Informality Detection and Firm Outcomes: Evidence from Brazil[*]

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Abstract

We study the firm's response to informality detection. We combine rich Brazilian administrative data and apply a Difference-in-difference framework to estimate the effect of informality detection on firm dynamics and credit outcomes. We find that formal employment spikes in the year of the labor inspection, suggesting that firms become more responsive to the threat of a future labor inspection. However, by the fourth year after informality detection, the firms' formal employment and revenue are, respectively, 18% and 38% lower relative to the not detected ones. The average wage falls by approximately 1% in the year of labor inspection, but the effect reverts in the long run. Concerning the firm-credit outcomes, we document that outstanding loan growth decreases and the non-perform loan rate increases after labor inspection. We do not find significant effects on loan interest rates, which is inconsistent with the positive effect on the default rate. A possible explanation is that the detected firms, which should be facing higher interest rates, are responding to the increase in credit costs by borrowing less. Taking together, our results are consistent with the hypothesis that informality detection interacted with financial frictions negatively affect firms' external financing.

Keywords: Enforcement of Labor Regulations, Informality, Firm Dynamics, Financial Frictions.

JEL Classifications: D22, G32, J23, J46, K20, O17

1   Introduction

A central concern related to informality in developing economies is that deterrence policies may have adverse effects on labor markets. While empirical evidence suggests that stricter enforcement of labor regulation has a negative effect on total employment (Almeida and Carneiro (2009), Almeida and Carneiro (2012), Ulyssea and Ponczek (2021)), little is known about how firms respond to the detection of labor informality and whether it generates negative credit outcomes. This is important because credit restrictions can be a determinant in the firms response since it affect firm dynamics(e.g. Cooley and Quadrini (2001), Buera et al. (2011), Midrigan and Xu (2014), Gopinath et al. (2017)), firm investments (Ponticelli and Alencar (2016)) and labor market outcomes (e.g. Caggese and Cuñat (2008), Pagano et al. (2012), Caggese et al. (2018), Fonseca and Van Doornik (2021)). Moreover, understanding the interaction of enforcement of labor regulation with the credit market is especially relevant because frictions in the credit market are pervasive in economies with high labor informality[1].

In this paper, we shed light on this issue by investigating how firm dynamics outcomes and firm-credit outcomes are affected by the detection of labor informality. We combine Brazilian labor inspection data with firms' credit records and administrative matched employer-employee data. Our labor inspection data is informative only for firms with legal registration. Therefore, we focus on the intensive margin of informality[2]. We then apply a Difference-in-differences (DID) framework to estimate the effects of labor inspections on firms' growth, formal employment, wages, credit costs and credit risk indicators.

Our results suggest that firms employing informal workers are negatively affected by the enforcement of labor regulations. In the spirit of an event-study analysis, we show that formal employment growth spikes in the year of the labor inspection, which suggests that firms respond to the informality detection by "formalizing" some informal vacancies and become more responsive to the threat of a future labor inspection. However, the short-term effect on formal employment is not sustained - it monotonically decreases in the following years after the labor inspection. We also observe a persistent decrease in firms' revenue growth. These effects are large in magnitude: by the fourth year after the labor inspection, firms' formal employment and revenue growth are respectively 18% and 38% lower relative to the not detected firms. The average wage falls by approximately 1% in the year of labor inspection, but the effect reverts in the long run. We interpret these results as indirect evidence that labor costs increase for the detected firms.

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[1]In appendix A, we show that there is a negative correlation between financial development and informal employment.

[2]As in Ulyssea (2018), we define the extensive margin of informality as informal firms and the intensive margin of informality as informal workers employed by formal firms.

The higher labor costs imply lower growth, less wealth accumulation and higher credit risk. Then, we examine the effects of informality detection on credit outcomes. Our goal is to shed light on the impact of the interaction of informality detection with financial frictions on firms' external financing. We find that outstanding loan growth decreases and firms credit risk (measured by the firm's non-performing loan rate) increase after the labor inspection. Although we observe that there are more firms in defaulting status after the labor inspection, we do not find effects on the loan interest rates. A possible explanation is that the detected firms, which should be facing higher interest rates, are adjusting the higher credit costs by borrowing less.

Taking together, our results are consistent with firms facing a trade-off between the expected return from hiring inputs and the costs related to the risk of default (Arellano et al. (2019)). This trade-off arises in an economy with financial frictions and distorts firm's inputs and borrowing decisions. Our results are also compatible with firms becoming more financially constrained because the collateral required by the lender grows at a slower rate (Buera et al. (2011)).

Our study complements the informality literature that uses microdata to estimate the effects of enforcement of labor regulation on firm outcomes (Almeida and Carneiro (2009), Samaniego de la Parra (2017), Brotherhood et al. (2020)). We mainly add to this literature by documenting the effect of informality detection on firm credit outcomes. We also contribute to the literature that studies the impact of labor market frictions on the firm's financial outcomes and credit markets (Simintzi et al. (2014), Schmalz (2015), Favilukis et al. (2020)).

The rest of the paper is organized as follows. Section 2 presents the background and section 3 describes the data. Section 4 presents our empirical strategy. Section 5 reports the results and Section 6 concludes.

2   Informality and enforcement in Brazil

Brazil has a highly regulated labor market. Formal employment is subject to a minimum wage law, income tax obligation, social security contributions (INSS), severance payment fund (FGTS) contribution, severance payment fee in case of lay-offs, 13th salary and vacation stipend payments, among other minor obligations. Although labor informality has declined in Brazil over the last 20 years, it is still high.[3] Besides informal self-employees and workers employed in informal firms, labor informality also encompasses workers employed at formal firms, but without legal labor registration (Ulyssea (2018)).

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[3]See Haanwinckel and Soares (2020) for more detailed information about the Brazilian informality history and labor regulations.

The Ministry of Labor conducts labor inspections in Brazilian establishments to enforce the labor regulation. The selection of firms to be audited is not random. Moreover, labor inspections are centered on formal firms, which are more visible to the regulator (Almeida and Carneiro (2012)). Once detected, the infringing firms must pay a fine per labor infraction. The penalty is doubled in case of recidivism on the infraction of employment of workers without a registry.

3 Data

We combine three different data sources, which contain information on the firm level:

1. Labor inspections data set from *Secretaria de Inspeção do Trabalho* (Labor Inspection Office). Our labor inspections dataset contains information of formal firms (i.e, with legal registration) that were inspected and found to be in breach of labor regulation. Specifically, we have information on firms that incurred at least one of the following infractions: unregistered employees, payments, hours worked, and hours of rest. The data contain, for each infringing firm, the information on the date of the infraction[4], the type of infraction, the amount of the fine and the firm's identification (name and legal registration number). We restrict our analysis to firms with "unregistered employees" infraction type and firms with no recidivism.

2. Credit registry data from *Sistema de Informações de Créditos* (SCR) from Brazilian Central Bank. SCR contains detailed information on all corporate loans granted by a financial institution operating in Brazil. Besides the loan characteristics, SCR also provides the firm's annual revenue information, which is collected and informed by the financial institution.

3. Brazilian administrative data of all registered workers and their employers - *Relação Anual de Informações Sociais* (RAIS). RAIS provides both employer and employee ID identification. This data allows us to calculate the total number of formal workers employed in a given firm and time. We can also extract from the dataset information of the formal employees such as wage, type of labor contract, tenure, dismissal motive, education, age and sex.

4. Formal firms' geographical information from *Receita Federal*. This data set contains information on the date of creation, location, industry, legal nature and date of closing of all Brazilian firms with legal registration.

We use Brazilian firm legal registry identification (CNPJ) to join the information from the different data sets. Our final panel is composed of firm-year observations for the period ranging from 2010 to 2018. We also restricted our sample to firms inspected

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[4]Usually the date of infraction corresponds to the date of the labor regulations audition.

by the labor auditor between 2013 and 2018.

Table 1 and 2 provides descriptive information of our sample. On average, firms had 18 formal employees, 7.9 informal employees[5] and 10 years old in the period previous to the labor inspection. It is important to highlight that the majority of the firms are small - 65% of the detected firms had up to 9 formal employees. For the firms in the SCR dataset, they had on average 2 bank- relationships, 9 loans and 0.6 millions *Reais* (BRL) in outstanding loans.

4 Empirical Strategy

Since labor inspections are unlikely random (Almeida and Carneiro (2012)), we apply a difference-in-differences (DID) research design to estimate the effect of labor inspections on the firm's outcomes. There is recent literature showing that the application of standard Two-way-fixed-effects (TWFE) in the presence of heterogeneous effects generates biased estimations (e.g de Chaisemartin and D'Haultfouille (2020), Borusyak et al. (2021)). Since our research setting relies on heterogeneous treatment effects - both at the treatment timing and multiple periods dimensions - we use the Callaway and Sant'Anna (2021) estimator.

Following Callaway and Sant'Anna (2021), we estimate the Average Treatment Effect on the Treated for each group of treated units g and time t (ATT(g,t))[6]. In our setup, firms inspected in the same year belong to the same group g. Define $Y_{it}(0)$ as unit $i's$ untreated potential outcome in time period t, $Y_{it}(g)$ as unit $i's$ potential outcome in time period t if they become treated in period g and G_i the time period when unit i becomes treated. Then, the average effect of participating in the treatment for units in the group g at time period t is given by:

$$ATT(g,t) = E[Y_t(g) - Y_t(0)|G]$$

The group-time average treatment effects are identified under parallel trends assumption. Our identification relies on conditional parallel trends assumption. In this paper, we use firms not yet inspected as a control group (i.e., we will use firms' outcomes from periods before the inspection date as counterfactual information).

Define D_{it} as an indicator variable for whether unit i has been treated by time t, Y_{it} as the unit $i's$ observed outcome in time period t and X_i as the vector of pre-treatment

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[5]Using the value of the fine, we can calculate a proxy of the number of informal workers employed by the detected firm in the moment of the labor inspections.

[6]In practice, we employ Stata package developed Rios-Avila and Naqvi, which implements Callaway and Sant'Anna (2021) and Sant'Anna and Zhao (2020) estimators.

covariates. Under parallel trends conditional on covariates assumption based on never-treated units, we have that, for all $t > g$

$$ATT(g, t) = E[Y_t - Y_{g-1}|X, G = g] - E[Y_t - Y_{g-1}|X, D_t = 0, G \neq g]$$

Our firm-credit outcomes of interest are the (log) outstanding loan amount, non-perform loan rate and loan interest rates[7]. For the latter outcome, we restrict our panel to the new loans with fixed interest rates[8]. This restriction allows us to have a clean interpretation of the effects on credit costs. For the firm dynamics outcomes, we are interested in the firm's (log) revenue, the (log) total formal employees and the (log) average formal wage per employee.

5 Results

We first present the results of the effect of labor inspection on formal employment, average wages and revenue growth. Then, in the second subsection, we examine the effect of informality detection on the firm credit outcomes: loan amount growth, non-performing loan rate and interest rates.

We present the average treatment effects (ATT) aggregate by the time periods after the event had occurred. This aggregation scheme, as in the Event Study applications, allows us to assess how the treatment effect varies with the length of exposure. We also plot the results by the time periods before the event, which works as a test for the parallel trends assumption.

5.1 The effect of labor inspections on firm's dynamics outcomes

Figure 1 - panel 1a shows the results for the formal employment. We observe a spike in formal employment in the year of the labor inspection. In the periods after the informality detection, total formal employment declines. Pannel 1b presents the results for the revenue growth outcome. It monotonically decreases after the labor inspection. The effects on both outcomes are persistent: by the fourth year after the labor inspection, the firm's formal employment and revenue growth are respectively 18% and 38% lower relative to the not detected firms.

As regards the effect on wages, panel 1c shows that the formal employee average wage falls by approximately 1% in the year of the labor inspection, but this effect fades in the

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[7]We define non-perform loan rate the total amount of loans on overdue relative to total debt for a given firm in a given period.

[8]In our sample, around 80% of the loans are granted with fixed interest rates.

long run.

(a) Event study estimates on firm's formal employment

(b) Event study estimates on firm's revenue

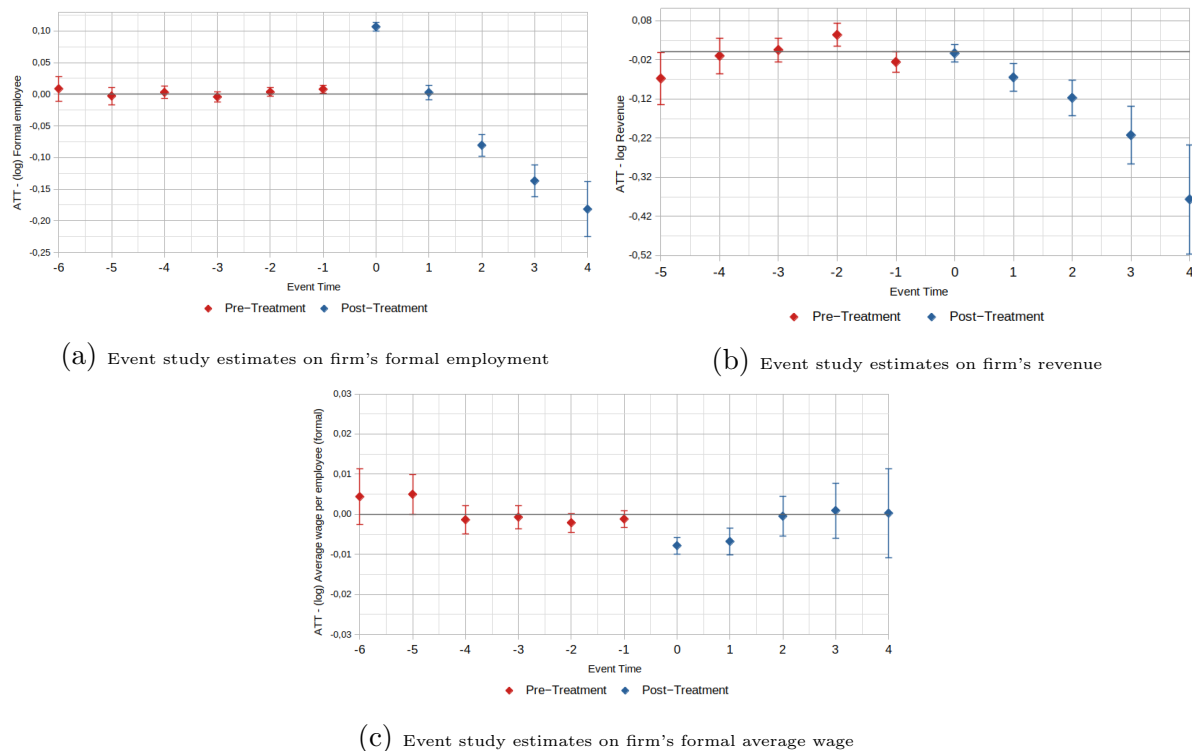(c) Event study estimates on firm's formal average wage

Figure 1: Effect of labor inspections on firm's formal employment, formal wages and revenue growth.

We interpret these results as indirect evidence that firms face higher labor costs in the aftermath of informality detection. The positive jump in formal employment in the short term after the inspection suggests that firms "formalize" (at least) some of their informal vacancies[9]. The absence of a positive rise in the firm's revenue in the same period is consistent with firms increasing the share of formal employment and not increasing total employment. This result is also in line with Samaniego de la Parra (2017) findings[10].

Since formal employment entails more costs than informal employment, firm expenditures are likely to increase after labor inspection. Even if firms compensate for the rise in labor costs by decreasing wages, the sudden increase in formal employment indicates that firms face higher expected informality costs after being detected. The fact that the punishment in the case of recidivism is harsher in Brazilian legislation supports our argument that firms become more responsive to the threat of a future labor inspection. We highlight, however, that the expenses with the infraction penalty likely have a minor

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[9]Since we do not have information about the informal employees working at the moment of the labor inspection, we can not assess whether the newly hired workers were the employed informal ones.

[10]Samaniego de la Parra (2017) analysis Mexican formal establishments randomly selected to be inspected by the Ministry of Labor. She found that the probability of an informal worker to transit to a formal job within the establishment and the probability of an informal worker to be separated from the establishment increase after the labor inspection.

impact on the firm's response. Table 1 - panel C presents the distribution of the value of the penalty relative to the firm size (proxy by the firm's revenue). The median of the relative penalty is very low - approximately 0.1%.

Finally, labor inspection may also trigger other indirect labor costs, such as employees law suits against these firms (Corbi et al. (2022)). Quantifying such effects is beyond the scope of this paper.

The new labor costs creates a wedge between the marginal product of labor and the wage, distorting the labor allocation. It might be optimal to the firm to reduce the production inputs, which in turn negatively affects its growth. The medium and long run effects of informality detection favors the hypothesis that labor costs increase in the aftermath of the labor inspection.

5.2   The effect of labor inspections on firm's credit outcomes

We argued in the previous section that informality detection increases labor costs, which should negatively affect the firm's growth. The higher labor costs could also trigger additional adverse effects and potentially amplifies the harmful effects of enforcement of labor regulation. In this section, we investigate the effect of informality detection on the firm's credit outcomes. We are motivated by two channels in which the interaction of informality detection with financial frictions may negatively affect firms' external financing.[11]

The first channel is related to the theories relying on limited enforcement of financial contracts. As in Buera et al. (2011) in such an environment, lenders impose a collateral requirement that limits the borrowing amount in proportion to the borrower's wealth. We have discussed in the previous section that informality detection negatively affects the firm's growth by distorting the firm's inputs allocation and possibly the firm's productivity. If firms face collateral constraints, the amount of borrowing is limited in proportion to the firm's size, which is lower in the case of informality detection.

The second channel is related to models that link loan pricing with credit risk. These models assume the existence of market frictions that make lenders increase the interest rates as the borrower's default probability raises. It is the case of an economy with incomplete markets and negative idiosyncratic shocks (e.g.,Arellano et al. (2019)). The higher interest rates can be also related to the costs of monitoring the borrower's default state (Townsend (1979)). In the informality detection context, the increase in labor expenses and the rigidity of labor formal contracts make firms more prone to default

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[11](Brotherhood et al. (2020)) explore the impact of higher labor costs, entailed by the labor inspections, on firms' productivity. Although we focus on the impact of enforcement of labor regulation on firms' external financing, our findings and interpretation do not rule out the productivity channel. We view our work as complementary to theirs and vice-versa.

after informality detection[12]. Hence, lenders raise the loan interest rates according to the increase in the firm's credit risk. Effective (or expected) higher external financing costs affect firms borrowing decisions and may distort even further their inputs allocation.

Next, we turn to the results of informality detection on firms' credit outcomes. We begin by examining the effects of labor inspection on the firm's external financing. Fig 2 - panel 2a shows that the firms outstanding loan growth decrease after the labor inspection. Like formal employment and revenue outcomes, the effect on the firm's debt growth is persistent. After four years, outstanding loan growth is approx. 30% lower for the firms detected by the labor regulator compared to the firms not detected. This result is consistent with the channels discussed above. We highlight, however, that firms may be also decreasing their external financing through a mechanical channel.[13].

Panel 2b of figure 2 presents the result for the non-performing loan rate outcome. It increases after the labor inspection, suggesting that the enforcement of labor regulation affects the firm capacity to repay its debt and increases its credit risk. The pre-trend test suggests that the no-performing loan rate was already increasing, relative to the control group, before the event. In this case, we failed in the parallel trends assumption. We highlight that the increase in the no-perform loan rate after the event is much higher than the trend before the event. We interpret this difference as indicative that the bias in the treatment effect is likely to be small (Rambachan and Roth (2020). As a robustness check, we estimate the effect of the labor inspection separated for the firms with no default loans previously to the event. The results are presented in Appendix B. The estimations still indicate a rise in the non-performing loan rate after the event, but with no violation in the parallel pre-treatment trends assumption.

As discussed above, we expect that credit costs should increase after the informality detection as a sign that firms are becoming riskier and, then, more credit constrained. Panel 2c shows no statistically significant effects (at 5%) on interest rates. This result is inconsistent with our previous finding on the no-performing loan rate since a higher default rate implies higher loan interest rates.

Several reasons can explain the contradictory results. One possibility is that the default does not explain credit costs for the subset of firms studied in this paper. To investigate this hypothesis, we regress the interest rate on non-performing loan rate controlling for firm fixed effects, loan characteristics and other variables that likely affect the firm's interest rate. The results are in Table 3. The non-perform loan rate coefficient is

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[12]Higher labor stipends, for example, may reduce the operating profit left to the interest payments. Additionally, a larger share of formal employment implies that firms have less margin to adjust for the negative shocks since the formal labor contract feature more rigidity than the informal one.

[13]If the firm reduces inputs allocation in the aftermath of labor inspection, then external financing may be decreasing in proportion to the production inputs variation.

(a) Event study estimates on outstanding loan (log) amount.

(b) Event study estimates on no-performing loan rate.
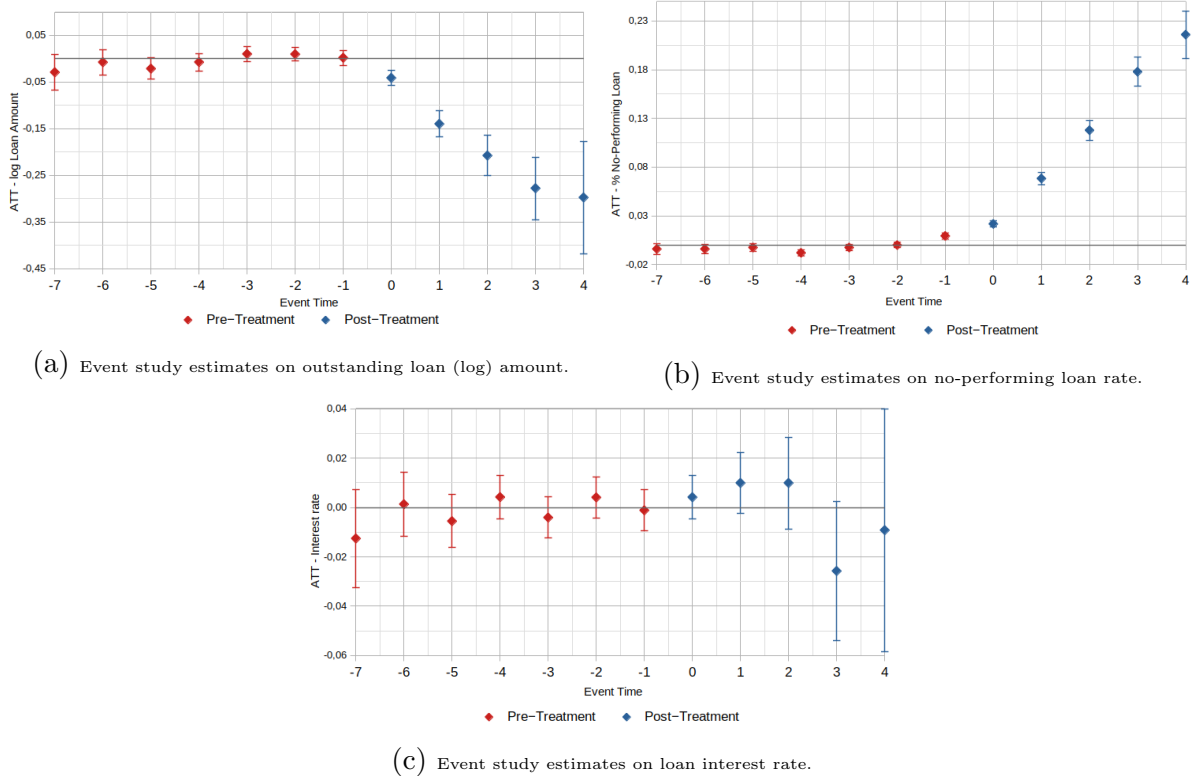

(c) Event study estimates on loan interest rate.

Figure 2: Effect of labor inspections on firm-credit outcomes.

positive and significant at 1% in all the specifications. These results are suggestive that the default rate is an important outcome to price loans.

The effect on the no-performing loan rate is driven by the extensive margin (i.e, the labor inspection increase the share of firms with loans in overdue). Then, another possibility is that although there are more firms going into default, there are fewer defaulting firms taking new loans. Table 4 shows that on average 27% of the firms with no default loans take a new loan (at a quarterly frequency). This figure is 16% for the not yet detected firms at defaulting status, but 7% for the detected firms at defaulting status. These figures indicate that our results fit well with this explanation.

A complementary explanation is that after informality detection, firms decrease their leverage on the high-interest rates loans in response to the expected rise in future defaults and, hence, to prevent higher future external financing costs. The decrease in the firm's external financing leverage is also consistent with this explanation.

6   Conclusion

In this paper, we study the firm's response to the enforcement of labor regulation. Our findings suggest that firms employing informal workers are negatively affected by infor-

mality detection. We showed that formal employment increases in the year of the labor inspection, which suggests that firms become more responsive to the threat of informality detection and "formalize" some informal vacancies. In the years after the labor inspection, formal employment and revenue growth decrease monotonically. The average wage falls slightly in the year of the labor inspection, but the effect is reversed in the long run.

The labor inspection implies that firms employing informal workers face higher labor costs after being detected. It should affect the firms' growth and increase the firm's credit risk. Then, we investigate the effect of informality detection on firm credit outcomes to shed light on the interaction of financial frictions and the enforcement of labor regulation. We find that the firm's outstanding loan growth persistently decreases after the labor inspection. We also find that the firm's non-perform loan rate increases after being detected, supporting the hypothesis that firms become riskier. However, we do not find effects on interest rates. A possible explanation is that the detected firms, which should be facing higher interest rates, are responding to the increase in credit costs by borrowing less.

Our results are consistent with the hypothesis that informality detection interacted with financial frictions negatively affect firms' external financing. It raises the question of whether improving credit market access would mitigate the harmful effects of enforcement of labor regulation on firms' growth. Future research quantifying the causal effect of borrowing restrictions on the negative and persistent effects of informality detection on firms' growth is needed to complement our work.

Our findings also have important policy implications for developing economies. For instance, a labor policy designed to increase informality detection could increase the aggregate default rate. It could further tighten credit market access and amplify the negative effects of fighting informality on employment.

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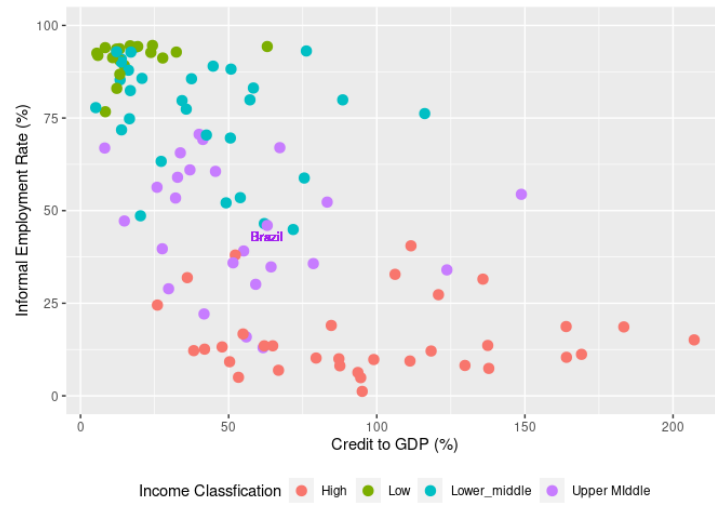# A Online Figures and Tables

Figure 3: Informal Employment Rate and Financial Development. Each dot in the graph represents a country. Data of informal employment rate is from ILO (2018) and Credit to GDP information is from World Bank Database

Table 1: Descriptive Statistics

A. Firm Characteristics (RAIS)

	Mean	Std. dev.	N
Formal employees	18.61	217.15	44,736
Informal employees	7.92	172.91	43,003
Age	10.23	9.58	42,677

B. Firm Characteristics (SCR)

	Mean	Std. dev.	N
Age	10.05	7.80	25,744
Revenue (MM)	123.00	12,600.00	24,694
Outstanding Loan (MM)	0.66	8.94	25,747
Maturity (months)	34.45	27.07	24,100
Spread (%)	38.76	63.32	23,277
Collateral	0.58	0.40	25,747
Number of Loans	8.86	27.72	25,747
New loan	0.69	0.46	25,747
Number of Bank-relationships	2.05	1.52	25,747
Credit market relationship (years)	10.45	7.79	25,747
Default	0.20	0.40	25,747
NPL	0.14	0.30	25,747

Note: In this table, the sample is restricted to the year previous of the year of firm's labor detection. Informal employees outcome is a proxy of total workers employed without legal registration at the moment of labor inspection.

Table 2: Descriptive Statistics

A. Firm size - total employees classification (RAIS)

	Frequency (%)	Formal emp. (mean)	Informal emp. (mean)
1 to 4	38.95	2.41	2.55
5 to 9	26.60	6.72	3.17
10 to 19	18.79	13.43	6.99
20 to 49	10.99	29.67	13.06
50 to 99	2.68	67.55	20.04
100 to 249	1.30	154.22	99.12
250 to 499	0.41	339.59	165.03
More than 500	0.28	1764.42	351.09

B. Firm size - revenue classification (SCR)

	Frequency (%)
Less than 0.360 MM	28.96
0.360 to 4.8 MM	61.46
4.8 to 90.0 MM	8.61
90.0 to 300.00 MM	0.46
More than 300.00 MM	0.31

C. Distribution of the penalty amount relative to the firm's revenue

	Percentiles
1%	0.00002
25%	0.0005
50%	0.0012
75%	0.0035
99%	0.2864

Note: In this table, the sample is restricted to the year previous of the year of firm's labor detection.

Table 3: Regression on loan interest rate

	(1)	(2)	(3)	(4)
Maturity	-0.00885***	-0.00887***	-0.00865***	-0.00897***
	(-46.25)	(-46.27)	44.6	(-44.70)
NPL	0.144***	0.144***	0.117***	0.119***
	(22.22)	(22.12)	-19.4	(19.19)
Past Default	0.0101**	0.0105**	-0.0401***	-0.00768
	(3.05)	(3.15)	9.94	(-1.83)
Firm-Bank relationship (months)	-0.0000575***	-0.0000583***	0.000107***	0.000337***
	(-3.38)	(-3.42)	(-7.55)	(21.83)
Number of banks relation	-0.00229***	-0.00237***	0.0105***	0.0130***
	(-3.40)	(-3.53)	-12.02	(14.15)
Collateral	-0.217***	-0.214***	-0.197***	-0.193***
	(-77.35)	(-74.91)	74.35	(-71.53)
Firm age	-0.00262***	-0.00259***		
	(-6.67)	(-6.57)		
Firm age^2	0.0000402***	0.0000397***	0.0000253	0.000440***
	(3.68)	(3.63)	-1.11	(29.97)
Size (employment)	-0.0000664	-0.0000663	-0.000024	0.00000659
	(-1.87)	(-1.87)	1.64	(0.71)
Constant	1.611*	1459	0.183*	0.172*
	(2.10)	(1.95)	-2.32	(2.13)
Time FE	Yes	Yes	Yes	Yes
Firm FE	No	No	Yes	Yes
Bank FE	Yes	Yes	Yes	Yes
Loan characteristcs controls	Yes	Yes	Yes	Yes
Firm controls	Yes	Yes	No	No
Firm size type	Yes	Yes	Yes	Yes
Time x State FE	Yes	No	Yes	No
N	357613	357613	357613	363408
R-squared	0.5465	0.5419	0.4531	0.4114
Adj. R-squared	0.5439	0.5407	0.4501	0.4101

The dependent variable is the firm's average interest rate. It is restricted only to the new loans and it is weighted by the loan value. The sample used in the regression is at a quarterly frequency. The variable "NPL" is the non-performing loan rate; "Past Default" is a dummy that equals one if the firm had a loan with more than 90 days overdue in the past; "Size" is the total number of formal employees; "Loan characteristics controls" includes the loan type and the loan resources; "Firm controls" encompasses the firm's state, industry and firm legal nature; "Firm size type" refers to the category of the firm's size (micro, small, medium or large).

t-statistics are in parentheses; * p<0.05, ** p<0.01, *** p<0.001

Table 4: Proportion of firms with new loans

	Not detected firm			Detected firm		
	Mean	Std. dev.	N	Mean	Std. dev.	N
Defaulting firm						
No	0.27	0.45	744,342	0.27	0.45	658,726
Yes	0.16	0.36	64,750	0.07	0.26	242,381

B Heterogeneous effects across default status

Figure 4 presents the results separated for firms with no default loans (in a darker color) and with default loans in the year previous to the labor inspection. In this exercise, we restrict our sample to firms inspected in 2014[14].
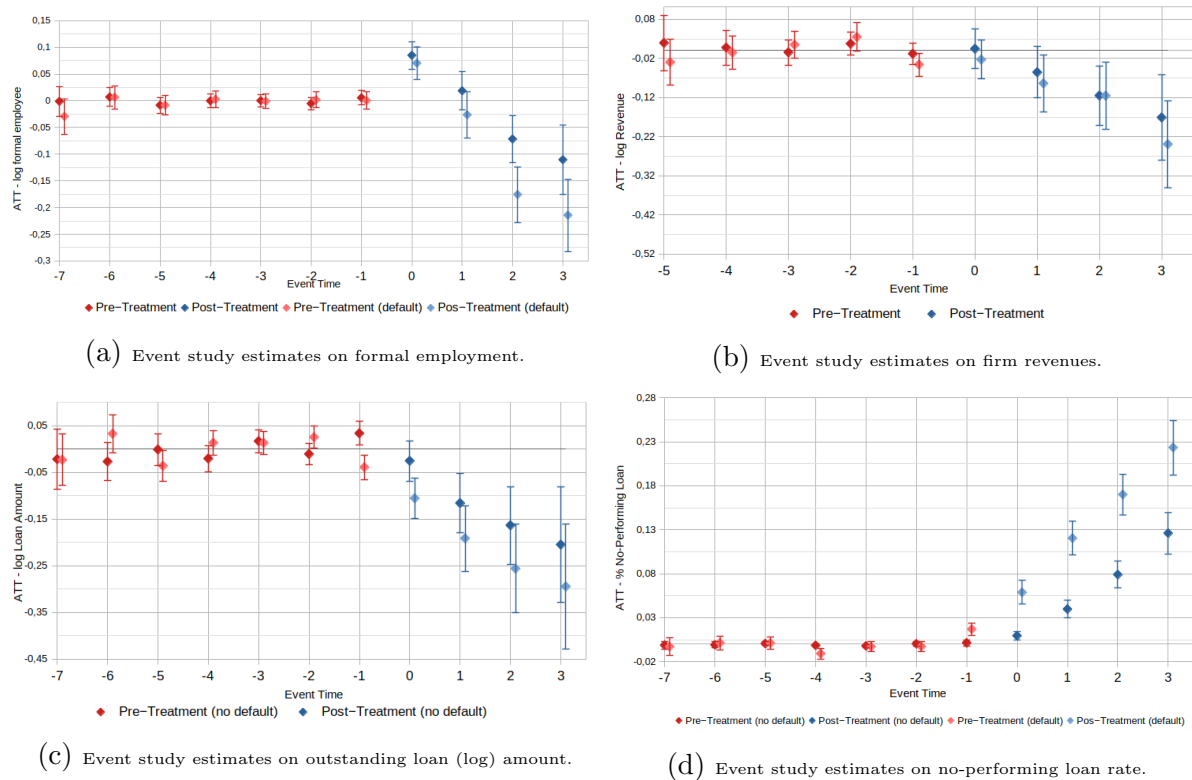

(a) Event study estimates on formal employment.

(b) Event study estimates on firm revenues.

(c) Event study estimates on outstanding loan (log) amount.

(d) Event study estimates on no-performing loan rate.

Figure 4: Effect of labor inspections on firm dynamics and firm-credit outcomes by default status.

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[14]The default status is a time-varying variable and all the firms receive the treatment at a point in time in our sample. Then, we can only fix this variable in the baseline period if we restrict the analysis to a single treated cohort.