factors like income can affect demand. Access to credit can facilitate the entry of new businesses, and competition can motivate the private sector to be more innovative. In this section, we focus on these three factors, which affect the economic environment in which companies may wish to start a new business.

Income

Whether or not wealth affects entrepreneurship is still an issue of scholarly debate. Conventional wisdom indicates that wealthier economies should generate more new businesses than poor ones, but the economic literature provides arguments to the contrary.

Generally, when wages increase as a result of economic growth, the opportunity costs of setting up a business also increase because of the income that an individual has to forgo to set up a business (Carree et al. 2002). The decision to become an entrepreneur, scholars argue, depends on wages. If wages are low, individuals would be more inclined to start their own businesses, with the hope of earning a higher wage than what prevails in the market.

Lucas (Lucas 2003), in his theory of the firm, further justifies the rationale to be employed, depending on the prevailing wage. He hypothesizes that an entrepreneur has to recognize the fact that his or her self-earned wages would be uncertain, and thus it would be less desirable to set up a company when wages are high (Kihlstrom et al. 1979). Given the impact of wages on individuals' decisions to set up a company, we should find an equilibrium wage, where the number of individuals who become entrepreneurs equals the number of individuals who enter the labor market. This, however, cannot be categorically established because individuals' attitudes towards risk differ, which means that the wage at which people are willing to start a business differs from person to person (Kihlstrom et al. 1979). It is additional factors like this one that make the relationship between income and entrepreneurship unclear (Elston et al. 2011).

At a more granular level, (Hurst et al. 2004), found a significant relationship between wealth and entrepreneurship only in the top quintile of wealth distribution (Parker 2005). Evans and Jovanovic (Evans et al. 1989a) also found that wealthier individuals are able to start businesses with more efficient capital levels than poorer individuals. They argue that individuals will decide whether or not to become entrepreneurs based not only on their wealth, but also on their ability.

Sufficient personal income can allow an individual to finance a start-up company. According to Elston and Audretsch (Elston et al. 2011), government grants, credit cards and personal wages are the main sources of income for starting a company. In a country with underdeveloped financial markets, only wealthier individuals will be able to set up businesses, because they have the resources to pay for the higher collaterals normally found in these more uncertain economies (Evans et al. 1989b). Likewise, in the presence of imperfections in financial markets, individuals can borrow only a limited amount of capital, which may limit them from becoming self-employed and oblige them to work for a wage (Banerjee et al. 1993b).

A country's level of development affects individuals' occupational decisions because it affects the demand and supply of labor (Banerjee et al. 1993a). Since wealth has an impact on one's decision to become an entrepreneur, the distribution of wealth has an impact on entrepreneurship. According to Banerjee and Newman (Banerjee et al. 1993a), in countries that have high income inequality, "[t]he process of development runs out of steam," leading to little employment and low wages. The opposite is also true—when income inequality is low, the economy will grow, leading to high wages and a high employment rate (Banerjee et al. 1993b).

There is an interesting phenomenon related to the notion of risk aversion. According to Kan and Tsai (2006, as cited in Elston & Audretsch, 2011) people who are less risk-averse are more likely to start a company. This is consistent with the findings of Carree (2002), who argues that higher income leads to less entrepreneurship. The issue here is whether less developed countries are more or less risk-averse, and whether the fact that they have nothing to lose and the fact that they have less income lead them to take more risks and set up businesses.

Given the evidence we have so far, it is difficult to determine which of the two forces has a greater impact on the creation of new businesses. Some scholars would argue that with low wages, which is a characteristic during a recession, there will be a greater motivation to initiate a business. However, during recessions there are also fewer sources of capital to finance these entrepreneurs. Korosteleva and Mickiewicz (2011) argue against growth during recessions. They expect less business creation in times of economic contraction and an expansion of newly established businesses in times of growth.

Given the lack of consensus regarding income, we include in this study the GDP per capita, to establish, albeit imperfectly, the average income of the population. Similarly, given the impact that income inequality can have on the growth of newly established firms, we include the GINI index, which measures the extent to which the distribution of income within an economy deviates from a perfectly equal distribution. A GINI index of 0 represents perfect equality, while an index of 100 implies perfect inequality.

Access to credit

Well-developed financial institutions and access to credit enhance entrepreneurial activity in a country (Aidis et al. 2008). Consequently, several studies have found that a lack of credit is one of the major constraints to those wishing to start a new business (Beck et al. 2008; Beck et al. 2005; Storey 1994). This problem is particularly severe for small firms (De Mel et al. 2011), due to several significant impediments: They experience higher risks because of their lack of a credit history, have a high failure rate, and require greater monitoring costs (Korosteleva & Mickiewicz, 2011; Elston & Audretsch, 2011). These factors are exacerbated when a country also has a weak legal and financial system that has not developed the means to provide credit to these smaller entities.

Scholars have offered explanations of why new companies experience difficulties obtaining financing. In 1981, for example, Stiglitz and Weiss (Stiglitz et al.) asked, Why is credit rationed? This and subsequent work by them, by de Meza and Webb (De Meza et al.) and by Evans and Jovanovic (Evans et al.) argue that this happens because it is impossible for banks, due to asymmetric information, to identify risky versus relatively safe projects to fund. This forces financial institutions to reduce interest rates and ration capital, instead of opting for a much higher interest rate that would attract only risky entrepreneurs who might not intend to, or be able to, pay back. This credit rationing results in under-investment relative to the social optimum (Parker 2005) p. 10). However, in an oft-quoted study, Berger and Udell (Berger et al.) found contrary evidence regarding credit rationing in the United States. Like Meza and Webb (De Meza et al.), they argue that the US does not actually have an under-investment, but an over-investment, problem because there are too many projects being funded that should not be (Parker 2005), p. 11). Because of this, they argue, credit should be made more expensive, so that it is accessible to only the ablest of entrepreneurs. We suspect, nonetheless, that these findings are based on studies of developed nations. Impediments to access to credit can be a real and severe problem in less developed countries (LDCs), where the economic and political circumstances, added to underdeveloped financial markets, require higher collateral requests in obtaining loans (Bianchi 2010), making it difficult for entrepreneurs to get access to capital.

Developed nations have greater access to credit not only from banks, but also from other sources, such as venture capital, loan guarantee schemes, direct loans to small businesses from government, and financial assistance programs for unemployed individuals who want to start a business (Bendick et al. 1987). These types of programs are not normally available to entrepreneurs in LDCs.

Financial institutions protect themselves against the higher risks of new firms not only by reducing the amount of capital available to entrepreneurs, but also by charging a risk premium. An increase in the risk premium negatively affects investment, as projects that could have been feasible before are no longer possible, given the increased cost of capital (Fuerst 2006). This was confirmed by Lamont (Lamont) and Lettau and Ludvigson (Lettau et al.), who found that investments increase when risky discount rates fall.

Capital from financial institutions is not always available in LDCs. In light of various constraints, scholars have found that entrepreneurs' alternative sources of funding are government programs or family and friends (Beck et al. 2008). Given that initial capital may have not come from a bank, we wondered whether there are an equally robust number of companies entering the market in countries with weak financial institutions versus those with strong ones. This was an important insight as we constructed and analyzed the data on the strength of the financial sector and the manner in which it does or does not affect entrepreneurial activity. If we were to find, for example, that poor financial institutions do not affect the rate at which companies are being formed, this would give an indication of the strength of alternative sources of capital in countries where businesses are able to fill the void caused by the behavior of formal financial companies.

The literature finds that there are close interactions among the strength of a country's financial institutions, the risk premium that results from those markets and the amount of credit available to the private sector. For the purpose of this study, we included the amount of domestic credit available to the private sector, which helped us determine the amount of capital available to small companies.

Competition from abroad

National boundaries separate countries' economic policies and institutions. Within these boundaries, governments tend to implement policies to protect their economies (Olson, 1996). It is therefore not unusual to find policies restricting trade across markets (Busenitz et al., 2000) or bureaucratic procedures that erect barriers to foreign investors (Banga). Through trade agreements, governments can regulate commerce and find new opportunities for entrepreneurs beyond their borders (Olson Jr 1996). Trade policies open overseas markets for local companies, while also opening the national market to entrepreneurs from other regions (Von Bargen et al., 2003). Trade thus has the potential to foster cooperation and problem

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solving among entrepreneurs from different countries (Casson 1990). Trade agreements can be negotiated at the regional level, sometimes through the creation of free-trade areas (Alhorrt et al. 2008).

Governments may find themselves in need of finding new markets for their new or growing businesses (Olson Jr 1996). When negotiating trade agreements, the policies of host countries are very important because they influence entrepreneurial activity (Minniti 2008). A country's institutions and policies determine the level of uncertainty in markets and affect entrepreneurs' motivation during their decision-making process (Minniti 2008). Other factors that affect a person's desire to start a business are taxation, regulation, the size of the trade sector, differences between official exchange rates and black market exchange rates, and international capital market controls (Nystrom 2008).

The literature on trade finds two opposing consequences from a trade agreement. Trade agreements facilitate the movement of people and goods, and increase the volume of business and the hiring of qualified workers, which is easier than when trade agreements do not exist (Galindo Martin et al. 2010). The opposite is the potentially negative effect on small local businesses that need to compete with businesses and products from abroad (Galindo Martin et al. 2010).

Trade leads to domestic adjustments that may negatively affect employment. That is why governments often implement policies that may prevent trade flow, in an attempt to smooth the adjustment process (McGuire 2006). Trade agreements open opportunities for foreign entrepreneurs to enter new markets, but these opportunities are available to local business firms as well (Globerman & Shapiro, 1999).

Another consideration is that trade exposes the local economy to new technologies from many regions and promotes international competition, driving local firms to increase ICT investment (Seo et al. 2009). The most successful firms will be those that can offer competitive products and that can change or create strategies, depending on the environment they face (Globerman & Shapiro, 1999).

Policy makers believe that trade agreements increase foreign direct investment (FDI), promote the creation of new business and have a positive impact on the economy (O'Ryan et al., 2011). They also believe that countries that sign trade agreements are perceived as safe places to start new businesses (O'Ryan et al., 2011).

Trade agreements increase competition, which also generates incentives for entrepreneurs to develop new technologies to more adequately face such competition (McGuire, 2006), and trade generally facilitates technology transfer across countries and the diffusion of new products and processes.

Since 1995, the World Trade Organization has been notified of 125 new regional trading arrangements (RTAs). Notifications have risen from less than three per year during the period from 1950 to 1995 to more than 15 notifications per year between 1995 and 2002 (WTO, 2002).

Despite the general belief that trade agreements increase competition and provide incentives to entrepreneurs to develop new technology, the case of Chile demonstrated that the desired efficiency from trade agreements was not as significant as expected, because of the low participation of critical sectors (O'Ryan et al., 2011). To assess the impact better, an equilibrium analysis will be needed to identify the direct and indirect effects of trade agreements, something that can be done only after they have been in effect for several years (O'Ryan et al., 2011).

The freedom to trade internationally is subject to diverse factors, such as taxation on international trade, regulatory trade barriers, the size of the trade sector, official exchange rates, black market exchange rates, and international capital market controls (Nystrom, 2008). Nystrom considers that "the opportunities to engage in international trade influence an entrepreneur's market potential," because entrepreneurs make decisions to participate or not in international trade, based on the estimated maximum total sales revenue of a product in a specific market during a specific period of time (Nystrom, 2008). On the other hand, Sobel et al. (2007) found a negative correlation between barriers to international competition, measured by tariff barriers, and entrepreneurship. Finally, registering a third viewpoint, Bjornskov and Foss (Bjornskov et al.) did not find any significant relationship between international trade and entrepreneurship.

For the purpose of this paper, we will measure the exposure of an economy to trade, based on three variables: The weighted mean of the tariff rate for all products (%); the time in days it takes to import products; and the number of documents one has to complete to import merchandise.

Social Factors: Education

There are many elements that make up the social fabric of a nation; however, in this section, we focus only on education, one of the factors that the literature has found to have an impact on the creation of new business. Schultz conceives of entrepreneurial ability as a form of human capital (Schultz et al. 1982).

Therefore, the human infrastructure of a country refers to the pool of skills available in the population that can be hired for productive activities (Chan et al. 2008). Schooling is acknowledged not only for its productive effect on the quality or quantity of labor supplied, as is assumed by Mincer, but also for its role as a signal of productive ability in labor markets without complete information (Spence 1973).

Scholars have provided several ways to measure the quantity and quality of education (Barro et al. 1996; Engerman et al. 1997) and its impact on investment. Acemoglu et al. (Acemoglu et al.) (Acemoglu et al.), and Easterly and Levine (Easterly et al.) offer primary school attainment, the attainment level of females, ratings from international examinations and measures of health status—another dimension of human capital—as determinants of growth and investment.

Empirical evidence shows that education was the most important factor for new firm creation in the period 1976-1989 (Christensen 1993). Le (Le) similarly argues that there are several channels through which one's level of education might influence the propensity to become self-employed. Calvo and Wellisz (Calvo et al.), inspired by Lucas' general equilibrium model (1978), explain the impact of one's educational attainment on the probability of selecting an entrepreneurial position, given managerial ability. This means that education can enhance managerial ability, which in turn increases the probability of entrepreneurship.

By analyzing the effect of education on entrepreneurship, we are trying to capture the extent to which an educated population, as well as the amount of resources that the government dedicates to this activity, affects the level of entrepreneurship in a country. We want to determine the percentage of the labor force that is educated (how many workers have secondary and tertiary educations), the amount of resources allocated to educate the population, and the impact these have on new business creation.

Technological Factors: ICT

Many factors can affect the technological sophistication of a nation. In regard to the technological base, we focus exclusively on information and communication technologies (ICTs) that are available to the population and that facilitate the exchange of information.

Today, the barriers to entry for certain business have been reduced by the capabilities that information and communication technologies (ICTs) have made possible. There are opportunities for creative individuals to take advantage of a global market opened up through these technologies. It shouldn't be surprising, therefore, to find that the information technology revolution would have an effect similar to that of the Industrial Revolution. As suggested by a number of researchers (see, e.g., Cohen 1981; Millward 1981; North 1981), in the long run, the Industrial Revolution and the new forms of production that resulted led to major innovations.

The ICT infrastructure of a nation is a key variable in this study, because we wish to determine if access to these technologies can help to overcome weaknesses in other areas. We selected the variables that are most likely to have an impact on the creation of new businesses. Scholars have identified several technologies that have had a positive effect on businesses: mobile phones (measured as mobile cellular subscriptions per 100 people), computers (measured as the percentage of individuals and households with PCs) and the infrastructure to connect them, specifically broadband (measured as the number of fixed broadband Internet subscribers per 100 people).

Based on Schumpeter's (Schumpeter) concept of technological change, we can consider ICTs as tools for strengthening multi-factor productivity (i.e., productivity that is not added by capital and labor). In the neoclassical tradition of economic theory, technological progress is associated with total factor productivity (TFP) or multifactor productivity and its relationship with economic growth (Harrod 1949; Solow 1956; Swan 1956). Technological progress has also been associated with the so-called theory of endogenous technical change (Grossman et al. 1991; Mankiw et al. 1992; Romer 1986; Romer 1990).

Authors such as Tebaldi and Elmslie (Tebaldi et al.), Acemoglu et al. (Acemoglu et al. 2001; Acemoglu et al. 2004), and Easterly and Levine (Easterly et al. 2003) have developed formalized models of economic growth which evaluate the influence of institutions on economic performance, taking into consideration the impact of investment in ICT technologies.

Research by Katz (Katz 2009a) has also shown that the productivity of information workers, and therefore of economic growth, depends directly on ICT investment. Studies from Latin American (Katz, 2009a) and industrialized countries (Katz 2009b) show that a higher percentage of the workforce dedicated to information processing or generation leads to a higher proportion of investment devoted to the acquisition of capital goods.

ICTs, and particularly broadband, have been identified as a factor in job creation. A regional comparative analysis on job creation and broadband penetration indicates that this technology has the capacity to stimulate economic growth, promote the creation of innovative businesses and create sources of employment. (Fornfeld et al. 2008; Gillett et al. 2005; Katz 2009b) claim there is a direct relationship between the diffusion of broadband and the generation of employment.

Scientific and technological activity is a major driver of productivity and economic growth. Global exports of ICTs goods represented 12% of the world merchandise trade in 2009, and they are increasingly dominated by Asia. In fact, seven of the top ten exporters are Asian economies, with China clearly in leading position.

In part, due to the effects mentioned above, ICTs can be a catalyst in overcoming the economic crisis that is affecting both emerging and industrialized countries. Their contribution materializes at two levels relating to the creation of jobs: from investment in the deployment of infrastructure and from the positive externalities derived from new businesses and economic growth.

The effects of ICT infrastructure deployment can be divided into three categories related to job creation: direct, indirect, and induced effects.

Direct effects involve employment creation (construction, telecommunications and engineering) generated, in the short term, from the construction and installation of networks.

Indirect effects involve employment creation as a result of the operation of other industries (e.g., metallurgy, electric equipment, and professional services) that do not come directly from ICTs, but from industries that use ICTs in their operations.

Induced effects involve employment generated from household consumption, based on income generated by companies in the sectors that generate direct and indirect effects.

For this paper, we used data from the International Telecommunications Union to capture the level of ICTs in any given country. Specifically, the variables we chose are the number of fixed Internet subscriptions per 100 inhabitants, the number of fixed broadband subscribers per 100 inhabitants, the number of mobile subscriptions per 100 inhabitants and the percentage of individuals with a personal computer. Our objective is, as stated before, to determine if investment in ICTs can facilitate the entry of new businesses and overcome weaknesses in other areas of the economy and government.

REGRESSION MODEL

The dependent variable new business density (DNBRDENS) is heterogeneous across countries. Thus, we can observe that the sample contains some countries with a low density of start-ups; another part of the sample has an average density; and yet another set of countries experiences a high number of new businesses registered. Intuitively, we can think of the business density as a latent variable ordered into three different types of countries: those with low, medium and high-density business creation.

More formally, consider the observed categorical variable new business density with a latent density status by country $DNBRDENS_{(i,t)}$. Let $DNBRDENS$ be the ordered categories, $DNBRDENS \in J = \{1,2,3\}$ where each number in J denotes one of the categories for the business creation variable. For independent and identically distributed (iid), let $DNBRDENS$ for $i = 1, \dots, N$ observations (i denotes cross-sectional units, and t the time dimension of the data panel) be a nominal variable representing the ordered categories $k = 1, \dots, K$.

The latent variable is tied to the (observed) ordered variable $DNBRDENS_{i,t}$ by the observation rule:

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

$$\text{DNBRDENS}_{i,t} = \kappa \text{ if } \tau_{i\kappa} < \text{DNBRDENS}_{i,t} \leq \tau_{i\kappa+1}, \kappa = 1, \dots, \kappa$$

where thresholds τ_i are strictly increasing $\tau_{i\kappa} < \tau_{i\kappa+1}$ for all κ .

The structure of our data set allows us to use an ordered probit panel data methodology. This type of analysis can control for heterogeneity across countries and reduce collinearity among the selected variables (Arellano et al. 1990). Our ordered probit panel data model may be represented as follows:

$$\text{DNBRDENS}_{i,t} = x'_{it}\beta + \varepsilon_{i,t}; \quad t = 1 \dots T; i = 1 \dots N \quad (1)$$

The cumulative probabilities for the $\text{DNBRDENS}_{i,t}$ are then related to a set of explanatory variables, x , which is affected by political, social, economic and ICT infrastructures; these are determined by the following equation:

$$\Pr[\text{DNBRDENS}_{i,t} \leq j | x] = F(\kappa_j - x'\beta) \quad j = 1, 2, 3$$

The function F represents an accumulative standard normal distribution, resulting in an ordered probit model. Including the latent variable in this model, we have

$$\text{DNBRDENS} = j \text{ if and only if } \kappa_{j-1} \leq \text{DNBRDENS} = x'\beta + \varepsilon_{i,t} < \kappa_j \quad j = 1, \dots, 3$$

This equation means that the thresholds divide the linear slope DNBRDENS into J categories. Moreover, different factors (observable and unobservable) influence the latent variables density of business creation, where $\varepsilon_{i,t}$, $t = 1 \dots T$ represents the composite errors. For each t , $\varepsilon_{i,t}$ is the sum of unobserved effects and an idiosyncratic error. This error term, $\varepsilon_{i,t}$, is iid across countries and over time, where $(\varepsilon_{i,t} | x) = 0$, for $i = +100$ countries, and $T = 11$ years. For this error, we assume a zero mean and a constant variance, e.g., $\sigma^2 = 1$.

The probability that a country will report a business density status to be in $J = \{1, 2, 3\}$ is expressed in the next equation:

$$\Pr[\text{DNBRDENS}_{i,t} = j | x] = F(\kappa_j - x'\beta) - F(\kappa_{j-1} - x'\beta) \quad (2)$$

Note that we have a vector β , which is presumed to be the same for all categories (one obstacle to the appropriate implementation of an ordered probit is the parallel lines assumption). This means that with the increase of an independent variable, the accumulated distribution shifts to the right or left, but there is no shift in the slope of the distribution. Greene et al. (2008) suggest that in a set of thresholds, individual variation that appears in the data is an indicator for heterogeneity. Thus, allowing the indices to differ across the outcomes leads to a generalized ordered probit model.

$$\kappa_j = \tilde{\kappa}_j + x'_i \gamma_j \quad (3)$$

where γ_j are the influence parameters of the covariates on the thresholds. Entering (3) in (2), we have the generalized ordered probit model (4):

$$\Pr \text{DNBRDENS}_{i,t} \leq j | x = F(\tilde{\kappa}_j + x'_i \gamma_j - x' \beta) = F(\tilde{\kappa}_j - x' \beta_j) \quad (4)$$

In (3), the threshold coefficients cannot be identified separately for this system of vectors x . Note that in (4), $\beta_j = \beta - \gamma_j$, $x' \beta_j$ identifies one index for each category j of the outcome variable. Thus, we have a generalized ordered probit model with $J-1$ binary probit models. The last equation allows heterogeneity across the categories of the business density variable.

We will define a nonlinear model

$$F(\Pr(\text{DNBRDENS}_{i,t} | x_{i1}, x_{i2}, \dots, x_{iT})) = g(\text{DNBRDENS}_{i,t}, \beta' x_{it} + \kappa_j + \theta) \quad (5)$$

where θ is a vector of ancillary parameters and captures an overdispersion in the threshold parameters in an ordered probit model.

A random-effects ordered probit relaxes this assumption and allows the effects of the explanatory variables to vary with each of the ordinal dependent variables.

For panel data, individual heterogeneity is accounted for by using a random-effects generalized ordered probit approach (Arellano et al. 1995). In this case, we find that the outcome probabilities are conditional on the individual effect α_i .

$$\Pr \text{DNBRDENS}_{i,t} = 1 | x_{it}, \alpha_i = F - x'_{it} \beta_1 - \alpha_i$$

$$\Pr \text{DNBRDENS}_{i,t} = 2 | x_{it}, \alpha_i = F - x'_{it} \beta_2 - \alpha_i - F - x'_{it} \beta_1 - \alpha_i \quad (6)$$

$$\Pr \text{DNBRDENS}_{i,t} = 3 | x_{it}, \alpha_i = F - x'_{it} \beta_3 - \alpha_i - F - x'_{it} \beta_2 - \alpha_i$$

The random-effects generalized ordered probit model uses the standard normal as the accumulative distribution. The individual effects are presumed to be normally distributed, with zero mean and variance σ^2 .

Using panel data allows the inclusion of two kinds of heterogeneity. The first is unobserved individual heterogeneity, which is captured by a random-effects specification. The second results from differences in the beta coefficients represent the observed heterogeneity in the reporting of the categories for DNBRDENS.

In this system, we do not have explicit solutions for the parameter estimates, and they must, therefore, be solved iteratively. To find the solution of the model, we need to construct a maximum likelihood the estimator, a parametric approach to modeling. First, the density is presumed to be fully defined. In equation (7), we have a likelihood function for a sample of N observations:

$$L = \prod_{i=1}^N \prod_{t=1}^{T(i)} g(\text{DNBRDENS}_{i,t}, \beta' x_{it} + \alpha_i, \theta). \quad (7)$$

The likelihood equations are

$$\frac{\partial \log L}{\partial \beta} = 0, \quad \frac{\partial \log L}{\partial \alpha_i} = 0, i = 1, \dots, N, \quad \frac{\partial \log L}{\partial \theta} = 0,$$

The likelihood contribution for each cross-sectional unit was approximated using a Gauss-Hermite quadrature.

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

DATA ANALYSIS

For our data, we relied on two databases from the World Bank (WB) and one from the International Telecommunications Union (ITU). From the WB, we collected data from the World Development Indicators (WDI) and the Worldwide Governance Indicators (WWGI); from the ITU, we consulted the ICT indicators. For each of the variables, which come from the World Bank, Table 1 presents an abbreviation, a description, the source, the data and the unit of measurement.

VN: Variable name A: Abbreviation M: Measure S: Source	DESCRIPTION
VM: New businesses registered density A: nbrdens M: number per 10,000 people S: World Bank	This is the number of new limited liability corporations registered in a calendar year, divided by the population size and then multiplied by 10,000.
GOVERNANCE VARIABLES	
VN: Rule of law: Estimate A: rol M: index (-2.5 to 2.5) S: WB Worldwide Governance Indicators	This variable captures perceptions of the extent to which agents have confidence in, and abide by, the rules of society, and in particular estimates the quality of contract enforcement, property rights, the police, and the courts, as well as the likelihood of crime and violence. The estimate gives the country's score as an aggregate indicator, in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.
VN: Government effectiveness A: ge M: index (-2.5 to 2.5) S: WB Worldwide Governance Indicators	This variable captures perceptions of the quality of public services, the quality of the civil service and the degree of its independence from political pressure, the quality of policy formulation and implementation, and the credibility of the government's commitment to such policies. The estimate gives the country's score as an aggregate indicator, in units of a standard normal distribution, i.e., ranging from approximately -2.5 to 2.5.
VN: Ease of doing business A: eob M: 1 = easiest, 183 = most difficult S: WB Doing Business	Economies are ranked on their ease of doing business, from 1 (easiest) to 183 (most difficult). A good (low) score on the ease of doing business index means the regulatory environment is conducive to the operation of business. This index averages the country's percentile rankings on 10 topics, made up of a variety of indicators, giving equal weight to each topic. The 2009 rankings are from <i>Doing Business 2010: Reforming through Difficult Times</i> , covering the period June 2008 through May 2009.
VN: (Credit) Strength of legal rights index A: slr M: index (1-10) S: WB Doing Business	The strength of legal rights index measures the degree to which collateral and bankruptcy laws protect the rights of borrowers and lenders and, thus, facilitate lending. The index ranges from 0 to 10, with higher scores indicating that these laws are better designed to expand access to credit.

VN: Procedures to build a warehouse A: pbw M: number World Bank	This variable consists of the number of interactions of a company's employees or managers with external parties, including government agency staff, public inspectors, notaries, land registry and cadastre staff, and technical experts apart from architects and engineers.
VN: Time required to build a warehouse A: trbw M: days S: WB World Development Indicators	This variable consists of the number of calendar days needed to complete the required procedures for building a warehouse. If a procedure can be speeded up at additional cost, the fastest procedure, independent of cost, is chosen.
VN: Procedures to register property A: prp M: number S: WB World Development Indicators	This is the number of procedures required for a business to secure rights to property.
VN: Time required to register property A: trrp M: days S: WB World Development Indicators	This is the number of calendar days needed for a business to secure rights to property.
VN: Time to import A: tim M: days S: WB World Development Indicators	The time calculation for a procedure (recorded in calendar days) starts from the moment it is initiated and extends until it is completed. If a procedure can be accelerated for an additional cost, the fastest legal procedure is chosen. It is assumed that neither the exporter nor the importer wastes time and that each commits to completing every procedure without delay. Procedures that can be completed in parallel are measured as simultaneous. The waiting time between procedures—for example, the unloading of the cargo—is included in the measure.
VN: Documents to import A: dim M: number S: WB World Development Indicators	All documents required per shipment to export goods are recorded. It is presumed that the contract has already been agreed upon and signed by both parties. Documents required for clearance by government ministries, customs authorities, port and container terminal authorities, health and technical control agencies and banks are taken into account. Since payment is by letter of credit, all documents required by banks for the issuance or securing of a letter of credit are also taken into account. Documents that are renewed annually and that do not require renewal per shipment (for example, an annual tax clearance certificate) are not included.
ECONOMIC VARIABLES	
VN: GDP Per capita A: gdppc M: dollars S: WB World Development Indicators	This is the GDP per capita based on purchasing power parity (PPP). PPP GDP is the gross domestic product converted to international dollars, using purchasing power parity rates. An international dollar has the same purchasing power over GDP as the U.S. dollar has in the United States. The GDP at purchasers' prices is the sum of the gross value added for all resident producers in the economy, plus any product taxes and minus any subsidies not

	included in the value of the products. It is calculated without making deductions for the depreciation of fabricated assets or for the depletion and degradation of natural resources. Data are in constant 2005 international dollars.
VN: GINI Index A: gini M: index (1-100) S: WB World Development Indicators	The GINI index measures the extent to which the distribution of income (or, in some cases, consumption expenditure) among individuals or households within an economy deviates from a perfectly equal distribution. A Lorenz curve plots the cumulative percentages of total income received against the cumulative number of recipients, starting with the poorest individual or household. The GINI index measures the area between the Lorenz curve and a hypothetical line of absolute equality, expressed as a percentage of the maximum area under the line. Thus, a GINI index of 0 represents perfect equality, while an index of 100 implies perfect inequality.
VN: Tariff rate, applied, simple mean, all products A: trap M: percentage S: WB World Development Indicators	The simple mean applied tariff is the unweighted average of effectively applied rates for all products subject to tariffs, calculated for all traded goods. Data are classified using the Harmonized System of Trade at the six- or eight-digit level. Tariff line data were matched to Standard International Trade Classification (SITC) Revision 3 codes to define commodity groups. Effectively applied tariff rates at the six- and eight-digit product level were averaged for products in each commodity group. When the effectively applied rate was unavailable, the most favored nation rate was used instead. To the extent possible, specific rates have been converted to their <i>ad valorem</i> equivalent rates and have been included in the calculation of simple mean tariffs.
SOCIAL VARIABLES	
VN: Labor force with secondary education A: lfse M: % of total S: WB World Development Indicators	This is the proportion of the labor force that has a secondary education, expressed as a percentage of the total labor force.
VN: Labor force with tertiary education A: lfte M: % of total S: WB World Development Indicators	This is the proportion of the labor force that has a tertiary education, expressed as a percentage of the total labor force.
VN: Expenditure per student, secondary A: epss M: % of GDP per capita S: WB World Development Indicators	Public expenditure per student is the amount of current public spending on education, divided by the total number of students at each level, and expressed as a percentage of GDP per capita. Public expenditures (current and capital) include government spending on educational institutions (both public and private) and on education administration, as well as subsidies for private entities (students/households and other private entities).
TECHNOLOGICAL VARIABLES	

VN: Fixed broadband Internet A: fbisphp M: subscribers per 100 people S: ITU ICT Indicators	This is the percentage of fixed broadband Internet subscribers possessing a digital subscriber line, cable modem, or other high-speed technology.
VN: Mobile cellular A: mcsphp M: subscribers per 100 people S: ITU ICT Indicators	This is the percentage of the population subscribing to a public mobile telephone service using cellular technology, which provide access to the public switched telephone network. Post-paid and prepaid subscriptions are included.

Table 1. Data descriptions

One of the main challenges when doing empirical international research is coping with missing data. This study is no exception. It has been well documented that analyzing only cases for which there is complete data can lead to biased results. In this study, the initial number of countries in the sample was 213. This was reduced to 167 because many of them were not countries and more countries were eliminated because they had data available for only two or three of the variables chosen for the analysis. The elimination of these countries should not bias the results, because they either had very small economies or were going through major transitions.

Examples of countries that were eliminated include Afghanistan, Andorra, Bahamas, Barbados, Korea, Dem. Rep. Kosovo, Libya among others. This should not imply that we had complete data for all the remaining countries; for some variables, many data points were missing. Table 2 presents the list of variables and the number of observations that were available. Data were collected for 11 years for each of the 167 countries, resulting in a total of 1,837 observations.

Variable	Number of missing variables	Percentage of missing variables
New businesses registered	1,428	71%
GOVERNANCE FACTORS		
Rule of law	349	17%
Government effectiveness	349	17%
Ease of doing business	1,670	83%
(Credit) Strength of legal rights index	700	35%
Procedures to build a warehouse	847	42%
Time required to build a warehouse	847	42%
Procedures to register property	707	35%
Time required to register property	707	35%
Time to import	846	42%
Documents to import	846	42%
ECONOMIC FACTORS		
GDP per capita	400	20%

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

Population	168	8%
SOCIAL FACTORS		
Labor force with secondary education	1,608	80%
Labor force with tertiary education	1,601	80%
Expenditure per student, secondary education	1,330	66%
TECHNOLOGICAL FACTORS		
Mobile cellular	179	9%
Fixed broadband Internet	337	17%

Table 2. Missing data statistics

Because missing data are a common problem, scholars have devised techniques to calculate fill in for them by working from existing variables. Some methods of this sort include the ad hoc techniques of using the mean from the observed values and extrapolating from the latest value available (also known as last-observation-carried-forward [LOCF])—which some researchers see as inadequate (Graham et al. 1994; Little et al. 1987)—and using regression analysis to estimate values. For this study, these methods were particularly problematic because, for some variables, data were missing for two or three consecutive years. This meant that in the case of any of the ad hoc or regression methods, the same value would have been given for three years. Thus, we used a multiple imputation method, by which missing data were generated simultaneously from all the available variables for all the observations and years. The mathematical algorithms that are needed for multiple imputation are now easier to use, thanks to a new routine available in statistics software such as Stata.

Table 3 present the descriptive statistics for all the variables by threshold. It should be noted that countries that have a higher business density entry also have higher incomes, higher access to credit, lower trade tariffs, simpler bureaucratic procedures and a higher proportion of highly educated people. Data affected by these considerations are highlighted in gray.

	New business density, first percentile		New business density, second percentile		New business density, third percentile	
Variable	Mean	Std.	Mean	Std.	Mean	Std.
gdppc	4900.58	5537.481	12068.24	12179.73	18582.2	15670.52
gini	40.63806	8.394794	41.69406	10.69476	41.08757	8.717709
slr	4.176056	2.307248	5.958333	2.311041	6.686833	2.269708
dcps	24.43504	14.43407	54.68013	45.84608	91.93271	60.25784
trap	8.7727	3.826463	5.103217	3.60234	3.17375	3.683712
din	9.299145	2.640092	7.736	2.469635	6.257261	2.177584
tid	38.77778	20.00867	29.152	20.76872	16.53527	11.65403
lfpe	43.52143	20.46713	31.85814	18.74916	24.40234	15.64143
lfse	24.09286	15.7701	43.805	19.92424	45.83594	16.75409
lfte	17.22143	8.012028	21.71628	10.37047	27.72891	13.78812
epss	20.88967	13.01787	18.52771	6.808856	22.81011	7.333138
fbis	241038.4	757710.9	2435920	5772173	2175644	3769618
fbiphp	0.4256019	1.374823	4.465919	6.743718	12.60597	10.58319

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

mcs	19,000,000	44200000	25,000,000	28300000	17,000,000	31800000
rol	- 0.5407326	0.4523323	- 0.1392674	0.8331934	0.7560968	0.8857771
pbw	18.22222	7.127062	17.496	6.967232	16.76763	9.470346
trbw	248.906	117.7026	200.416	104.2585	195.3154	115.7711
prp	7.091549	2.9461	6.222222	2.540427	5.454545	2.234584
trrp	100.669	80.4697	45.73611	42.84449	66.48364	104.8641

Table 3. Descriptive statistics

Table 4. shows the correlation coefficients for the governance indicators; several inferences can be drawn from these. A number of the governance variables (government effectiveness and rule of law, strength of legal rights) are highly correlated (>.5). This is not surprising, given that they all reflect, to a certain extent, different elements of government. For the final model, we decided to use the ease of doing business, because it more accurately captures the investment climate, as opposed to the general environment of governance.

There are also high correlations (>.6) among the trade-related variables (trade tariff, days to import and documents to import). For the model, we included only the tariffs variable.

	ge	rol	slr	pbw	trbw	prp	trrp	rdegdp	trap	tid	Din
ge	1										
rol	0.9492	1									
slr	0.5356	0.5055	1								
pbw	-0.1264	-0.1579	-0.1024	1							
trbw	-0.3222	-0.3695	-0.1829	0.1779	1						
prp	-0.3009	-0.3218	-0.1209	0.0745	0.1181	1					
trrp	-0.2143	-0.2025	-0.1282	0.0046	0.3335	0.1819	1				
Eob	-0.8325	-0.8071	-0.5366	0.1713	0.3816	0.3912	0.3821	1			
Trap	-0.5843	-0.5376	-0.3862	-0.0789	0.1623	0.1863	0.1945	0.7018	1		
Tid	-0.663	-0.6644	-0.3577	0.1258	0.2529	0.1905	0.1561	0.6206	0.49	1	
Din	-0.6217	-0.6093	-0.4075	0.2633	0.2715	0.1412	0.1343	0.6493	0.4253	0.6599	1

Table 4 Correlation coefficients for governance variables

Table 5 shows the correlations among the economic variables. Here, the GPD per capita and the domestic credit available to the private sector show a high correlation, while there is little correlation between income and income inequality.

	gdppc	gini	dcps
gdppc	1		
gini	-0.2963	1	
dcps	0.5303	0.0457	1

Table 5 Correlation coefficients for economic variables

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

Table 6 presents the correlations among the social variables. Regarding the variable “labor force by education level,” only “labor force with primary education” is highly correlated with “labor force with secondary education.” This indicates to a certain extent that in many countries, the number of workers with primary and secondary educations are similar. The correlation of primary and secondary education with tertiary education is small, which points to a great difference in numbers between workers with a primary or secondary, and those with a tertiary education. In most countries, there are a significant number of individuals who either drop out of high school or do not continue to college.

	lfpe	lfse	lfte	epss
lfpe	1			
lfse	-0.6657	1		
lfte	-0.4536	-0.1435	1	
epss	-0.1857	0.1199	0.114	1

Table 6. Correlation coefficients for social variables

Table 7 shows correlations among technological factors. Among these data, we see a high correlation between the two ICT variables, “broadband” and “mobile subscriptions.”

	fbiphp	mcsphp
fbiphp	1	
mcsphp	0.647	1

Table 6. Correlation coefficients for technological variables

REGRESSION RESULTS

As was indicated before, we estimated the model using a random-effects generalized ordered probit. The ordered dependent categorical variables are associated with business density, a three-level variable where 1 represents very low-density business creation (countries that fall within the lowest 25th percentile) and 3 represents high-density business creation (countries above the 75th percentile). As explanatory variables, we included a set of social, economic, political and technological capabilities. For each of these four factors, we collected more data than appear in the model, because in constructing it we found significant correlations among variables that measure similar factors.

Table 8 shows the marginal effects which quantify the variation in the estimated probability to a marginal change in the independent variable. In this case, the marginal effects measures the changes in the probability that a country experiences when the independent variable changes for each of the three country types.

	Variables	dbrdens==1	dbrdens==2	dbrdens==3
Technological	Fbiphp	-.0106026*** (.002398)	.0098323*** (.0019839)	.0007703 (.0016318)

Technological	Mcsphp	-.0018105*** (.0003703)	.0018609*** (.0003162)	-.0000503 (.000284)
Economic	Dcps	-.000859 *** (.000359)	.0002889*** (.0001226)	.00057*** (0.018)
Social	Lfte	-.0028174*** (.0007468)	.0009477*** (.0002632)	.0018697*** (.0005043)
Economic	Gini	-.0014235 (.0010766)	.0004788 (.0003643)	.0009446 (.000716)
Institutional	Eob	-.001171*** (.0002937)	.0003939*** (.0001045)	.0007771*** (.0001983)
Institutional	Tbrw	-.000106 (.0000829)	.0000357 (.000028)	.0000703 (.0000552)

NOTES: dy/dx is for discrete change of dummy variable from 0 to 1. Standard errors are in parentheses (Delta Method)
 ***p<0.01, **p<0.05, *p<0.1

Cells in grey show the factors that have the highest probabilities.

Table 8: Average marginal effects after the random-effects ordered probit

Regarding technological variables, “broadband” and “mobile subscriptions” are significant for only the first two country categories. We find that increases in mobile and broadband infrastructure reduce the likelihood of a country’s ending up in the low “new business density” category and increases the likelihood of having an average density of business creation. More concretely, an increase of one percent in the number of broadband subscribers per one hundred inhabitants reduces by 1.06 percent the probability of being in the low-density, new business creation category.

Infrastructure improvements have not had much impact in countries with a high level of new business creation. If we look at the summary statistics table, we find that countries with a high business creation density are also high in ICT infrastructure. This could mean that in countries where there is already a substantial infrastructure, a percentage increase in infrastructure will have no impact on the number of businesses created.

The model includes two economic variables: the “domestic credit available to the private sector” and the GINI, which was not significant for any of the thresholds. Understanding this will require further research by the academic community because it contradicts previous studies’ suggestions regarding the inability of an economy with high income inequality to sustain an engine of new business creation.

The other economic variable, “domestic credit available to the private sector,” was significant for all thresholds. This means that the availability of domestic private sector credit decreases the probability of having a low density of business creation and increases the probability of having a medium and high new business density. A 1% increase in the amount of domestic credit available reduces the likelihood of a country’s having a low density by 0.08 percentage points, and it increases the likelihood of having a medium to high density to 0.08 and 0.06 percentage points, respectively.

Of the social variables, we included only the labor force with tertiary education. The rationale for this is consistent with the existing literature, which indicates that more educated individuals are more likely to start a business. Thus, we assume that countries where the labor force is more educated (i.e., having more individuals with a college degree) will be more entrepreneurial. The results support this hypothesis for all three thresholds and suggest that the probability of experiencing a higher rate of business creation increases with education. An increase of one worker with a tertiary education reduces the probability of having low business creation (per 10,000 population) by 0.03 percentage points, while it increases the probability by 0.009 percentage points for countries with an average business density, and by 0.03 percentage points for those with a high density.

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

Of all the governance variables, we included only two: “ease of doing business” and “the time required to build a warehouse.” Of these two, only “ease of doing business” was significant. Even though we wanted to capture the complexity of bureaucracies with these and similar variables, we suspect that new companies are not yet large enough to register property or warehouses. So even if the number of procedures or the length of time that it may take to register them it does not affect new businesses, this does not mean it will likewise have no effect on established and larger companies, which may need to buy and register property.

The ease of doing business is statistically significant for all three density thresholds of entrepreneurship. Thus, increases in this index reduce the likelihood of having a low density of business creation and increase the likelihood of having a medium or high density.

Figure 1 shows the results of the differences in probability for the different thresholds, for each of the variables in the model.

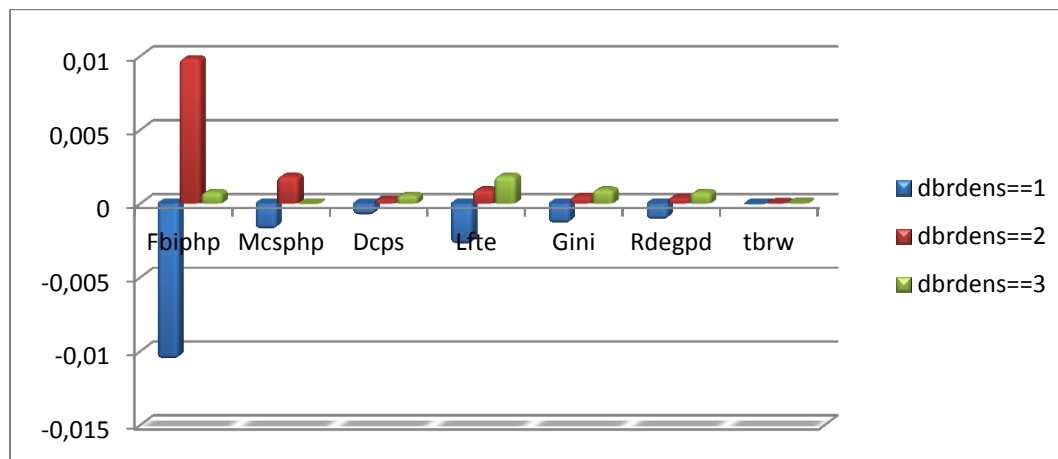


Figure 1: Probability differences for each of the three types of countries regarding new business creation

ANALYSIS

At the beginning of the paper, we asked, Where should governments invest? As could be expected, different countries have different governance, economic, political, social and technological circumstances. In our case, we only make a distinction among three different types of countries: those that have low, medium and high business entry. Countries that experience low business entry can reduce the probability of being in this situation by investing in broadband infrastructure and education. For countries that experience a medium level of business entry, investment in ICT infrastructure increases the probability of maintaining that standing, and for countries in the high business entry group, investment in education generates the highest probability of remaining there.

CONCLUSIONS

Businesses are the economic engine of a nation. It is through these enterprises that jobs get created, capital investment happens and innovation improves the welfare of the population. In this paper, we wanted to determine two things: first, to identify the factors that have the greatest influence on the creation of new business, and second, to determine if ICTs had a significant role in promoting business entry.

In the academic literature, we find that political, economic, social and technological factors can affect the level of business entry in a country. Of the political factors, or more accurately, the governance factors, general policies for business creation can be more helpful than targeted ones. Because of this, in this study we focus only on general governance factors. Of these, the literature, and empirical analysis, suggest that bureaucratic processes are more likely to impair business, especially in terms of “ease of doing business” and “tariffs.” It should be noted that all the other governance variables that we

contemplated were highly correlated, and were thus eliminated from the final model. For countries that experience low business entry, improvements in the ease of doing business will improve the probability of generating more businesses.

In regard to the economic factors, we found no conclusive effect of income on business creation; but while the results indicate that income does not play a role, access to credit matters. This shows that even if we have a low-income country, we can still see business being created if there is access to credit.

The academic literature has accurately predicted the positive impact that education (human capital) can have on entrepreneurial activity. We find that this is particularly true for countries that experience either low or high business entry. It is not clear why the probability is higher for these two types of countries; explaining this will entail a more detailed exploration. It is nonetheless clear that investment in education can generate economic activity.

Finally, as has been predicted by the academic literature, both of our technological variables, "broadband" and "cellular subscriptions," were highly significant. It appears that these technologies now play an important role in business. Perhaps the most surprising result is how large these are with respect to the other factors. It appears that governments would be wise to invest in their information infrastructures, because of all the other places where they could invest, ICTs have the greatest impact on business creation.

Further research will be necessary to analyze these data at a higher level of granularity. For example, they could be explored by income level and by region.

We hope that this research provides some guidelines for governments regarding their decision to invest in the country when the desire is to generate economic activity.

REFERENCES

1. Acemoglu, D., Johnson, S., and Robinson, J. A. "The Colonial Origins of Comparative Development: An Empirical Investigation," *American Economic Review* (91:5) 2001, pp 1369-1401.
2. Acemoglu, D., Johnson, S., and Robinson, J. A. "Instituciones as the fundamental cause of long-run growth," *Discussion paper* /4458) 2004, p ALL.
3. Aidis, R., Estrin, S., and Mickiewicz, T. "Institutions and entrepreneurship development in Russia: a comparative perspective," *Journal of Business Venturing* (23:6) 2008, pp 656-672.
4. Alhor, H. S., Moore, C. B., and Payne, G. T. "The Impact of Economic Integration on Cross-Border Venture Capital Investments: Evidence From the European Union," *Entrepreneurship: Theory & Practice* (32:5) 2008, pp 897-917.
5. Arellano, M., and Bover, O. "Another look at the instrumental variable estimation of error-components models," London, 1990, p. 29.
6. Arellano, M., and Bover, O. "Another look at the instrumental variable estimation of error-components models," *Journal of econometrics*. (68:1) 1995, p 29.
7. Audretsch, D. B. "Research issues relating to structure, competition, and performance of small technology-based firms," *Small Business Economics* (16:1) 2001, pp 37-51.
8. Ayyagari, M., Demircuc-Kunt, A., and Maksimovic, V. "Small vs. young firms across the world: contribution to employment, job creation, and growth," in: *Policy Research Working Paper 5631*, World Bank, 2011.
9. Banerjee, A. V., and Newman, A. F. "Occupational Choice and the Process of Development," *Journal of Political Economy* (101:2) 1993a, pp 274-298.
10. Banerjee, A. V., and Newman, A. F. "Occupational choice and the process of development," *Journal of Political Economy*) 1993b, pp 274-298.
11. Banga, R. "Impact of government policies and investment agreements on FDI inflows," Indian council for research on international economic relations, pp. 1-43.
12. Barro, R. J., and Lee, J. W. "International Measures of Schooling Years and Schooling Quality," *The American Economic Review* (86:2) 1996, pp 218-223.
13. Baumol, W. J. "Entrepreneurship: Productive, Unproductive, and Destructive," *Journal of political Economy* (98:5) 1990, pp 893-921.
14. Beck, T., Demircuc-Kunt, A., and Maksimovic, V. "Financing patterns around the world: Are small firms different?," *Journal of Financial Economics* (89:3) 2008, pp 467-487.

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

15. Beck, T., DEMIRGÜÇ-KUNT, A., and Maksimovic, V. "Financial and legal constraints to growth: does firm size matter?," *The Journal of Finance* (60:1) 2005, pp 137-177.
16. Bendick, M. J., and Egan, M. L. "Transfer Payment Diversion for Small Business Development: British and French Experience," *Indus. and Labor Relations Rev* (40) 1987, pp 528-542.
17. Berger, A. N., and Udell, G. F. "Some evidence on the empirical significance of credit rationing," *Journal of Political Economy* 1992, pp 1047-1077.
18. Bianchi, M. "Credit constraints, entrepreneurial talent, and economic development," *Small business economics* (34:1) 2010, pp 93-104.
19. Bjornskov, C., and Foss, N. J. "Economic freedom and entrepreneurial activity: Some cross-country evidence," *Public Choice Public Choice* (134:3-4) 2008, pp 307-328.
20. Calvo, G. A., and Wellisz, S. "Technology, Entrepreneurs, and Firm Size," *The Quarterly Journal of Economics* (95:4) 1980, pp 663-677.
21. Carree, M., van Stel, A., Thurik, R., and Wennekers, S. "Economic Development and Business Ownership: An Analysis Using Data of 23 OECD Countries in the Period 1976–1996," *Small business economics* (19:3) 2002, pp 271-290.
22. Casson, M. *Enterprise and competitiveness : a systems view of international business* Clarendon Press ; Oxford University Press, Oxford [England]; New York, 1990.
23. Chan, C. M., Isobe, T., and Makino, S. "Which country matters? Institutional development and foreign affiliate performance," *Strategic Management Journal* (29:11) 2008, pp 1179-1205.
24. Christensen, C. M. "The rigid disk drive industry: A history of commercial and technological turbulence," *The Business History Review* 1993, pp 531-588.
25. De Mel, S., McKenzie, D., and Woodruff, C. "Getting Credit to High Return Microentrepreneurs: The Results of an Information Intervention," *The World Bank Economic Review* (25:3) 2011, pp 456-485.
26. De Meza, D., and Webb, D. C. "Too much investment: a problem of asymmetric information," *The Quarterly Journal of Economics* (102:2) 1987, pp 281-292.
27. Easterly, W., Levine, R., and Roodman, D. "New data, new doubts: A comment on Burnside and Dollar's" aid, policies, and growth"(2000)," National Bureau of Economic Research.
28. Elston, J., and Audretsch, D. "Financing the entrepreneurial decision: an empirical approach using experimental data on risk attitudes," *Small business economics* (36:2) 2011, pp 209-222.
29. Engerman, S., and Sokoloff *Factor Endowments, Institutions, and Differential*) 1997.
30. Evans, D. S., and Jovanovic, B. "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy* (97:4) 1989a, pp pp. 808-827.
31. Evans, D. S., and Jovanovic, B. "An Estimated Model of Entrepreneurial Choice under Liquidity Constraints," *Journal of Political Economy* (97:4) 1989b, pp 808-827.
32. Evans, D. S., and Leighton, L. S. "Some Empirical Aspects of Entrepreneurship," *The American Economic Review* (79:3) 1989c, pp pp. 519-535.
33. Fornefeld, M., Delaunay, G., and Elixmann, D. "The impact of broadband on growth and productivity," *A study on behalf of the European Commission*) 2008.
34. Fuerst, M. E. "Investor risk premia and real macroeconomic fluctuations," *Journal of Macroeconomics* (28:3), Sep 2006, pp 540-563.
35. Galindo Martin, M.-A., Méndez Picazo, M. T., and Alfaro Navarro, J. L. "Entrepreneurship, income distribution and economic growth," *Int Entrep Manag J International Entrepreneurship and Management Journal* (6:2) 2010, pp 131-141.
36. Garcia-Murillo, M. "Regulation Resources and Innovation:The Argentinean Telecommunications Case," *Journal of Information Policy* (1) 2011, pp 260-286.
37. Gillett, S. E. S. E., Lehr, W. H. W. H., and Osorio, C. "Local government broadband initiatives," *Telecommunications Policy* (28:7-8) 2005, pp 537-558.
38. Graham, J. W., Hofer, S. M., and Piccinin, A. M. "Analysis with missing data in drug prevention research," *NIDA research monograph* (142:Journal Article) 1994, pp 13-63.
39. Grossman, G. M., and Helpman, E. "Quality Ladders in the Theory of Growth," *The Review of Economic Studies* (58:1) 1991, pp 43-61.
40. Haltiwanger, J., Jarmin, R., and Miranda, J. "Business formation and dynamics by business age: Results from the new business dynamics statistics," CAED, Budapest, Hungary, 2008.
41. Harrod, R. "Wesley Mitchell in Oxford," *Economic Journal* (59) 1949, pp 459-460.
42. Hurst, E., and Lusardi, A. "Liquidity constraints, household wealth, and entrepreneurship," *Journal of political Economy* (112:2) 2004, pp 319-347.

Proceedings of 23rd European Regional International Telecommunication Society Conference, Viena, Austria 1st- 4th July 2012.

43. Jacobides, M. G., Knudsen, T., and Augier, M. "Benefiting from innovation: Value creation, value appropriation and the role of industry architectures," *Research Policy* (35:8) 2006, pp 1200-1221.
44. Katz, R. L. "The economic and social impact of telecommunications output," *Intereconomics* (44:1) 2009a, pp 41-48.
45. Katz, R. L. "Estimating broadband demand and its economic impact in Latin America," 2009b.
46. Kaufmann, D., Kraay, A., and Mastruzzi, M. "The Worldwide Governance Indicators: Methodology and Analytical Issues," *SSRN eLibrary:Journal Article*) 2010.
47. Kihlstrom, R. E., and Laffont, J. J. "A general equilibrium entrepreneurial theory of firm formation based on risk aversion," *The Journal of Political Economy*) 1979, pp 719-748.
48. Lamont, O. A. "Investment plans and stock returns," *The Journal of Finance* (55:6) 2000, pp 2719-2745.
49. Le, A. T. "Empirical Studies of Self-Employment," *Journal of Economic Surveys* (13:4) 1999.
50. Lettau, M., and Ludvigson, S. "Time-varying risk premia and the cost of capital: An alternative implication of the Q theory of investment," *Journal of Monetary Economics* (49:1) 2002, pp 31-66.
51. Little, R. J. A., and Rubin, D. B. *Statistical analysis with missing data* Wiley, New York, 1987.
52. Lowrey, Y. "Business density, entrepreneurship and economic well-being," 2004.
53. Lucas, M. R. "Pricing decisions and the neoclassical theory of the firm," *Management Accounting Research* (14:3) 2003, pp 201-217.
54. Mankiw, N. G., Romer, D., and Weil, D. N. "A contribution to the empirics of economic growth," *The Quarterly Journal of Economics* (107:2) 1992, pp 407-437.
55. McGuire, S. "No more euro-champions? The interaction of EU industrial and trade policies," *Journal of European Public Policy* (13:6) 2006, pp 887-905.
56. Minniti, M. "The role of government policy on entrepreneurial activity: Productive, unproductive, or destructive?," *Entrepreneurship Theory and Practice* (32:5) 2008, pp 779-790.
57. North, D. C. *Institutions, institutional change, and economic performance* Cambridge University Press, Cambridge, NA, 1990.
58. Nystrom, K. "The institutions of economic freedom and entrepreneurship: evidence from panel data," *Public Choice* (136:3-4) 2008, pp 269-282.
59. Olson Jr, M. "Distinguished Lecture on Economics in Government," *Journal of Economic Perspectives* (10:2) 1996, pp 3-24.
60. Parker, S. C. "The economics of entrepreneurship: what we know and what we don't," in: *Discussion papers on entrepreneurship, growth, and public policy #1805*, The Max Planck Institute for Research into Economic Systems., 2005.
61. Puia, G. M., and Minnis, W. C. "The Effects of Policy Frameworks and Culture On the Regulation of Entrepreneurial Entry," *Journal of Applied Management and Entrepreneurship* (12:4) 2007, pp 36-50.
62. Romer, P. M. "Increasing Returns and Long-Run Growth," *The Journal of Political Economy* (94:5) 1986, pp 1002-1037.
63. Romer, P. M. "Endogenous technological change," *Journal of Political Economy* (98:5) 1990, pp 71-78.
64. Schultz, T. W., and Schultz, T. W. *Investing in people: The economics of population quality* Univ of California Pr, 1982.
65. Schumpeter, J. A. "Theoretical Problems: Theoretical Problems of Economic Growth," *The Journal of Economic History* (7) 1947, pp 1-9.
66. Scott, W. R. *Institutions and organizations* Sage Publications, Inc, 2001.
67. Seo, H. J., Lee, Y. S., and Oh, J. H. "Does ICT investment widen the growth gap?," *Telecommunications Policy* (33:8), Sep 2009, pp 422-431.
68. Shane, S. "Why encouraging more people to become entrepreneurs is bad public policy," *Small business economics* (33:2) 2009, pp 141-149.
69. Solow, R. M. "A contribution to the theory of economic growth," *The Quarterly Journal of Economics* (70:1) 1956, pp 65-94.
70. Spence, M. "Job market signaling," *The Quarterly Journal of Economics* (87:3) 1973, pp 355-374.
71. Stiglitz, J. E., and Weiss, A. "Credit Rationing in Markets with Imperfect Information," *The American Economic Review* (71:3) 1981, pp 393-410.
72. Storey, D. J. *Understanding the small business sector* Thomson Learning Emea, 1994.
73. Swan, T. W. "Economic growth and capital accumulation," *Economic record* (32:2) 1956, pp 334-361.
74. Tebaldi, E., and Elmslie, B. *Institutions, innovation and growth* Economics Seminar Series at the University of New Hampshire., 2007.