Thesis for the degree of Master of Sc. in Economics

The Impact of a Business Entry Regulation in Colombia

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Abstract

This paper evaluates the impact of a regulatory reform implemented in Colombia that aimed to promote the formalization of new start-ups by cutting down registration costs. We analyze static and dynamic effects of such reform on the creation of formal firms. Additionally, we analyze the quality of the new firms created by testing whether they had a higher probability of survival thanks to the reform, and whether they faced fewer financial constraints through access to formal credit. Using a rich combination of administrative records that allow us to follow in time the universe of formal firms in the country, we estimate difference in differences and Cox Hazard ratio models. We find that the reform increased the number of formal small firms registered by 30%. Additionally, we do not find evidence that the newly created firms that benefited from the reform had higher survival probability which means that reducing formalization costs could not be enough to improve the quality of the new firms created. Finally, we consider financial leverage as a possible channel to benefit firms covered by the reform. However, we find a negative effect on said outcome.

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1. Introduction

Firm informality is one of the main issues in developing countries. Particularly in Colombia, about 60% of firms are not legally registered as formal entities, which implies that they do not comply with laws and regulations (Fernández, 2018). Informal firms have been shown to hurt economic growth because they do not offer guarantees to their employees as they do not pay social security nor taxes (Dabla-Norris & Inchauste, 2008; World Bank, 2003). The high barriers to register a formal business are one of the causes of informality (De Soto, 1989; Djankov et al., 2002). Therefore, analyzing policies that aim to reduce entry barriers to the formal sector becomes an object of interest for both researchers and policy makers.

The existing literature has studied the impact of policies aimed at reducing entry barriers for start-ups. Most authors have found that these programs have a positive (but modest) significant effect on the number of registered formal firms (Branstetter et al., 2014; Bruhn, 2011; Sharma, 2009). On the other hand, Yakovlev and Zhuravskaya (2013) find that there is no effect with the implementation of these policies, while Bruhn and McKenzie (2013) find a negative effect. In general, the consensus is that these policies have moderate effects.

This paper analyzes the impact of a specific policy implemented in Colombia in 2010 and its effects on the number of firms formally registered. Moreover, we evaluate firm survival of new firms created after the program throughout time and their access to financial systems. To do so, we use a rich combination of administrative records from the Integrated Record of Contributions to Social Security (PILA), the main Chamber of Commerce in Colombia, and individual reports of all debtor transactions. The methodology

implemented is difference-in-differences and Cox Hazard model in order to find the number of firms legally created because the law and their performance through time.

A brief one-paragraph description of the policy is needed here …

The main contribution of this paper is to add evidence to the literature that studies the effects of these policies. Unlike most of the literature, this paper not only studies effects on the number of firms created but goes further and analyzes the performance of these firms. To do so, we analyze the survival probability of firms created due to the reforms, and we explore a variable that, to our knowledge, has not been studied in this context: the probability of accessing the financial system.

Our results provide evidence that reducing entry barriers to the formal sector effectively induce an increase in the number of new formal firms by about 30%. Nonetheless, we find that the firms created due to the program do not have a higher probability of survival which shows that they are probably firms that otherwise would not have been formed, but which do so given the incentive of cost-free registration. However, they are not strong enough to survive for a long time after the benefits decrease. Moreover, we find that these firms probably face financial constraints due to a lower probability of accessing the financial sector.

The rest of the document is organized as follows. The next section presents a review of the main results found in the literature. Section 3 describes the policy. Section 4 describes the data used in this study, and sections 5 and 6 discuss our empirical strategy and report our main estimates; we also include some robustness checks. Finally, section 7 summarizes the main findings and concludes.

2. Literature review

Entry regulation may be understood as the costs and number of procedures required for an individual to set up a new business. Countries have historically faced the dilemma of excessive regulations. On the one hand, it discourages entrepreneurship and development. On the other hand, it contributes to tax collection and controls the creation of low-quality firms. One of the first authors who pointed out this situation was Hernando de Soto in 1989 with his groundbreaking study "The other path." He argued that excessive regulation generates a broader informal economy by limiting prospective entrepreneurs to access the formal sector in Peru in light of the unaffordably high costs (De Soto, 1989).

Djankov et al. (2002) contrasted two theories about the regulation of entry, namely, "public choice" and "public interest". The first theory is in line with De Soto's view. It presents regulations as a mechanism to exclude competitors and increase the profits of existing firms. Furthermore, regulations are intended to benefit bureaucrats through higher rents and not to benefit society (Peltzman, 1976; Posner, 1975; Stigler, 1971). The second theory, public interest, explains regulations as a mechanism to correct market failures. It states that regulations prevent the entry of low-quality firms, protecting consumers, which is beneficial for the economy (Pigou, 1938).

The empirical literature has shown adverse effects of business regulations, supporting the public choice view. Over-regulation and high entry barriers are associated with a broader informal economy (Dabla-Norris & Inchauste, 2008; De Soto, 1989; Djankov et al., 2002), and lower firm entry and employment (Ardagna & Lusardi, 2008; Belitski et al., 2016; Bertrand & Kramarz, 2002; Fisman & Allende, 2010; Klapper et al., 2006; Klapper et al., 2011). More business regulations are also associated with less growth and

productivity (Barseghyan, 2008; Ciccone & Papaioannou, 2007; Loayza et al., 2004), less investment (Alesina et al., 2005; Djankov et al., 2010; Munemo, 2014), and more poverty (Djankov et al., 2018).

In general, the literature has focused on evaluating two types of interventions: liberalization of entry and reduction of taxes. The first type refers to policies that aim at reducing entry barriers either through a reduction in the number of procedures, in the number of days required to open a business, or in opening costs. The second type of interventions are related to a reduction in operational costs through fewer payroll and corporate taxes.

Different interventions have been implemented worldwide to mitigate the effects of excessive regulation on the formal labor market. For instance, Mexico conducted a deregulation program in 2002 in a bid to simplify the registration procedure. Bruhn (2011) studied the effects of this reform by using variations across municipalities and time in the implementation of the program. She found that simplifying entry regulations increases the number of registered businesses by 5% in the studied industries. This study also indicated that employment increased by 2.2% and prices decreased by 1% after the reform was enacted. Kaplan et al. (2011) studied the same Mexican reform by using census data and applying a diff-in-diff-in-diff strategy, resulting in a positive impact of about 5% on new firm creation and 10% on employment.

Similarly, Branstetter et al. (2014) studied a Portuguese entry policy which significantly reduced administrative fees and simplified incorporation procedures, by using information about counties at different periods of time to evaluate the effects of the reform on firm entry. They found that the program produced an increase of approximately 17% in the

number of new firms. They also analyzed firm-level data to determine the quality of these new firms. The results demonstrated that the new firms established after the program were smaller and less likely to survive in the first two years than firms founded in the absence of the program.

An internal liberalization also occurred in India, which was a progressively dismantling of industrial licensing during the 1980s. Aghion et al. (2008) focused on the effects of this policy by using aggregated data at the industry level and they found that the program led to an increase of around 6% in the number of factories in delicensed industries. Similarly, Sharma (2009) evaluated the same Indian program, and concluded that removing regulatory barriers to industrial entry successfully reduced informality.

Another noteworthy case can be tracked back in Mullainathan and Schnabl (2010) study. In essence, by using administrative records and interviews with newly licensed businesses, they evaluated a Peruvian reform with a before-after analysis. Such a reform targeted the cost and time reduction to register for a local business license. They concluded that the reform was effective in increasing the number of new firms registered with a 43% increase in the stock of licensed businesses.

In short, the aforementioned papers provided evidence of a positive impact of deregulation on firm entry. However, most of them concluded that the effects are modest and not as large as expected. Other authors have found mixed evidence on this point. In fact, Ulyssea (2020) reviewed the economic literature on informality, revealing that reducing the costs of entering the formal sector has very limited or no formalization effects. A case in point is Yakovlev and Zhuravskaya (2013), whose study addressed the effects of

a liberalization reform implemented in Russia. They found effects on employment and firm performance, but not on the entry of new firms.

Regarding the negative effects of deregulation on firm entry, Bruhn and McKenzie (2013) evaluated the "*Minas Fácil Expresso*" program implemented in Brazil. They showed that the program had a negative impact on the new firm's registration and suggested that the reasons for these negative results could be that the size of the reform was not dramatic. In the same line, Klapper and Love (2010) discovered with a cross-country study that the benefit of a reform is small if the reduction of entry barriers is not substantial.

In terms of the evidence on the reduction of taxes, we highlight the studios carried out in Brazil, where different interventions have been implemented. In 1996 Brazil implemented the *SIMPLES* program in order to simplify bureaucracy and reduce tax rates for small and micro firms. Not every sector was eligible for the program, which led to the construction of a comparison group. Monteiro and Assunção (2006) used firms in non-eligible sectors as a control group to analyze the effect of the program using difference-in-differences strategy. They found effects only in one sector; the licensing of retail firms increased 13 percentage points while the other eligible sectors were not affected by the program.

Fajnzylber et al. (2011) evaluated the effect of the *SIMPLES* program as well. The difference with Monteiro and Assunção (2006) lies in the fact that, in addition to difference-in-differences strategy, they also conducted a Regression Discontinuity Design, exploiting the discontinuity among the formality rates in eligible firms that started their operations after November 1996 and those that started before. They came to the realization that the program led to an increase of 7.5% and 6.4% in the number of firms registered as a

formal business for each technique, respectively. Moreover, the program showed an increase in tax payments and social security contributions.

Along these lines, in 2009, Brazil set in motion the *Individual Micro-Entrepreneur Program*, which reduced registration costs in the first phase and taxes in the second phase. Rocha et al. (2018) encountered that the first phase had not had a significant effect, while the second phase had had a positive and significant effect on the number of formal businesses. In this vein, they claimed that only reducing entry costs has no effect on firm informality, whereas reducing taxes, once registration costs have been eliminated, is effective in reducing firm informality.

In the case of Colombia, there is few evidence on the effects on business start-ups of policies related to the reduction of entry barriers and tax reduction. Cárdenas and Rozo (2009) evaluated the impact of a program aimed at integrating into one office several procedures in the six main cities of the country in 2003. They found evidence of a positive effect of 5.18% in the number of registered firms using the difference in the implementation time in each city.

The rest of the literature for the Colombian case has focused mainly on the employment and wage effects of a change in payroll taxes. The 2012 tax reform, which reduced payroll taxes by a total of 13.5 percentage points of wages, has been widely studied. In general, the outcomes show that the tax reform increased employment and average wages, and decreased informality (Bernal et al., 2017; C Fernández & Villar, 2017; Morales & Medina, 2017). On the other hand, Kugler and Kugler (2009) studied the Colombian social security reform of 1993, which introduced a large increase in payroll taxes for pensions and health

of 10.5%. They revealed that a 10% increase in payroll taxes reduced wages by about 1.4% and 2.3% and employment by about 4% and 5%.

In summary, the existing literature on the effects of entry regulation is mixed and in the Colombian case is scarce. Therefore, this study attempts to show new evidence on the effects of this reform in the creation of new business, their survival and access to the financial system. and going further in analysis studying the performance in terms of survival and access to the financial system of firms created due to the intervention. Colombia is an interesting study case due to the high levels of informality that reach about 60% of the firms despite the fact that Colombia has implemented several reforms to boost formality (Fernández, 2018).

3. Institutional background and the intervention

In this study, we focus on analyzing the effects of the Law of formalization and employment generation (Law 1429 of 2010), launched by the government of Colombia on December 29, 2010. The objective of this law was to facilitate employment creation and the formalization of micro and small businesses in their initial stages. The law was enforced simultaneously in all cities and in equal extent. It introduced changes in several areas related to the liberalization of entry and reduction of taxes. In this section, the institutional setting in Colombia before and after the Law 1429 of 2010 are discussed.

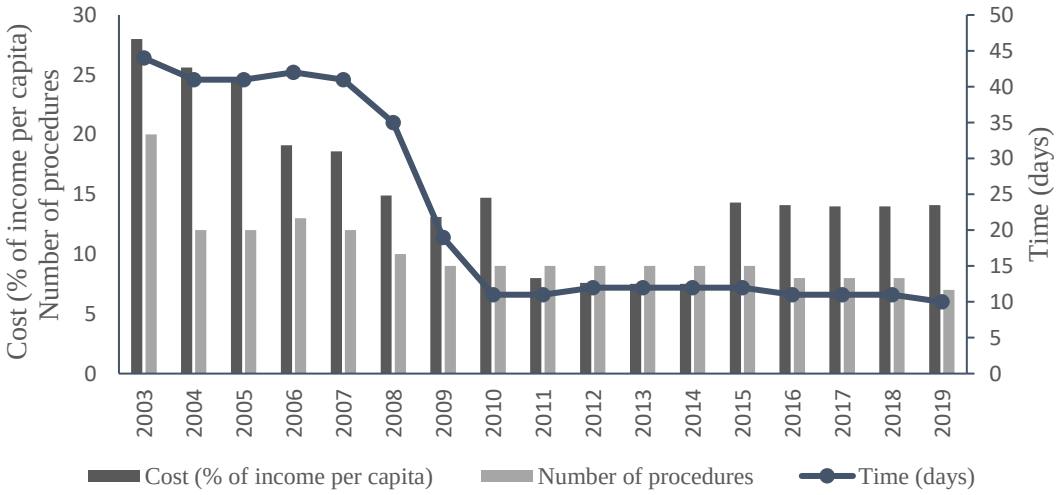
Before the Law 1429 of 2010.

Prior to 2003, to start a new business in Colombia, in accordance with legal requirements, the entrepreneur had to comply with 19 procedures, which took about 60

days (World Bank, 2004). According to the Doing Business Report 2004, these requirements were excessive compared to other countries, and placed to Colombia as one of the countries with the highest number of procedures to start a business.

Over the period 2000 to 2010, Colombia implemented several reforms to boost its business environment. Figure 1 shows the evolution over time since 2003 of the number of procedures, costs, and days required to open a formal business in Colombia. On the left axis are the costs and procedures and on the right axis are the number of days. The number of procedures decreased quickly from 19 stabilizing at about 9. The number of required days was 44 in 2003 and decreased at a slower rate than the number of procedures until stabilizing at 11 after 2010. Finally, costs had a different path. They decreased substantially between 2011 and 2014 and increased again after 2015. In general, this behavior shows that the best conditions to open a new formal business took place between 2011 and 2014.

Figure 1: Evolution of regulation measures per year



Note: The left axis represents a percentage in the case of costs and a number in the case of procedures. The right axis shows the number of days.

Source: Doing Business Database.

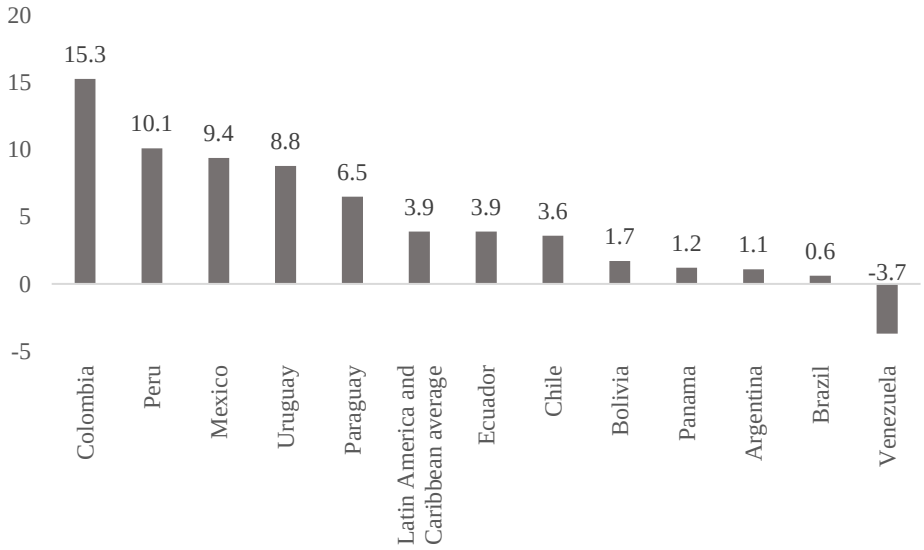
Among the main reforms that have been carried out in Colombia are the implementation of one-stop shops[1] in 2003, which simplified the process to register formal firms. Likewise, the introduction of the electronic system Integrated Record of Contributions to Social Security (PILA), which became mandatory for all firms from 2007 and unified in a single online payment the social security contributions and labor risk insurance.

The progress made by Colombia was so remarkable that, between 2007 and 2009, Colombia was recognized by the World Bank as one of the top 10 reformers countries (World Bank, 2007, 2008, 2009). In addition, the Doing Business 2013 report, recognizes the progress made by Colombia by making it a study case. According with this report, Colombia was the country that made more progress in regulatory practices than any other Latin American economy since the beginning of the Doing Business reports in 2003 (World Bank, 2012).

Figure 2 shows a comparison in the progress made in regulatory practice among Latin American countries. It shows, on average, an indicator of the progress of each country in narrowing the distance to the best performance achieved by any economy on each Doing Business indicator between 2005 and 2012. Thus, a larger number implies greater advances in terms of regulations. Therefore, by 2013 Colombia was the country in the region with greater progress.

[1] One-stop shops refer to offices that integrate several procedures into one with the aim of simplifying the process of starting a business.

Figure 2: Colombia's performance compared to other countries in the region, 2005-2012



Note: The graph shows, on average, an indicator of the progress of each country in narrowing the distance to the best performance achieved by any economy on each Doing Business indicator between 2005 and 2012. Thus, a larger number implies greater advances in terms of regulations.

Source: Doing Business 2013 (World Bank, 2012).

The Law 1429 of 2010.

The Law 1429 of 2010 focused on three aspects. First, it sought to benefit young individuals under 28 years old with some education level who wanted to start their own business by giving them financial aid and training. Second, it offered benefits in the payment of payroll taxes, and registration and renewal fees to micro and small entrepreneurs who began their economic activity[2] from the enactment of the law until December 31, 2014, when the validity of the law ended. Third, it provided benefits to any

[2] The beginning of the economic activity is understood by the law as the formal registration of the firm in Chamber of Commerce.

entrepreneur who employs a person in a vulnerable situation, such as new young employees, displaced people, and new employees who earn less than 1.5 minimum wages.[3]

In this study, we are specifically interested in the benefits for micro and small entrepreneurs. The law sought to encourage the creation of formal firms by providing them financial aid in entry and operating costs. Only micro and small businesses first registered as a formal entity between 2011 and 2014[4] could access these benefits. Hereafter, we will call them new formal micro or small firms. That is, both new firms and former firms that were informal could access the benefit if they registered during the term of the law. For purposes of the law, micro and small businesses are those with less than 50 employees; this was defined according to the firm size classification established in Colombia since 2000.[5]

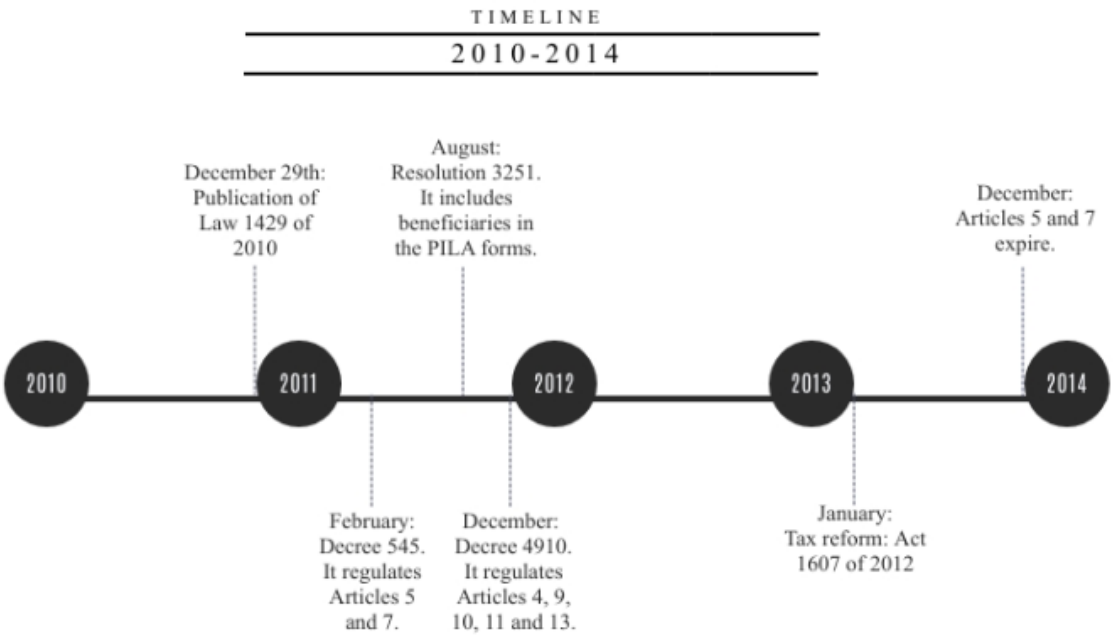
Specifically, Article 5 states that new formal micro or small firms enjoyed progressivity in the payment of payroll taxes as follows: 0% of the general charge for the first two taxable years, 25% in the third taxable year, 50% in the fourth year, 75% in the fifth year and 100% from the sixth year onwards. Besides, thanks to Article 7, those firms had a zero cost to register with the Chamber of Commerce and progressivity of the annual fee established for the renewal of the commercial register as follows: 50% of the total fee in the second year of economic activity, 75% the third year, and 100% from the fourth year onwards. For instance, an entrepreneur who went to the Chamber of Commerce in September 2011 to register a new business with less than 50 employees, did not have to pay for the registration, and the costs of payroll taxes were 0. A year later, the entrepreneur paid

[3] The last one could generate perverse incentives since it promotes the hiring of low-skilled labor.
[4] The years in which the law was in force.
[5] Law 590 of 2000 classified firm size in 4 categories: micro (up to 10 employees), small (between 11 and 50 employees), medium (between 51 and 200 employees), and large (more than 200 employees).

only 50% of the commercial renewal fee and the costs of payroll taxes were 0 again. The costs then increased until reaching 100% by the sixth year.

Figure 3 shows the timeline of the implementation of the law. It takes effect from January 2011 until December 2014. In February 2011, the government published the Decree 545 of 2011 regulating Articles 5 and 7. It was established in Article 2 that no express statement was required to receive the benefits of the law. It was enough to verify that the firm had a maximum of 50 employees and the Chamber of Commerce was obliged to apply the progressive fees for registration and renewal.

Figure 3: Timeline of the law



Source: Ley 1429 de 2010.

Although Decree 545 specified that PILA and Chamber of Commerce should modify their forms to include the law's beneficiaries by March 2011, it was not until July 2011 that this option was included in the PILA forms and then regulated in August through

Resolution 3251 of 2011. Finally, in December 2014 the validity of the benefits of the law expired.

4. Data

In this study, we use three sources of information: First, we use administrative data from the Integrated Record of Contributions to Social Security (PILA) collected on a monthly basis by the Colombian Ministry of Health and Social Protection. PILA is a census that links information about all formal employers and employees. Therefore, it does not cover informal firms. PILA includes information about health insurance payments, pension contributions, wages, basic characteristics of the employee, such as sex and age, and basic characteristics of the firm such as the economic sector and location.

Using PILA, we construct an aggregated panel data for the period July 2010 – December 2012 with two dimensions: city and firm size category. We only use 6 months in the pre-treatment period[6], and in the post-treatment period, we use 24 months to avoid contamination from the tax reform implemented by the government in January 2013. We use information for the 23[7] main cities of Colombia[8] and the size categories defined by Law

[6] We found an atypical behavior in the number of registered firms in March 2010. There is an unexplained over-accumulation of new firms, so we avoid this data. However, our results are robust to the inclusion of the first six months of 2010.

[7] As robustness exercise, we also construct a panel with more cities using all the cities with Chamber of Commerce.

[8] In Colombia the 23 main cities are: Armenia, Barranquilla, Bucaramanga, Bogotá, Cali, Cartagena, Cúcuta, Florencia, Ibagué, Medellín, Manizales, Montería, Neiva, Popayán, Pasto, Pereira, Quibdó, Riohacha, Santa Marta, Sincelejo, Tunja, Valledupar and Villavicencio.

590 of 2000.[9] We focus exclusively on firms since they were the objective of the law, so that, we exclude from our analysis those who are self-employed.

Panel A of Table 1 shows descriptive statistics of the first outcome used from PILA. The number of observations corresponds to the 23 cities followed by 30 periods for each firm size category. In the pre-treatment period, the number of new formal small firms created was 12.30 per month on average, while it was 1.25 for medium firms. Panel B shows the other outcome we use from PILA. The duration of new firms measured in months. In this case, we use individual data for 7572 small firms and 680 medium firms that were created in the period July 2010 – December 2012. In the pre-treatment period the average duration for small firms was about 15 months and 19 months for medium firms.

The second source of data comes from administrative data of all firms registered in the Chamber of Commerce for the main four cities in Colombia (Barranquilla, Bogota, Cali and Medellín).[10] We cannot identify a firm that was operating prior to the registration date given that we have limited access to the data. Only for Barranquilla we observe information about the constitution date, the registration and renewal dates and information about sector, assets and wealth. For Bogota, we only observe the period of registration, the period of renewal and the firm size, but we do not have information about assets or related variables. For Cali and Medellín, we have the same information as in Bogota plus sector and assets. The differences in the availability of information by cities leave us only with the variables period of registration, period of renewal and the firm size.

[9] Law 590 of 2000 defined the following categories by firm size: micro (up to 10 employees), small (between 11 and 50 employees), medium (between 51 and 200 employees), and large (more than 200 employees).

[10] The main four Chamber of Commerce compress 70% of the total firms registered. We did not have access for other Chamber of Commerce.

Finally, we merge the data from Chamber of Commerce with our third data source, the format 341 from *Superfinanciera*.[11] We do this by using the firm's identification number to obtain individual reports of all debtor transactions. Thus, we have information about the number and amounts of credits that a firm has each period. Information from the credit system is on a quarterly basis, then we construct a database where we observe the firms registered each quarter from July 2010 to December 2012, and we observe a dummy variable which takes the value of 1 if the firm took a new credit and 0 otherwise.

Panel C of Table 1 shows descriptive statistics of the outcome defined above. For the period analyzed we observe 4632 small new firms and 621 medium new firms with this data, and only 0.9% of the firms has a formal credit in the financial system in the pre-treatment period.

[11] We cannot do this using data from PILA since it does not contain the firm's identification number.

Table 1. Summary Statistics

Variable	Mean pre treatment	Mean post treatment	Number of observations
A. New formal firms (monthly)			
Small (between 11 and 50 employees)	12.30	16.96	690
	(0.92)	(3.63)	
Medium (between 51 and 200 employees)	1.25	1.92	690
	(0.32)	(0.62)	
B. Duration (monthly)			
Small (between 11 and 50 employees)	14.77	17.01	7572
	(12.51)	(14.22)	
Medium (between 51 and 200 employees)	19.01	21.52	680
	(13.75)	(14.25)	
C. New credits (quarterly)			
Small (between 11 and 50 employees)	0.009	0.017	4632
	(0.095)	(0.131)	
Medium (between 51 and 200 employees)	0.009	0.050	621
	(0.098)	(0.219)	

Note: Mean and standard deviation (in parenthesis). Data from PILA, chamber of commerce and Format 341. We use 6 months prior to the beginning of the law as the pre-treatment period, and 24 months after that as the post-treatment period.

5. Empirical strategy

In this section, we discuss our main empirical strategy. Similar to most studies in the literature, we focus on the effects on new firms. At an initial point, we analyze whether or not the law contributed to the creation of new firms. Secondly, their lifespan over time, and finally, we discuss the leverage probability in the financial system.

5.1. Firm Entry

To check whether the reduction of entry barriers has an impact on the creation of formal firms, we study the Colombian intervention Law 1429 of 2010 using a difference-in-differences approach. As we already mentioned, the law affected all the cities simultaneously. Nonetheless, not all firms were eligible for the benefits; only businesses with up to 50 employees first registered as legal entities between 2011 and 2014 were eligible. The aforementioned condition affects micro and small firms according to the size classification well-established in Colombia since 2000 by Law 590.[12]

Considering that these categories have not changed since 2000,[13] it was possible for us to build aggregated data by firm size category and city, and follows its progress over time. The target eligible group to access the benefits granted by the law encompassed micro and small firms. Then, we use firms with more than 50 employees as the control group. In our main estimates, we try to make the treated and control groups as homogenous in composition as possible, so that we only use small firms (between 11 and 50 employees) as the treated group and medium firms (between 51 and 200 employees) as the control group. Nonetheless, the results are similar when we use other categories.[14]

Therefore, the strategy we follow is to use aggregated data by firm size category and city and we use as an outcome the number of formal firms created. The equation that we estimate can be represented as:

[12] Law 590 of 2000 defined the following categories by firm size: micro (up to 10 employees), small (between 11 and 50 employees), medium (between 51 and 200 employees), and large (more than 200 employees).
[13] Law 905 of 2004 modified Law 590 of 2000, but it did not change the size categories by employment.
[14] We cannot estimate our model using micro data at the firm level because we do not observe if the firm existed prior to the time it became formal. This lack of information prior to the formalization of the firm prevents us from using the probability of starting a new formal business as an outcome. This means that difference in differences and discontinuous regression at the firm level are out of reach.

$$y_{cst} = \alpha + \beta PostTreat_{st} + \theta Treat_s + \gamma_c + \delta_t + \varepsilon_{cst}, \quad (1)$$

where y_{cst} is the number of new firms in city *c* of firm size *s* in month *t*; $PostTreat_{st}$ is a dummy variable which takes the value of 1 if firm size is less or equal to 50 (treatment) in a period after December 2010, and 0 before this date; and $Treat_s$ is a dummy variable for treated observations. γ_c and δ_t represent city and time fixed effects, respectively, and ε_{cst} is the error term. Standard errors are clustered at the city and firm size level.

The main identification assumption in our setting is that prior to the law enforcement, treated and control groups had parallel trends in their behavior. To confirm the validity of our identification strategy, three tests were undertaken. First, we run the parallel trends test (slope), which includes differential linear pre-trends in the dynamic difference in differences model. If the parameter representing the difference in slope between the treatment and control group is not significant, this is evidence in support of the parallel trends assumption (Antwi et al., 2013; Muralidharan & Prakash, 2017). Second, we implement the parallel trends test (placebo). This test checks if there is a significant "treatment" effect prior to the intervention. If the joint significance test of the coefficients before the intervention is significant this suggests a violation of parallel trends (Goldman et al., 2018; Yurukoglu et al., 2017). Finally, we run a dynamic difference-in-differences. To do this, we decompose the overall estimate by replacing the indicator variable that interacts the treatment variable and the post-treatment period variable, with a set of indicator variables that interact the treatment and each period for the 6 months prior to the beginning of the law, and 24 months after that. The reference period is December 2010, i.e., all the estimated parameters β_k are relative to the number of new firms in the month before the law came into force. The equation in this case is a variant of our baseline model as follows:

$$y_{cst} = \alpha + \sum_{\substack{-6<k<24 \\ k\neq -1}} Treat_{s,t-k}\beta_k + \theta Treat_s + \gamma_c + \delta_t + \varepsilon_{cst} \quad (2)$$

If the coefficients prior to the beginning of the law (period 0 in Figure 4) are not statistically significant, then the evidence suggests that the decision to create a new firm prior to the law was not correlated with pre-existing trends which increase confidence in our identification strategy. Moreover, it suggests that the program was unanticipated by entrepreneurs.

5.2. Firm Survival and Access to Credit

The second strategy we follow seek to shed some light into the extent to which Law 1429 of 2010 increased not only the number of new firms created, but also could improve the performance of the new created firms through a greater probability of survival. To accomplish this, we use Cox Hazard models where we model the probability that a firm has exited the formal sector in period t.[15] We estimate the model with proportional Hazard of the form

$$h(t) = h_0(t) \cdot \exp(X'\pi) \quad (3)$$

The regressors in $X'\pi$ are defined in equation (1). We keep only firms that were founded between the analysis period (July 2010 and December 2012). We have data in PILA until 2016, this means, that a firm created in the last period of analysis (December 2012) could be observed a maximum of 49 months. In a bid to make fair comparisons between firms started up at different points in time, we keep only firms whose active life span did not

[15] We cannot identify whether the firm closed definitively or not. We only know that it left the formal sector because we no longer observe it.

exceed 49 months. Then, we estimate the hazard of leaving the formal sector following a similar specification as in our main estimates.[16] We compare treated (small firms) and control (medium firms) groups before and after the implementation of the law.

As final exercise, we are interested on studying the credit behavior of new firms as a mechanism of financial leverage. We cannot use our sample from PILA due to the lack of the identification number that prevents us from merging this data with data about the credit system. However, what we can do is use our sample from Chamber of Commerce at the firm level. In this case, we test whether firms covered by the law have a larger probability of financial leverage using a dummy of new credit as dependent variable. The estimation strategy follows the same model as equation (1) but data is at the firm level. Information from the credit system is on a quarterly basis, then we estimate the probability that a firm covered by the law has at least a new credit in its first quarter after the registration as a formal firm. We repeat the same exercise by quarters until 12.

6. Results

We start by showing the effects of the Law 1429 of 2010 on firms' creation. Table 2 presents the results of our main estimates. Column (1) shows the results of estimating equation (1) using only small firms as treated group and medium firms as control group for the aggregated sample of the 23 main cities. This is our preferred specification because it restricts the potential differences between the groups making them as similar in composition as possible. We find that the intervention represents an increase of 32% in the

[16] In this case, unlike previous estimates, we can use microdata at the firm level because we know the number of months a firm appeared in PILA. Thus, we can estimate the probability of exiting.

number of new firms created (see column 1 in table 2). That is, the positive and significant effect of approximately 4 new formal firms per month with respect to the 12.3 formal firms per month created on average in the pre-treatment period. Additionally, we report p-values for both tests, the parallel trends test (slope) and parallel trends test (placebo) in the last two rows of table 2 which shows no significance difference in the trends.

Table 2

	New formal firms			
	Baseline	**56 cities**	**All sizes**	**C. Commerce**
	(1)	**(2)**	**(3)**	**(4)**
TreatPost	3.98***	1.68**	24.47**	6.71**
	(1.43)	(0.66)	(9.79)	(2.55)
Constant	7.32***	3.47***	44.32***	19.23***
	(1.29)	(0.58)	(11.75)	(5.24)
Observations	1,380	3,280	1,380	240
R-squared	0.63	0.60	0.56	0.73
Mean dependent variable	12.30	5.74	85.81	34.02
Parallel trends test (slope)	0.35	0.20	0.68	0.88
Parallel trends test (placebo)	0.80	0.73	0.25	0.93

Notes: This table shows the estimates of the equation (1) under different specifications. In column (1) are our baseline estimates where we use the 23 main cities of Colombia; the small firms represent the treated group and the medium firms is the control group. Column (2) is same as column (1) but, the sample is composed by the 56 cities of Colombia that have a chamber of commerce. Column (3) uses micro and small firms as treated group and medium and large firms as control groups. Column (4) uses data from the Chamber of Commerce for the 4 main cities, the treated group are the small firms, while medium firms represent the control group.

Additionally, we estimate alternative models to test the robustness of our results in different samples. Column (2) presents the results of the estimation of equation (1) using information for the 56 cities that have a chamber of commerce in Colombia. Similarly, as in the baseline model, we find that the intervention represents an increase of 29% in the number of new firms created. In column (3) we estimate the model using again the sample

of the 23 main cities, but this time we use all firms with at least 50 employees (micro and small firms) as treated group and all firms with more than 50 employees (medium and large firms) as the control group. Likewise, we find a positive and significant effect which represents about 28% of new firms created.

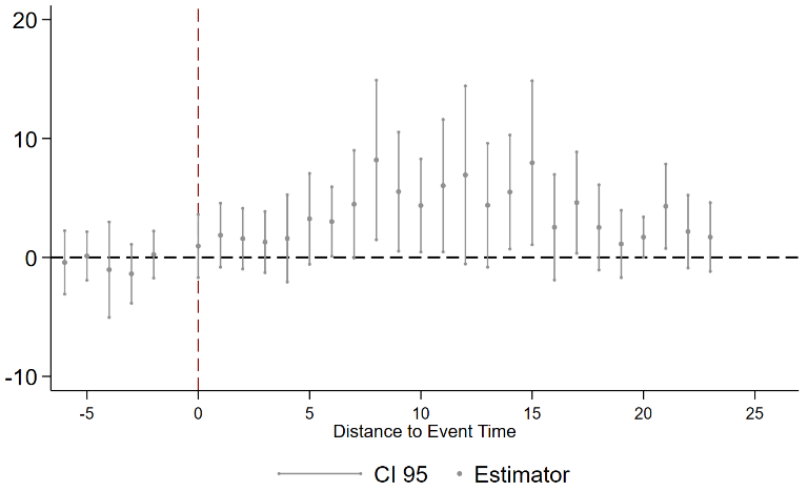
Finally, in column (4) we repeat the same exercise as in the baseline model, but using data from Chamber of Commerce. As we already mentioned, in this case we have a limited sample since we only have access to the information for Bogota, Medellin, Barranquilla, and Cali Chamber of Commerce. Nonetheless, consistently with previous estimates, we find an increase of about 20% in the number of firms created. The above results indicate that our estimates are robust regardless of the sample we use.[17] As before, we report p-values of the parallel trends tests in the last two rows of table 2. For all samples we observe no significance. Taken together, the above tests validate our main hypothesis that the Law 1429 from 2010 stimulate new entrepreneur projects.

Figure 4 plots the coefficients β_k estimated in equation (2). The coefficients prior to the beginning of the law (period 0 in Figure 4) are generally not statistically significant. This suggests that the decision to create a new firm prior to the law was not correlated with pre-existing trends which increase confidence in our identification strategy. Coefficients from the first month onwards in Figure 4 show the effects for each month since the beginning of the law.

[17] We also estimate the baseline model disaggregating the categories of size to create more comparable treated and control groups. We group firms that have between 25 and 50 employees and firms that have between 51 and 75 employees. We repeat the same exercise as in column (1) and find again a significant effect of 31% of new firms created after the intervention. We do the same exercise with different size categories and find consistent results in all cases. We do not like these exercises because arbitrarily grouping the number of employees to create treated and control groups do not guarantee that we are following the same groups over time. Hence, we prefer using the standard categories established in Colombia since 2000.

An important feature of the law is that despite the fact that it came into effect in January 2011; it was not necessary to register a firm immediately to enjoy the benefits. Any new firm with up to 50 employees registered between January 2011 and December 2014 could benefit from the law. As can be seen, the effects are especially evident after 8 months, i.e., August 2011, this is not surprising given that PILA included the option to report beneficiaries of the law in their forms in August 2011 through Resolution 3251. Records prior to this date could be underreported. This implies that our results for the first months could be underestimated. However, we still observe an increasing trend from the beginning, which becomes much more prominent after a few months, and finally decreases.

Figure 4: Number of new formal firms



Source: Aggregated data from PILA for the 23 main cities.

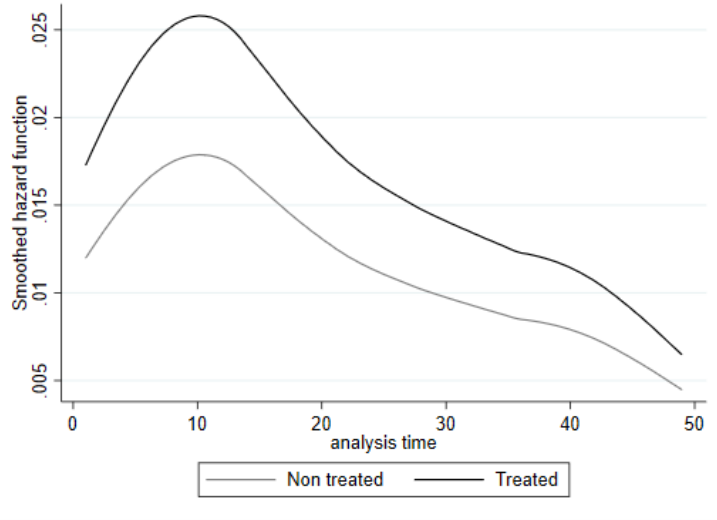
Notes: Data with seasonal adjustment. Base period is December 2010.

The results up to this point shows clear evidence that the Law 1429 of 2010 creates more firms. Now we want to test whether this firms state longer in the market. Regarding the results from the Cox hazard model, Figure 5 shows that treated firms (small firms created

after the implementation of the law) have a greater probability of exit from the formal sector than non-treated firms for the whole analysis period. This implies that even with the benefits provided by the law, new small firms created because the law would not have a greater probability of survival than the rest of the firms. Additionally, Figure 5 shows that both comparison groups have similar behavior. The probability of exiting is increasing in the first 12 months until reaching the maximum and starting to decrease.

These results show that even with the benefits received by the treated firms, it did not suffice to help with the survival. This could indicate that the type of firms that were established thanks to the benefits of the law were marginal firms, i.e., firms that otherwise would not have been formed, but which did so given the incentive of cost-free registration. Still, as the benefits were reduced, these firms that were probably not strong enough to stand on their own were more likely to disappear.

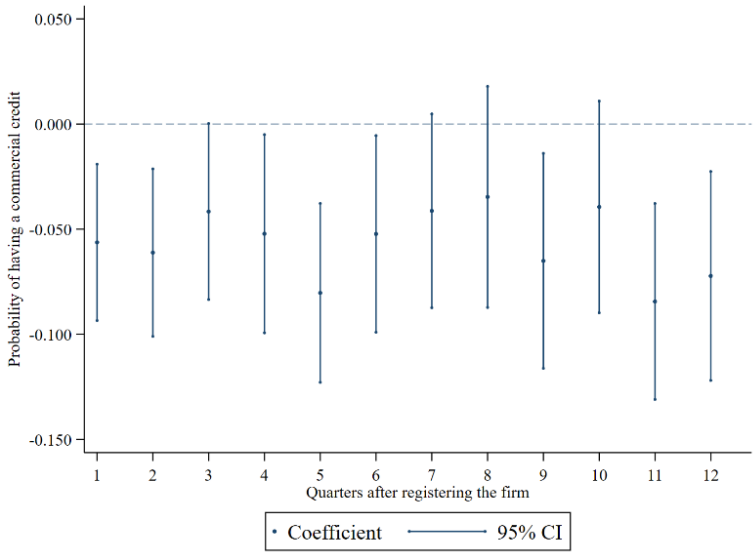
Figure 5: Probability of exiting the formal sector



Source: Data from PILA at the firm level.

Finally, we test whether the firms created after the law have higher access to the financial market. To do this, we use our sample from Chamber of commerce merged with the financial system data. Figure 6 plots the coefficients and confidence interval for the estimates of the probability of having a new credit. In general, we find negative effects. That is, new firms legally entitled by the law do not have a greater probability of accessing to the financial sector than non-covered firms. In fact, they have a lower probability. This could explain why covered firms do not last longer despite having benefited from the law.

Figure 6: Financial leverage



Source: Data from Chamber of Commerce and Formato 341, Superfinanciera at the firm level.

These results are in line with the idea that the firms created are, in general, weak in nature and that they do not have the resources to survive over time. To our knowledge, they are not using the credit system with a higher probability, but we cannot differentiate if the firms do not access a credit despite having requested it or if they are simply not trying to

access credit. However, the shortage of financial funds could show the general weakness of the new firms.

7. Conclusion

Policy makers around the world have been implementing several programs to reduce the obstacles to create new firms. This paper presents evidence that this kind of programs effectively induces an increase in the number of new firms created for a developing country such as Colombia in about 30%. However, the results showed that the number of benefits were not enough to boost sustainable development of the new firms. They showed to be weak in general, with a higher probability of leaving the formal sector, probably when the benefits started to decrease. They also showed financial constraints through a lower probability of financial leverage than those firms created without the benefits of the law.

In general, the effects seem to be of a small magnitude even though the law was designed to reduce not only the cost of entry but also the operating costs through taxes. On this basis, it is fair to note that future investment of this kind of policies should take into account better strategies to promote long-term sustainability of firms. It is necessary to promote the growth of the firms created through assistance and improvement of financing opportunities.

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