Unleashing Mass Entrepreneurship: Firm-Level Evidence on the Impact of China's Registered Capital Reform

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Abstract

We study a major reform of business entry regulations in China and its impact on business creation. To stimulate entrepreneurship, an amendment of China's Company Law in 2013 eliminated minimum "registered capital" requirements, allowing firms to form without significant equity investment. Using a confidential taxpayer dataset of all firms in a large province and a regression discontinuity design, we investigate the legislation's causal impact on firm formation, financing choices made by newly registered firms, and their overall performance. We find that the reform enabled firms to start with 40%lower assets and 90% lower equity capital, but generate similar levels of revenues as firms registered before the reform, indicating an improvement in investment efficiency. On average the newly registered firms are just as profitable as prior firms, but profitability in the smallest firms (by revenue) is higher, suggesting the entrance of productive but wealth-constrained firms. The reform also allowed firms to optimize their financing structure by borrowing more and smoothing equity contributions over time. Firm registration substantially increased, especially among firms owned by single individual entrepreneurs.

Keywords: Capital structure; Entrepreneurship, Entry regulation, Informality, Registered capital

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1 Introduction

The regulation of business entry is among the world's most widely debated policy topics. Early cross-country studies (Djankov et al., 2002; Klapper et al., 2006) argue that regulations hamper business creation and are detrimental to economic growth. The influence of this view, magnified by the World Bank's Doing Business Rankings, led to reforms in over a hundred countries since the early 2000s to lower barriers to business entry (Djankov, 2009). Yet more recent studies based on quasiexperimental design challenge this orthodox view and suggest that reducing costs of entry may have limited or no effect on firms' decisions to formalize (Bruhn and McKenzie, 2014), while formalization itself may not give rise to better firm performance (Benhassine et al., 2018; Ulyssea, 2020). Still, some theories predict—with some empirical support—that reducing business entry costs may have positive effects at the aggregate level, especially when binding financial constraints can be relaxed in addition to entry cost reduction (Lopez-Martin, 2019; Ulyssea, 2018).

In this paper, we study China's amendment of the Company Law (CL) in 2013, which removed mandatory minimum capital contribution requirements in favor of a regime where shareholders merely declare intentions to contribute capital in the future. The Chinese government undertook this reform of registered capital (RC) regulation as a part of its effort to stimulate entrepreneurship.¹ The reform significantly reduced the initial costs of forming limited liability companies, the primary corporate form in China. It also provided companies with greater flexibility in their financing choices. In contrast to entry regulation reforms examined in previous studies (Branstetter et al., 2014; Bruhn and McKenzie, 2014; Kaplan et al., 2011), China's RC reform offers a unique opportunity to study entry regulation's impact on corporate finance in small private firms.

We start by outlining a simple model for understanding how a minimum equity requirement affects business formation and new firms' financing choices. Following Evans and Jovanovic (1989), our model features heterogeneity in productivity and wealth among entrepreneurs and predicts that the RC reform may affect new firms on both extensive and intensive margins. On the one hand, lowering entry barriers may induce both entrepreneurs with low productivity—those that would not have found the fixed cost of a new company worthwhile—and produc-

¹China specifically aimed to improve China's place in the Doing Business Rankings. The 2013 CL amendment stood at the beginning of a series of policy measures that China enacted in the ensuing years to improve the business environment. The World Bank suspended its Doing Business Rankings in 2021 after allegations that Bank executives may have yielded to pressures from several governments, including China, to change ranking methodologies. By 2020, before the Ranking was suspended, China had risen to the 31st place.

tive entrepreneurs—who would have been prevented from forming a business because of limited wealth—to launch new firms. On the other hand, eliminating the RC requirements allows newly registered firms to optimize the level of initial investments and the debt/equity mix.

Using a confidential administrative dataset from a large Chinese province and a regression discontinuity design (RDD), we causally identify the new RC regime's impact on the financial decisions, performance, and composition of newly formed companies. We first investigate certain changes predicted for both marginal entrants and infra-marginal firms. Theory indicates that the reform should lead to reduced firm asset size. The RDD results confirm this prediction: firms registered after the reform are on average 40% smaller than firms registered just before the reform and such gap is persistent for at least three years. Moreover, after the reform, shareholders in a large proportion of firms elected to contribute (almost) zero equity, and on average paid-in capital declined by over 90%. At the same time, firm liabilities increased by 11 percentage point (p.p), suggesting that post-reform firms benefited from new financing flexibility and preferred debt financing.

A second, striking, set of findings show that firms formed after the reform generated comparable levels of revenue, and displayed similar profitability and lossmaking probability, as firms formed before the reform. Given that post-reform firms had significantly lower assets, this indicates a dramatic improvement in investment efficiency. It also implies that the entry of unproductive firms induced by lower regulatory barriers was not a dominant effect of the reform. We further confirm these conclusions through evidence that post-reform firms displayed similar revenue growth as pre-reform firms, along with faster asset and paid-in capital growth and slower liability growth.

Thirdly, we explore the reform's heterogeneous effects depending on firm size (defined in terms of revenue, rather than asset). We find that among the smallest firms, average profitability was higher in the post-reform group, suggesting that the reform indeed encouraged business formation by wealth-constrained productive entrepreneurs. At the same time, among the largest firms, the increase in firm liability significantly exceeded the decrease in paid-in capital (in contrast to smaller firms). We interpret this as evidence for increased borrowing among firms that have access to external financing, as the increase in liability is unlikely to be explained just by firms substituting debt financing from owners for equity.

Finally, we examine two sets of extensive margin outcomes: the number of firms entering, and changes in shareholder structure. Using two different research designs difference-in-differences (DiD) and difference-in-discontinuities (DiRD)—we show that company formation significantly increased after the reform. While we cannot rule out the possibility that many new entrants would have operated as unincorporated sole proprietors in the absence of the reform, new entries cannot be explained by substitution away from unincorporated entity forms (e.g. partnerships). We also find a significant increase in the number of companies owned by a single individual.

Our study contributes to several existing literatures in developmental economics, law and finance, and entrepreneurship and business dynamism in China. The first literature our work relates to is studies of the impact of entry deregulation on entrepreneurial activities (Djankov, 2009; Djankov et al., 2002; Klapper et al., 2006). Utilizing the rich dataset on firm characteristics, we provide a comprehensive evaluation of firm investment, performance, and financing choices to answer the question: how did entry regulations distort market entry decisions and choices made by newly formed businesses?

Our study is closely related to the contemporaneous work of Barwick et al. (2022), which analyzes business entry liberalization in China's Guangdong province between December 2012 and March 2014. The Guangdong reform both relaxed RC requirements and consolidated business registration procedures: in effect, they implemented, on an experimental basis, both the changes to the CL adopted nationwide in 2014 and a set of business registration simplification measures rolled out nationwide in 2015-2016. Barwick et al. (2022) use the reform's staggered introduction in Guangdong to identify its causal effect on business dynamism and productivity. Our study is distinct from theirs in three respects. First, the nature of Guangdong's reform was such that one cannot separate the effects of RC rule changes and those of cutting registration red tape. In contrast, we sharply identify the effect of eliminating the RC requirement alone. We thereby reveal a mechanism of productivity enhancement-improvements in investment efficiency-that they do not consider. We also emphasize the impact of the reform even on infra-marginal firms, which we believe to be an important perspective in evaluating the 2013 CL amendment. Second, while Barwick et al. (2022) focus on increased market turnover, we give greater attention to firms' financing decisions and firm-level dynamics. Third, our RD design complements their DiD design by identifying the immediate impact of the reform, which is helpful given the multiplicity of Chinese government policies showered upon small businesses (e.g. tax cuts) that may confound the reform's observed effect over longer periods of time.

A second literature to which we contribute is the study of the financing behavior of privately-held firms. Brav (2009) documents extensive differences in capital structure among UK private and public firms consistent with more costly equity financing for private firms. While a number of studies have emerged to analyze private firm capital structure in developed countries Bigelli and Sánchez-Vidal (2012); Cole (2013); Gao et al. (2013), Colla et al. (2020) highlights the dearth of studies of private firm capital structure in developing countries. Our study not only helps to fill this gap but also uses a quasi-natural experiment to provide support for the pecking order of financing options postulated in the prior literature.

A third literature germane to our paper examines entrepreneurship and business dynamism in China. Brandt et al. (2012) finds that net business entry accounted for two thirds of China's total factor productivity growth during 1998-2007, and suggests that government policies liberalizing business entry played an important role. Jiang et al. (2022) similarly shows that reform-induced business entry accounted for a substantial portion of productivity growth in China's manufacturing sector during 2004-7, and identifies multiple channels through which reducing entry barriers improves productivity growth. Brandt et al. (2020) further focuses on entry barriers and shows that a measure of such barrier—calibrated by data from the World Bank's Doing Business Index for Chinese cities in 2008—predicts interprovincial variations in labor productivity. Cerdeiro and Ruane (2022) argues that declining business dynamism may explain China's slower productivity growth in the 2010s compared to the 2000s. The 2013 CL amendment we study can be seen as a part of the Chinese government's new response to this threat of declining business dynamism, a response that may turn out to be as important as regulatory reforms adopted in the late 1990s. Our study is not only among the first to examine the impact of this new policy, but also offers a unique perspective by identifying the granular causal impact of a policy sharply defined by legislation on the choices of new market entrants.

In the following, Section 2 summarizes the background of the 2013 CL amendment. Section 3 presents a simple model that delivers our main predictions. Section 4 describes our data and preliminary graphic evidence of the impact of the RC reform. Section 5 discusses our empirical strategy and how two challenges to identification, in particular, are resolved. Section 6 provides results regarding the RC reform's impact on firm financial decisions, operations, and growth. Section 7 reviews evidence regarding firm entry and changes in ownership composition. Section 8 contains two sets of robustness checks, one using different bandwidths for the benchmark RD analyses and the other applying placebo tests to validate the RD design. The Conclusion discusses the implications of our findings.

2 Policy Background

Registered capital (RC) rules—also known as "legal capital" requirements—were a common feature of company law regimes around the world and generally comprised two components (Armour, 2006): a requirement of minimal capital contributions by shareholders upon company formation, and a requirement to maintain any declared amount of equity capital (above the minimum) in the company by limiting distributions to shareholders. Legal capital requirements were generally abolished under state law in the U.S. by the 1970s, have been eroded in Europe due to regulatory competition, and are currently required under EU law only for public companies. Critics of the legal capital requirement argue that the requirement does little to protect creditors (or do so in an extremely crude way) while hindering entrepreneurship, and that contract and insolvency laws render the requirement redundant (Armour, 2006; Schön, 2004).

We refer to China's Company Law prior to its 2013 amendment as the "2005 CL" (the statute had its previous amendment in 2005) while the statute after its 2013 amendment as the "2013 CL." Under both the 2005 CL and the 2013 CL, in principle, a shareholder is liable to the company to the extent of their subscribed capital contributions. Under the 2005 CL, this principle was implemented in part through the RC rules. A company's RC is the total amount of shareholder-subscribed capital that is reported to the business registration authority and stated in the company's business license. The 2005 CL provided that for a company to be properly established, shareholders must contribute a minimum amount of equity capital, and such contributions must be verified by qualified third parties. For most limited liability companies (youxian zeren gongsi or LLCs),² the minimum capital required to be contributed upon company formation was the greater of (i) CNY100,000 for an LLC owned by a single individual, or CNY 30,000 otherwise, and (ii) 20% of the RC that shareholders intend to be declared on the company's business license. Any portion of a company's RC not contributed upon company formation must be contributed within two years. The company's business license must offer information about the cumulative aggregate contributions made towards the company's RC. Each company must also maintain a record of shareholders with the registration authority, listing each shareholder's actual capital contribution.

China's National People's Congress (NPC) amended the CL on December 28, 2013, with the sole aim of changing the RC system. The amended CL took effect on March 1, 2014, and entirely removed the mandatory minimal RC requirement: a company can be formed even with just CNY 1 of RC. Moreover, restrictions on the timing by which subscribed capital must be actually contributed were removed, leaving such timing to shareholder agreements and company charters. In short, the

²The LLC form is restricted to no more than 50 shareholders. We ignore CL provisions regarding companies limited by shares (*gufen youxian gongsi*), which permit more shareholders but are relevant mainly when companies aim for stock market listing and therefore are rare in our sample.

2013 CL no longer imposes any requirement on actual capital contributions to back up shareholder subscriptions to RC. Correspondingly, although an RC amount still needs to appear on the company's business license, no capital contribution or capital verification is required for company formation; the business license no longer states the actual amount of capital contributed (and is no longer updated in this respect), and the shareholder registry filed with the registration authority no longer needs to offer information about actual contributions. Further, a previous requirement that at least 30% of the company's RC must be contributed in cash is removed. Table table 1 summarizes these changes introduced by the 2013 CL.

	2005 Company Law	2013 Company Law	
Minimum initial capital con- tribution at company forma- tion	The greater of CNY30,000 and 20% of RC; CNY100,000 for an LLC owned by a single individual.	None.	
Time limit on full contribu- tion of RC	Generally, within 2 years for company formation.	None.	
Limitations on types of capi- tal contribution	Cash contribution must be at least 30% of RC.	None.	
Capital verification	All contributions must be ver- ified by a qualified 3rd party; required for registration.	Only in-kind contribu- tions need to be veri- fied.	
Business license reference to contributed capital	A business license must state the company actual contributed capital.	No statement of con- tributed capital.	
Shareholder registry filed with public authority	Must contain contributed capital for each shareholder.	Shareholder contribu- tion omitted.	
Limitations on capital reduc- tion	RC cannot be reduced below statutory minimum (same as for initial contribution).	No statutory minimum.	

Table 1: Main Changes to Registered Capital Requirements in 2013 Company Law Amendment

The 2013 CL clearly lowered both the regulatory barrier to company formation and regulatory burdens on corporate operations. Not only are shareholders freed from committing to a minimum amount of equity capital and to a restricted period for capital contributions at the start of a company, but they are also freed from the red tape of making changes to the business license and publicly-filed shareholder registry whenever new shareholder capital contributions are made. An equally important set of implications (though their empirical manifestations is beyond the scope of this paper) relates to corporate distributions. The 2013 CL leaves unchanged a number of provisions on distributions that are tied to the concept of RC. Nominally, changing RC constitutes a major corporate change and must be approved by shareholder meetings. Moreover, "capital reductions"-understood as the reduction of RC—must be preceded by an accounting of the company's assets and liabilities and by notices to creditors. Before the 2013 CL, since RC and actual capital contributions were tied together (subscribed capital must be contributed within 2 years), changes in actual capital typically required changes to RC and would trigger the requirements of shareholder meetings and notifications for creditors. Once the 2013 CL severed the relation between RC and actual contributions, however, shareholders have greater freedom with respect to distributions as well as contributions—both can be made without changing the company's RC.³

The legislative history of the 2013 CL amendment is relevant for our research design. On March 14, 2013, China's State Council presented a comprehensive package of regulatory reform principles to the NPC. The idea of converting the RC system from an "actual contribution" to a "subscription only" system was mentioned in one sentence, but neither specific terms nor the timelines for implementing this change was given. In essence, the NPC gave the State Council mandate to make more specific proposals.

On October 25, 2013, the State Council was reported to have approved a Plan for Reforming the Registered Capital and Business Registration System, but the plan was not released to the public until after the CL amendment. The details of the RC reform came to be known only when the State Council presented draft legislation to the NPC on December 23, 2013. The 2013 CL was enacted 5 days later. There was thus little opportunity for the public to anticipate the details of the CL amendment before December 28, 2013. The main anticipation period of the new RC rules lasted from December 28, 2013 to February 28, 2014.

The reform led by the executive branch was quickly implemented throughout China. Judicial response and elaboration of the consequences of the change of the RC requirement would not come until years later.⁴

³Moreover, under both the 2005 CL and the 2013 CL, 10% of current-year profits must be retained by the company in a "statutory common reserve" until the reserve reaches 50% of RC, before distributions can be made. Therefore the freedom to lower the RC also permits greater flexibility in payouts.

⁴The radical change to the RC regime brought about by the 2013 CL left many questions open critically, how a shareholder's obligations to the company to the extent of subscribed capital con-

3 Theoretical Motivation

This section lays out a model for analyzing firm entry decisions made by potential entrepreneurs. The model follows Evans and Jovanovic (1989) and introduces two sources of entrepreneurial heterogeneity, productivity and wealth. To keep the model simple, we study a static environment and focus on how a minimum equity requirement forces potential entrepreneurs to stay out of the market and distorts new firms' financing and investment decisions.

3.1 Setup

Assume a mass of heterogeneous agents, endowed with wealth a and productivity θ , each drawn from independent distribution G(a) and $G(\theta)$. In the beginning of the period, an agent faces an opportunity to start a business.⁵ If she starts a business, she chooses capital input k financed from equity investment e and firm debt b. The firm faces a borrowing constraint: b is no greater than a fraction ϕe . Firm equity comes from entrepreneur wealth and faces a resource constraint: $e \leq a$. Assume the production function to be Cobb-Douglas with decreasing return to scales: $f(\theta, k) = \theta k^{\alpha}$, where $\alpha < 1$. The profit function of the firm is given by:

$$\pi(\theta, e, b) = \max_{k, e, b} f(\theta, k) - rb - c$$

s.t. $k = e + b, b \le \phi e, e \le a,$

where c is a fixed operation cost, and r the exogenous borrowing rate faced by the firm.

The agent will choose to start a business if:

$$L(\theta, e, b) = (1 - \tau)\pi(\theta, e, b) - r^d e \ge 0,$$
(1)

where τ is the corporate tax rate and r^d is the interest rate if the agent chooses to save in the risk-free assets. Both r and r^d are assumed to be exogenous to the firm,

tributions is to be enforced. According to China's Supreme People's Court (SPC), subscribed capital that has not been contributed is considered a part of a company's assets at liquidation. Creditors may enforce the contribution of subscribed but unpaid capital when a company's assets are insufficient for debt repayment. A 2019 SPC interpretation, however, limited the circumstances under which creditors can pursue such enforcement.

⁵Agents only live for one period and by the end of the period, they consume all of their wealth. This simplifying assumption allows us to show how productivity and wealth determine firm entry and investment decisions in the absence of inter-temporal choices. To extend the static model to a multiple-period one, productive but financially constrained agents may save to accumulate assets in order to start businesses in the future (Moll 2014). In that case, we could introduce exogenous wealth shocks to ensure the existence of wealth-constrained agents in the equilibrium.

with $r^d \leq r.^6$ The firm's profit depends on the choice of e and b, shown in equation 1. By solving profit maximization problem, we could derive the optimal choice of equity $e(r, r^d, \theta, a)$ and debt $b(r, r^d, \theta, a)$ as functions of interest rates and the agent's endowment in wealth and productivity.

If the agent has enough wealth, the firm's input choice should only depend on interest rates and its productivity: $e^*(\theta) = g(\theta, r, r^d)$ and $b^*(\theta) = h(e^*(\theta))$, where $g_{\theta}(\theta, r, r^d) > 0$ and $h_{\theta}(e^*(\theta)) \ge 0$, i.e., firm's optimal equity strictly increases in firm productivity θ and the optimal firm debt increases in firm productivity.⁷ In this scenario where the resource constraint is slack, the economic profit becomes $L(\theta, e^*(\theta))$, which also strictly increases with θ . Equalizing the economic profit to zero, we could derive a minimum productivity $\underline{\theta}$ such that

$$\forall \theta < \underline{\theta}, L(\theta, e^*(\theta)) < 0.$$

Thus, agents with $\theta < \underline{\theta}$ will choose to stay out of the market regardless of their wealth positions.

Next, by setting firm's economic profit $L(\theta, e) = 0$, we can find the minimum and maximum equity investments for a firm such that

$$\forall \theta > \underline{\theta}, e \in [e_L(\theta), e_H(\theta)], L(\theta, e) \ge 0.$$

Therefore, for agents with $\theta \ge \underline{\theta}$ and $a \ge e_L(\theta)$, it is profitable to enter the market. This condition sets the minimum amount of wealth that each agent needs to hold to start a business. Note that the minimum asset threshold is decreasing in θ : $e'_L(\theta_i) < 0$: the higher productivity an agent is endowed with, the lower is the minimum wealth threshold for her to start a business.

Proposition 1: An entrepreneur with θ and a will choose to enter the market if and only if $\theta \ge \underline{\theta}$ and $a \ge e_L(\theta)$. An entrant's equity investment will be:

$$e(\theta) = \begin{cases} a & \text{if } e^*(\theta) > a \ge e_L(\theta), \\ e^*(\theta) & \text{if } a \ge e^*(\theta). \end{cases}$$

⁶We do not analyze capital market clearing conditions. The capital gain tax is also assumed away in this model.

⁷When $r^d > (1 - \tau)r$, the optimal debt $b^*(\theta) = \phi e^*(\theta)$. Otherwise, $b^*(\theta) = 0$.

3.2 Minimum equity requirement

Suppose regulators impose a minimum equity requirement \underline{e} to start the business, i.e., $e \geq \underline{e}^{8}$ Now, the equity investment is bounded by both the minimum equity requirement \underline{e} and the entrepreneur's wealth position a. The direct effect of such a equity restriction is to stop potential entrepreneur with limited wealth to enter the market: agents with productivity $\theta \geq \underline{\theta}$ and wealth $\underline{e} > a \geq e_{L}(\theta)$ are forced to stay out of the market. We refer to this type of firm as the productive but financially constrained entrants.

The second effect of the minimum equity requirement is to raise the productivity threshold for potential entrants. Recall that the maximum equity investment $e_H(\theta)$ for firms characterized by a given $\theta \ge \underline{\theta}$. $e_H(\theta)$ sets the upper limit for profitable equity investments, such that $\forall e > e_H(\theta)$, $L(\theta, e) < 0$. Note $e_H(\theta)$ increases with θ . By equating $e_H(\theta) = \underline{e}$, we could derive the minimum productivity $\underline{\theta}'$, such that

$$\forall \theta < \underline{\theta}', L(\theta, \underline{e}) < 0.$$

Thus, agents with $\underline{\theta}' > \theta > \underline{\theta}$ will choose to stay out of the market under the minimum equity requirement.⁹ We refer to this type of entrepreneur as the unproductive marginal entrants.

So far, we have discussed how minimum equity requirement affects market entry decisions. Next, we investigate how this requirement distorts the investment decisions of market entrants. Consider an agent with $\theta \ge \underline{\theta}'$ and $a \ge \underline{e} \ge e^*(\theta)$: she is forced to increase equity investment to meet the requirement. By equating $e^*(\theta) = \underline{e}$, we could find $\overline{\theta}$ such that

$$\forall \underline{\theta}' \le \theta < \overline{\theta}, e^*(\theta) < \underline{e}.$$

Agents with $\bar{\theta} > \theta \ge \underline{\theta}'$ and $a \ge \underline{e}$ will be forced to increase equity investment.

Proposition 2: Under the minimum equity requirement, entrepreneurs choose to enter the market if and only if $\theta \ge \underline{\theta}'$ and $a \ge \underline{e}$. Market entrants choose equity investment levels as follows:

⁸Assume $\underline{e} > e^*(\underline{\theta})$ so that the minimum equity requirement raises the entry barrier.

⁹If $\underline{e} < e^*(\underline{\theta})$, this type of firms does not exist: when the minimum equity requirement is smaller than the optimal equity for any market participants, it cannot stop any wealthy agents from entering the market.

$$e(\theta) = \begin{cases} \underline{e} & \text{if } \underline{\theta}' \leq \theta \leq \overline{\theta}, a \geq \underline{e} \\ a & \text{if } \theta > \overline{\theta} \text{ and } e^*(\theta) > a > \underline{e}, \\ e^*(\theta) & \text{if } \theta > \overline{\theta} \text{ and } a \geq e^*(\theta). \end{cases}$$

3.3 Removing the minimum equity requirement

Comparing the entrance threshold for asset and productivity in Proposition 1 and 2, we can conclude that the minimum equity requirement stops two types of potential market entrants: (i) $\theta \ge \underline{\theta}'$ and $a < \underline{e}$; (ii) $\underline{\theta}' > \theta \ge \underline{\theta}$ and $a > e_L(\theta)$. Removing the entry barrier allows both types to enter the market, leading to an increase in the number of firm entries.

Moreover, removing the minimum equity requirement should lead to changes in firm size, financing decisions, and productivity. Specifically, we predict the average firm size will decline after the reform, driven by two factors: the newly eligible entrants are smaller than already eligible ones, due to limited wealth (type i) or low productivity (type ii); and already eligible entrants with $\underline{\theta}' < \theta < \overline{\theta}$ and $a > \underline{e}$ would be able to reduce investments after the reform.

Whether entrants will adjust their financing decisions depends on their optimal capital structure, which is determined by the relationship between borrowing rate r, saving rate r^d , and corporate tax rate τ . In particular, when $r(1 - \tau) < r^d$, firms prefer debt to equity financing to enjoy the benefit of tax shield. Imposing the minimum equity requirement forces firms with $\theta < \bar{\theta}$ to switch from debt to equity financing.¹⁰ Therefore, holding firm size constant, we should expect an increase in firm liabilities and a decrease in equity investment after the reform. If $r(1 - \tau) > r^d$, equity financing is always preferred, and imposing the minimum equity requirement does not affect firm's capital structure. By testing changes in firm financial characteristics, we could identify the optimal capital structure for market entrants.

As for firm productivity, the result is more involved. The first type of market entrants would drive down average productivity, while the second type increases it. To investigate the overall effect, we first derive the average productivity under the old and new regimes:

¹⁰If $r(1 - \tau) < r^d$, the optimal leverage is $\phi/(1 + \phi)$, determined by the collateral constraint. For agents with $a > e > e^*(\theta)$ and $e_H(\theta)$, they were forced to use equity financing under the old regime.

$$\begin{split} E^{0}(\theta_{i}|entrant) - E^{1}(\theta_{i}|entrant) = & E(\theta|\theta \geq \underline{\theta}, a \geq e_{L}(\theta)) - E(\theta|\theta \geq \underline{\theta}', a \geq \underline{e}) \\ = \underbrace{E(\theta|\theta \geq \underline{\theta}, a \geq e_{L}(\theta)) - E(\theta|\theta \geq \underline{\theta}', a \geq e_{L}(\theta))}_{\text{productivity change by unproductive entrants}} \\ + \underbrace{E(\theta|\theta \geq \underline{\theta}', a \geq e_{L}(\theta)) - E(\theta|\theta \geq \underline{\theta}', a \geq \underline{e})}_{\text{equation}} \end{split}$$

productivity change by productive entrants

The first component represents the productivity change caused by the unproductive entrants and the second component captures the productivity change due to relaxing the financial constraint. As $\underline{\theta} < \underline{\theta}'$, the first component suggests that the average productivity will decrease after the reform. In contrast, how the second component would change the average productivity is less straightforward. Because $e'_L(\theta) < 0$, the probability of $a \ge e_L(\theta)$ increases with θ , whereas the probability of $a \ge \underline{e}$ is constant for all agents with productivity θ .¹¹ Intuitively, the higher productivity θ an agent is endowed with, the less initial investment she needs to start the business. For the same level of wealth, a more productive agent is likely to be precluded from entry by the minimum equity requirement than a less productive one. Therefore, by allowing the productive but financially constrained agents enter the market, the second component should increase the average entrant's productivity.

To summarize, we predict that with the removal of the minimum equity requirement, there will be an increase in firm entry, decreases in firm size (total assets) and ambiguous changes in firm's financial characteristics and productivity. Changes in firm financial characteristics depends on the preference between debt and equity financing methods. The change in average firm productivity will depend on which type of new entrants dominates.

4 Data and Motivating Facts

Our analyses use a confidential, de-identified administrative data set from a large and prosperous Chinese province.¹² The data is extracted from the comprehensive database used by the provincial tax agency for all of its activities, including taxpayer risk assessment and inspections. One portion of the data-set, the taxpayer

¹¹This is because wealth and productivity distributions are assumed to be independent from each other. If the two distributions are positively correlated, the productivity change due to financially-constrained firms will be smaller, because the more productive agents tend to own more wealth

¹²This dataset has been used in Cui et al. (2022b), Cui et al. (2021), and Cui et al. (2022a).

registry, records information for all firms registered before mid-2017—including, inter alia, establishment date, RC, employees (either upon initial registration or as subsequently updated by the taxpayers), and industry. Another portion of the dataset covers the period 2010-2016 and contains a large number of variables from firms' annual income tax returns and financial statements. The aspect of our data most worth emphasizing is its coverage of all firms regardless of sector and size. In contrast, recent research using firm-level data from China generally relies on data on larger firms (e.g. listed firms, "above-scale" firms in the Annual Survey of Industrial Firms, and large and medium firms sampled in the National Taxpayer Survey), which is inadequate for studying firm entry and small firms.

As a preliminary indication of the effect of the RC reform, Figure 1 plots the time series of RC declared by newly established firms. Panel (a) depicts the monthly average log-form of RC from 2010 onward: the average RC amount experienced a gradual decline from 2010 to 2013, followed by a substantial increase from 2014 onward. Panel (b) shows the percentage of firms registered with RC below 30,000 yuan, the minimum amount required under the 2005 CL. This percentage notably increased in March 2014 and reached 2.5% by 2016. The RC reform thus had two opposite effects on RC declarations: the average RC of newly registered firms increased and the percentage of firms with very low RC also increased.



Figure 1: Time series of registered capital with business formation

Panel (a) plots the monthly average log registered capital from January 2010 to December 2016. The dashed lines in panel (a) correspond to the 2013 CL announcement and effective dates. Panel (b) plots the percentage of monthly startups with registered capital below CNY 30,000, the minimum requirement under the 2005 CL, from January 2010 to December 2016. The dashed line in the panel (b) corresponds to March 2014.

Of course, changes in declared RC may not reflect actual changes in business characteristics, when the declared RC does not create any immediate obligations for a firm and its shareholders. To offer a glimpse of how the RC reform affected real business formation, Figure 2 plots the first-year asset and revenue distributions for firms registered before and after the reform. Panel (a) shows that the assets distribution after the reform became more dispersed, with more firms in the left tail. The decline in firm assets after the reform is consistent with our model prediction that relaxing the minimum equity requirement allows market entrants to start businesses with lower initial investments. Interestingly, Panel (b) shows that the change in the revenue distribution is much smaller, with the post-reform distribution shifting only slightly to the left. Intuitively, if firms entering after the reform have significantly lower assets but only slightly lower revenues compared to firms that entered before, an improvement in capital efficiency has come about.



Figure 2: Firm characteristic distributions

Panel (a) and (b) plot the distributions of revenue and assets, respectively, for firms registered before and after the reform. Firms registered one year after March 1, 2013 or March 1, 2014 are included in each group, to make the distributions comparable.

Table 2 presents summary statistics for the financial characteristics, performance, and growth rates of firms registered in the pre- and post-policy groups. Several patterns emerge. First, in contrast to the average asset size reduction, the average total liability is more than 50% higher for firms in the post-reform group. Second, the post-reform firms also appear to take advantage of the new flexibility of delayed capital contributions. We measure paid-in capital as the difference between a firm's total equity and undistributed profits. The difference in average paid-in capital between the pre- and post-reform groups of firms is stunning, with the pre-policy group contributing 100 times more capital than the post-policy group. Table D.2 provides a more detailed summary of paid-in capital, where we find that close to 40% of post-policy firms had zero owner's contribution in 2014, compared to just

over 7% firms in the pre-policy group.

Panel B of Table 2 depicts firm performance, as observed through firm revenue, profits,¹³ and loss-making probability. With respect to all three variables, the differences between pre-reform and post-reform groups are less pronounced than in Panel A. Post-reform firms are somewhat smaller in terms of revenue and somewhat less profitable, but have roughly the same loss-making probability as pre-reform firms. Panel C summarizes firms' annual growth rates from 2014 to 2015 in terms of revenue, assets, and paid-in capital. The post-reform group exhibits faster growth for all three variables. However, one should not draw any inference on firm growth from these summary statistics, as firms in the post-reform group are younger and younger firms generally grow faster.

	pre-re	eform gr	oup	post-reform group					
	N	mean	std	N	mean	std			
Panel A: firm size and	Panel A: firm size and financial characteristics								
ln(asset)	16,213	13.27	1.97	28,608	12.47	2.40			
ln(liability)	15,160	8.56	5.67	27,359	9.23	5.18			
ln(paid-in capital)	16,212	11.79	4.36	28,607	7.95	6.49			
Panel B: performance	characte	ristics							
ln(revenue)	11,745	13.03	2.06	20,589	12.60	2.05			
profit_IHS	16,388	-3.68	9.50	28,608	-3.95	9.05			
loss-making prob.	16,388	0.72		28,608	0.74				
Panel C: firm growth									
$\Delta \ln(\text{revenue})$	14,025	0.702	4.11	24,493	0.97	4.25			
$\Delta \ln(\text{asset})$	14,028	0.18	0.78	24,497	0.35	1.08			
$\Delta \ln(\text{paid-in capital})$	14,026	0.046	0.33	24,495	0.13	0.53			

Table 2: Summary S	Statistics
--------------------	------------

Note: the pre-policy observations include firms registered within two months before March 1st, 2014. The post-policy observations include firms registered within half year after March 1st, 2014 RC and liability and paid-in capital variables are added by one before taking the log transformation to include the zero-valued observations. Profits are taken inverse hyperbolic sine transformation.

5 Empirical Strategy

We employ a sharp regression discontinuity design (RDD) to exploit the sharp cutoff date in detecting the new RC regime's effects. Specifically, we use the following

¹³Note profits are given the inverse hyperbolic sine (IHS) transformation to condense the distribution.

regression form:

$$y_{it} = \alpha + \beta D_{it} + f(t) + D_{it}g(t) + \phi_w + \phi_{mj} + \phi_r + \epsilon_{it}, \qquad (2)$$

where the running variable t measures the firm-entry date relative to the policy date, centered at zero. y_{it} is the variable of interest for firm i registered at time t. D_{it} equals to one for firms registered from March 1, 2014, and onward. f(t) and g(t) are smooth functions of the running variable. ϕ_w , ϕ_{mj} , and ϕ_r denote day-of-the-week, month-by-industry, and prefecture fixed effects, respectively.

Identification in the classic sharp RDD requires the relationship between error term ϵ_{it} and time not to change discontinuously on or near the policy date. Specifically, the function form f(t) and g(t) capture any smooth relationship between time and error term ϵ_{it} . If this assumption holds, β captures the effect of the removing RC restriction on the outcome variables.

The first major challenge to identification is the manipulation of running variables. As the policy was announced on December 28, 2013, two months before its effective date, one may be concerned that business formation patterns in the pretreatment period changed after the policy announcement. For instance, owners of smaller businesses that would have found the minimum equity requirement binding may choose to delay registration until after the new policy takes effect. If this happened systematically, we should expect (i) a decrease in the number of business registrations during the anticipation period combined with bunching of registration immediately after the policy effective date, and (ii) an increase in firm size (as well as other changes in firm characteristics) during the policy anticipation period. ¹⁴

However, Figure C.3 shows that there is no obvious bunching in business registration after March 1, 2014. In addition, in Appendix A we implement a combination of difference-in-differences and RDD test (difference-in-discontinuity, DiRD) around the policy announcement date to investigate whether firms registered during the anticipation period display any selection effect (i.e. with smaller firms selecting into later registration). The choice of the DiRD method is dictated by the fact that business formation in the post-announcement period is contaminated by Chinese holiday effects. To address this issue, we use the business formation patterns during the same time period in the previous year to control for time-invariant holiday effects, and assign any additional changes after the policy announcement date to the policy announcement.¹⁵. We find no significant difference in firm char-

¹⁴Effect (i) would lead to a bias towards finding increased entry after the policy effective date. Effect (ii) could create biases towards finding greater magnitudes and significance for outcomes associated with small firm entry.

¹⁵Section A of Appendix discusses the DiRD approach in detail.

acteristics for firms registered during the anticipation period.

A second threat to identification is that the reform may have a retroactive effect. Shareholders of businesses registered under the 2005 CL were allowed to complete their full contribution of registered capital within two years. For businesses registered between March 1st, 2012, and February 28th, 2014, the 2013 CL may release owners from the obligation to contribute subscribed capital if they have not fulfilled it by the policy date. If such a retroactive effect is significant, we should expect the effect of 2013 CL to be underestimated, as the pre-treatment group will effectively have received partial treatments.

To investigate this possibility, we analyze the gap between a firm's declared RC and paid-in capital (i.e. shareholders' actual capital contribution), measured at the end of 2013 and 2014 separately. Figure 3 plots this gap (averaged for firms registered on the same date) based on firms' registration date. The solid red line represents the gap at the end of 2013 and the blue dashed line represents the gap at the end of 2013 and the blue dashed line represents the gap at the end of 2014. Focusing first on firms registered before the policy announcement, on average firms contributed around 80% of their declared RC in the registration year, and the gap remains at similar levels in the second year.¹⁶ If there was spillover to the pre-treatment group, we should expect a significant increase in the RC gap for businesses registered during the policy anticipation period (or even after the October news release date on the 2013 CL). However, any such increase before the policy effective date seems gradual and small relative to the jump on March 1, 2014. Nor do we find strong evidence of paid-in capital reduction for the pre-treatment firms after the 2013 CL took effect.

Other concerns regarding identification are economic or policy shocks that may have occurred in the same short time window around the date when the 2013 CL took effect. To the best of our knowledge, there were no such other policy shocks. Economic factors like interest rates and inflation, exhibit strong cyclical patterns and lead to business formation fluctuations, which may not be captured by lower order polynomial smooth functions f(t) and g(t).¹⁷ We use fixed effects on day-of-theweek and month-by-industry fixed effects to capture business fluctuations caused by cyclical factors.

We employ a local linear RD estimator for all the outcome variables. As suggested by Gelman and Imbens (2019), the local linear or quadratic polynomials are preferred RD estimators over global high-polynomial functions. We follow Calonico

¹⁶Appendix Table D.3 shows that around 70-80% of newly registered firms contributed their declared RC in the first year, and this ratio remains stable in the next three years.

¹⁷For instance, if the borrowing rate experienced a dramatic drop around the policy date, we could expect an increase in business entry to take advantage of cheaper financing costs.



Figure 3: Daily average gap between RC and paid-in capital

Note: this figure plots the daily average RC gap, measured as the ratio of (i) the difference between RC and paid-in capital to (ii) RC, for businesses formed from September 1st, 2013 to May 31st, 2014. The figure covers four periods (separated by the vertical dashed lines): (a) the two months before the first news release about the RC reform (October 28, 2013), (b) the period between the news release date and the 2013 CL announcement date (December 28, 2013), (c) the policy anticipation period, and (d) two months after the 2013 CL effective date. Because paid-in capital is time-varying, the solid red line refers to the RC gap at the end of 2013, and the dashed blue line the RC gap at the end of 2014.

et al. (2014) to choose the optimal bandwidth to minimize mean squared errors and correct bias in the RD estimates. To further alleviate the concern about the estimation bias introduced by local nonlinear variations, we test the sensitivity of our estimates to various bandwidth choices and polynomial orders.

6 Reform Impact on Firm-level Characteristics

In this section, we start by examining the impact of the RC reform on firm asset size and financing decisions. Our theoretical model predicts a decrease in average firm size measured by assets resulting from two mechanisms: smaller assets of newly eligible market entrants, and the reduction of over-investment made by firms that would have entered despite previous RC requirements (the "infra-marginal" firms). We also investigate how firms' financing structures change after the reform, since the RC requirement put restrictions on both the amount of total investment made and the financing method available to new businesses. We next analyze firm performance, which allows us to begin investigating whether the reform led to composition changes of market entrants. Potentially, changes in firm performance may reveal the presence of productive but financially constrained entrants. Thirdly, we analyze how firm growth (in terms of assets, revenue, and numerous other characteristics) changed after the reform, which could provide additional evidence on the composition of market entrants.

6.1 Asset size and financial characteristics

Before tabulating regression results, we present regression discontinuity plots for total assets, liabilities, and paid-in capital in Figure 4. ¹⁸ Panel (a) shows the trend in total assets (reported on 2014 balance sheets) of firms formed in the one-year period centered around the 2013CL effective date. Each dot represents the average assets for firms registered during the corresponding month. Average total assets exhibit a gradually decreasing trend in both the pre- and post-policy periods, suggesting that firm size generally increases with firm age. Around the cutoff date, we find a clear discontinuous drop by more than 40%.

Figure 4b similarly shows a clear trend break in total liabilities reported by firms. But in contrast to the decline in assets, the reform led firms to start with greater liabilities, suggesting possible changes in financing methods. This figure also shows that, in the pre-policy date period, average liability experienced a significant drop around 70-90 days before the policy date, followed by a small increase leading to the policy date. This may be caused by the Chinese New Year holiday season. To screen out any potential holiday effect, we exclude all national holidays in all subsequent RD regressions. In robustness checks summarized in Section 8.1, we also conduct RD tests with a 21-day bandwidth, which yields a time window that excludes the Chinese New Year holiday in 2014.

Figure 4c displays a similar pattern for paid-in capital as for total assets, with a gradually decreasing trend for firms registered in both the pre- and post-reform periods and a significant drop around the policy date. But the decline in the paidin capital around the cutoff appears larger than the change in total assets, which is consistent with the significant increase in average liabilities.

Table 3 confirms the patterns in Figure 4 with RD estimates. Column 1 suggests firms registered under the 2013 CL are around 40% smaller by total assets than firms registered previously. In Appendix Table D.7, we show that the asset gap persists after three years, with a 28.8% gap in 2016. Appendix Table D.5 decomposes the observed drop in average assets into changes in liquid assets, fixed assets, and other (including intangible) assets. As the Appendix Table D.4 shows, liquid assets de-

¹⁸We use quadratic smooth functions to draw fitted lines in the RD figures, as the raw data exhibits slightly non-linear trends in the longer time span. In Table 3, we present RDD results with both linear and quadratic smooth functions.



Figure 4: Effect of removing RC requirements on firm financial characteristics

Note: panel (a), (b) and (c) plot the average total assets, liabilities and paid-in capital in 2014 by business formation date in a half-year bandwidth around the 2013 CL effective date. The fitted line on each side is separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.

creased by approximately the same magnitude as total assets,¹⁹ fixed assets display no significant change, and "other assets" show a small decrease that is somewhat significant.²⁰ We further analyze changes in sub-categories of liquid assets, and find a significant 27% decline in the cash category, ²¹ while the changes in account receivables and inventory are insignificant. These last findings are consistent with the results, discussed in Section 6.2 below, that the average level of revenue and costs of goods sold of newly registered firms remained similar to pre-reform firms.

Table 3 Column 3 shows that the average liability in the post-reform group increased by around 88% as compared to the pre-reform group. Our data offer less

¹⁹Note that for around 70% of newly registered firms, liquid assets are equal to total assets.

²⁰This is driven by the greater number of firms reporting no "other assets."

²¹In unreported RD results, we find that there is no difference between pre- and post-policy firms in terms of the cash-to-total-asset ratio. This suggests that the 30% minimum cash contribution requirement under the 2005 CL was not binding on most newly formed firms.

	asset		liab	ility	paid-in	paid-in capital	
	(1)	(2)	(3)	(4)	(5)	(6)	
RD estimate	-0.404*** (0.071)	-0.389*** (0.075)	0.632*** (0.141)	0.635*** (0.163)	-2.468*** (0.241)	-2.356*** (0.262)	
week FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
month-industry FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
prefecture FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
bandwidth (days)	50	92	56	107	45	80	
poly. order	linear	quad	linear	quad	linear	quad	
N(effective)	34127	59364	37643	65175	31116	52170	

Table 3: Effect of removing RC requirements on asset size and financial decisions

Note: this table reports the estimated effect of the RC reform on firm size and financial characteristics. The dependent variables are in log-form. In columns (3)-(6), the dependent variables are added by one to include zero-value observations. The running variable is the date of firm registration relative to March 1st, 2014. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. Standard errors clustered by business formation date are in parentheses. (2014). * p < 0.1, ** p < 0.05, *** p < 0.01.

detailed breakdowns of firm liabilities. Most importantly—as shown in Appendix Table D.4—only a very small fraction of firms report long-term liabilities: the entire increase in average liabilities is attributable to short-term liabilities. Within the latter, an RD estimate shows that there is no significant change in the average level of accounts payable for newly registered firms, which is consistent with the null results for accounts receivable and inventory on the asset side (discussed above). Along with the results for revenue discussed in Section 6.2 below, they suggest that on average, post-reform firms operated at similar scales as pre-reform firms.²²

The last two columns of Table 3 estimate the reform's impact on paid-in capital. Column 5 shows that paid-in capital dropped by almost 90%. As striking as this is, it is consistent with the facts that 40% of firms registered within half-year after the reform saw zero shareholder investment—a pattern that persisted in the next two years (Appendix Table D.3)— and that over 50% firms registered in 2015 and 2016 started their business with zero paid-in capital (Appendix Table D.2). Section 7.2 below will show that the decline in capital contributions reflects declines in both the average number of investors per firm and the average contribution per investor.

²²An important question concerning post-reform firms' increased liabilities is whether the latter reflects external borrowing or merely shareholder loans. We defer this question until Section 6.3.

6.2 Firm performance

The changes brought about by the RC reform discussion in the preceding section–reduced asset size, increased use of debt, and reduced shareholder capital–can all be rationalized regardless of firm type. In this subsection, we analyze changes in firm performance with an eye on distinguishing between the different types of market entrants theorized in Section 3. Instead of using structural methods to estimate firm TFP, we rely on firm revenue, profitability, and loss-making probability to analyze firm productivity. ²³

Figure 5 presents changes in the performance of firms registered within halfyear around the 2013 CL effective date by plotting their 2014 average monthly revenue,²⁴ profit to revenue ratios, and loss-making probabilities. Panel (a) shows that the average monthly revenue slightly decreases with the registration date, for both the pre- and post-reform periods, with a small and noisy drop around the policy date. In Panel (b), the profit-to-revenue ratio is also downward-sloping with the registration date, but the trend is continuous around the policy date. Panel (c) shows a positive relationship between loss-making probabilities and business registration date for both the pre- and post-policy periods, with an insignificant change around the threshold. Critically, none of these three variables exhibits any discontinuous change around the policy date.

Table 4 presents the RD estimates for firm performance outcomes.²⁵ Columns 1-2 show that the 2014 revenue gap is insignificant between firms in the pre- and post-reform groups. According to the theoretical model in Section 3, newly eligible market entrants-both the productive but financially constrained and unproductive types-should have lower revenues than the already eligible entrants. An average revenue decrease after the reform would be strong evidence for newly eligible marginal entrants in the post-reform group. But Table 4 suggests that the marginal firms are not the majority in the post-reform group.

However, recall that the 2013 CL led to around a 40% decline in average assets. Given that new firms produced similar amounts of revenues as pre-reform firms, the later-registered firms appear to be immediately more efficient in their investments, which strongly implies over-investment in firms in the pre-reform group.

²³We choose this approach for two reasons. First, our dataset includes firms from all sectors, with the majority of post-reform observations coming from the service sector. But measuring TFP of service firms faces challenges to accurately quantify firm inputs. Second, labor productivity is often used as a proxy for TFP, but wage data is incomplete in our dataset.

²⁴Computed by dividing a firm's total revenue in 2014 by the number of months it operated.

²⁵In columns 1-2 we employ annual revenue as the dependent variable, instead of monthly average revenue. This is because the month-industry fixed effect we use can absorb the non-linear relationship between months of operation and revenue accumulation in 2014, making it unnecessary to assume a linear relationship between annual revenue and months of operation.



Figure 5: Effect of removing RC requirement on firm performance.

Note: panel (a) - (c) plot the average monthly revenues, profit to revenue ratio and loss-making probabilities in 2014 by business formation date in a half-year bandwidth around the 2013 CL effective date. The average monthly revenue is computed as the annual revenue divided by the number of months operated during 2014. The fitted line on both side are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.

Next, we use profitability to analyze changes in the average productivity of market entrants. (In our model, an increase in firm's average productivity leads to an increase in firm's profitability.) To measure profitability, we scale a firm's total profits before taxes by its revenue. Column 3-4 of Table 4 shows that firm profitability is again indistinguishable between firms registered in the pre-reform period and post-reform period. Unlike the revenue result, however, this does not imply that infra-marginal entrants dominated business formation in the post-reform period, since the effects of the high-productivity and low-productivity marginal entrants may cancel out each other in the profitability estimations.

Finally, we estimate changes in the probability to make losses, measured by the binary value of reporting positive profits. Assuming the high-productivity entrants

share the same loss-making probability with the infra-marginal entrants, the binary dependent variable may help us identify changes in the prevalence of lowproductivity firms in the post-reform group. However, columns 5-6 show no significant change in the loss-making probability.

	revenue		profit/1	revenue	loss-making	
	(1)	(2)	(3)	(4)	(5)	(6)
RD estimate	-0.027 (0.065)	0.006 (0.057)	0.058 (0.264)	0.023 (0.016)	0.001 (0.012)	-0.037 (0.015)
week FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
month-industry FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
prefecture FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark
bandwidth (days)	45	79	88	76	89	82
poly. degree	linear	quad	linear	quad	linear	quad
N(effective)	19775	36887	49306	36168	49720	54319

Table 4: Effect of removing RC requirement on firm performance

Note: this table reports the estimated effect of the RC reform on firm performance. Columns (1)-(2) take the log form of the dependent variable. Columns (5)-(6) take the binary value of the dependent variable. The running variable is the date of firm registration relative to March 1st, 2014. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

6.3 Heterogeneity Test

The combination of significant declines in firm assets (Section 6.1) and insignificant changes in firm revenue (Section 6.2) in response to the RC reform implies that in our setting, a firm's revenue is a more accurate measure of its business scale. In this section, we leverage this insight and use firm revenue as a measure of firm size to investigate whether the RC reform had differential impacts on small vs. large firms. We first consider firms' financing behavior. Section 6.1 had left unanswered the question as to the sources of firm borrowing—whether the observed post-reform increase in average firm liability should be attributed to shareholder loans or external borrowings.²⁶ In the finance literature, firm size is commonly used as an

²⁶Anecdotally, the use of shareholder loans (often informal and undocumented) is prevalent in Chinese business practice. If reflected in financial statements at all, they are reported as "other payables" (a category of short-term liabilities not observed in our data). However, there appears to be little discussion of such practice in the academic legal or accounting literature.

indicator of a firm's borrowing capacity (Almeida and Campello, 2007; Hadlock and Pierce, 2010; Whited and Wu, 2006). By comparing the financial characteristic changes of small and large firms, one may gain more insights into the source of average firm liability increase.

In the heterogeneity analysis, we use firms' 2014 monthly revenue, instead of annual revenue, to measure firm size, to reflect the fact firms registered after March 1, 2014, operated for only part of the year. We define small (large) firms as firms with monthly revenue below (above) the first (third) quartile of the monthly revenue distribution in 2014 for firms in the pre-reform group,²⁷ and implement the RDD regressions for small and large firms separately. One concern regarding this design may be that firms in the post-reform group are smaller (in terms of monthly revenue) simply by virtue of being younger, and our selection criteria would disproportionately select post-reform observations (younger firms) into the small firm group and pre-reform observations (older firms) into the large firm group. However, our identifying assumption is that firm characteristics should change continuously with its registration date around the policy date in the absence of the reform. Therefore, the probability of firm revenue meeting the selection criteria for a small (large) firm group should also change continuously around the policy date, as would other firm characteristics. Within each firm sub-group, any discontinuous change in firm characteristics around the policy date should be attributed to the effect of the reform.

Table 5 presents the regression results for firm characteristics changes in each group.²⁸ The first two columns in Panel A reveal strikingly heterogeneous responses in terms of firm assets: small firms experienced a more than 57% decline in assets, whereas large firms experienced no significant change. Compared to the benchmark estimate of an average response of -40%, this suggests that the effects of the reform on firm assets are concentrated among small firms. By contrast, large firms were not forced to stuff excess assets because of the RC requirement.

Columns 3 to 6 in Panel A show that the effects of the reform on firm liabilities and paid-in capital are significant for both small and large firms, with around 93% and 57% increases in firm liabilities and around 92% and 84% declines in paid-in capitals for small and large firms, respectively. The fact that large firms—which are unlikely to be restricted by the *minimum* equity requirement—also chose to reduce equity investments after the reform suggest that the RC requirement distorted

²⁷We use revenue distribution in the pre-reform group because it is less likely to have been affected by the reform. The first and third quartiles in the monthly revenue distribution are 14,000 RMB and 185,000 RMB, respectively.

²⁸The corresponding RD figures are presented in the Appendix Figure C.6.

Panel A: financial characteristic									
	ass	et		liab	ility		paid-in capital		
	small	large		small	large		small	large	
RD estimate	-0.575***	0.111		0.661**	0.455**		-2.520***	-1.864***	
	(0.098)	(0.092)		(0.337)	(0.211)		(0.377)	(0.383)	
BW(days)	48	52		60	70		42	42	
N(effective)	8001	5019		9106	6099		6680	4027	
Panel B: firm	performanc	ce							
	rever	nue		profit/1	evenue		loss-m	naking	
	small	large		small	large		small	large	
RD estimate	-0.021	0.057		0.057**	0.008		0.030	-0.016	
	(0.060)	(0.057)		(0.028)	(0.007)		(0.024)	(0.034)	
BW(days)	53	62		63	79		68	69	
N(effective)	8669	5803		9919	7103		10557	6316	

Table 5: Effect of removing RC requirement on business formation: small vs large firms

Note: This table reports the estimated effects of 2013 CL amendment on firm characteristics by firm size. The even columns present the RDD results for firms small by individuals and the odd columns present the RDD results for large firms. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. (2014). The coefficients in the bold font are significantly different from each other at 10% confidence level. * p < 0.1, ** p < 0.05, *** p < 0.01.

their financing decisions. Interestingly, the magnitude of the positive coefficients for firm liabilities for large firms imply that such increase cannot be fully explained by relabelling shareholder's investment. A 56% increase in firm liability should translate into around 369,000 RMB increase in the level of liabilities (the mean level of liabilities in the pre-reform group was 581,000 RMB), whereas an 84% decline in paid-in capital translates into a 234,000 RMB reduction in levels (the mean level of paid-in capital in the pre-reform group was 279,000).²⁹ That is, the increase in liability is substantially larger than the decline in paid-in capital. This cannot be easily interpreted in terms of firms using shareholder loans to substitute for equity contributions. Instead, it supports the hypothesis that firms registered after the reform increased external borrowing.

Although the benchmark regression (Table 4) shows that the RC reform had no significant impact on the performance of new businesses on average, this may

²⁹In contrast, the estimated coefficients for small firms suggest around a 6,140 RMB decline in paid-in capital with an average of 6,700 and a 900 RMB increase in firm liability with an average of 6,800 in the pre-reform group.

have masked variations across firms of different sizes. Panel B of Table 5 therefore presents heterogeneity results for firm performance. While the null results for firm revenues and loss-making probability continue to hold for both small and large firms, as does the null result for profitability among large firms, we find that among small firms, there is a significant increase by 5.7 p.p. in profitability after the reform. This suggests that by lowering the entry barrier, the reform may have encouraged more productive marginal firms to enter, thereby increasing the average profitability among small firms in the post-reform group.³⁰

6.4 Firm growth

This investigates how the firm growth dynamics of newly registered businesses change after the reform. ³¹ Specifically, the findings in subsections 6.1 and 6.2 should have implications for observed firm growth rates. Pre-reform firms that over-invested in assets and under-borrowed should have slower asset and equity growth but faster liability growth. At the same time, comparing revenue growth provides another perspective on any intrinsic differences between pre- and post-reform firms.

Figure 6 graphically illustrates the RD estimation of firm growth. Panel (a) shows that annual revenue growth from 2014 to 2015 decreases with firm age and changes continuously around the policy date. Asset growth (panel (b)) also decreases with firm age, but changes discontinuously around the policy date. In Appendix Table D.9, we decompose asset growth by the subcategories available in our data. Consistently with Appendix Table D.5, liquid assets (and cash holding in particular) appear to drive the difference between pre- and post-reform firms.

Panel (c) shows that liability growth displays a discontinuous drop around the policy date. This implies that the jump in asset growth must be driven by equity growth, which is confirmed in panel (d), showing a clear discontinuous increase in paid-in capital growth around the policy date. ³²

³⁰Note that the benchmark estimate in Table 4 contains a coefficient with similar magnitude but larger standard errors.

³¹The model proposed in Section 3 does not incorporate firm dynamics. To provide reasons for firms to grow or shrink over time, we could change the model setting to be stochastic by introducing idiosyncratic shocks in productivity. In general, firm growth should be affected by both firm size and productivity: smaller firms with higher productivity have faster growth rates. The firm dynamic literature explains the relationship between firm size and firm growth with various theories, ranging from firm selection (Hopenhayn, 1992; Jovanovic, 1982) to financial frictions (Albuquerque and Hopenhayn, 2004; Clementi and Hopenhayn, 2006; Cooley and Quadrini, 2001). We do not attempt to explain firm growth with a particular theory. Instead, we aim to analyze types of market entrants by estimating changes in the firm growth dynamics.

³²Appendix Figure C.5 shows that retained profits growth changes smoothly around the policy date, implying that the discontinuous increase in paid-in capital growth is responsible for the discontinuous



Figure 6: Effect of removing RC requirement on firm growth.

Note: panel (a) - (d) plot the average growth in revenue, assets, liabilities and paid-in capital in 2014 by business formation date in a half-year bandwidth around the 2013 CL effective date. The fitted line on both side are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.

Regression results in Table 6 confirm the patterns in Figure 6. We find firm in the post-reform group grew by 9.7 p.p. faster in terms of assets than firms in the prereform group, together with a 24.6 p.p. faster growth in paid-in capital, and 15.8 p.p. slower growth in liability. These results can all be explained by over-investment among firms in the pre-reform group. They confirm our conclusion that the reform allowed firms to choose the optimal asset size and their preferred financing methods at the start, avoiding much dead-weight loss.

increase in total equity growth.

	revenu	ie growth	asset g	growth	
	(1)	(2)	(3)	(4)	
RD estimate	0.030	0.007	0.097***	0.091***	
	(0.101)	(0.114)	(0.023)	(0.031)	
bandwidth (days)	55	84	55	74	
poly. order	linear	quad	linear	quad	
N(effective)	34276	47306	34281	42412	
	paid-in capital growth		liability	liability growth	
	(1)	(2)	(3)	(4)	
RD estimate	0.246***	0.244***	-0.158**	-0.288**	
	(0.046)	(0.0455)	(0.074)	(0.152)	
bandwidth (days)	58	104	60	109	
poly. order	linear	quad	linear	quad	
N(effective)	34841	58071	32875	60804	
week FE	\checkmark	\checkmark	\checkmark	\checkmark	
month-industry FE	\checkmark	\checkmark	\checkmark	\checkmark	
prefecture FE	\checkmark	\checkmark	\checkmark	\checkmark	

Table 6: Effect of removing RC requirement on firm growth.

Note: this table reports the estimated effect of the RC reform on firm growth. From top left to bottom right, dependent variables in each column take the first difference of log form of revenue, asset, paid-in capital, and liability, respectively. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p <0.1, ** p <0.05, *** p <0.01.

7 Reform Impact on Firm Entry and Investor Structure

7.1 Firm entry

This section examines whether the de facto removal of the RC requirement encouraged greater firm entry. Our main analysis employs the difference-in-differences (DiD) approach. Our dataset identifies 51 organizational types for firms and from this classification, we can distinguish among firms that are state- or collectivelyowned, foreign-owned, Hongkong, Macau, and Taiwan-owned (HMT), and privately owned. In addition, we can distinguish between organizational types with unlimited liabilities—mainly partnership and "solely-individually-owned enterprise" (*gerenduzi qiye*)–and limited liability companies. Appendix Figure C.3 shows that the daily firm entry patterns for LLCs and all other firm types track each other very closely up until the policy effective date. However, although only corporate forms are affected directly by the RC reform, the reform may encourage unincorporated firms (referred to as "unlimited liability entities" or ULEs below) to incorporate.

Therefore, we use state-owned, foreign-owned, and HMT-owned enterprises as the control group, as they are least likely to be affected by the restrictions of the previous RC regime.³³ An added benefit of this choice for a control group is that we can use ULEs as a second treatment group to test whether the reform has led to substitution away from unincorporated business forms.

The DiD regression specification is as follows:

$$y_{ijt} = \beta T_i \times D_t + \gamma_{1,i} \times Time_t + \gamma_{2,i} \times Time_t^2 + \delta_i + \delta_j + \delta_t + \epsilon_{ijt},$$

where y_{ijt} is the total number of firm entries by quarter t, industry j, and firm type i. T_i is an indicator for the treatment group. D_t is an indicator for the post-reform period, which is equal to one from first quarter of 2014 forward. To account for potential differential trends, we include $Time_t$ and $Time_t^2$ to allow for group specific time trend. δ_i , δ_j , δ_t capture the firm type, industry, and time fixed effects. The data period covers from January 2013 to December 2014 to include 4 quarters in the preperiod and 4 quarters in the post-period.³⁴

Table 7 presents firm entry results for both the LLC and ULE groups. Columns 1-2 show that the reform led to around 34% increase in the firm entries for LLCs. This estimate seems large at the first glance, especially compared to the estimates documented in the previous literature on the effect of entry deregulation in other countries (ranging from 5 to 27%, Bruhn (2011), Kaplan et al. (2011), De Andrade et al. (2013)). The closest comparison to our estimates is Barwick et al. (2022), which concludes that the business registration reform in Guangdong led to 25% increase in firm entries.³⁵ Interestingly, our estimate is larger, despite the fact that Guangdong's reform both removed the RC requirement and simplified registration

³³Foreign- and HMT-owned firms in China were still sufficiently regulated during the period we study that they tended to be larger and made lumpier investments/dis-investments. It is also reasonable to assume that state-owned enterprises were little constrained by the RC requirements. The 2013 CL amendment did not affect certain regulated industries (e.g. banking and other financial services) where separate, higher RC requirements are imposed. In theory, privately-owned LLCs in these industries can serve as additional control firms. We stay with a control group comprising state-, foreign, and HMT-owned firms to preserve parallel trends.

³⁴Ending the post-period in December 2014 avoids capturing the impact of a later policy reform aimed at simplifying the business registration process. In our sample, prefectures implemented this new policy at different times and the earliest one started in January 2015.

³⁵Barwick et al (2022) conjecture that their estimate is larger than studies from other countries because, in China, simplification of business registration went hand-in-hand with RC reform.

	LI	LC		ULE
	(1)	(2)	(3)) (4)
$T_i \times D_t$	0.336*** (0.113)	0.346*** (0.123)	-0.01 (0.12	.85 -0.0824 20) (0.133)
time FE industry FE industry-time FE	\checkmark	\checkmark \checkmark	\checkmark	\checkmark
Ν	1,115	992	99	1 858

Table 7: Effects of removing RC requirement on firm entry

Note: this table reports the estimated effect of the RC reform on firm entry. The dependent variable is the log-form of firm entries by quarter and industry. Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

procedures. There are several possible explanations. One is that the Guangdong reform was not launched by a legislative change, whereas the 2013CL amendment may have triggered stronger responses from potential entrants. Another possibility is regional heterogeneity between the two provinces. Differences in research design—in their case, staggered introduction with not-yet-reformed prefectures serving as controls, while in ours unaffected firm types serve as controls—may also have contributed to the difference in results. Indeed, in Appendix B, we present an alternative analysis of firm entry based on a Difference-in-Discontinuities approach and obtain a much smaller estimate (6.7%) for the immediate impact of the new policy on firm entry.

Columns 3-4 in Table 7 show that the RC reform did not have significant impacts on the ULEs, suggesting the increase in firm entry did not result merely from substitution away from unincorporated entity forms. In our dataset, we do not observe individual proprietor businesses (*getihu*) that do not assume the entity form. Thus, we cannot rule out the possibility that some of the new entrants we observe would have started businesses as individual proprietors. Even so, the corporate form is presumably markedly superior for such entrants, and incorporation can be viewed as economically positive.³⁶

Figure 7 confirms that the parallel trend assumption largely holds between the treated and control groups in the pre-treatment periods, with a small and noisy increase in the first period before the reform (December).

³⁶As discussed in Cui et al. (2021), the corporate form is potentially more advantageous than individual proprietorship from the perspective of Chinese income taxation. Being able to incorporate may thus further relax entrepreneur's financial constraints.



Figure 7: Dynamic effects of RC reform on firm entries

Note: panel (a) - (b) plot the estimated dynamic effects of the RC reform on the firm entries for LLCs and ULEs. 95% confidence intervals are plotted around the fitted line.

7.2 Investor structure

In this subsection, we investigate differences in the ownership structure of newly registered firms between the pre- and post-reform groups. Ownership structure can potentially help detect financially constrained entrants in several ways. First, such entrants are more likely to be individual-owned, rather than corporation-owned. Second, entrepreneurs may seek to overcome their financial constraints by bring-ing in fellow investors. The RC reform should obviate some entrepreneurs' need for seeking equity financing from others, thereby reducing the presence of multi-shareholder firms.

The taxpayer registration dataset records the shareholdings of each shareholder with their shareholder type, including enterprises, individuals, and other organizations. Table 8 provides the summary statistics for the investor structures of firms formed within a half year before and after the reform. Notably, the average number of investors (column 2) decreased by around 10% after the 2013 CL. There is an approximately 10 pp. increase in the proportion of single-investor businesses, which is entirely driven by individual investors.

Table 9 further tests our predictions by estimating changes in the number of investors, the probability to be wholly owned by one individual, and the average equity contribution per investor after the reform using RDD. Focusing on the linear smooth function, the regression results show that the RC reform leads to a 4.6% decrease in the number of investors, a 5.2 pp. increase in the individual wholly-

	Ν	investor		single investor		majority investor	
		mean	std.	indv.(%)	corp.(%)	indv.(%)	corp.(%)
pre-policy	64,531	2.08	2.17	28.47	3.22	84.98	6.14
post-policy	99,519	1.89	1.80	39.38	2.67	87.49	4.99

Table 8: Investor structure

Note: this table summarizes the investor structure for firms registered within a half-year time span of the policy date. Columns 2 and 3 present the average number and standard deviation for the number of investors. Columns 4 and 5 present the percentage of firms that are wholly owned by individuals and corporations, respectively. Columns 6-7 summarize the percentage of firms that are majority-owned by individuals or corporations.

owned business, and a more than 90% decline in the average equity contribution per investor. Together with the significant increase in total firm entry after the reform, one can conclude that the RC reform especially encouraged entry by one-individual-owned businesses, which were most likely to be constrained by the equity requirement under the previous regime.

	number of investors		individu	individual-owned		average paid-in capital	
	(1)	(2)	(3)	(4)	(5)	(6)	
RD estimate	-0.046*** (0.0085)	-0.035*** (0.0108)	0.052*** (0.011)	0.041^{***} (0.014)	-2.12*** (0.283)	-2.09*** (0.267)	
week FE month-industry FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
prefecture FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
poly. order bw (days) N(effective)	linear 76 49342	quad 107 65239	linear 82 53049	quad 97 61554	linear 35 23738	quad 71 45550	

Table 9: Effect of removing RC requirement on investor structure.

Note: this table reports the estimated effects of 2013 CL reform on the investor structure of newly registered firms. In column (1)-(2) and (5)-(6), dependent variables are in log form. In column (3)-(4), the dependent variable is a binary variable and equals to one if firm is fully owned by one individual. The standard errors clustered by entry date are in parentheses. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. (2014). * p <0.1, ** p <0.05, *** p <0.01.

8 Robustness

8.1 Different bandwidth

In this section, we present RD estimates with a 21-day bandwidth, instead of the optimal bandwidth selected by the algorithm proposed by Calonico et al. (2014), to test the robustness of benchmark results. We choose 21 days as the bandwidth to avoid the Chinese New Year holiday during January 31-February 6 2014. Using firms registered during the holiday season may increase the mean squared error as it increases the estimation bias in the pre-period smooth function.

Table 10 summarizes all the RD results on firm's financial decisions, performance and growth dynamics into three panels. Panel A presents the results for financial characteristics. The RD estimates for assets, total liabilities, and paid-in capital confirm our findings in Table 4. Panel B presents results for the firm's overall performance. All RD coefficients are similar to the benchmark results shown in Table 4 both in terms of magnitude and statistical significance. Panel C confirms most of the benchmark firm dynamic results in Table 6: assets and paid-in capital growths are significantly faster in the post-reform group while revenue growth is indistinguishable between the pre- and post-reform groups. The only exception is that liability growth is insignificantly different in this table, while the benchmark regression suggests that liability growth is slower in the post-reform group. The discrepancy between these two estimates may be attributable to the RDD regression with shorter bandwidth being noisier.

8.2 Placebo Test

As supporting evidence, we use one year before the actual policy date, March 1st, 2013, to run a placebo test and examine whether our results are driven by some time-invariant seasonal patterns, rather than the policy shock. Appendix Figure C.9 presents the RD plot for total assets, paid-in capital, and other outcome variables. Panels (a) and (b) in Figure C.9, for example, show that there are small and noisy increases in the asset and paid-in capital panel around the placebo policy date, in the opposite direction as the benchmark figures. Along with the other panels, they suggest that the drastic jumps shown in the benchmark figures are unlikely to be driven by time-invariant seasonal factors.

Appendix Table D.10 presents the RD results that replicate the benchmark specifications. In Panel A, we do not find significant changes in assets, liabilities, or paidin capitals in the post-placebo group in 2013. Panel B summarizes the RD results for firm performance. Except for revenue, we find no significant changes in firm

	Panel A: fi	Panel A: firm size and financial characteristics					
	assets	liability	paid-in capital				
RD estimate	-0.326***	0.662***	-2.355***				
	(0.101)	(0.409)	(0.372)				
N(effective)	16503	15586	16501				
]	Panel B: firm perf	ormance				
	revenue	profit/revenue	loss-making				
RD estimate	0.021	0.028	-0.025				
	(0.062)	(0.018)	(0.019)				
N(effective)	12072	12072	16503				
		Panel C: firm g	rowth				
	revenue	asset	liability	paid-in capital			
	growth	growth	growth	growth			
RD estimate	0.029	0.087**	0.007	0.228***			
	(0.121)	(0.035)	(0.20)	(0.065)			
N(effective)	14321	14323	14323	14320			

Table 10: Effect of Reform on Business Formation: 21-day Bandwidth

performance. The significant decrease in the firm revenue is puzzling and may be spurious. Panel C presents the test results for firm's growth dynamics. There are no significant discontinuous changes in the firm growth for the post-placebo group.

9 Conclusion

In the last decade, in response to slowing productivity growth (as well as to burnish its international reputation for offering a business-friendly environment), the Chinese government adopted a series of policies to promote "mass entrepreneurship and mass innovation." Whether these new recent policies will turn out to be as effective in stimulating productivity growth as the market liberalizations in the late 1990s (Brandt et al 2012, Jiang et al 2022) is an important question not only for China but for the world economy as a whole. In this paper, we use a large and unique confidential taxpayer dataset to study the most significant recent change to

Note: estimates reported are obtained using a local linear RD estimator with a 21-day bandwidth. Standard errors clustered by entry date are in parentheses. Running variable is the date of firm registration relative to March 1st 2014. Week, month-industry, and prefecture fixed effects are included in all regressions. * p < 0.1, ** p < 0.05, *** p < 0.01.

the regulation of business entry in China, the 2013 amendment of the Company Law. In contrast to entry de-regulations studied in the previous literature, the reform of the registered capital system brought about by 2013 CL not only reduced red tape but also relaxed wealth constraints on potential entrepreneurs and enhanced financial flexibility. Moreover, these latter changes allow specific predictions about firms' financing choices in response.

Using a regression discontinuity design, we confirm a number of theoretical predictions. Firms registered after the reform reported sharply lower equity capital contributions, reflecting two distinct changes: a lower average level of corporate assets to begin with, and greater use of debt financing. Post-reform firms increased their asset size and paid-in capital more rapidly than pre-reform firms, consistent with the newly available option to scale up asset size gradually. Further, among the larger firms, there is evidence of an increase in external borrowing.

In the meantime, we find that on average, firms established post-reform enjoyed the same level of revenue, profitability, and loss-making probably as firms registered under the previous regulatory regime. This implies a significant improvement in capital efficiency. In addition, among the smallest firms, profitability actually increased, providing evidence that productive but wealth-constrained entrepreneurs entered the market after regulatory barriers are removed. We also find evidence that the reform induced greater market entry overall, especially among firms with single owners, although the magnitude of the increase is sensitive to the methods of identification.

Overall, therefore, we find that the de facto abolition of the registered capital system removed several sources of distortion in Chinese firms' financing choices, and made additional entry by very small but highly-productive firms possible. Our results thus complement the findings of Barwick et al. (2022) that the reform of the RC system increased market entry, market competition, and average productivity.

It is worth noting that much recent international commentary on China's economic policies focused on the regulation of large market incumbents among digital platforms and in the real property sector (The Economist, 2022). In contrast, government policies targeted at China's vast population of small firms and start-ups such as entry deregulation and tax cuts (Cui et al., 2021) have received far less attention. This neglect seems unjustified given that the question of whether new entrants or incumbents make greater contributions to productivity growth in an economy like China's remains unsettled. Our study attempts to help correct that neglect.

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Appendix A Anticipation period

Did the 2013 CL amendment affect business formation during the policy anticipation period? The simplest approach to answering this question is to implement an RDD analysis using firms registered within 63 days before and after December 28, 2013 (the anticipation period lasts for 63 days). But the policy announcement date is only three days away from the New Year Holiday and the post-policy period covers the Chinese New Year holiday season, during which nearly all economic activities slow down. Although our analyses exclude all holidays, the remaining observations may still be subject to the holiday spillover effects, which may not be captured by smooth functions or time fixed effects.

To test whether business formation displays a holiday effect, we use firms registered within 63 days before and after December 28, 2012, as a placebo group and examine their characteristics along with those formed during the same time windows a year earlier. Figure A1 confirms our concern: assets and revenue exhibited discontinuous changes around December 28, 2012, with significant declines in the post-"treatment" group. These patterns challenge the identification assumption of the standard RDD analysis. To disentangle the policy announcement effect from seasonal factors, we employ the Differences-in-Discontinuities (Di-RD) approach developed by Grembi et al. (2016).

The idea of the Di-RD approach is to use the previous year's observation as the control group to capture the time-invariant discontinuous changes due to seasonal factors. Consider the following equation for capturing seasoning effects on business formation:

$$y_{its} = \alpha_s + \beta_s D_{it} + f_s(t) + D_{it}g_s(t) + \epsilon_{its}, s \in \{0, 1\}$$

where $D_{it} = 1\{t \ge d_t\}$ and d_t is December 28. $f(t)_s$ and $g(t)_s$ capture the local linear trend of firm characteristics for businesses registered before and after d_t in year s, where s = 1 represents the actual policy announcement year. In addition to the continuity assumption required for standard RDD, we need to assume the seasonal effect is constant over years such that $\beta_1 - \beta_0$ captures the causal effect of policy announcement on the business formation.

Combining the above equation written for each of the treated and control groups into one regression, we obtain:

$$y_{its} = \alpha + \beta D_{it} + f_0(t) + D_{it}g_0(t) + S_i \times (\tau + \gamma D_{it} + f_1(t) + D_{it}g_1(t)) + \phi_w + \phi_{mj} + \phi_r + \epsilon_{ist}$$

where $S_i = 1$ for firms registered around the 2013 CL announcement. β captures

the discontinuous changes in firm characteristics due to holiday effects. γ is the coefficient of interest, capturing the additional changes in the firm characteristics caused by policy announcement. We control for week-of-the-day, month-industry, and region fixed effects in the regression.

Table A2 presents regression results for firm characteristic changes in response to the policy announcement. Panel A suggests that after controlling for holiday effects, the policy announcement has insignificant impacts on the firm's financial characteristics, rejecting the hypothesis that a significant number of small firms chose to delay business registration until the policy effective date. Panel B shows that policy announcement does not have any impact on the firm performance either. Overall, therefore, there is no compelling evidence that the business formation process changed during the policy anticipation period.

Table A1: Effect of policy announcement on business formation

γ	asset -0.041 (0.090)	paid-in capital -0.078 (0.157)	liability -0.158 (0.300)				
FEs N(effective)	week, m 49346	week, month-industry, prefe 49346 49344 4					
Panel B: firm performance							
	revenue	profit/revenue	loss-making				

0.016

(0.133)

34939

 γ

FEs

N(effective)

Panel A: financial characteristics

Note: This table reports the Di-RD estimates of the effect of the 2013CL policy announcement on
business formation. Estimates reported are obtained using a local linear RD estimator. The bandwidth
is chosen on 63 days. Standard errors clustered by business formation date are in parentheses. * p
<0.1, ** p <0.05, *** p <0.01.

-0.021

(0.025)

34941

week, month-industry, prefecture

0.007

(0.021)

45427



Figure A1: The effect of policy announcement on financial characteristics.

(c) paid-in capital

Note: panel (a)-(c) presents the average asset, liability, and paid-in capital in 2013 (2014) by business formation date in a 63-day bandwidth around December 28 of 2012 (2013). 95% confidence intervals are plotted around the scatter plot.



Figure A2: The effect of policy announcement on firm performance.

(c) loss-making probability

Note: panel (a)-(c) presents the average business revenue, profitability, and loss-making probability in 2013 (2014) by business formation date in a 63-day bandwidth around December 28 of 2012 (2013). 95% confidence intervals are plotted around the scatter plot.

Appendix B Di-RD Analysis of Firm Entry

In this section, we employ the Di-RD approach to estimate the effect of RC reform on firm entry. Ideally, we would want to implement the benchmark RDD exercises on the total number of firm entries by industry, prefecture, and date. However, business formation exhibits strong cyclical patterns, as shown in Figure C.4. Moreover, as Figure A3a showed, firm entries exhibit a discontinuous jump around March 1st, 2013 as a placebo policy date. To disentangle the causal effects of policy shocks from seasonal factors, we implement the Difference-in-Discontinuities (Di-RD) approach discussed in Appendix A. The Di-RD approach uses the previous year's observations to capture the time-invariant seasonal effects on business entry. After controlling for the seasonal changes, any additional discrete changes around the policy date can be attributed to the policy effects. The regression specification is as follows:

$$y_{it} = \alpha_0 + \beta_0 D_{it} + f_0(t) + D_{it} g_0(t) + S_t \times (\alpha_1 + \beta_1 D_{it} + f_1(t) + D_{it} g_1(t)) + \phi_w + \phi_{mj} + \phi_r + \epsilon_{it}$$

The subscript j, r, and t denote for industry, region, and date. $D_{it} = 1\{t \ge d_t\}$ and d_t is March 1st. S_{it} is an indicator for firms registered around the policy date. β_0 captures the discontinuous changes in firm characteristics due to holiday effects. β_1 is the coefficient of interest, capturing the additional changes in the firm characteristics caused by the policy shock. We continue to control for week-of-the-day, month-industry, and region-fixed effects. In addition, we divide firms into two groups based on their registered employees and analyze firm entries for each group.

Table A2 presents the aggregate firm entry results by firm-size group. We find the RC reform leads to a 6.7% increase in the firm entry. Splitting by firm size group, we find that firms with more than 8 employees experienced 3.8% increases in the number of firm entries, while firms with 0-8 registered employees did not respond significantly to the policy shock.



Figure A3: Effect of removing RC requirement on firm performance.

Note: the left and right panels plot the total number of firm registries, number of firms with less than 9 employees, and number of firms with more than 8 employees by business formation date in a halfyear bandwidth around the policy effective date in 2013 and 2014, respectively. The fitted line on both side are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.

	all	0-8	> 8
β_1	0.067*	0.054	0.038**
	(0.038)	(0.041)	(0.019)
FEs	week, m	onth-indu	istry, prefecture
BW	90	90	90
N(effective)	50,525	41,173	21,634

Table A2: Effect of policy announcement on business formation

Note: this table reports the differences-in-discontinuity estimates of the effect of 2013CL policy announcement on business formation. Estimates reported are obtained using a local linear RD estimator. Standard errors clustered by business formation date are in parentheses. * p <0.1, ** p <0.05, *** p <0.01.

Appendix C Figures



Figure C.1: Searching intensity

Note: this figure plots the Baidu search intensity for the key words: Registered Capital (blue), and New Company Law (green). The time period covers from March 1st, 2013 to March 1st, 2015.

Figure C.2: Daily average registered capital during Chinese New Year



Note: panel (a) and (b) plot the daily average log-form of registered capital in the first quarter of 2012 and 2013, respectively. The dashed lines in panels (a) and (b) correspond to the start of the Chinese New Year holiday and 14 days afterward.



Figure C.3: Daily firm registration around policy effective date

Note: This figure plots the daily number of business registrations for LLCs and all other types of business from January 1st to April 30th, 2014. The left and right y-axes correspond to the number of LLCs and other businesses, respectively. The dashed vertical line refers to the 2013CL effective date. Other types of business include unlimited liability companies and partnerships.



Figure C.4: Monthly firm registrations from 2010 to 2016

Note: this figure plots the monthly number of business registrations for LLCs and all types of business from January 2010 to December 2016. The dashed vertical line refers to the 2013CL effective date.



Figure C.5: The effect of policy announcement on firm equities.

Note: panels (a)-(b) present the average growth in total equity and retained earnings by business formation date in the half year bandwidth around policy date. The fitted line on both sides are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the scatter plot.



Figure C.6: The effect of policy announcement on firm characteristics: small vs large firms.

Note: panels (a)-(c) present the average number of shareholders, paid-in capital per shareholder, and percentage of individual-owned firms by business formation date in the half year bandwidth around policy date. The fitted line on both sides are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the scatter plot.



Figure C.7: The effect of policy announcement on the firm characteristics: small vs large firms.

(e) loss-making probability: small firms (f) loss-making probability: large firms

Note: panels (a)-(c) present the average number of shareholders, paid-in capital per shareholder, and percentage of individual-owned firms by business formation date in the half year bandwidth around policy date. The fitted line on both sides are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the scatter plot.



Figure C.8: The effect of policy announcement on the investor structure.

Note: panels (a)-(c) present the average number of shareholders, paid-in capital per shareholder, and percentage of individual-owned firms by business formation date in the half-year bandwidth around policy date. The fitted lines on both sides are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the scatter plot.



Figure C.9: Effect of removing RC requirement on firm characteristics: placebo test I.

Note: panel (a)-(e) plot the average assets, liability, paid-in capital, monthly revenue, profitability, and loss-making probability in 2013 by business formation date in a half-year bandwidth around the placebo policy date. Panel (f)-(h) plot the growth in monthly revenue, total asset, and paid-in capital in 2014. The average monthly revenue is computed as the annual revenue divided by the number of months operated during 2013. The fitted line on both side are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.





Note: panel (a)-(d) plot the growth in monthly revenue, total asset, and paid-in capital in 2014. The average monthly revenue is computed as the annual revenue divided by the number of months operated during 2013. The fitted line on both side are separately estimated with a local quadratic regression. 95% confidence intervals are plotted around the fitted line.

Appendix D Tables

Ν	p10	p50	p90	mean	SD
119,052	11.51	13.60	15.89	13.65	1.61
125,006	10.31	13.12	15.42	12.34	3.73
125,006	10.89	13.18	15.42	13.14	2.18
120,638	11.51	13.82	16.12	13.86	1.53
121,014	0	11.40	14.51	7.65	6.55
121,014	8.49	12.58	14.94	12.07	2.67
129,278	12.21	13.82	16.12	14.04	1.59
130,172	0	0	14.51	6.09	6.60
130,172	8.16	12.14	144.93	11.84	2.75
145,556	12.21	13.82	16.12	14.04	1.90
138,665	0	0	13.88	5.02	6.41
138,669	8.39	12.06	14.84	11.83	2.64
	N 119,052 125,006 125,006 120,638 121,014 121,014 121,014 129,278 130,172 130,172 130,172 145,556 138,665 138,669	Np10119,05211.51125,00610.31125,00610.31125,00610.89120,63811.51121,0140121,0148.49129,27812.21130,1720130,1728.16145,55612.21138,6650138,6698.39	N p10 p50 119,052 11.51 13.60 125,006 10.31 13.12 125,006 10.89 13.18 120,638 11.51 13.82 121,014 0 11.40 121,014 0 12.58 129,278 12.21 13.82 130,172 0 0 130,172 0 0 130,172 0 0 138,665 0 0 138,665 0 0 138,665 0 0	Np10p50p90119,05211.5113.6015.89125,00610.3113.1215.42125,00610.8913.1815.42120,63811.5113.8216.12121,014011.4014.51121,0140014.51130,1720014.51130,1728.1612.14144.93145,55612.2113.8216.12138,6650013.88138,6698.3912.0614.84	Np10p50p90mean119,05211.5113.6015.8913.65125,00610.3113.1215.4212.34125,00610.8913.1815.4213.14120,63811.5113.8216.1213.86121,014011.4014.517.65121,014012.5814.9412.07129,27812.2113.8216.1214.04130,1720014.516.09130,1720014.5111.84145,55612.2113.8216.1214.04138,6650013.885.02138,6698.3912.0614.8411.83

Table D.1: Summary statistic	: Summary statistics
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Note: this table presents the summary statistics for registered capital, paid-in capital, and total asset for firms registered one year before the effective date of 2013 CL, 9 months after the effective date of 2013 CL in 2014, in 2015, and 2016. Before taking log formation, registered capital and paid-in capital are added by one to include zero-valued observations.

	2014		2015		2016	
	Ν	zero-value	Ν	zero-value	Ν	zero-value
Sept, 2013-Feb, 2014	55,321	7.13%	51,425	7.17%	49,331	7.32%
March, 2014-Aug, 2014	84,361	39.99%	84,231	39.76%	81,866	39.24%

Table D.2: Percentage of firms with zero-valued paid-in capital

Note: This table presents the percentage of observations each year from 2014 to 2016 with zero-valued paid-in capital, for firms registered within half-year around the policy effective date.

Table D.3: Percentage of firms with positive RC and paid-in capital gap

	Total Number	2013	2014	2015	2016
Sept,2013-Oct,2013	17,382	21.60%	19.99%	19.84%	21.36%
Nov,2013-Dec,2013	16,661	23.73%	22.56%	22.03%	23.39%
Jan,2014-Feb,2014	16,442		26.66%	26.50%	27.00%
Mar,2014-Apr,2014	30,495		60.68%	59.18%	58.75%

Note: this table presents the percentage of observations with positive gap between declared RC and paid-in capital for firms registered in the corresponding time period. It summarizes this statistics for four different time periods: two months before the news release, time in between the news release and policy announcement, anticipation period, and two months after the reform.

	pre-reform group			post-reform group		
	N	mean	std	N	mean	std
Panel A: asset categories						
liquid asset/asset	52,100	0.925	0.193	83,769	0.922	0.207
cash/asset	52,100	0.502	0.725	83,769	0.546	0.422
liquid asset only	52,100	0.602		83,769	0.696	
Panel B: liability categories						
short-term liability/liability	36,634	0.989	0.108	63,342	0.993	0.106
pr(long-term liability)	36,634	0.006		63,342	0.003	

Table D.4: Summary statistics of assets and liabilities

Note: the pre-policy observations include firms registered within six months before March 1st, 2014. The post-policy observations include firms registered within half year after March 1st 2014. The third row reports the percentage of firms that only have liquid assets.

	liquid_assets		fixed	assets	other_assets		
RD estimate	-0.421*** (0.076)	-0.352*** (0.083)	-0.077 (0.138)	0.078 (0.167)	-0.044* (0.027)	-0.051* (0.030)	
bandwidth N(effective)	49 35141	86 55853	56 35694	79 50730	75 49160	116 74351	
	cash		account	receivable	inventory		
RD estimate	-0.276*** (0.100)	-0.240** (0.098)	-0.142 (0.123)	0.045 (0.172)	-0.107 (0.153)	-0.119 (0.166)	
bandwidth	51	107	75	84	76	141	
N(effective)	41170	68667	48492	54136	50537	90133	
FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
month-industry FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	
prefecture FE	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	\checkmark	

Table D.5: Effect of removing RC requirement on business formation: asset decomposition

Note: this table reports the estimated effects of the RC reform on various categories of newly registered firms' assets. The running variable is the date of firm registration relative to March 1st, 2014. Estimates reported are obtained using a local linear RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01. Note that the decline in cash does not fully explain the decline in total liquid assets. There may be changes in other liquid asset categories, e.g. liquid financial assets, unobserved in our data.

	short-ter	m liability	account	payable
RD estimate	0.914^{***} (0.170)	0.854^{***} (0.173)	0.065 (0.107)	0.193 (0.135)
week FE month-industry FE prefecture FE	\checkmark	\checkmark	$\checkmark \\ \checkmark \\ \checkmark$	\checkmark
bandwidth	51	116	71	77
N(effective)	36932	75356	46655	50537

Table D.6: Effect of removing RC requirement on business formation: liability decomposition

Note: this table reports the estimated effects of 2013 CL reform on the newly registered firms' liability categories. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

Panel A: fina	ncial charac	teristic				
	as	set	1	iability	paid-in	capital
	2015	2016	2015	2016	2015	2016
RD estimate	-0.264***	-0.191***	0.453***	0.222***	-2.052***	-2.036***
	(0.058)	(0.052)	(0.195)	(0.147)	(0.294)	(0.214)
BW(days)	40	41	40	65	39	40
N(effective)	25296	21908	33314	31731	23698	21904
Panel B: firm	performan	ce				
	reve	enue	prof	it/revenue	loss-m	naking
	2015	2016	2015	2016	2015	2016
RD estimate	-0.038	0.085	0.005	0.006	0.003	-0.013
	(0.055)	(0.061)	(0.01)	(0.01)	(0.012)	(0.014)
BW(days)	54	39	88	108	70	60
N(effective)	27843	18466	39476	46254	40178	32734
Panel C: firm	growth					
	revenue	asset	liability	paid-in capital		
	growth	growth	growth	growth		
RD estimate	0.068	0.045**	-0.064	0.181***		
	(0.114)	(0.021)	(0.12)	(0.027)		
BW(days)	94	88	124	85		
N(effective)	43711	41656	58227	39719		

Table D.7: Effect of removing RC requirement on business formation: 2015-2016

Note: this table reports the estimated effects of 2013 CL reform on the newly registered firms' characteristics during 2015-2016. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.

	equ	equity retained earning		
RD estimate	0.124^{***}	0.120^{***}	0.009	0.007
	(0.021)	(0.024)	(0.063)	(0.073)
week FE month-industry FE prefecture FE	\checkmark \checkmark	$\checkmark \\ \checkmark \\ \checkmark$	\checkmark	\checkmark \checkmark
poly. order	linear	quad	linear	quad
BW(days)	53	83	56	94
N(effective)	24815	21908	33829	52274

Table D.8: Effect of removing RC requirement on firm growth: equity and retained earnings

Note: this table reports the estimated effects of 2013 CL reform on the growth of total equity and retained earnings. Columns (1)-(2) take the first difference of log form of total equity. Columns (3)-(4) take the percentage change in the retained earnings. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear (quadratic) RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p <0.1, ** p <0.05, *** p <0.01.

	liquid_assets growth		fixed. gro	fixed_assets growth		assets wth	
RD estimate	0.112*** (0.024)	0.112*** (0.032)	-0.017 (0.065)	-0.024 (0.066)	0.011 (0.020)	0.0147 (0.022)	
bandwidth	54	86	66	111	78	128	
N(effective)	34950	43596	38436	62101	43751	70937	
	cash growth		account i gro	account receivable growth		inventory growth	
RD estimate	0.110*** (0.036)	0.083^{**} (0.048)	0.006 (0.82)	-0.029 (0.095)	0.094 (0.082)	0.096 (0.10)	
bandwidth	80	105	73	109	75	131	
N(effective)	45280	61231	41688	60804	43128	73334c	
FE month-industry FE prefecture FE	\checkmark \checkmark	√ √ √	\checkmark	\checkmark \checkmark \checkmark	$\checkmark \\ \checkmark \\ \checkmark$	\checkmark \checkmark \checkmark	

Table D.9: Effect of removing RC requirement on business formation: asset growth decomposition

Note: this table reports the estimated effects of 2013 CL reform on the newly registered firms' asset categories. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p<0.1, ** p<0.05, *** p<0.01.

Panel A: financial decisions				
	assets	liability	paid-in capital	
RD estimate	-0.011 (0.052)	-0.277 (0.180)	0.099 (0.085)	
BW(days)	78	56	76	
N(effective)	38857	30608	38166	
Panel B: firm performance				
	revenue	profit/revenue	loss-making	
RD estimate	-0.128*	0.0024	-0.015	
	(0.066)	(0.011)	(0.012)	
BW(days)	51	67	77	
N(effective)	12072	23145	38715	
Panel C: firm growth				
	revenue	asset	liability	paid-in capital
	growth	growth	growth	growth
RD estimate	-0.033	-0.016	-0.065	0.068
	(0.134)	(0.023)	(0.125)	(0.042)
BW(days)	61	86	68	55
N(effective)	28274	36417	29940	27507

Table D.10: Effect of policy announcement on business formation: placebo test

Note: this table reports the estimated effects of the placebo 2013 CL reform on the firm characteristic. Running variable is the date of firm registration relative to March 1st 2014. Estimates reported are obtained using a local linear RD estimator with bandwidth selection as per Calonico et al. (2014). Standard errors clustered by entry date are in parentheses. * p < 0.1, ** p < 0.05, *** p < 0.01.