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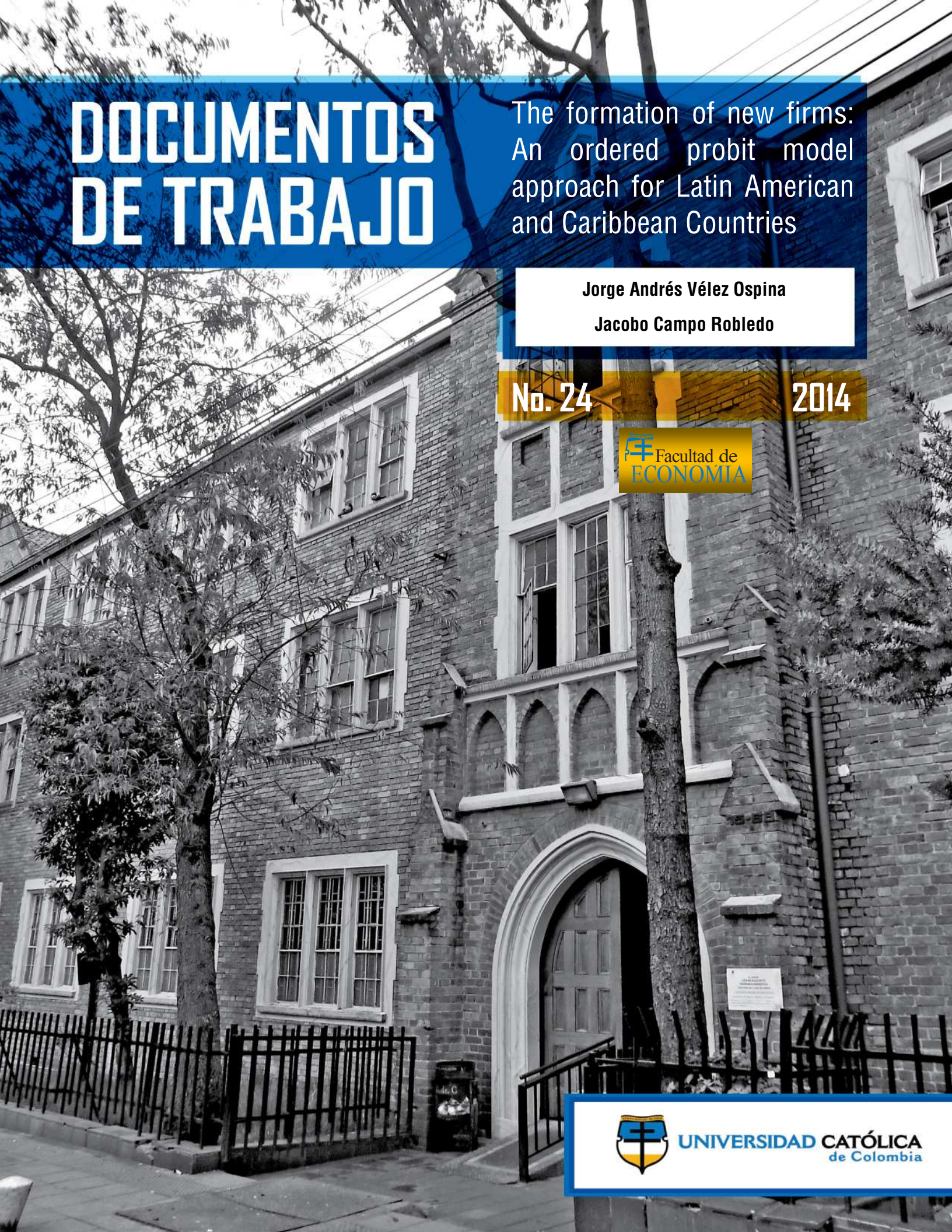

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The formation of new firms: An ordered probit model approach for Latin American and Caribbean Countries

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Abstract

The purpose of this paper is to identify the factors that affect the creation of new firms in Latin American countries. 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 model. The results indicate that credit and government effectiveness enhance the probability of generating new business but it depended of business density.

Keywords: New business, governance, income, credit, education, trade.

JEL Classification: C23, C25, M13.

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1. INTRODUCTION

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

This paper is organized as follows. A literature review on the main factors that explain the formation of new companies is presented in the second section. In the third section the methodology of the regression model and the data used is exposed. The fourth section presents the results and interpretation of the estimates. Finally, we conclude in the fifth section.

2. LITERATURE REVIEW

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 factors (See table 1).

Table 1: Main factors that explain the formation of new firms.

Factors	Description
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. • 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.
Economic Factors	• *Income:* 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). • 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. • *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).
Social Factors	• *Education:* 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). • 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.

Source: The authors.

3. REGRESSION MODEL AND DATA

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, $\mathrm{DNBRDENS} \in \mathrm{J} = \{1,2,3\}$ 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 $\mathrm{DNBRDENS}_{\mathrm{i,t}}$ by the observation rule:

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

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:

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

The cumulative probabilities for the DNBRDENS (i,t) are then related to a set of explanatory variables, x, which is affected by political, social and economic; these are determined by the following equation:

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

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

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

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 $\varepsilon_{it}, t = 1 \ldots . T$ represents the composite errors. For each t, ε_{it} is the sum of unobserved effects and an idiosyncratic error. This error term, ε_{it} , is iid across countries and over time, where $(\varepsilon_{it}|x) = 0$, 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:

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

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.

$$\kappa_j = \widetilde{\kappa_j} + x_i'\gamma_j \quad (3)$$

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

$$\Pr \text{DNBRDENS}_{\text{i,t}} \leq j|x = F\left(\widetilde{\kappa_j} + x_i'\gamma_j - x'\beta\right) = F\left(\widetilde{\kappa_j} - x'\beta_j\right) \quad (4)$$

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

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

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.

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

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

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

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:

$$L = \prod_{i=1}^{N} \prod_{t=1}^{T(i)} g(DNBRDENS_{it}, \boldsymbol{\beta}' \mathbf{x}_{it} + \alpha_i, \theta). \qquad (7)$$

The likelihood equations are

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

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

The final model is presented in equation (8)

$$\mathrm{DNBRDENS}_{i,t} = \alpha_0 + \alpha_1 dcps + \alpha_2 lfte + \alpha_3 ge + \alpha_4 tradeopp + \alpha_5 othertaxes + \alpha_6 ggfce + \varepsilon_{i,t} \quad (8)$$

Where:

$\mathrm{DNBRDENS} \in \mathrm{J} = \{1,2,3\}$, where each number in J denotes one of the categories for the business creation variable.

dcps : Domestic credit to private sector percent of GDP, refers to financial resources provided to the private sector, such as through loans, purchases of non-equity securities, and trade credits and other accounts receivable, which establish a claim for repayment. For some countries, these claims include credit to public enterprises.

lfte: Labor force with tertiary education, this is the proportion of the labor force that has a tertiary education, expressed as a percentage of the total labor force.

ge: Government effectiveness: 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.

tradeopp: The trade-to-GDP ratio is frequently used to measure the importance of international transactions relative to domestic transactions. This indicator is calculated for each country as the simple average (i.e. the mean) of total trade (i.e. the sum of exports and imports of goods and services) relative to GDP.

othertaxes: Other taxes include employer payroll or labor taxes, taxes on property, and taxes not allocable to other categories, such as penalties for late payment or nonpayment of taxes.

ggfce: The variable general government final consumption expenditure (formerly general government consumption) includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defense and

security, but excludes government military expenditures that are part of government capital formation.

4. 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 1 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.

The model includes two economic variables: the "domestic credit available to the private sector" and the trade openness. For the first variable increase of 1% of domestic credit reduce the medium business density likelihood and increase in 2.9 perceptual points the likelihood to find high business density. 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. For trade openness variable 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 trade and its effects on new business creation.

Variables	*Low Business Density*	*Medium Business density*	*High Business density*
Domestic Credit to private sector	-9.068 (8.744)	-19.982** (1.0204)	2.9051*** (0.8196)
Labor Force with tertiary education	-1.5898 (4.5412)	0.5025 1.428	1.0874 .0031176
Government effectiveness	- 22.2775*** (9.1495)	7.0406** (3.2736)	15.237*** (6.2898)
Trade Openness	-1.777 (3.991)	0.0561 (0.1259)	0.1215 (0.2739)
Taxes	18.9157*** (0.64834)	-41.8829*** (0.067233)	22.9671** (0.53946)
General Government Final Consumption	- 10.6688*** 3.0649	3.3718*** 1.2159	7.297*** 2.118
Number observations	300		
Wald Chi2(8)	49.81		
Wald test of parallel lines assumption for the final model:	4,35 – Pvalue: 0.3610		

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

Table 1: Average marginal effects after the random-effects ordered probit

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 do not support this hypothesis for all three thresholds and suggest that the probability of experiencing a higher rate of business creation increases does not depend of education.

The governance effectiveness and general government consumption were 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 governance effectiveness. Thus perceptions of the quality of public services and the quality of the civil service and the degree of its independence from political pressure affect positively the likelihood to find medium and high business density. We obtain the same result for the general government consumption.

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

5. CONCLUSIONS

In this document we wished to determine the impact that political, economic, social and technological factors have on the development of new businesses. As could be expected, different countries have different governance, economic, political, social 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 government effectiveness, domestic credit and government consumption. On the other hand, the governance effectiveness, taxes and credit increase the probability of maintaining that standing, and for countries in the high business entry group.

In regard to the economic factors, we found no conclusive effect of trade openness on business creation; but while the results indicate trade 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.

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.

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