Financial Development and Labor Market Outcomes: Evidence from Brazil*

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Abstract

We estimate the effect of an increase in the availability of bank credit on the employment and the wages of high- and low-skilled workers. To do so, we consider a bankruptcy reform that increased the legal protections of secured creditors, which led to an expansion of bank credit to Brazilian firms. We use detailed administrative data and an empirical strategy that exploits cross-sectional variation in the enforcement of the new legislation arising from differences in the congestion of civil courts. We find that the expansion in credit led to an increase in the skill intensity of firms and in within-firm returns to skill. To rationalize these findings, we design a model in which heterogeneous producers face constraints in their ability to borrow and have production functions featuring capital-skill complementarity. We use this framework to generate an industry-level measure of capital-skill complementarity, which we use to provide direct evidence that the effect of access to credit on skill utilization and the skill premium is driven by a relative complementarity between capital and labor.

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Financial constraints are a pervasive characteristic of low- and middle-income economies. In Brazil, for instance, 45 percent of firms identify access to finance as a major constraint (2009 World Bank Enterprise Survey). Extensive literature has found that financial frictions affect economic development not only by slowing down capital accumulation but also by causing capital to be misallocated across producers.[1] Because there is complementarity between capital and labor, these findings suggest a role for the cost and availability of external finance in determining labor market outcomes. Moreover, financial frictions may also impact the skill composition of a firm's workforce, as well as the returns to skill, as skilled and unskilled labor potentially differ in how complementary they are to capital.

This paper sheds light on the effect of increased access to bank credit on the employment and wages of skilled and unskilled workers. To conduct our analysis, we assemble a comprehensive firm-level panel of formally registered Brazilian firms using matched employer-employee data, credit registry data, and data on real outcomes such as assets, investment, and output. Our identification strategy makes use of a 2005 reform to the legislation governing bankruptcy proceedings in Brazil, which significantly strengthened the rights of secured creditors and led to an increase in the borrowing capacity of firms.

To identify the impact of the 2005 bankruptcy reform and subsequent credit expansion on labor market outcomes, we exploit cross-sectional variation in the enforcement of the new legislation arising from differences in the congestion of civil courts (Ponticelli and Alencar 2016). We start by documenting that the 2005 bankruptcy reform significantly increased firm-level access to bank credit. We find that the growth in bank credit is 7.4 percentage points higher for firms in high-enforcement localities relative to firms in low-enforcement localities following the reform.

[1] Early work includes King and Levine (1993), Jayaratne and Strahan (1996), and Rajan and Zingales (1998). For studies on the impact of financial frictions on capital accumulation, see also Levine and Zervos (1998) and Rioja and Valev (2004). See, for instance, Bertrand, Schoar, and Thesmar (2007), Buera, Kaboski, and Shin (2011), Moll (2014), Cong et al. (2019), Catherine et al. (2017), and Bai, Carvalho, and Phillips (2018) for studies on the impact of financial frictions on the allocation of capital.

Our research has three main sets of empirical results. First, we find that increased access to credit causes firms to increase their skill intensity. In particular, we find that the growth in the share of skilled workers is 4.0 percentage points higher for firms in high-enforcement localities relative to firms in low-enforcement localities after the reform, with skill defined as educational attainment. We also observe an increase in employment in occupations that are traditionally performed by skilled workers. These findings suggest that access to credit allows firms to hire and retain relatively more skilled workers.

Second, we further find that increased access to credit leads to an increase in the within-firm return to skill. Specifically, we find that firms in high-enforcement localities experience 3.9 percentage point higher growth in the skill premium relative to firms in low-enforcement localities. This suggests that access to credit impacts not only the relative quantity of skilled labor but also its relative price, thus affecting within-firm earnings inequality.

What can explain the observed increase in the relative utilization of skill and the return to skill following a credit expansion? One possibility is that capital and skilled labor are relative complements.[2] If that is the case, an increase in capital accumulation will cause skilled labor to become more productive relative to unskilled labor. This in turn will lead to an increase in the employment of skilled workers relative to unskilled workers and/or an increase in the skill premium.

Our third set of empirical findings sheds light on the mechanism behind the effect of access to credit on skill intensity and the skill premium. We find that firms in high-enforcement localities increase their level of investment following the expansion in credit, relative to firms in low-enforcement localities. Moreover, we provide direct evidence in favor of the capital-skill

[2]Another possibility is that financial frictions directly impact employment decisions due to a mismatch between payments to labor and the generation of cash flows or the fact that labor has a fixed-cost component including, for instance, hiring and firing costs (Benmelech, Bergman, and Seru 2015; Bai, Carvalho, and Phillips (2018); Caggese, Cunat, and Metzger (2019)). Since skilled labor requires larger wages than unskilled labor and is arguably associated with higher recruiting costs, this has the potential to explain our results. While we do not rule out this channel, we provide evidence that our results are at least partly driven by capital-skill complementarity.

complementarity channel by exploiting variation in the degree of capital-skill complementarity at the industry level. We find that treated firms in high-complementarity industries increase their utilization of skilled labor and their within-firm returns to skill by more than treated firms in low-complementarity industries.[3] In this set of results, we can flexibly control for any unobserved time-varying differences between localities, alleviating concerns that our findings are driven by local economic conditions or other regional differences.

To rationalize these findings, we design a model in which heterogeneous producers face constraints in their ability to borrow (Moll 2014) and technology is such that skilled labor is more complementary to capital than unskilled labor. Production functions have a nested CES form and feature capital-skill complementarity as in Krusell et al. (2000). In the presence of capital-skill complementarity, an increase in capital will cause the productivity of skilled workers to increase by more than the productivity of unskilled workers. These theoretical predictions are in line with the observed increase in investment the employment of skilled workers, and the skill premium, as long as we assume a relative complementarity between capital and skilled labor.

To provide direct evidence in favor of the capital-skill complementarity assumption, we estimate production function parameters for each two-digit industry and compute the elasticities of substitution between unskilled labor and capital and between skilled labor and capital. Our estimation procedure involves first estimating a second-order approximation of the production function as in De Loecker and Warzynski (2012). In a second step, we use these reduced-form estimates to recover the structural parameters of our nested CES production function using a minimum distance estimation procedure. We find that all industries in

[3] We use estimates of the parameters of a nested CES production function to compute the elasticities of substitution between unskilled labor and capital and between skilled labor and capital for each 2-digit industry. Our industry-level measure of capital-skill complementarity is the ratio between the two elasticities—a high ratio implies that, in relative terms, skilled labor is a considerably more complementary to capital than unskilled labor. We also show that these results are robust to using alternative measures of capital-skill complementarity which are not based on production function estimation.

manufacturing and extractive sectors display some degree of capital-skill complementarity.[4] This is in line with previous work that sought to quantify the degree of capital-skill complementarity in different industries (Larrain 2015).

Another theoretical prediction that arises from our model is that financially constrained firms should experience larger employment effects as a consequence of the bankruptcy reform and the subsequent expansion in bank credit. We take this prediction to the data using firm size and firm age as proxies for financial constraints.[5] According to both measures of financial constraints, the share of skilled workers rises by more at financially constrained firms in high-enforcement localities, relative to unconstrained firms in high-enforcement localities. This suggests that increased access to bank credit impacts not only the overall level of skill utilization but also the allocation of skill, with resources shifted towards financially constrained firms. As in the analysis that exploits industry-level variation in the degree of capital-skill complementarity, we can include locality-time fixed effects in these specifications. This is thus another set of results suggesting that our findings are not driven by any unobservable time-varying differences across localities.

In addition to ruling out differences in local economic conditions as the driving force behind our results, we confirm the robustness of our empirical findings to flexibly controlling for industry-specific trends. This alleviates concerns that our results are biased by differential firm growth across product categories. We also control for pre-existing differences in the share of skilled workers across firms, suggesting that our results are not driven by a disproportionate increase in borrowing and investing by skill-intensive firms. Finally, while it is the case that financially constrained firms experience larger employment effects as a consequence of the 2005 reform, we show that our results are robust to controlling for proxies for funding needs.

[4] We are only able to estimate production function parameters for industries in manufacturing and extractive sectors as this estimation procedure requires data on the stock of capital, which is only available for firms in these sectors.

[5] Hadlock and Pierce (2010) assess the informativeness of several measures of financial frictions and find that size and age are the most successful predictors of financial constraints.

Overall, our results add to a growing body of evidence supporting the existence of an important link between financial frictions and labor markets. Moreover, our findings suggest that by introducing distortions in the allocation of capital, financial frictions lead to distortions in the allocation of skill. We thus provide new evidence on the specific channels through which financial development can improve the allocation of production factors and hence increase aggregate productivity.

Our work contributes to the recent literature on the impact of financial frictions on long-term labor market outcomes. For instance, Benmelech, Bergman, and Seru (2015), Bai, Carvalho, and Phillips (2018), and Caggese et al. (2019) find that financial frictions impact firm-level employment decisions, with consequences for the allocation of labor across producers as well as aggregate unemployment rates. We add to this literature by providing evidence that access to external finance impacts the types of workers a firm employs, in terms of both educational attainment and occupation, as well as the within-firm returns to skill. Moreover, we provide direct evidence that the shift in skill intensity and the rise in the skill premium triggered by increased access to credit are at least partly driven by complementarities between capital and skill.

The present work is also connected to a rich body of literature in macroeconomics and finance that studies the impact of financial frictions on the allocation of capital across producers (Bertrand, Schoar, and Thesmar 2007; Buera, Kaboski, and Shin 2011; Moll 2014; Cong et al. 2019; Catherine et al. 2017; Bai, Carvalho, and Phillips 2018). We contribute to this literature in three ways. First, we provide causal, micro-level evidence of the effect of financial constraints on the allocation of both capital and labor in the context of a middle-income country. Second, we find that financial frictions affect not only investment and total employment, but also the types of workers that a firm employs.

This paper also relates to the literature that estimates the effect of transient negative credit supply shocks on total employment (Peek and Rosengren 2000, Chodorow-Reich 2014, Green-

stone et al. 2020, Duygan-Bump, Levkov, and Montoriol-Garriga 2015, Benmelech, Bergman, and Seru 2015, Bottero, Lenzu, and Mezzanotti 2020, Huber 2018, Benmelech, Frydman, and Papanikolaou 2018). We complement this literature by shedding light on the characteristics of employees whose hiring and firing are impacted by a firm's access to credit. We also provide new evidence on the impact of access to bank credit on wages, demonstrating that gains are concentrated on skilled workers.

A small number of prior or concurrent studies within the literature on credit and employment focus on the heterogeneous effects of negative credit supply shocks on workers with different levels of educational attainment (Berton et al. 2018; Barbosa et al. 2020). We contribute to this work in three ways. First, we analyze the effect of a positive and persistent shock to bank credit in a middle-income country. Second, we shed light on the mechanism behind the link between access to credit and the skill composition of firms and provide direct evidence that our results are driven by a relative complementarity between capital and skilled labor. Finally, we show that financially constrained firms experience a larger increase in skill intensity, suggesting that access to credit meaningfully impacts the allocation of skill.

Finally, this paper is also related to previous work analyzing the 2005 Brazilian bankruptcy reform. Ponticelli and Alencar (2016) find that firms in localities with less-congested courts experienced a larger increase in credit, investment, and output following the reform. Our results are consistent with these findings and we add to this work by investigating the effect of the credit expansion triggered by the reform on the skill composition of firms and the within-firm returns to skill, and by showing that these results are at least partly driven by capital-skill complementarity.

The remainder of this paper is structured as follows. Section 1 describes the data and the institutional features of the Brazilian bankruptcy reform. Section 2 develops the conceptual framework that guides our empirical work and describes our estimation procedure. Section 3 details our empirical strategy. Section 4 reports our main results and evaluates their

robustness. Section 5 concludes.

1 Institutional Setting and Data

1.1 The 2005 Bankruptcy Reform in Brazil

Our empirical strategy uses the 2005 Brazilian bankruptcy reform as a source of exogenous variation in the availability of credit to firms. In this section, we describe the key features of the reform and discuss how these changes resulted in increased access to corporate credit. For a thorough discussion of the changes implemented by the new bankruptcy legislation, see Araujo and Funchal (2005).

The bankruptcy legislation that came into effect in Brazil in 2005 was the most consequential reform to the country's insolvency procedures since 1945 when the previous insolvency statute was enacted. The pre-2005 legislation was considered punitive to creditors and was criticized for contributing to Brazilian interest rate spreads ranking among the highest in the world.[6] The main issues with the existing legislation were: (i) the bankruptcy priority rule, which prioritized both labor claims and tax claims before of creditors, and (ii) what is generally referred to "successor liability" (Araujo, Ferreira, and Funchal 2012). Successor liability meant that tax claims, labor claims, and all other liabilities were transferred to the buyer of an asset sold in liquidation which, according to anecdotal accounts, led to a depressed market value of the pool of bankruptcy assets. These issues resulted in an estimated rate of recovery in the event of insolvency of about 0.2 percent in 2004, which is extremely low even in comparison with other Latin American countries (World Bank Doing Business database).

[6] For instance, according to Paiva Muniz and Palhares Basilio (2005), "The inefficiency of [the prior] Brazilian insolvency rules ha[d] severe negative impacts on the economy, to the extent that they adversely affect[ed] the spread in the interest rates charged by financial institutions, which are among the highest in the world."

Efforts to reform Brazilian bankruptcy laws started in 1993, with the goal of making legislation more creditor-friendly and increasing the recovery rate of creditors. The reform was seen as a crucial step toward reducing bank spreads and increasing the volume of private credit to corporations.[7] After several amendments, the reform package was approved by the House of Representatives in October 2003 and by the Senate in December 2004. The approved bill was signed into law in February 2005 and became effective 120 days later.

In this paper, we focus on two key aspects of the new legislation that introduced changes to the liquidation procedure. First, secured creditors were given priority over tax claims in the bankruptcy priority rule. Second, tax claims, labor claims, and other liabilities were no longer transferred to the buyer of an asset sold in liquidation. Figure 1 shows the expected recovery rate estimated by the World Bank from 2004 to 2013. According to these estimates, the recovery rate increased sharply from about 0.2 in 2004 to 12.1 cents on the dollar in 2007, in line with what we would expect given the nature of the changes introduced by the new legislation.

As a consequence of higher rates of recovery, we expect an increase in the availability of credit. In Panel A of Figure 2, we show that private credit expanded rapidly following the reform, from under 30 percent of GDP in 2004 to close to 63 percent in 2013. In all likelihood, this aggregate trend is partially attributable to a credit boom that was felt throughout the continent. But while Brazil was not the only Latin American country to experience a private credit expansion during the 2000s, Brazil's expansion seems to have surpassed those of other countries. We illustrate this in Panel B of Figure 2 by also showing the evolution of credit other Latin-American countries.

[7] For instance, this argument was made by the then Minister of Finance Antonio Palocci in his inauguration speech, in January 2003 (http://www1.folha.uol.com.br/folha/dinheiro/ult91u61397.shtml)

1.2 Data Sources

Our analysis makes use of data from four distinct sources. Matched employer-employee data come from the *Relação Anual de Informações* (RAIS), a mandatory survey filled out annually by all tax-registered firms in Brazil. Incomplete or late information results in severe penalties, which leads to a high degree of compliance and essentially complete coverage of all employees in the Brazilian formal sector. RAIS contains a time-invariant identifier for each worker as well as time-invariant firm identifiers. This allows us to link all workers to the firm that employs them and to follow a given worker over time. Importantly, this dataset also has information on the geographical location of the firm, which we use to link it to data on judicial outcomes described below. We observe data on average gross monthly earnings and the average number of hours worked, as well as worker characteristics such as education, occupation, race, age, and gender. We restrict our attention to full-time workers at private-sector firms and use data at the firm-level from 2000 to 2010. Additionally, we restrict attention to firms with more than one employee to avoid the inclusion of individuals registered as firms.

Credit registry data are from the *Sistema de Informações de Créditos* (SCR) of the Central Bank of Brazil and are available from 2003 onwards. This dataset contains information on the geographical location of the firm, as well as time-invariant identifiers for each loan, bank, and firm, allowing us to track any corporate loan above 5,000 BRL granted by a financial institution operating in Brazil. This information is reported by banks to the Central Bank of Brazil and is of high quality because loan amounts reported to the credit registry must match banks' quarterly accounting figures. We collapse the data to the firm-quarter-year level and restrict attention to private-sector firms.

Data on judicial outcomes come from *Justiça Aberta*, a dataset covering all Brazilian courts maintained by the National Justice Counsel. Data are collected through a mandatory survey filled out monthly by judges and administrative staff of each court. This dataset contains

information on the number of cases and judges for all Brazilian courts, which we use to construct a court-level measure of congestion equal to the number of cases divided by the number of judges. We focus on first instance civil courts as these are the courts responsible for bankruptcy cases. We use information about the municipality in which courts are located to link these data with our other datasets. We also use this geographical information to merge in other municipality characteristics in the pre-reform period. These include local GDP per capita and population, which we obtain from the Brazilian Institute of Geography and Statistics (IBGE), and the number of bank branches in a given locality, which we obtain from the ESTBAN database maintained by the Central Bank of Brazil.

Finally, firm-level data on real outcomes come from the *Pesquisa Industrial Anual da Empresa* (PIA), which is based on annual surveys filled out by firms in the manufacturing and mining sector. The surveys are mandatory for all firms with 30 or more employees or above a certain threshold of revenues (300,000 USD in 2012), and there are fines for non-compliance. The PIA dataset also includes a random sample of firms with 5 to 29 employees, referred to as "sampling stratum" (*estrato amostrado*). We restrict our analysis to the universe of larger firms, which are sampled with a probability of one, because we are unable to follow firms over time in the sampling stratum or observe information such as the municipality in which the firm is located. These data contain information on operational and non-operational costs, revenues, assets, and investments, as well as time-invariant firm identifiers.

Panel A of Table 1 provides summary statistics of firm characteristics. Employment information comes from the RAIS dataset, credit information comes from SCR, and data on output and investment is from PIA. Note that, even though it is available at a quarterly frequency, the SCR dataset has a similar number of observations as RAIS since it is only available from 2003 onward and for firms with bank loans above 5,000 BRL. The PIA dataset, in turn, has fewer observations as it only contains information on firms in manufacturing or mining sectors with at least 30 employees. Panel B of Table 1 reports descriptive statistics of geo-

graphical area characteristics in the pre-reform period, with one observation per geographical area.[8]

2 Conceptual Framework

In this section, we introduce a simple model in which firms face constraints in their ability to borrow and production functions have a nested CES form featuring capital-skill complementarity as in Krusell et al. (2000).

The goal of the model is to shed light on how we should expect the 2005 bankruptcy reform to affect the employment and earnings of high- and low-skilled workers. We start by describing the model and then discuss the effect of loosening credit constraints on firms' employment and investment decisions in the context of the model.

2.1 Model

2.1.1 Preferences and Technology

The model has two periods, $t = 0, 1$. There is a continuum of entrepreneurs indexed by their productivity Z and their initial wealth A. Productivity and initial wealth are distributed uniformly and independently across entrepreneurs.

Each entrepreneur i owns a private firm which uses K_i units of capital, S_i hours of skilled labor, and N_i hours of unskilled labor at $t = 0$ to produce Q_i units of the final good at $t = 1$ according to the following production technology

[8] To account for the fact that municipality borders have changed over time, we use as our level of aggregation minimum comparable areas (Área Mínima Comparável, or AMC), which can be consistently compared throughout our sample period. During our sample period, Brazil had 4,620 AMCs.

$$Q_i = F(Z_i, K_i, S_i, N_i) = Z_i \left(\nu N_i^{\sigma} + (1-\nu)(\tau K_i^{\rho} + (1-\tau) S_i^{\rho})^{\frac{\sigma}{\rho}} \right)^{\frac{1}{\sigma}}. \quad (1)$$

This production function is a version of the technology in Krusell et al. (2000) without capital differentiation and, as in Krusell et al. (2000), there is capital-skill complementarity as long as $\sigma > \rho$.

Firms are monopolistically competitive, and each firm faces an isoelastic demand curve with a common elasticity of demand $\varepsilon > 1$.

2.1.2 Financial Markets

The only asset in this economy is productive capital. A perfectly-competitive financial intermediary collects deposits and rents out capital to entrepreneurs. The return on deposited assets is r and the break-even condition of the intermediary implies that the rental price of capital is $r + \delta$, where δ is the rate at which capital depreciates.

The key friction is this market is limited enforcement. In period $t = 1$, an entrepreneur can steal a fraction $1 - \eta$ of rented capital K_i. As punishment, the entrepreneur would lose her wealth. The intermediary will then allow the entrepreneur to rent capital as long as the entrepreneur's incentive compatibility constraint is satisfied. This requires that

$$R_i K_i - (1+r)(K_i - A_i) \geq R_i K_i - \eta K_i,$$

where R_i denotes the gross return to capital investment of entrepreneur i. This implies that an entrepreneur faces a collateral constraint given by

$$K_i \leq \lambda(r, \eta) A_i, \quad (2)$$

where

$$\lambda(r, \eta) \equiv \frac{1+r}{1+r-\eta}, \tag{3}$$

While simple, this formulation yields a tractable model of capital market imperfections that cause initial wealth to limit investment. Moreover, by varying η (and consequently λ), we are able to outline all degrees of capital-market efficiency. This formulation of a capital rental market in which entrepreneurs face collateral constraints is similar to that of Buera et al. (2013) and Moll (2014), and captures the intuition that the amount of capital available to an entrepreneur is limited by her personal assets (Kiyotaki and Moore 1997)

2.1.3 Firm Optimization

Each entrepreneur faces the following profit maximization problem, which will determine her factor demands

$$\begin{aligned} \max_{P_i, Q_i, K_i, S_i, N_i} \; & P_i(Q_i)Q_i(Z_i, K_i, S_i, N_i) - w_s S_i - w_n N_i - (r+\delta)K_i \\ \text{s.t.} \quad & K_i \leq \lambda(r, \eta) A_i, \end{aligned}$$

The first-order conditions with respect to skilled and unskilled labor for an active entrepreneur (i.e., an entrepreneur with production Q_i greater than zero) are, respectively

$$\begin{aligned} w_s &= (1-\nu)\left(\tau K_i^{\rho} + (1-\tau)S_i^{\rho}\right)^{\frac{\sigma-\rho}{\rho}}(1-\tau)S_i^{\rho-1}\left(1-\frac{1}{\varepsilon}\right)P_i Z_i^{\sigma} Q_i^{1-\sigma} \\ w_n &= \nu N_i^{\sigma-1}\left(1-\frac{1}{\varepsilon}\right)P_i Z_i^{\sigma} Q_i^{1-\sigma} \end{aligned}$$

Dividing one expression by the other and rearranging terms, we obtain the following equation for the skill premium

$$\frac{w_s}{w_n} = \frac{(1-\nu)(1-\tau)}{\nu}\left(\frac{N_i}{S_i}\right)^{1-\sigma}\left[\tau\frac{K_i}{S_i}^{\rho} + (1-\tau)\right]^{\frac{\sigma-\rho}{\rho}}. \tag{4}$$

2.2 Estimating Production Function Parameters

The key determinants of the response of employment and earnings of high- and low-skilled workers to a loosening of credit constraints in this model are the parameters governing the elasticities of substitution between unskilled labor, capital, and skilled labor (σ and ρ), as illustrated by Equation 4. Accordingly, in order to use this framework to generate predictions about the impact of credit constraints on the skill composition and the skill premium, we use our firm-level PIA-RAIS sample to estimate these and other production function parameters.[9] Moreover, in Section 4.3, we describe how we use these structural estimates to provide evidence that our empirical results are at least partly driven by the capital-skill complementarity channel.

Our estimation procedure consists of two steps. In the first step, we estimate an approximation of the production function in Equation (1). Letting lower case variables represent logged upper case variables, a second-order approximation yields

$$q_i = \gamma_s s_i + \gamma_n n_i + \gamma_k k_i + \sum_{x\in\{s,n,k\}} \gamma_{xx} x_i^2 + \sum_{w\neq x} \sum_{x\in\{s,n,k\}} \gamma_{xw} x_i w_i + z_i, \tag{5}$$

where

[9] We are only able to estimate production function parameters for the PIA-RAIS sample as this estimation procedure requires data on the stock of capital, which is only available in the PIA sample, as well as employment data from RAIS. As discussed in Section 1.2, this sample contains information for firms in manufacturing and extractive sectors.

$$\gamma_k = (1-\nu)\tau \tag{6}$$

$$\gamma_n = \nu \tag{7}$$

$$\gamma_s = (-1+\nu)(-1+\tau) \tag{8}$$

$$\gamma_{kk} = -\frac{((-1+\nu)^2(-1+\sigma)\tau^2)}{2} + \frac{(-1+\nu)\tau(-\rho+\rho\tau-\sigma\tau)}{2} \tag{9}$$

$$\gamma_{nn} = \frac{\nu^2+\nu\sigma-\nu^2\sigma}{2} \tag{10}$$

$$\gamma_{ss} = \frac{(-1+\nu)^2(-1+1/\sigma)(-\sigma+\sigma\tau)^2}{2\sigma} - \frac{(-1+\nu)(\sigma^2+\rho\sigma\tau-2\sigma^2\tau-\rho\sigma\tau^2+\sigma^2\tau^2)}{2\sigma} \tag{11}$$

$$\gamma_{kn} = (-1+\nu)\nu(-1+\sigma)\tau \tag{12}$$

$$\gamma_{ks} = (-1+\nu)\tau(-1+\nu+\rho-\nu\sigma+\tau-\nu\tau-\rho\tau+\nu\sigma\tau) \tag{13}$$

$$\gamma_{sn} = (1-\nu)\nu(-1+\sigma)(-1+\tau)), \tag{14}$$

Our preferred method follows De Loecker and Warzynski (2012) and estimates Equation (5) separately for each 2-digit industry relying on proxy methods developed by Olley and Pakes (1996), Levinsohn and Petrin (2003), and Ackerberg et al. (2015) in order to control for unobserved productivity shocks, which are potentially correlated with input choices. More specifically, we proxy for productivity using the demand for materials and follow Ackerberg et al. (2015) in estimating all production function parameters using second-stage moments. From this step, we obtain estimates of the coefficients in Equation (5) as well as estimates of markups. We discuss the details of this production function estimation procedure in Appendix A.

In a second step, we use reduced-form estimates of the coefficients in Equation (5) to recover the structural parameters of Equation (1) using a minimum distance estimation procedure. Let $\theta = \{\nu,\ \tau,\ \sigma,\ \rho\}$ represent the vector of structural parameters and $\gamma = h(\theta)$ represent the nonlinear system of Equations (6)–(14). With an estimate $\hat{\gamma}$ of the coefficients in Equation

(5) obtained in the first step of our estimation procedure, we compute an efficient minimum distance estimator of the vector of structural parameters θ by solving

$$\min_{\theta \in \Theta} \{\hat{\gamma} - h(\theta)\}' \hat{\Xi}^{-1} \{\hat{\gamma} - h(\theta)\}, \tag{15}$$

where $\hat{\Xi}$ is the variance-covariance matrix of the reduced-form coefficients obtained in the first step of our estimation procedure. This two-step estimation procedure produces estimates of production function parameters for each 2-digit industry.

In Table 2, we report estimates of the parameters governing the elasticities of substitution between inputs (σ and ρ) and of the parameters governing income shares (ν and τ). We find that $\sigma > \rho$ for all 2-digit industries, suggesting that all industries in manufacturing and extractive sectors display some degree of capital-skill complementarity. This result is consistent with previous work that finds evidence of capital-skill complementarity for all industries in manufacturing using US data (Larrain 2015).

2.3 The Effect of Loosening Credit Constraints

In Section 1.1, we argued that the 2005 bankruptcy reform increased the recovery rate of creditors. Through the lens of our model, this can be interpreted as an increase in the recovery rate η. From Equation (3), this implies an increase in the maximum leverage rate λ, i.e., a relaxation of the credit constraint modeled in Equation (2). For that reason, it will be useful to consider the implications of an increase in λ in the context of our model.

Intuitively, a constrained entrepreneur sees a direct increase in her ability to rent capital as a result of looser credit constraints. Assuming the constraint binds for at least some firms, we should then expect an increase in capital accumulation and borrowing (given by $K - A$ in the model) following the reform.

Note that the maximum leverage rate λ has no direct effect on either skilled or unskilled labor in our model. However, labor is still impacted by the effect of looser credit constraints on capital. More specifically, an increase in capital raises the marginal productivity of labor which, all else equal, increases the demand for labor.

The model also has implications for the ratio of skilled to unskilled hours (S/N) and for the skill premium (w_s/w_n). Rearranging terms on Equation (4), we obtain

$$\frac{w_s}{w_n}\left(\frac{S}{N}\right)^{1-\sigma} = \frac{(1-\nu)(1-\tau)}{\nu}\left[\tau\frac{K^{\rho}}{S} + (1-\tau)\right]^{\frac{\sigma-\rho}{\rho}}.$$

Under capital-skill complementarity ($\sigma > \rho$), consistent with the estimates we obtain in Section 2.2, an increase in the stock of capital relative to skilled hours leads to an increase in the skill premium, an increase in the ratio of skilled to unskilled hours, or both. Intuitively, if capital is relatively more complementary to skilled labor, the marginal productivity of skilled labor rises by more than the marginal productivity of unskilled labor when capital utilization increases. This increase in relative productivity leads to an adjustment in quantities (the skill composition), in prices (the skill premium), or both.

3 Research Design

Our identification strategy uses the 2005 Brazilian bankruptcy reform as plausibly exogenous variation in the recovery rate of lenders and, consequently, in the availability of credit to firms. To identify the causal effect of increased access to credit, we exploit cross-sectional variation in the congestion of civil courts. In this section, we first discuss our empirical strategy and then describe how we measure court congestion in the data.

3.1 Empirical Strategy

We estimate the effect of increased access to credit using the 2005 Brazilian bankruptcy reform as a quasi-natural experiment and employing a difference-in-differences research design, in which we compare outcomes for firms who were more exposed to the reform (the "treatment" group) and firms that were less exposed (the "control" group), before and after the reform. Our variation in exposure to the reform arises from cross-sectional variation in the congestion of civil courts. Intuitively, creditors in localities with less congested courts should be better positioned to reap the benefits of the reform, as more efficient courts are better able to enforce the new legislation (Ponticelli and Alencar 2016). This suggests that the recovery rate of creditors in localities with less congested courts should increase by more than that of other creditors.

The framework of Section 2 implies that a relative increase in the recovery rate of creditors should lead to looser credit constraints, directly increasing the borrowing capacity of firms. This relative increase in borrowing capacity should lead to higher investment which, under the assumption of capital-skill complementarity, should lead to an increase in the relative utilization of skill, in the skill premium, or both.

The role of the control group is to provide a counterfactual of what would have happened to firms' outcomes if this legislation had not been implemented. Accordingly, the identifying assumption is that, in the absence of the 2005 bankruptcy reform, outcomes for treatment and control firms would have maintained parallel trends. Our main approach to assess the validity of this assumption is to examine outcomes for firms in the treatment and control groups in the pre-reform period. As we discuss in Section 4, our estimates show that outcomes for the two groups move in close parallel prior to the reform. We take these results as evidence that our control group establishes an accurate counterfactual for what would have happened to the treatment group in the absence of the reform.

Our baseline specification consists of a difference-in-differences specification of the form

$$g(Y_{icst}) = \beta_0 + \beta_1 Reform_t \times HighEnforcement_c + \beta_2 X_{it} + \kappa_i + \theta_{st} + \epsilon_{icst}, \qquad (16)$$

where $g(Y_{icst})$ is the growth rate in the outcome of interest for firm i in locality c in state s between the years $t-1$ and t; $Reform_t$ is a dummy that equals 0 prior to the reform and 1 after the reform, $HighEnforcement_c$ is a dummy for firm i being in a locality c with below-median court congestion; X_{it} is a set of controls; κ_i is a vector of firm fixed effects; θ_{st} is a vector of state-year fixed effects. Our coefficient of interest β_1 represents the average within-firm change in our outcome variables for firms in localities with low court congestion relative to firms in high-congestion localities, following the 2005 bankruptcy reform.

We compute growth rates using the Davis and Haltiwanger (1992) growth measure

$$g(Y_{it}) = \frac{Y_{it} - Y_{it-1}}{\frac{1}{2}\left(Y_{it} + Y_{it-1}\right)}. \qquad (17)$$

We opt for this measure of growth rates due to its useful statistical properties, such as symmetry around zero and boundedness in the range $[-2, 2]$, and to the fact that it leads to estimates that are easy to interpret and compare.[10] As a robustness check, we show estimates with dependent variables in logs in Appendix Table B4 and are reassured to find that results are qualitatively identical.

To provide evidence in favor of the parallel trends assumption discussed above, we also estimate equations of the following form

[10] For further details on the advantages of this growth measure, we refer the reader to Davis and Haltiwanger (1992).

$$g(Y_{icst}) = \alpha + \sum_{\tau \in \mathcal{T}} \beta_\tau I(\tau) \times HighEnforcement_c + \gamma X_{it} + \kappa_i + \theta_{st} + \epsilon_{icst}, \qquad (18)$$

where $I(\tau)$ is a dummy equal to one exactly τ years after (or before if τ is negative) the reform.

3.2 Measuring Court Congestion

In Section 3.1, we argue that less congested courts are better able to enforce the 2005 bankruptcy reform and, consequently, firms in localities with less congested courts are differentially exposed to the new legislation. We follow Ponticelli and Alencar (2016) and measure court congestion in a given court as the total number of pending cases divided by the number of judges working in that court. For municipalities that have a specialized bankruptcy court, we assign the congestion measure of that court to the municipality. For all other municipalities, we measure congestion as the average congestion of all first instance courts, weighted by the number of pending cases in each court. We focus on first instance courts as these are the courts responsible for bankruptcy cases in the absence of specialized courts.

To account for the fact that municipality borders can and have changed over time, we conduct our analysis at the minimum comparable area (Área Mínima Comparável, or AMC) level, an aggregation level that can be consistently compared over time.[11] We measure court congestion at the AMC level as the weighted average of congestion across municipalities in the same AMC, using the population in each municipality as weights.[12]

We define a locality as "high enforcement" ($HighEnforcement_i = 1$ in Equation 16) if its level of court congestion is below the median. As mentioned in Section 1, judicial variables

[11] In 2010, Brazil had 5,565 municipalities, which could be matched to 4,620 AMCs. Throughout the text, we use the terms AMC and locality interchangeably.

[12] Our population measure at the municipality level is constructed using data from the 2000 Population Census.

are available from 2009 onwards. Accordingly, we measure court congestion in January 2009 and use it as a time-invariant proxy for enforcement. In Table 3, we report differences in characteristics of high- and low-enforcement localities in the pre-reform period. Firms in high- and low-enforcement localities have a similar number of employees and a similar share of managers, pay a similar premium for skill, and have similar levels of investment and borrowing. High- and low-enforcement localities also have a similar level of GDP per capita, a similar share of manufacturing in local value added, and a similar number of bank branches.

The only statistically significant difference between firms high- and low-enforcement localities that we observe in Table 3 is in the share of skilled workers. Note that a level difference in the share of skilled workers is not a threat to our identification strategy as long as there are no differences in the trend of outcomes of treated and control firms.[13] However, we include the share of skilled workers prior to the reform (interacted with the $Reform_t$ dummy) as a control in our baseline specification, to alleviate potential concerns that our results are driven by a disproportionate increase in borrowing and investing by skill-intensive firms.

4 Results

4.1 Evidence of Credit Expansion

We start by providing evidence that the 2005 bankruptcy reform led to an increase in credit for firms in high-enforcement localities relative to firms in low-enforcement localities. Establishing this result is crucial to our identification strategy because we use the bankruptcy reform as a quasi-natural experiment that led to increased credit availability to firms. We do so by estimating Equation (16) with bank credit growth as the dependent variable. We

[13] We provide evidence in favor of the parallel trends assumption in Section 4.

define bank credit as the sum of all existing loans granted by any financial institution to a given firm at a point in time.

The specification in Equation (16) estimates how access to bank credit changed after the reform for firms in localities with less congested courts—and thus higher enforcement of the bankruptcy reform—relative to firms in localities with more congested courts. All specifications include firm fixed effects to account for any level differences between these groups of firms, as well as state×time fixed effects to flexibly control for any time trends common to all firms in a given state. Standard errors are clustered at the locality level throughout.

Column 1 of Table 4 shows that bank credit growth is higher for firms in high-enforcement localities relative to firms in low-enforcement localities following the reform. In column 2 of Table 4, our preferred specification, we add a series of controls to capture potential differences in economic and financial development at the locality level. These include local GDP per capita, the share of manufacturing in local value added, and the number of bank branches per 100,000 people. We measure these variables in 2004, the year before the reform, and interact them with the $Reform_t$ dummy. We also account for pre-existing differences in the skill intensity of firms by including the share of skilled workers in 2004, interacted with the $Reform_t$ dummy, as an additional control.[14] We find that the growth in bank credit is 7.4 percentage points higher for firms in high-enforcement localities relative to firms in low-enforcement localities following the reform.

Column 3 and 4 of Table 4 show results are robust to adding two-digit-industry×time fixed effects to allow for differing trends by industry. This implies that we observe a similar increase in credit availability to firms in high-enforcement localities relative to low-enforcement localities following the reform even when comparing firms producing similar products. We

[14] We measure economic development variables and skill intensity in 2004 and interact them with the $Reform_t$ dummy instead of including time-varying versions of these variables to avoid the issue of "bad controls." This issue is present in our setting because access to credit has been found to affect economic development and, as we show in the next section, skill intensity is also impacted by our credit shock.

take this as evidence that our results are not driven by differing industry-specific trends.

Moreover, the timing of this effect is entirely consistent with the reform. We provide evidence for this by estimating a version of Equation (16) by quarter-year. This specification replaces the $Reform_t$ dummy with a dummy for each quarter-year, hence separately estimating the difference in bank credit growth for firms in high- and low-enforcement localities at each time period. The omitted period is the last quarter of 2004, the quarter prior to the reform, so effects can be interpreted relative to this period. Panel A of Figure 3 plots the coefficients of this regression model, along with 95 percent confidence intervals. We estimate a sizable and significant increase in bank credit growth for firms in high-enforcement localities relative to firms in low-enforcement localities starting in 2005. Importantly, our coefficient estimates are close to zero and statistically insignificant in the period preceding the reform. This implies that our estimated treatment effect is consistent with the timing of the reform at the quarterly level and, in particular, we find no evidence of pre-existing trends.[15]

4.2 Effect on Skill Composition and on the Skill Premium

In this section, we present and discuss our key empirical findings. We show that firms in localities with less congested courts experience an increase in their skill intensity and their return to skill relative to firms in localities with more congested courts, following the reform and the subsequent increase in access to bank credit. In Table 5, we present estimates of Equation (16) for outcomes relating to the employment of skilled workers, with and without the inclusion of controls. This equation compares outcomes for firms in high-enforcement localities with those of firms in low-enforcement localities, before and after the reform. All models include firm fixed effects to account for any level differences between the two groups

[15] Recall that credit registry data are available from 2003 onward at a quarterly frequency and data on employment outcomes are available from 2000 onward at an annual frequency. This explains the difference in the number of estimates between Panel A of Figure 3 and the remaining panels.

of firms, as well as state×time fixed effects to flexibly control for any time trends common to all firms in a given state. Standard errors are clustered at the locality level.

In column 1, we document an increase in the share of employees who are skilled, with workers considered skilled if they possess at least some post-secondary education and unskilled otherwise. In column 2 of Table 5, we include as controls local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. As before, these variables are measured in 2004, the year before the reform, and interacted with the $Reform_t$ dummy.[16] We find that the growth in the share of skilled workers is 4.0 percentage points higher for firms in high-enforcement localities relative to firms in low-enforcement localities after the reform. While we document in subsequent sections that overall employment also rises as a consequence of increased borrowing capacity, this result speaks to the characteristics of the workers that a firm employs and to how these characteristics change when access to credit increases.

We also observe an increase in employment in occupations that are traditionally performed by skilled workers. Consistent with the International Standard Classification of Occupations, we classify legislators, senior officials, and managers as "managers" and assess whether the share of these workers also rises as a consequence of increased access to credit. In columns 3 and 4 of Table 5, we see that the share of managers also rises for firms in high-enforcement localities relative to firms in low-enforcement localities following the reform. According to our preferred specification, firms in high-enforcement localities experience 6.2 percentage points higher growth in the share of managers after the reform, relative to firms in low-enforcement localities. This indicates that our results are not specific to an education-based definition of skill and is further evidence that increased access to credit allows firms to hire and retain more skilled workers in our setting.

Columns 5 and 6 of Table 5 document a rise in the skill premium following the reform,

[16] See footnote 14.

with firms in high-enforcement localities experiencing 3.9 percentage point higher growth in the skill premium relative to firms in low-enforcement localities. This implies that increased access to credit affects not only the relative quantity of skilled labor but also its relative price, leading to a higher within-firm return to skill. This finding is consistent with subsequent work by Moser et al. (2020), who find that both between- and within-firm earnings inequality decline as a consequence of decreased access to credit.

Taken together, these findings suggest that access to credit allows firms to hire and retain relatively more skilled workers and that these firms do so by increasing their returns to skill. This is of particular importance given that the ability to hire and retain skilled labor has been shown to meaningfully impact firm-level productivity (Bloom et al. 2013; Bhattacharya et al. 2013). Our findings corroborate this existing body of work as we also find, as we discuss in a subsequent section, that firms in high-enforcement localities see an increase in measures of efficiency relative to firms in low-enforcement localities.

Finally, in Panel B of Figure 3, we show coefficient estimates and 95 percent confidence intervals for Equation (18), which separately estimates the differences in the growth rate of the share of skilled workers for firms in high- and low-enforcement localities at each time period, by replacing the $Reform_t$ dummy with a dummy for each year. The omitted period in this specification is 2004, the year before the reform, so effects can be interpreted relative to this period.

We find that the timing of the effect is consistent with the reform. The estimates indicate that, for firms in high-enforcement localities, the growth in the share of skilled workers is 1.0, 4.3, 4.6, and 5.0 percentage points higher one, two, three, and four years after the reform, respectively. Importantly, our estimates are close to zero and statistically insignificant prior to the reform, showing no evidence of pre-existing trends. We show analogous results with the share of managers and with skill premium as outcome variables in Panels C and D of Figure 3, respectively, and again find no evidence of pre-trends.

4.3 Analyzing the Mechanism: Capital-Skill Complementarity

To help shed light on the mechanism behind the effect of a relaxation of credit constraints on the skill composition and the skill premium, we start by investigating the response of firms' employment and investment decisions to the reform. In Table 6, we present estimates of Equation (16) for employment and investment outcomes. As before, this specification compares outcomes for firms in high-enforcement localities with those of firms in low-enforcement localities, before and after the reform. All specifications include both firm fixed effects, to account for any level differences between these groups of firms, and state×time fixed effects to control for any time trends common to all firms in a given state. Standard errors are clustered at the locality level.

Columns 1 and 2 of Table 6 show that firms in high-enforcement localities see higher overall employment growth following the reform. We find that firms in high-enforcement localities experience 1.3 percentage points higher employment growth after the reform, relative to firms in low-enforcement localities. Higher employment could be a consequence both of higher wages, which potentially make the firm more appealing to workers, or of firms' being better equipped to weather temporary shocks without laying off workers so as to economize on firing, hiring, and training costs. The latter, a phenomenon known as "labor hoarding," has been found to be negatively impacted by financial constraints (Giroud and Mueller 2017).

Next, we investigate the effect of increased access to credit on investment decisions. In column 4 of Table 6, our preferred specification, we show that investment measured as total capital expenditures scaled by lagged total assets grows by an additional 6.9 percentage points for firms in high-enforcement localities following the reform, relative to firms in low-enforcement localities. In columns 5 and 6 of Table 6, we document that firms in high-enforcement localities also experience an increase in output following the reform, relative to firms in low-enforcement localities.

Overall, these results suggest that firms increase their levels of capital and employment as a response to increased access to credit. Along with the shift in the skill composition toward better-educated workers and the increase in the skill premium, these results are consistent with a production function featuring complementarities between capital and skilled labor.

We provide direct evidence in support of the capital-skill complementarity hypothesis by showing that firms in high-enforcement regions in industries with high capital-skill complementary see a larger increase in the share of skilled workers and the skill premium following the bankruptcy reform, relative to firms in high-enforcement regions in industries with low capital-skill complementary. To do so, we use the parameter estimates obtained from the estimation procedure described in Section 2.2, which are available for all industries in manufacturing and extractive sectors, to compute the elasticity of substitution between capital and unskilled labor ($\varepsilon_{nk} = \frac{1}{1-\sigma}$) and between capital and skilled labor ($\varepsilon_{sk} = \frac{1}{1-\rho}$) for each 2-digit industry.

As we discuss in Section 2.2, we find that capital and skilled labor are relative complements in all manufacturing and extractive industries, meaning that our estimates imply that $\sigma > \rho$ (and hence $\varepsilon_{nk} > \varepsilon_{sk}$). In order to sort industries according to the degree of capital-skill complementarity, we use the ratio between the two elasticities of substitution ($\frac{\varepsilon_{nk}}{\varepsilon_{sk}}$) as a measure. Industries with high $\frac{\varepsilon_{nk}}{\varepsilon_{sk}}$ are such that the elasticity of substitution between unskilled labor and capital is much higher than the elasticity of substitution between skilled labor and capital, meaning that capital is much more complementary to skilled labor than to unskilled labor.

We sort firms into high and low complementarity according to this measure and estimate the following equation

$$
\begin{aligned}
g(Y_{icjt}) =& \beta_0 + \beta_1 Reform_t \times HighEnforcement_c \times HighCSC_j + \\
& \beta_3 Reform_t \times HighCSC_j + \\
& \beta_4 X_{it} + \kappa_i + \theta_{ct} + \epsilon_{icjt},
\end{aligned} \tag{19}
$$

where $g(Y_{icjt})$ is the growth rate in the outcome of interest for firm i in locality c in industry j between the years $t-1$ and t; $Reform_t$ is a dummy that equals 0 prior to the reform and 1 after the reform; $HighEnforcement_c$ is a dummy for firm i being in a locality c with below-median court congestion; $HighCSC_j$ is a dummy for firm i being in an industry j above the median in our measure of capital-skill complementarity; X_{it} is a set of controls; κ_i is a vector of firm fixed effects; and θ_{ct} is a vector of locality-year fixed effects.

Note that, since we have industry-level variation in our measure of capital-skill complementarity, we can include locality-year fixed effects to control for unobserved time-varying differences between localities. This exercise should thus alleviate concerns that our results are driven by regional differences, in addition to shedding light on the mechanism through which increased access to credit impacts the skill composition of a firm's workforce.

We show estimation results for Equation 19 in Table 7, with and without controls. According to our preferred specification, firms in high-complementarity industries and high-enforcement localities see 5.1 and 5.0 percentage points higher growth in the share of skilled workers and the skill premium, respectively, following the bankruptcy reform, relative to firms in low-complementarity industries and high-enforcement localities. These results suggest that firms in high-complementarity industries increase their utilization of skilled labor and their return to skill by more than firms in low-complementarity industries as a response to increased access to credit. These findings thus lend support to the theory that capital-skill complementarity is the mechanism behind the effect of a relaxation of credit constraints on the skill composition and the skill premium in our setting.[17]

[17] These findings supporting the importance of capital-skill complementarity as a mechanism are consistent

To assess the robustness of these results, we report estimates obtained using two alternative measures of capital-skill complementarity. The first is the index of Larrain (2015), constructed by estimating skilled-labor-share equations for both manufacturing and non-manufacturing industries using data from 20 mainly European countries from 1975 to 2005. We sort firms into high and low complementarity along the median according to this measure.[18] As in the current study, Larrain (2015) finds that all manufacturing sectors exhibit some degree of capital-skill complementarity. This work also finds that manufacturing industries are among the highest-complementarity sectors, as unskilled workers in manufacturing tend to perform more routine tasks. Our second alternative measure of capital skill complementarity builds on this finding and splits firms into manufacturing and non-manufacturing sectors as a measure of high and low capital-skill complementarity.

We report results of this estimation in Appendix Table B1. According to both alternative measures, we find that firms in high-complementarity industries increase their skill intensity and their skill premium by more than firms in low-complementarity industries following a relaxation of credit constraints. This is further evidence in favor of the capital-skill complementarity mechanism and should alleviate concerns that the results presented in this section are somehow driven by our production function estimation procedure.

4.4 Are Results Stronger for Financially Constrained Firms?

The model of Section 2 suggests that financially constrained firms should experience larger employment and investment effects as a consequence of the 2005 reform and the subsequent increase in access to credit. In this section, we take this prediction to the data by exploiting heterogeneity in how financially constrained firms were prior to the reform.

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with the evidence in Bau and Matray (2019), who find that capital account liberalization in India led to higher investment and higher wage bills for capital-constrained firms, relative to unconstrained firms.

[18] We use the capital-skill complementarity index reported in Table 4 column 4 of Larrain (2015).

Hadlock and Pierce (2010) assess the informativeness of several measures of financial frictions and find that size and age are the most successful predictors of financial constraints. Specifically, financially constrained firms are, on average, smaller and younger than unconstrained firms. Based on these finding, we estimate the following specification

$$\begin{aligned} g(Y_{ict}) =& \beta_0 + \beta_1 Reform_t \times HighEnforcement_c \times Constrained_i + \\ & \beta_2 Reform_t \times Constrained_i + \beta_3 X_{it} + \kappa_i + \theta_{ct} + \epsilon_{ict}, \end{aligned} \tag{20}$$

where $g(Y_{ict})$ is the growth rate in the outcome of interest for firm i in locality c between the years $t-1$ and t; $Reform_t$ is a dummy that equals 0 before the reform and 1 after the reform, $HighEnforcement_c$ is a dummy for firm i being in a locality c with below-median court congestion; $Constrained_i$ is either a dummy for a firm being below the median in firm size (measured by the number of employees) in the years preceding the reform or a dummy for a firm being below the median in firm age in the years preceding the reform; X_{it} is a set of controls; κ_i is a vector of firm fixed effects; θ_{ct} is a vector of locality-year fixed effects.

As in the previous section, since we have firm-level variation in the degree of financial constraints prior to the reform, we can include locality-time fixed effects in this specification and control for unobserved time-varying differences between localities. Thus, in addition to testing the hypothesis that financially constrained firms were disproportionately affected by the reform, this exercise serves to alleviate concerns that our results are driven by unobserved time-varying regional differences.

We report results of this exercise in Table 8. In both sets of results, we find that the share of skilled workers (measured by educational attainment in columns 1 and 2 and by occupation in columns 3 and 4) increases for financially constrained firms in high-enforcement localities, relative to unconstrained firms in high-enforcement localities. We also find that the skill premium rises for financially constrained firms in high-enforcement localities, relative to unconstrained firms in high-enforcement localities.

Taken together these results suggest that increased access to bank credit following the reform impacted not only the overall level of skill utilization but also the allocation of skill, with financially constrained increasing their employment of skilled workers relative to unconstrained firms.

4.5 Controlling for Industry-Specific Trends

One potential challenge to our identification strategy is that industry shares in high- and low-enforcement localities might systematically differ, and that sectors based in high-enforcement localities might experience differential growth from 2005 onward. This would be problematic as it would be consistent with the lack of pre-existing trends documented in Section 4, but would imply that something other than access to credit is the driving force behind our results.

To alleviate these concerns, we assess the robustness of our results to flexibly controlling for industry–specific trends through the inclusion of fixed effects. In Appendix Table B2, we show that our results are robust to including 2-digit-industry×time fixed effects to the specification in Equation (16), with or without the inclusion of controls. This specification compares outcomes for firms in high- and low-enforcement localities that are in the same 2-digit industry, before and after the reform. Estimates from this specification are qualitatively identical to our baseline results, thus providing strong evidence against the possibility that our results are driven by industry-specific trends.

4.6 Controlling for Funding Needs

In Section 4.4, we show that financially constrained firms increase their skill intensity and their returns to skill relative to unconstrained firms. This raises the potential concern that our results are driven by differences in funding needs across treatment and control groups.

We address this concern by adding firm size (measured by average log total employment in

2004, the year before the reform, interacted with the $Reform_t$ dummy) and firm age, which are good proxies for financial constraints (Hadlock and Pierce 2010), as controls in Equation (16).[19] We report estimates from this specification in Appendix Table B3, and find that our results are robust to controlling for firm-level proxies of funding needs. The fact that our results are robust to controlling for firm age is also reassuring in light of evidence that the pay structure at young and old firms is systematically impacted by worker selection (Babina et al. 2019).

5 Conclusion

In this paper, we investigate the effect of increased access to bank credit on the employment and earnings of high- and low-skilled workers. Our comprehensive dataset provides information not only on bank lending, output, investment, employment, and wages but also on characteristics of workers—such as education and occupation. Our identification strategy exploits a considerable reform to bankruptcy legislation undertaken by Brazil in 2005 that strengthened creditor rights. This reform led to an increase in the borrowing capacity of firms in regions with less congested civil courts, which were better positioned to enforce the new legislation. We show that the credit expansion resulting from the reform led firms in high-enforcement regions to increase their skill intensity and their return to skill. We also find that the effect of credit on skill utilization is stronger in industries with a high degree of capital-skill complementarity.

Taken together, our results suggest that increased access to bank credit impacts not only investment and total employment but also the type of worker a firm employs, in terms of both educational attainment and occupation. We establish a credible causal link between access to

[19] We include log employment in 2004 interacted with the $Reform_t$ dummy as a control instead of log employment because employment itself is affected by our credit shock, and is thus a "bad control."

credit and a firm's utilization of skilled labor, providing new evidence on the specific channels through which financial development can improve the allocation of production factors. In addition, we show that financial development, in the form of increased access to bank credit, impacts within-firm earnings inequality through its effect on the return to skill. Finally, we provide direct evidence that a relative complementarity between capital and skilled labor is a key mechanism through which access to credit impacts both the relative utilization of skill and the returns to skill.

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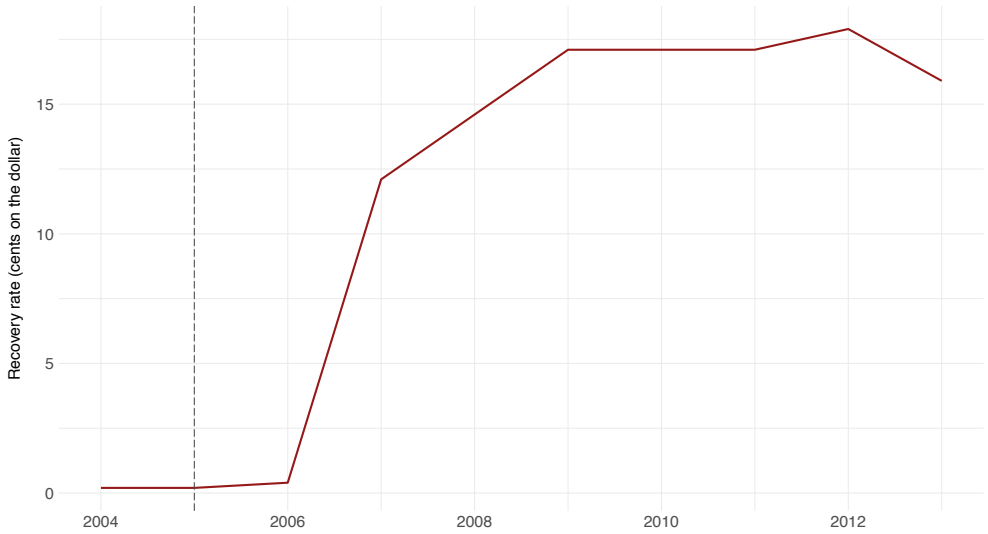
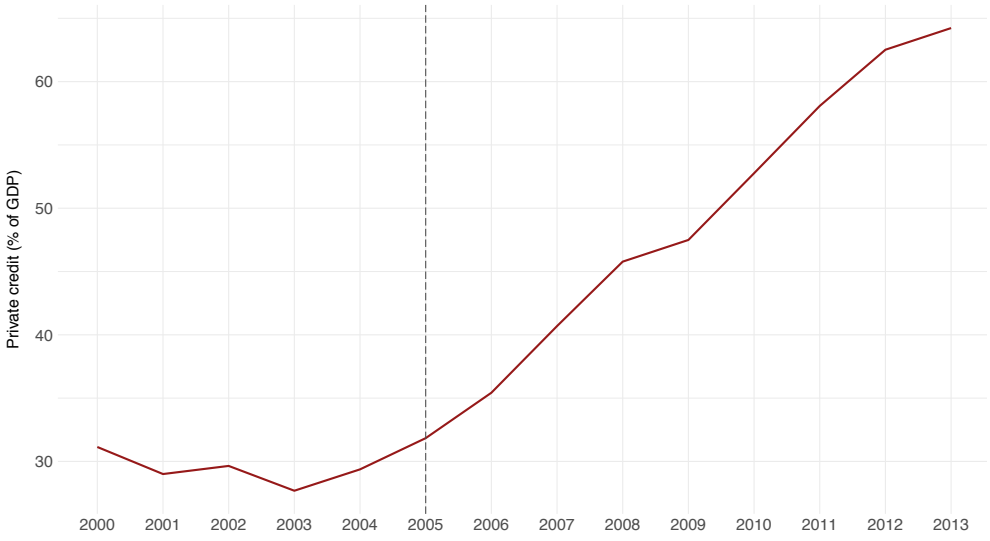
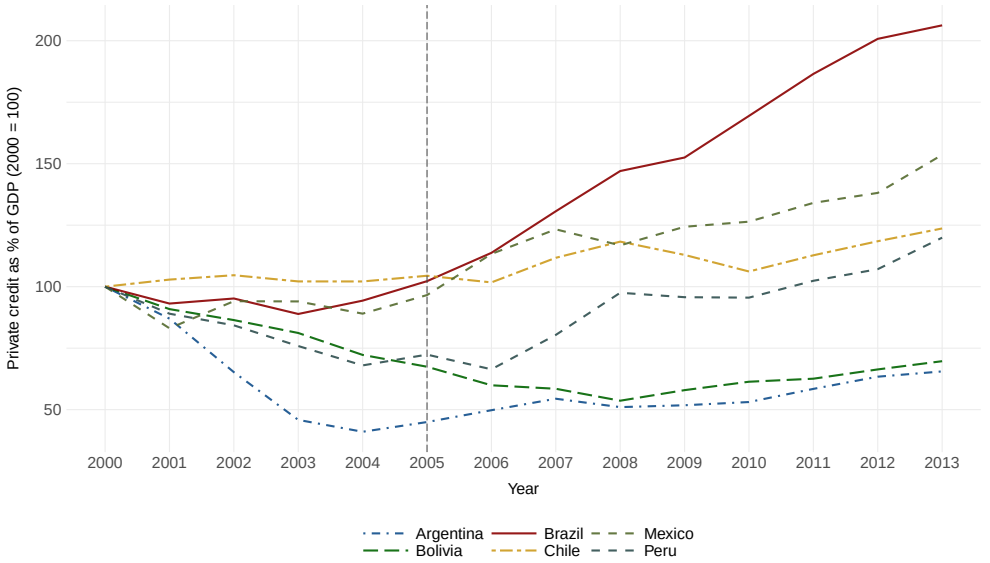


Figure 1: Expected recovery rate of secured creditors (cents on the dollar)

This Figure shows the expected recovery rate for secured creditors in Brazil. Data comes from World Bank's Doing Business database.



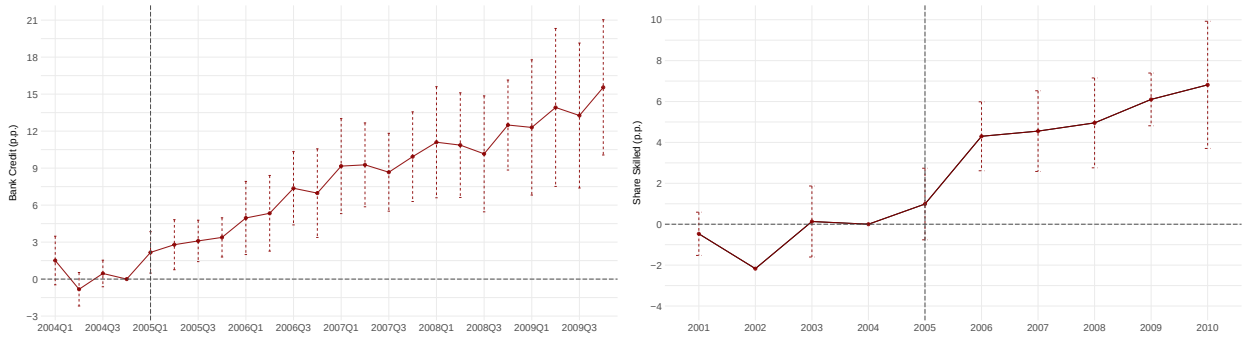
(a) Brazil



(b) Comparison with Latin America

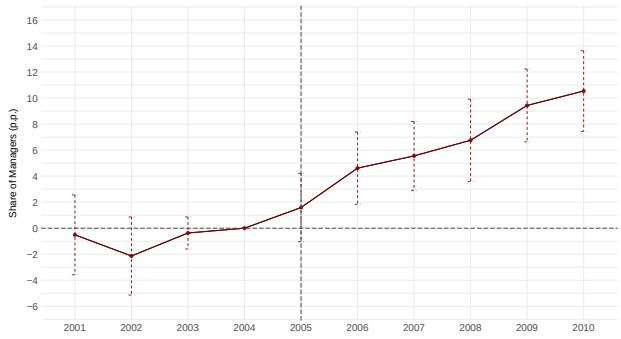
Figure 2: Private Credit as Percentage of GDP (%)

This Figure shows private credit as percentage of GDP. In panel A, we plot private credit as percentage of GDP in Brazil. In panel B, we superimpose the evolution of private credit for a subsample of other Latin-American countries. Data on private credit comes from the IMF.

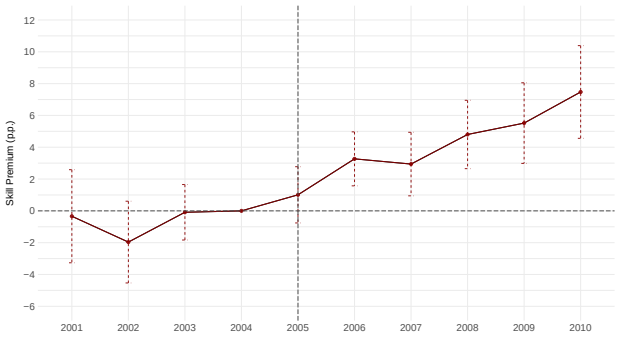


(a) Bank Credit

(b) Share Skilled



(c) Share Managers



(d) Skill Premium

Figure 3: Timing of Effect on Bank Credit, on Skill Intensity and on the Skill Premium

This Figure shows the timing of the effect of the 2005 bankruptcy reform on bank credit (panel A), on the share of skilled workers (panel B), on the share of managers (panel C), and on the skill premium (panel D). We plot coefficient estimates from Equation 18 along with 95 percent confidence intervals, with dependent variables in growth rates. Bank Credit is the sum of all outstanding bank loans for a given firm in a given quarter-year. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Observation is at the firm-quarter-year level in Panel A and at the firm-year level in the remaining panels. Standard errors are clustered at the AMC level. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Credit registry data is available from 2003 onward at a quarterly frequency and employment outcomes are available from 2000 onward at an annual frequency.

Table 1: Summary Statistics

Panel A: Firm characteristics

	Mean	Med.	St. Dev.	N
Total bank debt	216.74	40.84	4,410.01	2,907,501
Number of loans	9.82	6.00	10.29	2,907,501
Interest rate	25.94	20.07	20.33	2,147,499
Firm age	14.00	12.08	8.05	2,373,611
Number of workers	39.49	11.00	97.70	2,373,611
Share skilled	0.21	0.14	0.21	2,373,611
Share managers	0.05	0.00	0.10	2,373,611
Average monthly wages	0.87	0.70	0.73	2,373,611
Average skill premium	1.55	1.21	1.79	2,373,611
Investment/assets	0.05	0.02	0.09	227,920
Assets	12,009.94	2,169.54	22,054.36	227,920
Output	14,351.56	3,709.67	23,697.11	227,920
Capital/output	0.64	0.55	0.57	227,920
Value added per worker	71.12	37.88	209.18	227,920

Panel B: Locality characteristics

	Mean	Med.	St. Dev.	N
Local GDP per capita	8.61	6.83	9.00	2,876
Bank branches per 100,000 people	14.09	11.71	9.60	2,876
Manufacturing share in local value added	21.05	14.80	16.24	2,876

Notes: This Table shows descriptive statistics for firms in our sample, with credit registry data at the firm-quarter-year level, and data on employment outcomes and real outcomes at the firm-year level. We restrict our attention to private firms present in our sample prior to the 2005 bankruptcy reform. We obtain employment outcomes from the RAIS dataset from 2000 onward at an annual frequency. Real outcomes come from the PIA dataset and are available from 2000 onward at an annual frequency. The PIA dataset has information on firms in manufacturing and extractive sectors with at least 30 employees. We obtain credit outcomes from the SCR dataset, available from 2003 onward at a quarterly frequency. This dataset has information on firms with loans totaling at least 5,000 BRL. We obtain locality characteristics in 2004 from the Brazilian Institute of Geography and Statistics (IBGE). Monetary values are in thousands of 2003 BRL.

Table 2: Parameters

Parameter estimates

	Mean	Median	Min	Max
ν	0.14	0.10	0.05	0.41
τ	0.78	0.81	0.52	0.96
σ	0.68	0.56	-0.10	0.98
ρ	-0.23	-0.31	-0.43	0.04

Notes: This table summarizes results from the two-step estimation of production function parameters for each 2-digit industry described in Section 2.2.

Table 3: Comparing Treatment and Control

Panel A: Comparing firms in treated and control localities

	High - Low enforcement	P-value
Log number of workers	-0.024	0.16
Firm age	-0.000	0.67
Share skilled	0.008	0.00***
Share managers	0.001	0.18
Skill premium	-0.017	0.41
Investment/assets	-0.001	0.78
Log bank credit	0.009	0.52

Panel B: Comparing treated and control localities

	High - Low enforcement	P-value
Local GDP per capita	0.042	0.90
Bank branches per 100,000 people	-0.631	0.18
Manufacturing share in local value added	-0.257	0.97

Notes: This Table compares characteristics of the treatment and control groups in the pre-reform period. In Panel A, we report differences in firm characteristics between high-enforcement (treated) and low-enforcement (control) localities, along with p values. The differences reported in Panel A control for firm and state-year fixed effects, and standard errors are clustered at the locality level. In Panel B, we report differences between high-enforcement (treated) and low-enforcement (control) localities in characteristics at the locality level in 2004, along with p values. The differences reported in Panel B control for state fixed effects and standard errors are clustered at the AMC level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 4: Effect of Bankruptcy Reform on Bank Debt

Dependent Variable:	Bank Credit			
	(1)	(2)	(3)	(4)
Reform×HighEnforcement	**0.078*****	**0.074*****	**0.054*****	**0.051*****
	(0.011)	(0.010)	(0.010)	(0.010)
Firm FE	Yes	Yes	Yes	Yes
State-Quarter-Year FE	Yes	Yes	Yes	Yes
Industry-Year FE	No	No	Yes	Yes
Controls	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16), with the dependent variables in growth rates. Bank Credit is the sum of all outstanding bank loans for a given firm, in a given year. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Industry refers to 2-digit industry fixed effects. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 2,907,501 firm-quarter-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 5: Effect of Bankruptcy Reform on Skill Composition and Skill Premium

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement	**0.044*****	**0.040*****	**0.056*****	**0.062*****	**0.045*****	**0.039*****
	(0.008)	(0.008)	(0.011)	(0.010)	(0.008)	(0.007)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16), with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 2,373,611 firm-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 6: Effect of Bankruptcy Reform on Employment And Investment

Dependent Variable:	Employment		Investment/Assets		Output	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement	**0.009*****	**0.013*****	**0.072*****	**0.069*****	**0.016*****	**0.014****
	(0.003)	(0.002)	(0.012)	(0.011)	(0.006)	(0.007)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16), with all dependent variables in growth rates. Employment is the total number of employees of a given firm at a given year. Investment/Assets is total capital expenditures divided by lagged assets. Output is defined as net revenues. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. The regression in column 1 includes 2,373,611 firm-year observations and the regressions in columns 2 and 3 include 227,920 firm-year observations. The number of observations differs across regressions because real outcomes such as investment and output are only available for firms in extractive and manufacturing sectors with at least 30 employees. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 7: Results by Degree of Capital-Skill Complementarity

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement×HighCSC	**0.039****	**0.051*****	**0.030****	**0.027****	**0.045****	**0.050*****
	(0.017)	(0.017)	(0.014)	(0.013)	(0.017)	(0.017)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
AMC-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (19), with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. High CSC is a dummy for a firm being in an industry that is above the median in our measure of capital-skill complementarity. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 519,554 firm-year observations. The number of observations differs from previous regressions of employment outcomes because our baseline measure of capital-skill complementarity is only available for industries in manufacturing and extractive sectors * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table 8: Results by Degree of Financial Constraints

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement×Small	**0.031*****		**0.065*****		**0.022****	
	(0.009)		(0.020)		(0.009)	
Reform×HighEnforcement×Young		**0.021****		**0.054****		**0.018****
		(0.010)		(0.025)		(0.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
AMC-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (20), with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Small is a dummy for a firm being smaller than the median firm, with size measured as number of employees. Young is a dummy for a firm being younger than the median firm. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 2,373,611 firm-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

A Production Function Estimation

Our production function estimation procedure closely follows De Loecker and Warzynski (2012). Consider the following production function

$$q_{it} = f(s_{it}, n_{it}, k_{it}; \gamma) + \omega_{it} + \varepsilon_{it} \tag{21}$$

where q_{it} is logged value added, s_{it} is logged skilled labor, n_{it} is logged unskilled labor, k_{it} is logged capital, γ collects all coefficients, and ω_{it} is logged physical productivity (TFPQ). Our baseline specification relies on a translog functional form for $f()$, which is equivalent to approximating $f()$ by a second-order polynomial in which all inputs, inputs squared, and interaction terms between all inputs are included (in log form). We consider a translog production function of the form

$$q_{it} = \gamma_s s_{it} + \gamma_n n_{it} + \gamma_k k_{it} + \sum_{x \in \{s,n,k\}} \gamma_{xx} x_i^2 + \sum_{w \neq x} \sum_{x \in \{s,n,k\}} \gamma_{xw} x_{it} w_{it} + \omega_{it} + \varepsilon_{it} \tag{22}$$

In order to consistently estimate production function coefficients, we need to control for unobserved productivity shocks, since those are potentially correlated with input choices. We deal with this issue by relying on proxy methods developed by Olley and Pakes (1996) and Levinsohn and Petrin (2003), use material demand

$$m_{it} = m_t(k_{it}, \omega_{it}, s_{it}, n_{it}) \tag{23}$$

to proxy for productivity by inverting $m_t()$. We hence assume that the demand for materials is strictly monotone in ω_{it}.

We follow Ackerberg et al. (2015) and estimate all relevant coefficients using second-stage

moments, instead of attempting to identify labor coefficients in the first stage as in Levinsohn and Petrin (2003).[20] In the first stage, we estimate

$$q_{it} = \phi(s_{it}, n_{it}, k_{it}, m_{it}) + \varepsilon_{it} \tag{24}$$

and obtain an estimate of expected output ($\hat{\phi}$) and an estimate of ε_{it}. In the second stage, we rely on the assumed law of motion for productivity

$$\omega_{it} = g_t(\omega_{it}) + \xi_{it} \tag{25}$$

For a given set of parameters γ, we can compute $\omega_{it}(\gamma) = \hat{\phi} - \gamma_s s_{it} - \gamma_n n_{it} - \gamma_k k_{it} - \sum_{x\in\{s,n,k\}} \gamma_{xx} x_{it} - \sum_{z\neq x} \sum_{x\in\{s,n,k\}} x_{it} w_{it}$. We can then regress $\omega_{it}(\gamma)$ on its lag and recover the innovation to productivity (conditional on the set of parameters γ) $\xi_{it}(\gamma)$. We then estimate the production function parameters using GMM and moment conditions of the form

$$\mathbb{E}[\xi_{it}(\gamma) z^j] = 0 \; j \in \{s, n, k\}$$
$$\mathbb{E}[\xi_{it}(\gamma) z^j z^h] = 0 \; j, h \in \{s, n, k\}$$

where z^j, $j \in \{s, n, k\}$, is an instrument for skilled labor, unskilled labor, capital, or materials. We assume capital is decided one period ahead and is thus not correlated with the innovation in productivity. Under that assumption, we can use capital as its own instrument. We use lagged skilled and unskilled labor as instruments for skilled and unskilled labor, respectively. In order for these instruments to be valid, we require that skilled and unskilled

[20] See Ackerberg et al. (2015) and Wooldridge (2009) for a discussion of the issues with this approach.

wages be correlated over time, an assumption that is supported by our data.

We measure value added as the difference between deflated net revenue and deflated intermediate inputs, and measure materials as the deflated value of intermediate inputs. We measure skilled labor as the number of workers with at least some college education and unskilled labor as the number of workers with no college education. Finally, we measure capital as the deflated book value of fixed assets.

B Additional Results

Appendix Table B1: Robustness to Different Measures of Capital-Skill Complementarity

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement×HighCSC$_1$	**0.055*****		**0.051*****		**0.059*****	
	(0.011)		(0.017)		(0.010)	
Reform×HighEnforcement×HighCSC$_2$		**0.041****		**0.020**		**0.035****
		(0.015)		(0.027)		(0.014)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
AMC-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (19), with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. High CSC$_1$ is a dummy for a firm being in an industry that is above the median according to the capital-skill complementarity measure in Larrain (2015). High CSC$_2$ is a dummy for a firm being in an industry in the manufacturing sector. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Regressions in odd-numbered columns include 1,670,813 firm-year observations and regressions in even-numbered columns include 2,373,611 firm-year observations. The difference in the number of observations is due to the fact that the Larrain (2015) measure of capital-skill complementarity is not available for all sectors. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Table B2: Robustness to Controlling for Industry-Specific Trends

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement	**0.030*****	**0.028*****	**0.057*****	**0.054*****	**0.031*****	**0.027*****
	(0.007)	(0.007)	(0.009)	(0.009)	(0.006)	(0.006)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16) including two-digit-industry×time fixed effects, with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Industry refers to 2-digit industry fixed effects. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 2,373,611 firm-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Table B3: Robustness to Controlling for Funding Needs

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement	**0.040*****	**0.025*****	**0.062*****	**0.031*****	**0.039*****	**0.022*****
	(0.008)	(0.008)	(0.010)	(0.009)	(0.007)	(0.008)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Baseline Controls	Yes	Yes	Yes	Yes	Yes	Yes
Funding Need Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16), with all dependent variables in growth rates. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Baseline controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Baseline control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Funding need controls include log employment (measured in 2004 and interacted with the $Reform_t$ dummy) and firm age. Each regression includes 2,373,611 firm-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Appendix Table B4: Robustness to Using Logs instead of Growth Rates

Dependent Variable:	Share Skilled		Share Managers		Skill Premium	
	(1)	(2)	(3)	(4)	(5)	(6)
Reform×HighEnforcement	**0.021*****	**0.020*****	**0.029*****	**0.027*****	**0.010*****	**0.011*****
	(0.006)	(0.005)	(0.007)	(0.006)	(0.004)	(0.004)
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
State-Year FE	Yes	Yes	Yes	Yes	Yes	Yes
Controls	No	Yes	No	Yes	No	Yes

Notes: All columns report estimates of the linear regression model specified in Equation (16), with all dependent variables in logs. Share Skilled is the ratio of skilled workers to total employment, with a worker being categorized as skilled if possessing at least some post-secondary education. Share Managers is the ratio of managers to total employment. Skill Premium is the ratio of average hourly wages of skilled and unskilled workers. Standard errors, clustered at the AMC level, are reported in parentheses. The bottom rows specify the fixed effects and controls included in each column. Controls include local GDP per capita, the share of manufacturing in local value added, the number of bank branches per 100,000 people, and the firm-level share of skilled workers. Control variables are measured in 2004, the year prior to the reform, and interacted with the $Reform_t$ dummy. Each regression includes 2,044,035 firm-year observations. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.