Live and Let Die: Formal Firm Creation and Firms' Growth in Colombia

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Motivation I

How do firms respond to a **policy** that eliminates **entry costs** into the formal sector?

- Key fact 1: Firms are ex-ante **heterogeneous**.
- Key fact 2: Firms must decide on two margins, the **extensive** margin (to enter or not to the formal sector), and the **intensive** margin (to hire formal or informal workers), firm's growth.

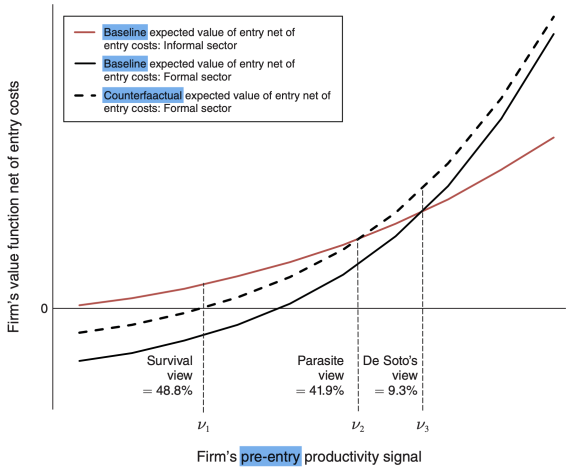
Motivation II

How do firms respond to a **policy** that eliminates **entry costs** into the formal sector?

- **Ulyssea (2018)** finds that it depends on the type of firm.
  - Survival firms: too unproductive to ever become formal, even if entry costs were removed.
  - **Parasite firms**: productive enough to enter formality, but choose not to do it as it is more profitable to operate in the informal sector.
  - De Soto's firms: productive firms that are kept out of formality by high entry costs.
    - lower entry costs –> formalize their business and would be better off.

Motivation II

How do firms respond to a **policy** that eliminates **entry costs** into the formal sector?



Source: Ulyssea (AER, 2018).

Motivation III

Sterk et al. (2021): following formal sector entry, firms' growth profiles are affected by at least two factors:

- Ex-ante heterogeneity: some startups are poised for growth (highly scalable ideas or technologies), while others are not.
- Ex-post shocks: Firms are potentially exposed to negative shocks to productivity or demand.

However, evidence from Sterk et al. (2021) suggests that, for the US, ex-ante heterogeneity accounts for most of the variance in firms' growth and probability of exiting formality.

- Only a few gazelles account for a large share of average firm growth.

Motivation III

Ex-ante heterogeneity accounts for most firms' growth and exit:

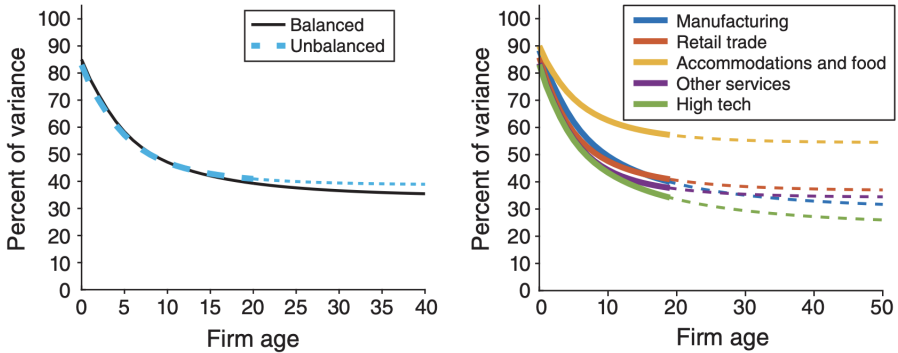


FIGURE 4. CONTRIBUTION OF EX ANTE HETEROGENEITY TO CROSS-SECTIONAL EMPLOYMENT DISPERSION

Source: Sterk, Sedlacek & Pugsley (AER, 2021).

Outline

This paper

We provide new evidence of the effect of a **policy** that lowers the **cost of entry** to the formal sector for small firms in order to promote formal firm creation in Colombia.

- Using a DiD design, we show that this policy has a significant impact on formal firm creation. This is consistent with Ulyssea (2018) findings for Brazil.
- Then, using Sterk et al. (2021) statistical model, we present two new stylized facts for Colombia:
  1. For all firms, the ex-ante heterogeneity in Colombia is high (similar to the US).
  2. This policy induced formalizing firms that were more ex-ante heterogeneous compared to similar firms created without the benefits of the law.

This paper

Consistent with the new firms created being more ex-ante heterogeneous, we show two additional results:

- We empirically show that the firms that benefited from this policy have a lower survival rate in the formal sector.
- We also find that there are financial frictions, in the shape of reduced credit access, as suggested by Sterk et al. (2021) that might drive the newly created firms to shut down.

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The intervention

Law 1429 of 2010 (aka "*Ley del Primer Empleo*")

- The goal was to promote the formalization of **micro and small** firms and create incentives for hiring young workers as well.

- It reduced both registration costs and payroll and corporate taxes for newly created firms that complied with the requirements for a fixed period of time.
  - After the 1st year of being a beneficiary, the benefits start to fade out in a staggered fashion.
  - At year 6, firms were meant to pay full taxes and registration costs.

- In order to facilitate access to credit, it offered a subsidy of up to 20% of the fees charged by a government-sponsored collateral agency (FNG). The FNG covered up to 80% of the credit for a maximum amount $270 million pesos.

The intervention

Table: Benefits per year of the Law 1429

Year	Registration cost	Payroll taxes*	Corporate taxes
1	0%	0%	0%
2	50%	0%	0%
3	75%	25%	25%
4	100%	50%	50%
5	100%	75%	75%
6	100%	100%	100%

Outline

Data

Integrated Record of Contributions to Social Security (PILA)

- Matched employer-employee administrative records on social security contributions.

Chambers of Commerce (Barranquilla, Bogota, Cali and Medellin)

- Administrative data of all firms registered in the chamber of commerce of each of the four cities.

Formato 341, Superfinanciera

- Administrative records of all debtor transactions in the formal banking system. Particularly, commercial credits.

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Empirical Strategy

We use a Difference-in-Differences (DiD) design exploiting variation in eligibility across firm size.

$$y_{cst} = \alpha + \beta \mathit{TreatPost}_{st} + \theta \mathit{Treat}_{s} + \gamma_c + \delta_t + \epsilon_{cst}$$

- $t =$ Monthly frequency, from july 2010 to December 2012.
- y_{cst} is the number of new formal firms in city c of size s in period t.
- Treat_s is a dummy variable that takes the value of one if the firm's size is small (11 to 50 employees).
- $\mathit{TreatPost}_{st}$ is a dummy variable that takes the value of one if the firm is small in a period after December 2010.
- γ_c is a city-specificFE, δ_t is a time FE, and ϵ_{cst} is the error term.

Empirical Strategy

To see dynamic effects, we also estimate the following version of our baseline model:

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

Where D_t are indicator variables for each month omitting D_{-1}. The reference period is December 2010, i.e. all the estimated parameters β_t are relative to the number of new firms in the month before the Law came into force.

Identification assumption: parallel trends in baseline outcomes (control units).

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Difference in differences results

	New formal firms				
	(1) Baseline Small vs medium	(2) 56 cities Small vs medium	(3) C. of Commerce Small vs medium	(4) Size 25-50 vs size 50-75	(5) All firms
TreatPost	3.98***	1.68**	6.71**	0.96***	24.47**
	(1.43)	(0.66)	(2.55)	(0.36)	(9.79)
	[32%]	[29%]	[20%]	[32%]	[28%]
Constant	7.32***	3.47***	19.23***	2.04***	44.32***
	(1.29)	(0.58)	(5.24)	(0.26)	(11.75)
Observations	1,380	3,280	240	1,380	1,380
R-squared	0.63	0.60	0.73	0.64	0.56
Mean dependent variable	12.30	5.74	34.02	3.01	85.81
Parallel trends test (slope)	0.35	0.20	0.88	0.16	0.68
Parallel trends test (placebo)	0.80	0.73	0.93	0.44	0.25

Note: *** p<0.01, ** p<0.05, * p<0.1. Clustered standard errors by city and size in parentheses. Relative effects are in brackets.
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 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. Column (4) uses firms between 25 and 50 employees as treated and firms between 50 and 75 as controls. Column (5) uses micro and small firms as treated group and medium and large firms as control groups.

Parallel trends tests

- Parallel trends test (slope)

$$y_{cst} = \alpha + \sum_{1<k<24} Treat_{s,t-k}\beta_k + \phi Treat_s t + \theta Treat_s + \gamma_c + \delta_t + \epsilon_{cst}$$

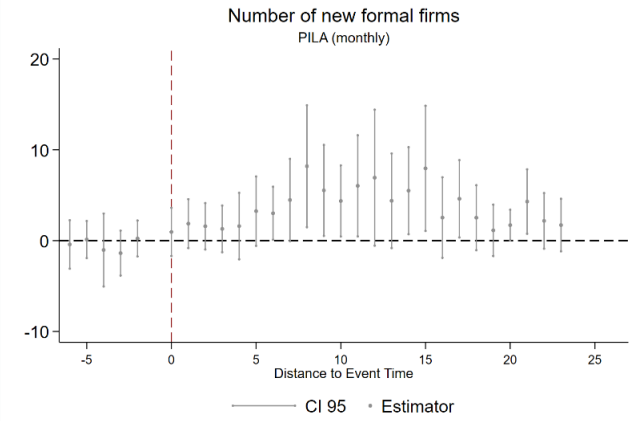
ϕ is the difference in slope between treatment and comparison groups prior to the intervention (Antwi et al., 2013; Muralidharan Prakash, 2017).

- Parallel trends test (placebo)

$$y_{cst} = \alpha + \sum_{-6<k<-2} Treat_{s,t-k}\beta_k + \theta Treat_s + \gamma_c + \delta_t + \epsilon_{cst}$$

We examine whether there is a significant treatment effect prior to the law enforcement (Goldman et al., 2018; Yurukoglu et al., 2017).

Dynamic difference in differences



Note: Data with seasonal adjustment. We use small firms as treated and medium firms as controls. The observational units are the 23 main cities. We use 6 months prior to the beginning of the Law, and 24 months after that.

Sterk et al. (2021) statistical model: ex ante heterogeneity and ex post shocks

- We use Sterk, Sedlacek, and Pugsley (AER, 2021) statistical model to study startup dynamics: why some startups grow successfully, while others have a low survival rate.
- We aim to decompose the cross-sectional dispersion of firm-level employment at any specific firm age between ex ante heterogeneity and ex post components.
- Today's presentation (preliminary results): we do two exercises:
  - Estimate the statistical model for all small and medium-sized firms created in Colombia and construct a cross-sectional auto-covariance function of employment by firm age.
  - Apply the statistical model to small and medium-sized firms created only just before and after the Law 1429 of 2010.
  - Focus on understanding the role of ex ante heterogeneity in determining firm growth at age 0, the year when the firm is created.

Sterk et al. (2021) statistical model: main results

- For all small and medium-sized firms, ex-ante heterogeneity can explain up to 75 percent of the dispersion in firm size at age 0 of the firm.
- Preliminary results show that small firms created after the change of the law exhibit larger ex-ante heterogeneity at age 0 compared to small firms created before the first employment law. No changes are found in medium-sized firms as expected.

Statistical Model: parameters

$$(1) \qquad \ln n_{i,a} = \underbrace{u_{i,a} + v_{i,a}}_{\text{ex ante component}} + \underbrace{w_{i,a} + z_{i,a}}_{\text{ex post component}},$$

where

$$\begin{aligned}
u_{i,a} &= \rho_u u_{i,a-1} + \theta_i, & u_{i,-1} &\sim iid\left(\mu_{\tilde{u}}, \sigma^2_{\tilde{u}}\right), & \theta_i &\sim iid\left(\mu_\theta, \sigma^2_\theta\right), & |\rho_u| &\leq 1,\\
v_{i,a} &= \rho_v v_{i,a-1}, & v_{i,-1} &\sim iid\left(\mu_{\tilde{v}}, \sigma^2_{\tilde{v}}\right), & & & |\rho_v| &\leq 1,\\
w_{i,a} &= \rho_w w_{i,a-1} + \varepsilon_{i,a}, & w_{i,-1} &= 0, & \varepsilon_{i,a} &\sim iid\left(0, \sigma^2_\varepsilon\right), & |\rho_w| &\leq 1,\\
z_{i,a} &\sim iid\left(0, \sigma^2_z\right). & & & & & &
\end{aligned}$$

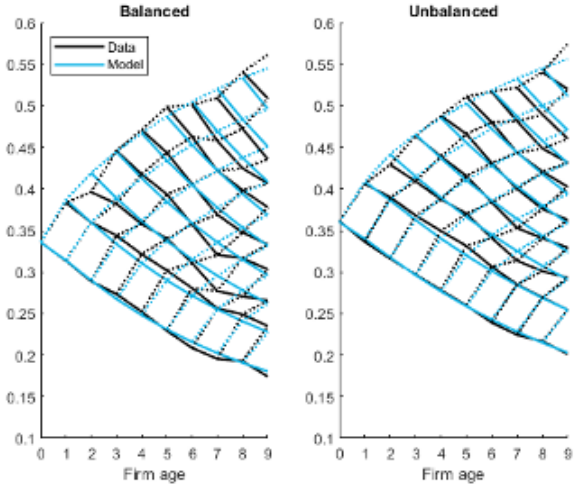
Statistical Model: estimation

- All key parameters of the statistical model can be identified from the autocovariance matrix. In particular, for any pair of ages, the model-implied cross-sectional covariance of employment can be written as closed-form expression of the model parameters.

- For the estimation of the parameters, we follow Sterk et al. (2021): matching the model's autocovariance structure to its empirical counterpart (minimum distance procedure, Chamberlain, 1984).

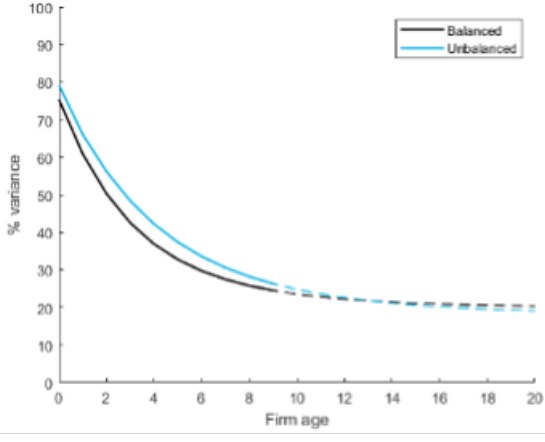
Model Results I: model fit

The model fit is good!



Model Results II: all small and medium-sized firms

For firms in age=0, the ex ante component accounts for about 75 percent of the cross-sectional variance in firm size. The remainder is due to ex post shocks that materialized in the first year.



Contribution of ex-ante heterogeneity to cross-firm employment dispersion

Small firms		Medium Firms	
Before	After	Before	After
51.66 %	67.88 %	48.27%	49.46 %

- The share of the variance of firm size explained by ex-ante heterogeneity at age=0 (year of creation) is larger for small firms created after the change in the law (December 2010), while for medium-sized firms there is no relevant change in the importance of ex-ante heterogeneity before and after the law as such firms were not affected by the policy.

Survival analysis

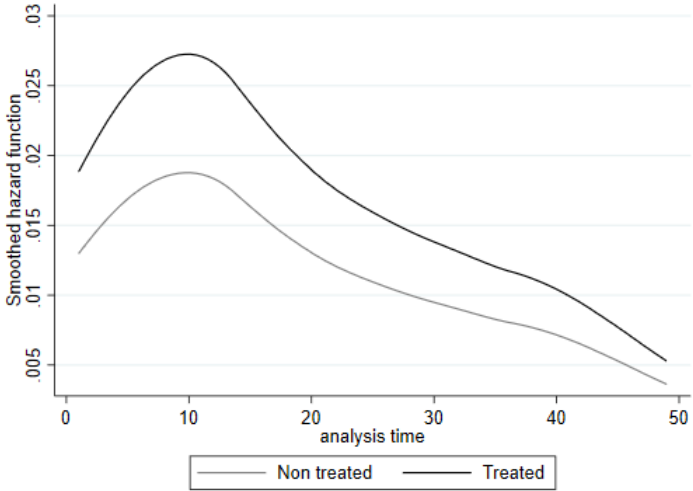
To estimate if treated firms have a larger probability of survival, we estimate a proportional Cox hazard model using micro-level data at the firm level from PILA:

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

where t is measured in months and censored at 49 months.

- We compare treated (small firms) and control (medium firms) before and after the implementation of the law.
- We find that treated firms have a larger probability of exiting the formal sector than non-treated firms.

Survival analysis (PILA)



Hazard ratio
1.45***
(0.06)

Note: Data from PILA. We use small firms as treated and medium firms as controls. The observational units are firms. We use 6 months prior to the beginning of the Law, and 24 months after that.

Access to credit

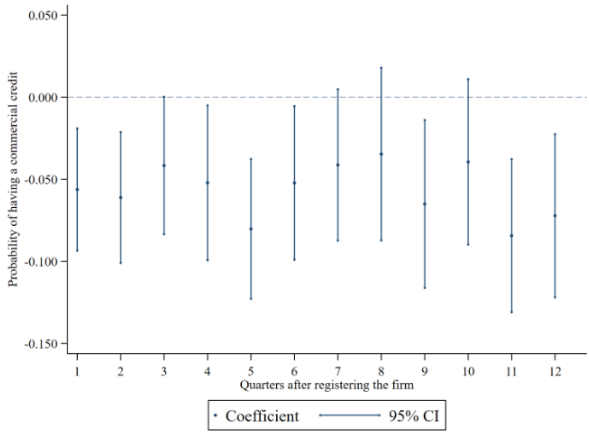
In order to study if treated firms had more access to credit, we use records from Camaras de Comercio from 4 cities (Bogota, Barranquilla, Cali and Medellin) and Formato 341 from Superfinanciera.

- We estimate the probability that a treated firm has at least one new credit in its first quarter after registration as a formal firm. We repeat the exercise up to 12 quarters.

$$y_{ist} = \alpha + \beta \mathit{TreatPost}_{st} + \theta \mathit{Treat}_s + \gamma_c + \delta_t + \epsilon_{cst}$$

- We find that that treated firms have a lower probability of having a credit than non-treated firms. We cannot observe if this is due to treated firms applying less to formal credit-granting institutions or if it is because they are rejected more often.

Access to credit



Table

Note: Data comes from Camara de Comercio and Formato 341.

Outline

Conclusion

- We find that the policy effectively promotes the creation of small formal firms. However, the effects seem to be small.
- There is evidence that the change in the policy that reduced taxes and registration costs in the formal sector induced the entry of more ex-ante heterogeneous firms when using a statistical framework that allows us to understand the drivers of firm growth.
- New treated firms have a lower probability of survival and lower probability of having a credit in the formal credit market than untreated firms. This could be due to:
  - New firms that are created under the incentives of the program are not as productive as they should be. Therefore, as soon as the benefits start decreasing, the firms start dying.
  - Entrepreneurs only seek to have access to the benefits of the law. Therefore, since the beginning they did not have long-term plans to stay open.

Thank you!

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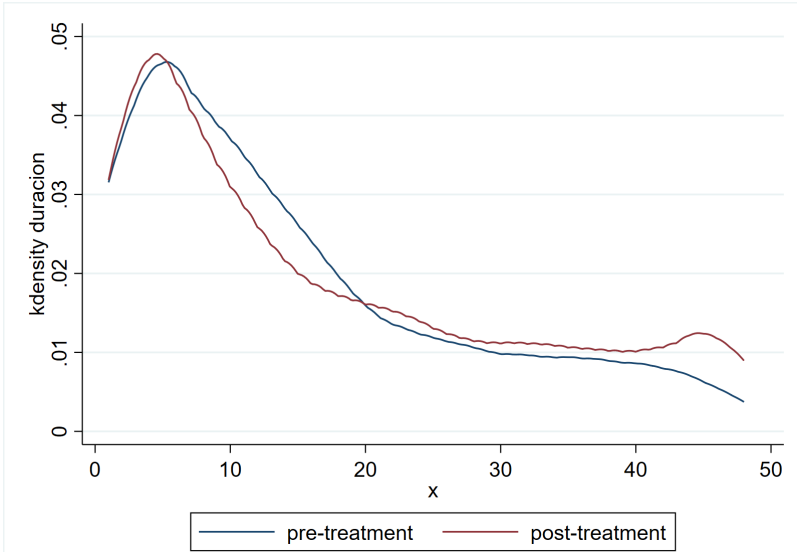
Density



Return

New credits

	1 quarter after registering	2 quarters after registering	3 quarters after registering	4 quarters after registering	5 quarters after registering	6 quarters after registering	7 quarters after registering	8 quarters after registering	9 quarters after registering	10 quarters after registering	11 quarters after registering	12 quarters after registering
	New credits											
TreatPost	-0.0563***	-0.0611***	-0.0416*	-0.0522**	-0.0803***	-0.0523**	-0.0413*	-0.0347	-0.0651**	-0.0394	-0.0844***	-0.0722***
	(0.0190)	(0.0203)	(0.0213)	(0.0240)	(0.0217)	(0.0238)	(0.0235)	(0.0268)	(0.0261)	(0.0257)	(0.0238)	(0.0253)
Constant	0.0741***	0.0909***	0.0814***	0.0937***	0.1189***	0.1027***	0.0948***	0.0952***	0.1225***	0.1022***	0.1287***	0.1128***
	(0.0142)	(0.0153)	(0.0159)	(0.0178)	(0.0164)	(0.0177)	(0.0174)	(0.0197)	(0.0193)	(0.0189)	(0.0178)	(0.0188)
Observations	5,253	5,253	5,253	5,253	5,253	5,253	5,253	5,253	5,253	5,253	5,253	5,253
R-squared	0.0277	0.0397	0.0478	0.0513	0.0543	0.0597	0.0606	0.0650	0.0744	0.0693	0.0727	0.0754

Return