

Relaxing credit constraints: Credit risk, financial intermediation quality, and environmental impact

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ABSTRACT

This paper studies the effect of credit supply shock, exploiting a quasi-experimental setting generated by a regulatory change to the priority sector lending (PSL) affecting manufacturing sector in India. Comparing profiles of firms around the cutoff of PSL eligibility, we find a substantial local effect on firm's liabilities and credit risk. The credit supply shock is targeting firms with better economic outlook (higher sales and profitability growth, higher credit rating) and commonly considered financially constrained (private and younger) suggesting that the mandated credit expansion does not compromise the intermediation quality of banking sector.

Furthermore, we find that relaxing financial constraints in firms, which operate in industries with high environmental impact and susceptible to climate change, can be potentially used as a policy tool toward lowering their environmental impact. We find that such firms adopt cost minimizing, energy-fuel-and-water-efficient processes and shift toward the less socially costly technologies.

JEL Codes: D22, G28

Keywords: Credit risk, SME credit constraints, banking regulation, environmental impact.

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1 Introduction

“ Across all stages of their life cycle, SMEs require access to appropriate sources of financing for their creation, survival and growth. Although SME access to bank finance largely recovered after the financial crisis, market failures and structural challenges remain, including information asymmetries, high transaction costs in servicing SMEs, and lack of financial skills and knowledge among small business owners.” - OECD discussion paper, SME Ministerial Conference, 22-23 February 2018, Mexico City.

A long-standing tradition in aiding economic growth includes boosting prospects of small and medium enterprises (SMEs). The idea is popular among many international governments, which intervene in credit markets to warrant a credit flow to this poorly funded (International Finance Corporation (2017)) sector of the economy. For example, in the US, the loans under the Small Business Administration benefit from low down payments and long payment terms. In the EU, the European Investment bank provides small business lenders with portfolio guarantees and securitization instruments. In India, the Reserve Bank of India (RBI) put in place a priority sector lending (PSL) program that mandates a large portion of bank lending portfolio to a priority sector, which includes small businesses.

Although the benefits of policies relaxing financial constraints of SMEs appear substantial, the subsidies and credit market “policy nudges” come with their own perils. Proponents of credit market interventions argue that a market failure in SMEs credit access warrants a policy intervention. It is well known that from the lender’s perspective SMEs are small hence less profitable, and opaque hence more risky. This explains why banks may be unenthusiastic in lending to SMEs.¹ This is supported by the International Finance Corporation (2017) stating that globally 41% of SMEs face some form of financial constrain with the finance gap reaching 55%. Also, relaxing financial constraints stimulates investment into value-increasing projects (Denis and Sibilkov (2009), Lemmon and Roberts (2010), or Almeida and Campello (2007)), in innovative projects (Hottenrott and Peters (2012)), and in environmentally innovative projects (Horbach (2008), or Hoogendoorn et al. (2015)). Moreover, Krishnan et al. (2014) estimates that relaxing financial constraints increases SMEs total factor productivity.

¹In many international markets, the stock market, even though relatively developed, remains still an inadequate source of financing for small businesses (for example The Economist (2008)).

Opponents of interventions in credit markets argue that these have consistently proved to be ill-guided and create inefficient capital allocation in the economy (BERTRAND et al. (2007), The Economist (2008)). Add to that the fact that historically subsidized loans have a high tendency to turn bad (The Economist (2008), Kanz (2016) provides evidence in the household credit market), and the idea of a policy intervention that may further worsen the bank’s loan portfolio does not look very appealing. Moreover, interventions in SMEs credit markets can create a disincentive to grow as firms avoid being stripped from their SME subsidies (Mohan (2002), Martin et al. (2017), and Bhue et al. (2016)). They can also motivate banks to crowd out the smaller, more financially starved PSL borrowers in favor of the larger PSL borrowers (Kale (2017)).

Interestingly, there is actually very little empirical evidence on consequences of interventions specific to financial intermediation quality, firm credit risk, and environmental risks. This paper fills this gap in literature by exploiting a quasi-experimental setting generated by a 2015 regulatory change to the PSL program in India. The regulatory change made a new, narrow set of medium-sized (from INR 50 to 100 million firm size) manufacturing firms suddenly eligible for the PSL lending program. Since the regulatory change was largely unexpected and no other “policy nudges” took place at the same time affecting credit markets of medium-sized manufacturing firms, it created a sharp discontinuity in firm credit availability.

We exploit this setting by comparing otherwise almost identical firms, which face different levels of credit availability. The otherwise identical firms above the PSL eligibility cutoff retain their pre-2015 lending environment. However, firms right below the PSL eligibility cutoff receive a positive shock to firm credit availability as they become eligible for a program mandating banks to commit a 40 % of their commercial lending activity to the PSL sector. Alternative ways to meet bank’s PSL target exist but they are either limited to a particular asset class or costly, which ultimately makes the PSL target of 40% binding among most of the banks (Banerjee and Duflo (2014)).

In view of this, we follow the standard regression discontinuity (RD) design, we analyze balance sheet data from a comprehensive data set on the Indian economy. We confirm that the relaxing financial constraints resulting from the regulatory change differentially increased the firm borrowing behavior at the PSL cutoff. Next, using a matched data on credit ratings from one of the top three credit rating agencies in India, we show a deterioration in the credit

rating associated with the relaxing of financial constraints. On the first sight, our results seem to confirm the worries of opponents of credit market interventions, since we uncover an overall local deterioration in credit quality in the affected firms. However, this relationship is more complex with evidence of simultaneous lower credit risk measured by two-year default rates.

It is not immediately clear why should credit rating decrease while simultaneously credit risk decreases. This points us in the direction of financial intermediation quality. We peel the layers of this complex relationship between relaxing financial constraints and credit risk by studying if banks by relaxing their credit supply, relax their lending policies as well. In general, the idea behind PSL is that banks presented with equally profitable opportunities, choose the one eligible for PSL program (Ananth and Mor (2012)). In practice, banks can decide to lend more liberally to the PSL sector to avoid penalties related to a missed PSL target. First, we show that among firms eligible for PSL program, banks tend to shift their lending to firms with better credit rating (A- to A+) at the expense of firms with lower credit rating (B- to B+). Second, we find evidence of greater credit supply to firms with good economic outlook (high sales and profitability growth), but no significant change in credit supply to firms with bad economic outlook. Moreover, banks choose to lend to firms traditionally considered as more financially constrained (private and young) at the expense of less financially constrained firms (public). This increase in borrowing is matched by no response on credit rating side. To the contrary, it is the firms deprived of banks relaxed credit supply are the firms, which respond with lower credit rating. In particular, we find evidence of lower credit rating among firms with bad economic outlook (low sales and profitability growth) and less financially constrained (private and old). Overall, our results point toward good financial intermediation quality and that the overall deterioration of credit rating among PSL eligible firms is related to their ability to benefit from the relaxed credit constrains as opposed to more liberal lending policies of the banks.

Next, comparing the cost of debt for firms marginally below the PSL cutoff to those marginally above the cutoff, we find no evidence that the cost of debt is lower for PSL firms. This result points in the direction that the firms newly eligible for PSL are financially constrained and that the PSL program relaxed those constraints allowing them to pursue profitable (but not more risky) opportunities. We also find evidence of substitution effect between bank credit and non-bank credit, which means that the firms newly eligible for PSL prefer to borrow from

banks.

Furthermore, we find evidence that following the PSL reform, banks choose to fill their PSL targets by lending to new borrowers (intensive margin) as opposed to extending larger loans to the existing borrowers (extensive margin). In addition, we show that banks do not substitute their existing small borrowers (firm size below INR 50 million) with the larger, newly eligible firms (firm size from 50 to 100 million INR). Both observations suggest that this particular credit market intervention was able to unlock new profitable projects in firms financially constrained prior to the policy change, without depriving other parts of the economy of the access to finance.

Shifting our attention to the environmental risks, we find that banks extend more credit to firms in industries with high environmental impact. This additional liquidity is used toward reducing their environmental risks and lowering their environmental impact. In particular, firms, which operate in industries with high environmental impact, reduce their power, fuel, and water consumption (as captured by the power, fuel, and water charges). This result indicates a move toward more energy and resource efficient production processes. At the same time, we observe a move towards more expensive packaging, which might signal a more sustainable packaging, which at the same time tends to be the more expensive packaging option.

The paper relates to several different strands of the extant literature. First, we contribute to the literature on efficiency of asset allocation following policy interventions in credit markets. So far, the evidence on the effectiveness of the policy interventions on the asset allocation is mixed. For instance (Agarwal et al., 2017) cite an example of an intervention that was largely successful. They examine the efficacy Home Affordable Modification Program (HAMP) which incentivized lenders to renegotiate mortgages. They find that this program, although reaching just one-third of its targeted indebted households, was associated with a lower rate of foreclosures, consumer debt delinquencies and house price declines. (Campello and Larrain, 2016) find that when reforms in Eastern Europe made secured debt transactions more flexible by allowing movable assets to be considered as collateral, firms with more movable assets borrowed, invested and hired more. These firms also became more efficient and profitable, and increased their share of fixed assets.

On the other hand, (Cole, 2009) examine the nationalization of large private Indian banks. They find that nationalization leads to lower interest rates and lower-quality intermediation with no impact on the real economy. (Vig, 2014) provide yet another example of capital miss-

allocation in credit markets. They find that firm response to strengthening of creditor rights was to decrease debt and asset growth while increasing in liquidity hoarding. Our paper contributes to this strand of literature by providing a comprehensive picture of an impact a credit market intervention on asset allocation to SMEs. We uncover a good financial intermediation quality. In particular, the PSL program stimulated banks to channel assets toward the firms with better economic outlook and those considered financially constrained, which potentially unlocks profitable projects in the economy. Moreover, we show that the driving force behind the at first glance discouraging results are bad quality borrowers that are not targeted directly by the policy intervention.

Second, our results shed light on the impact of relaxing credit constraints on SMEs credit risk, financial intermediation quality and firm environmental risks. It is well known that as compared to big firms, small businesses face considerable difficulty in obtaining credit, and are far more vulnerable to economic downturns. There are strong efforts by the governments in many countries to boost bank lending to small businesses. However, the empirical evidence on the effectiveness of those efforts is mixed. On the one hand, Banerjee and Duflo (2014) find no evidence that directed credit is being used as a cheaper substitute. Instead, the credit being used to finance more production leads them to conclude that many firms were credit constrained. On the other hand, Bhue et al. (2016) find that small-firm lending mandates inhibit firm growth. They report that firms, which became newly eligible for directed lending showed slow investment, sales and power consumption. We contribute to this literature with an analysis of credit risk and financial intermediation responses in a unique quasi-experimental setting.

Third, we study the impact of relaxing credit constraints on the environmental risks. Previous literature including Ghisetti et al. (2016) show direct negative effects of financial barriers on investments related to environmental innovation. Ekholm et al. (2013) study the effect of capital supply constraints on long horizon energy scenarios for Sub-Saharan Africa with a specific focus on the power sector. In particular, their results show that limited capital supply decreases investments to capital-intensive zero-emission technologies. Consequently, the emission price required to meet given emission targets is considerably increased. We add to this literature by providing casual effect of relaxing financial constraints on firm decision to pursue a power, fuel, and water efficient production processes.

Lastly, we contribute to the growing academic literature on Indian credit market. India's frequent regulatory changes and policy experiments make it a perfect ground to study effects of financial and economic phenomena. Among the papers already mentioned earlier, (Cole, 2009), (Lilienfeld-Toal et al., 2012), (Allen et al., 2012), (Vig, 2014), (Banerjee and Duflo, 2014), (Gopalan et al., 2016), (Bhue et al., 2016), (Martin et al., 2017), (Liberti et al., 2017), (Kale, 2017), (Tantri, 2018) are all papers that actively research the Indian credit market.

The remainder of the paper is organized as follows: in the next Section, we lay out the details of the PSL program in India. In Section 3 we discuss the unique matched dataset encompassing firm financials and credit risk items and we present our research design. The implication of the credit market intervention are covered in Section 4. We discuss there the relaxing of financial constraints, the impact on credit rating and credit risk, the significance for the financial intermediation quality, and finally the impact on environmental risks. Section 5 offers concluding remarks.

2 Institutional background

The Priority Sector Lending (PSL) in India was formalized in 1972. The implementation followed in 1974, when banks were given five years to raise their share of priority sector in their advances to 33% (Chakrabarty (2012)). Since then, numerous changes and reforms of the PSL program followed. In this paper, we focus on a particular regulatory change in April 2015 that affected lending to *medium sized manufacturing firms* done by commercial banks. The regulatory change involves the fact that, until 2015 loans to *micro* and *small* manufacturing enterprises were eligible for PSL program, but loans to *medium* sized manufacturing firms (with investment in plant and machinery between 50 and 100 million INR) were not. In April 2015, the PSL cutoff was raised suddenly to INR 100 million including the medium sized firms and generating a quasi-natural experiment for our research. While there have been instances of PSL cutoff changes in the past, the magnitude of this change, and the timing make it a significant yet unanticipated event. Figure 1 shows the variation with time of PSL cutoff on firm size for our sample window.

Our empirical identification relies on the fact that not all firms are eligible for the PSL program. In particular, with the 2015 PSL reform coming into effect, a firm with (the origi-

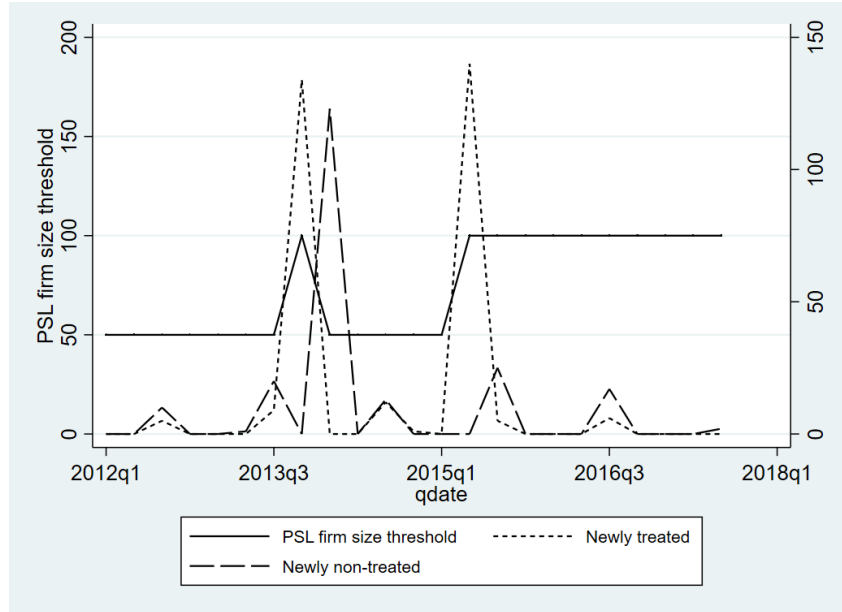


Figure 1: Number of newly eligible firms and newly ineligible firms. The figure presents a number of firms that become newly eligible for Priority Sector Lending (PSL), number of firms that become newly ineligible for the PSL (left axis), and the time-varying eligibility cutoff with respect to the firm size (right axis).

nal value of) investment in plant and machinery in the neighborhood of the INR 100 million cutoff, is eligible for PSL program depending on whether such investment is marginally above or marginally below the 100 million cutoff. This naturally yields us two groups of enterprises which should otherwise be very similar but only differ in their eligibility for PSL program.

One more rule that was formalized in 2015, which relates to eligibility criteria for PSL program. It states that firms can avail themselves of their PSL status up to three years after they grow beyond the size limit that qualifies them for PSL program. The rationale behind this rule is to remove the disincentive for firms to grow because they enjoy PSL status should they remain below the cutoff. ²

An implication of a firm becoming eligible for PSL program is that this eligibility can be considered as a shock to firm’s credit availability. Banks are expected to give priority to the PSL loans while choosing amongst equally profitable opportunities (Ananth and Mor (2012)), for “the greater national interest.” Some banks embed such priority rules into their internal

²In the year 2015, few additional changes were made to PSL regulation. For example, the distinction between direct and indirect lending to agriculture was removed. Foreign banks with more than 20 branches were asked to gradually move towards same PSL target as domestic commercial banks. Trading in PSL certificates was allowed. Sub-sub-targets were introduced for some sectors e.g out of 18% net credit to agricultural sector, 8% to be lent to small and marginal farmers. Banks were to calculate their net credit on a quarterly basis rather than on an annual basis. However, none of those additional changes influences our analysis, as they do not concern the INR 100 million cutoff for manufacturing firms.

lending policies. For example, Oriental Bank of Commerce India devised procedures that the denial of a PSL loan can be taken only by a next higher sanctioning authority (O.B.C. India (2015)).

Moreover, current PSL regulation stimulates the PSL lending in a formal way through PSL targets. The target is set at 40% of Adjusted Net Bank Credit (ANBC) or credit equivalent amount of Off-Balance Sheet Exposure, whichever is higher, and any advances by domestic commercial banks to medium-sized manufacturing firms from INR 50 to 100 million contribute to the bank's PSL target.

Alternative ways to meet bank's PSL target exist but they are either limited to a particular asset class or costly. For example, to make up for the shortfall in its PSL target, bank can decide to buy PSL certificates (which are issued by banks who have excess PSL), or finance trades receivables on the TReDS platform. In the second case, banks can enroll themselves on this online exchange and provide finance to fulfill any registered firm's working capital needs, via the platform. This qualifies as PSL.

If the bank is still unable to meet its PSL target, it is mandated to lend the shortfall amount to government organizations such as NABARD, SIDBI, MUDRA etc. which cater to rural development or help small businesses. The interest rate on these contributions is usually quite low and set by RBI. This is why a bank may look at this as the last resort to fill their PSL target, since lending to PSL eligible firms is priced at market prices. Moreover, failure to meet the PSL target weights on granting regulatory clearances and approvals by RBI. Banerjee and Duflo (2014) reports that in the early 2000s the 40% PSL target was binding among most of the banks.

3 Data and Methodology

3.1 Data

The first part of the data comes from Credit Rating Information Services of India Limited (CRISIL). CRISIL is among the top three rating agencies in India with \$ 1.3 billion in evaluated Indian debt securities, which covers 90% of India's banking industry. We begin with all manufacturing firms³ with a CRISIL credit rating from 2012q1 through 2017q3. From CRISIL

³We classify a firm to belong to manufacturing industry if its NIC code falls between 10000 and 34999.

we observe history of rating changes, in particular rating type, outstanding credit rating, credit rating on bank loans, last rating action date, rating action, and previous rating. In any quarter, we observe between \$ 243 million and \$ 1,2 billion in bank lending activity.⁴ We only analyze observations with Long Term credit rating type.

We transform the CRISIL history of rating changes into firm-quarter observations in the following way. For each observation with a Long Term credit rating, we identify the quarter in which the rating action takes place. If two rating actions take place during the same quarter, we keep the most recent rating action. This creates a firm-quarter data point in quarters of the rating action. If a firm is observed in multiple quarters, but its credit rating does not change every quarter, we fill the panel gaps with the latest observed credit rating. In the next step, we recode the credit rating grade into a numeric value with the lowest rating (default (D)) taking value of 2 to the best credit rating (AAA+) taking value of 9.5.⁵ The increment between two rating grades is equal to one and a “+” sign raises the value numerical value assigned to the rating grade by 0.5. Sometimes the credit rating spans more two or more rating grades, i.e. rating grade “AA / AAA” spans grades AA and AAA. In this case, we classify this observation according to the best grade mentioned (AAA from the example above).⁶ For details on recoding rating grades into numeric values please refer to Appendix A.

The second part of the data comes from Prowess - CMIE, a large database of Indian firms, which covers 100% of the manufacturing firms with CRISIL credit rating. Prowess provides detailed information on firm’s balance sheet items containing detailed modules on assets, and liabilities. To merge the CRISIL credit ratings with Prowess - CMIE, we use the Corporate Identity Number (CIN) which is a unique code given to all companies registered by Registrar of Companies (ROC) in India.

We impose an additional filter, namely we require a non-missing value of the gross value of plant and machinery. This data item is essential in determining our forcing variable, which is the *firm size* as defined by the MSMED Act 2006. The firm size is defined as the investment in plant and machinery minus certain costs as defined in the S.O.1722 (E) Notification issued under MSMED Act 2006. Here, we follow the MSMED Act 2006 as close as possible and we

⁴Exchange rate as of 28. August 2018.

⁵The value of 1 represents the rating suspension. Since the reason of rating suspension is unclear from the data, we drop the observations for which the rating was suspended.

⁶Our results are robust to changes in this classification, i.e. to classifying the observations according to the worst grade mentioned.

Table 1: Summary statistics. We use a CRISIL credit rating sample with a link to the CMIE data. In columns (1)-(3) we present statistics for a sample of firms within the INR ± 70 million of the PSL eligibility cutoff. In columns (4)-(6) we present statistics for the entire CRISIL-CMIE sample. Panel A presents statistics for the credit rating items from CRISIL (quarterly frequency). Panel B present statistics for the balance sheet items from CMIE (annual frequency).

	Firm size 30-170 million INR			All		
	<i>N</i>	Mean	SD	<i>N</i>	Mean	SD
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Panel A: CRISIL Credit rating data (quarterly frequency)</i>						
Credit Rating	6,164	5.311	1.315	26,292	5.786	1.604
Credit Rating on Bank Debt	6,164	5.234	1.254	26,168	5.696	1.548
One-year Downgrade	6,012	0.075	0.263	25,547	0.073	0.260
One-year Upgrade	6,059	0.141	0.348	25,796	0.029	0.168
Two-year Default Rate	1,995	0.032	0.176	8,172	0.024	0.152
<i>Panel B: CMIE Balance sheet items (annual frequency)</i>						
<i>a) Firm characteristics</i>						
Firm Size [million INR], (MSMED Act 2006)	1,994	92	40	8,346	3,497	41,014
Total Assets [million INR]	1,994	1,065	1,549	8,346	16,051	145,788
Fixed assets, gross [million INR]	1,994	413	460	8,345	7,729	80,314
PBDITA [million INR]	1,992	141	276	8,339	2,001	16,660
Sales [million INR]	1,858	1,678	3,051	7,917	19,578	189,084
Sales Growth	1,347	0.064	0.435	5,753	0.079	0.464
Profitability Growth	1,372	0.087	0.631	5,716	0.086	0.594
Private Dummy	1,994	0.399	0.490	8,346	0.360	0.480
Age	1,900	27.568	13.926	8,072	30.998	17.740
Power, fuel, and water charges [million INR]	1,778	58	87	7,634	538	3,856
Packaging exp. [million INR]	607	45	130	2,685	298	1,369
Total exp. [million INR]	1,991	1,661	3,049	8,338	18,423	183,732
<i>b) Borrowing growth rates (annual frequency)</i>						
Growth in Bank Borr.	1,393	0.089	0.710	5,694	0.039	0.790
Growth in Sec. Bank Borr.	1,374	0.095	0.709	5,587	0.038	0.800
Growth in ST Bank Borr.	1,305	0.096	0.713	5,305	0.052	0.856
Growth in LT Bank Borr.	1,011	-0.014	1.071	4,122	-0.035	1.018
Growth in Non-Bank Borr.	1,184	0.047	1.039	4,928	0.046	1.068
<i>c) Cost of debt (annual frequency)</i>						
Interest Expense / Total Borr.	1,870	0.129	0.373	7,832	0.134	0.592
Bank Charges / Bank Borr.	1,030	0.058	0.440	3,962	0.539	18.177

measure the firm size as the gross value of plant and machinery excluding the gross value of land and building.⁷ Moreover, as of 2015 the firm size definition includes a time clause. Within

⁷The S.O.1722 (E) Notification issued under MSMED Act 2006 stipulates further items to be excluded (for example the cost of stores, spares, tools consumed, or the cost of installation of plant and machinery).

this clause, any Micro, Small, or Medium sized firm is eligible for PSL program up to three years after growing out of this category.

Since the CRISIL sample cover almost entire universe of the bank lending activities, many large and micro firms are included in the original sample. The universe of manufacturing firms with Long Term CRISIL credit rating spans firms with firm size anywhere from INR -9,148.6 million (negative values denote a high gross value of land and building relative to the gross value of plant and machinery) to INR +1,317.5 billion. The firm size distribution is right skewed with many firms of extremely large firm size. To give a better overview of the firms in the neighborhood of the INR 100 million cutoff we also present the statistics for a subsample of firms that found within ± 70 million of the PSL eligibility cutoff. This local CRISIL-CMIE sample consists of 6,164 firm-quarter observations with 702 unique firms.

Summary statistics for the entire CRISIL-CMIE sample and the local subsample of small manufacturing firms in India within the vicinity of ± 70 million of the PSL eligibility cutoff are presented in Table 1. Firm Long Term CRISIL credit rating ranges from “Default” to “AA+,” with a low two-year default rate of 3.2%. In 14.1% of cases, we observe an “Upgrade”, and 7.5% a “Downgrade”. The average firm has a rating of “BB+.” The average form in our local subsample is public, with 40% of firms being privately held. It is also 28 years old with INR 1,065 million accumulated in total assets. The cost of debt is substantial and reaches 12,9% interest expenditures relative to total borrowing.

Throughout the analysis, firms can move in and out of the treated and control group, which is shown in Figure 1. A firm in the control group can become newly eligible for the PSL program if its qualifying costs increase to move it below the PSL cutoff. Firm may also purchase new land, which can move it below the PSL cutoff. Firm may also decide to disinvest its plant and machinery, which again can move it below the PSL cutoff. On the other hand, a treated firm can grow out of the PSL program by investing more in the plant and machinery. Figure 1 illustrates a time series of newly eligible firms for the PSL program and newly ineligible firms. Reassuringly, apart from the reform of the PSL cutoffs in November 2013 and April 2015 that caused the large jumps in the number of eligible firms, there is a steady flow between the groups of eligible and ineligible firms. Moreover, the growth of firms seems to take over the incentive

However, the Prowess database does not provide sufficiently detailed information for all the specific items. Potentially, this measurement error can move some of the treated firms to the control group. As a result, the estimate of treatment effect might be noisier, and might be biased. Either way, if we find a significant estimate of the treatment effect we are after, it is the lower bound of the actual treatment effect.

to remain small and under the cutoff as the outflows from the eligible group are consistently above the inflows into the eligible group.

3.2 Empirical specification

Our empirical strategy relies on the observation that the eligibility for the PSL program depends on the firm size.⁸ Following a reform in second quarter of 2015, firms marginally below the INR 100 million cutoff in firm size become eligible for the PSL program, while firms marginally above the cutoff do not fall under the PSL program. The differentiation based on a sharp cutoff creates a discontinuity in the ease with which firm can borrow from banks. We use this discontinuity to study the casual effect of relaxing credit constraints on firm credit risk, quality of financial intermediation, and environmental risks.

We exploit this eligibility rule in a regression discontinuity (RD) design (see for example Lee and Lemieux (2010), and Calonico et al. (2014)) to estimate the casual effect of relaxing credit constraints. The RD design uses the fact a known cutoff, \bar{x} , determines treatment status of the firm i , that is whether the firm is eligible for PSL program or not. The cutoff is along the forcing variable x_i , which in our design is given by the firm size. Then, the local average treatment effect, τ_{RD} , of being marginally eligible for the PSL program can be identified at the cutoff \bar{x} as:

$$\tau_{RD} = \tau_{RD}(\bar{x}) = \mathbb{E}[Y_i(1) - Y_i(0)|X_i = \bar{x}] \quad (1)$$

where $Y_i(1)$ and $Y_i(0)$ denote the outcome variable per firm under treatment and without treatment respectively. The local average treatment effect, τ_{RD} , is then estimated using local polynomial methods at the cutoff \bar{x} .

Our analysis focuses on a “local” sample of firms in the neighborhood of the INR 100 million cutoff in firm size. The “local” sample is given by the mean squared error (MSE)-optimal bandwidth selection procedure according to Calonico et al. (2014). Further, we follow Calonico et al. (2014) in estimation of the local discontinuity in the neighborhood of the INR 100 million cutoff and compute the robust, bias-corrected, and conventional estimates of the local treatment effect. The robust and bias-corrected estimates differ in value from the conventional estimates due to bias-correction procedure implemented according to Calonico et al. (2014). Moreover,

⁸We follow the MSMED Act 2006 and define the firm size as the value of investment in plant and machinery, subtracting the value of land and buildings.

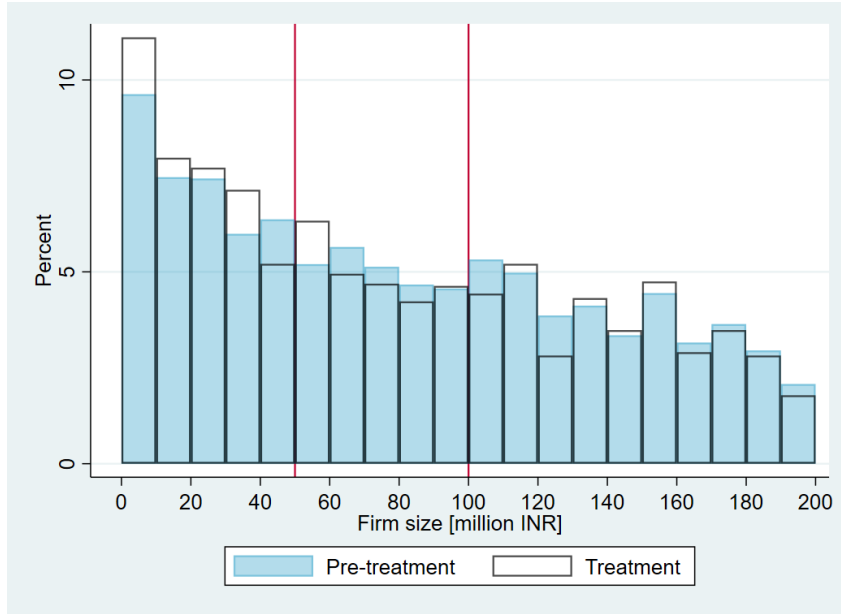
although the robust and bias-corrected estimates have the same value, their standard errors are different. We rely mainly on the robust estimates for inference.

The basic idea of the RD design is that the cutoff separating firms into eligible and ineligible for PSL program is difficult to control exactly. This means that there is an exogenous variation in the treatment not entirely controlled by the firm. Based on four facts listed below it is reasonable to assume that even though firms have some influence on their firm size, in our setting its exact value around the INR 100 million cutoff cannot be manipulated with precision.

Firstly, the 2015 reform of PSL cutoff was largely unanticipated.⁹ Secondly, the 2015 reform, introduces a rule under which firms retain their PSL status for three years after they grow above the INR 100 million cutoff. The new rule significantly reduces the incentive for firms to manipulate their firm size during our 2.5-year sample treatment window (from 2015q2 to 2017q3). Thirdly, Figure 2 panel (a) illustrates the firm size distribution of Indian firms, drawn from the CMIE-CRISIL matched databases, for the pre-treatment period (2012q1 to 2015q1) and treatment period (2015q2 to 2017q3). A visual examination suggests that there is no substantial change in the distribution following the 2015 reform. Alternatively, Figure 2 panel (b) plots the firm size distribution per year. Both panels suggest that there is no bunching of firms below the INR 100 million cutoff in firm size. Lastly, a manipulation test (see Cattaneo et al. (2018)) on the treatment period does not reject the null hypothesis of no bunching below the cutoff ($T= 1.195$, and p -value = 0.232). This result suggests that during our time window, firms are unable to manipulate precisely the assignment to the PSL program and the variation in firm size near the cutoff is approximately randomized.

Importantly, our identification rests on the assumption that baseline covariates have the same distribution in the neighborhood of the cutoff. In principle, if a discontinuity in the baseline covariates exists at the cutoff, the random assignment of firms into eligible and ineligible for PSL program might not be warranted. In Table 2 presents RD estimates for $\ln(TotalAssets)$, $\ln(FixedAssets)$, $SalesGrowth$, $ProfitabilityGrowth$, and dummy equal to one if firm is privately held and zero if the firm is public. As expected, we find no discontinuity in those baseline covariates following the 2015 PSL reform. This result indicates that any discontinuity in firm's level of bank borrowing and credit risk following the 2015 PSL reform is a result of the targeted extension of the PSL program as opposed to being a result of general characteristics of the firms

⁹With the exception of a temporary cutoff increase in November 2013, which was due to low economic growth and was reversed soon after in March 2014 by the RBI (Business Standard (2013)).



(a) Distribution in pre-treatment and treatment periods



(b) Distribution by year

Figure 2: Firm size distribution. The figure plots the density of the firm size within the INR ± 100 million of the PSL eligibility cutoff. In Panel (a), white bars show the density for the treatment period (2015q2 to 2017q3) and blue bars show the density for the pre-treatment period (2012q1 to 2015q1). Panel (b) illustrates the distributions by year. The firm size is given by the MSMED Act 2006 definition of micro, small and medium enterprises, which is the value of investment in plant and machinery, excluding the value of land and buildings. We pool the observations for the treatment period (2015q2 to 2017q3) and test for manipulation using the Cattaneo et al. (2018) (analogous to McCrary (2008)). The manipulation test does not reject the null hypothesis of no bunching below the cutoff ($T = 1.195$, and p -value = 0.232).

in the neighborhood of the cutoff.

Of particular interest are the results in column (3) and (4) on the sales and productivity growth. They provide some evidence against the alternative hypothesis, that the relaxing of credit constraints following the 2015 PSL reform allowed the small and medium firms to invest

Table 2: Validity of the regression discontinuity design (RDD). There is no significant discontinuity at the INR 100 million cutoff in the firm’s characteristics unrelated to bank borrowings. This table reports local linear estimates (bias corrected coefficients, robust, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The running variable of the estimation is firm size defined according to MSMED Act 2006 as the investment of plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3). We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)	(4)	(5)
VARIABLES	ln(Total Assets)	ln(Fixed Assets)	Sales Growth	Profitability Growth	Private
Robust	-0.267 (0.283)	-0.068 (0.280)	-0.022 (0.291)	-0.220 (0.299)	0.194 (0.147)
Bias-corrected	-0.267 (0.235)	-0.068 (0.227)	-0.022 (0.234)	-0.220 (0.252)	0.194 (0.127)
Conventional	-0.229 (0.235)	-0.043 (0.227)	-0.039 (0.234)	-0.208 (0.252)	0.162 (0.127)
Observations	1,029	1,029	651	615	1,029
Eff. N: Left of c	191	147	138	171	111
Eff. N: Right of c	178	153	118	144	122
BW (h)	26.095	21.537	27.257	37.261	16.970

into sales- and profitability-enhancing processes, which then attracted more bank financing. In the short-term, however, firms did not respond by improving the sales and profitability growth. This observation seems to rule out the endogenous loop fueling potentially the increase in bank financing into firms with better economic outlook.

On top of exploring the targeted nature of the 2015 PSL reform that incentivizes bank lending to the medium firms from INR 50 million to INR 100 million, we also investigate its timing. The 2015 PSL reform was announced and implemented in the second quarter 2015. Therefore, we should not observe any significant effects prior to the reform if the identified effects are indeed due to the introduction of new incentives to lend to the medium firms. We present those results throughout our baseline analysis.

4 Results

Our aim is to show a casual effect of relaxing financial constraints on firm credit risk, quality of financial intermediation, and on environmental factors within a firm. We identify the credit

supply shock, which relaxes credit constraints as a 2015 reform of PSL program in India. The PSL program mandates a large portion of bank credit portfolio to be dedicated to the priority sector. From 2015, manufacturing firms below INR 100 million became eligible for the PSL program. In our empirical design, we use this PSL eligibility cutoff to study responses of firms marginally below the cutoff, to responses of firms marginally above the cutoff.

First, we provide evidence that the credit supply shock increases firm borrowing from banks. In the second step, we show that credit rating of the eligible SMEs decreases significantly if the firm is eligible for PSL program. However, at the same time we find evidence of a drop in firm credit risk captured by two-year default rate. Next, we investigate, which populations of firms drives the drop in credit rating, and find that the deterioration in credit rating is explained by firms with poor economic outlook, public firms and old firms. Moreover, we find strong evidence in favor of diligent financial intermediation. The results show that banks tend to lend more to firms with high credit rating, with good economic outlook (high sales and profitability growth), as well as to private and young firms.

Second, we find evidence that the higher borrowing and diligent financial intermediation is not accompanied by increase in interest paid on bank debt, nor by higher bank charges. The latter can be interpreted as an evidence of market failure in the SME credit market, which was partially alleviated by the PSL program. Banks price the new loans issued under the PSL program at the market price and the price happened to be the same as equivalent non-PSL loans. It turns out that the credit gap precluded medium-sized firms from pursuing profitable projects of an acceptable credit quality.

Last, we shift our attention to environmental impact of the relaxing of credit constraints. Interestingly, we find that banks lend more to firms operating in industries with high environmental impact. This improved access to finance is then used by firms to invest in more energy- and resource-efficient technologies and is captured by drop in power, fuel, and water charges. The uncovered demand for more energy-efficient technologies among firms in high environmental impact industries suggests important regulatory implications. As policy makers may consider furthering capital flows to this sensitive part of the economy to stimulate environmental innovation.

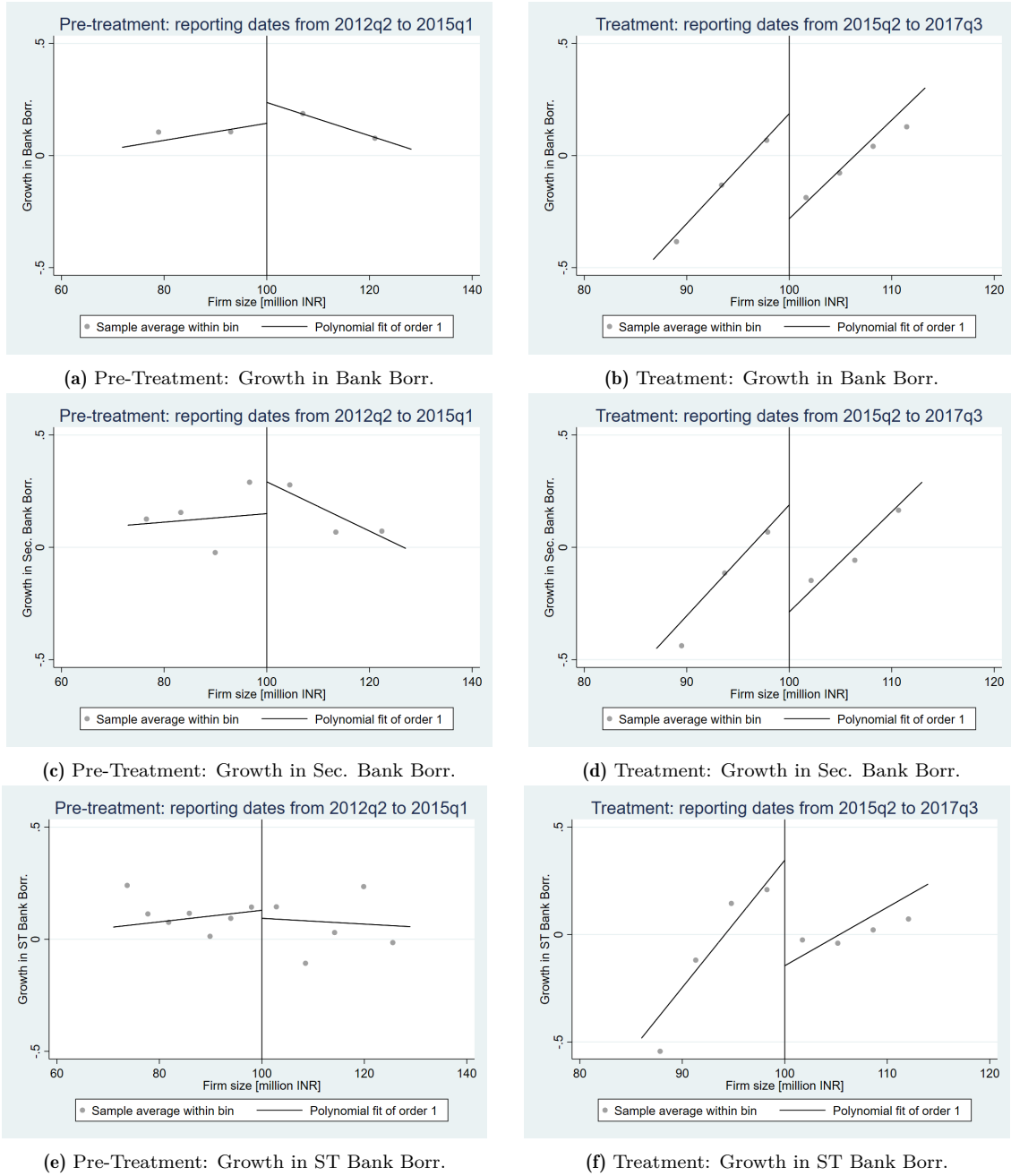


Figure 3: Relaxing credit constraints. Firms borrow significantly more from banks once they become eligible for the PSL. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (reporting dates from 2015q2 to 2017q3). This figure plots the growth in bank borrowings (Panel (a) and (b)), the growth in secured bank borrowings (Panel (c) and (d)), and the growth in short term bank borrowings (Panel (e) and (f)) as a function of firm size. The increase in bank borrowing is mainly due to the increase in the secured, and short term lending from banks.

4.1 Relaxing credit constraints

We begin by providing graphical evidence of the relaxing of credit constraints in medium-sized manufacturing firms over the sample period. Panel (a) and (b) of Figure 3 plot the average growth in bank borrowing by firm size, for the pre-treatment period (reporting dates from

Table 3: Relaxing credit constraints. This table shows that firms borrow significantly more from banks, if they are eligible for the PSL. Panel A shows a discontinuity in bank borrowings at the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel B shows no such discontinuity in the pre-treatment period (2012q1 to 2015q1). The table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: growth in total bank borrowings, growth in secured bank borrowings, growth in short term bank borrowings, and growth in long term bank borrowings. The running variable of the estimation is firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)	(4)
VARIABLES	Growth in Bank Borr.	Growth in Sec. Bank Borr.	Growth in ST Bank Borr.	Growth in LT Bank Borr.
<i>Panel A: Treatment: reporting dates from 2015q2 to 2017q3</i>				
Robust	0.557** (0.241)	0.564** (0.242)	0.590** (0.298)	0.258 (0.351)
Bias-corrected	0.557*** (0.212)	0.564*** (0.213)	0.590** (0.259)	0.258 (0.299)
Conventional	0.469** (0.212)	0.476** (0.213)	0.491* (0.259)	0.154 (0.299)
Observations	610	602	576	452
Eff. N: Left of c	62	59	61	59
Eff. N: Right of c	61	59	60	55
BW (h)	13.256	12.947	13.965	17.891
<i>Panel B: Pre-treatment: reporting dates from 2012q1 to 2015q1</i>				
Robust	-0.057 (0.208)	-0.127 (0.212)	0.046 (0.130)	0.156 (0.217)
Bias-corrected	-0.057 (0.189)	-0.127 (0.195)	0.046 (0.115)	0.156 (0.195)
Conventional	-0.093 (0.189)	-0.142 (0.195)	0.036 (0.115)	0.102 (0.195)
Observations	783	772	729	559
Eff. N: Left of c	167	154	160	95
Eff. N: Right of c	151	146	144	100
BW (h)	28.130	27.028	28.935	25.049

2012q1 to 2015q1) and for the treatment period following the PSL reform (reporting dates from 2015q2 to 2017q3). We measure the growth in bank borrowing as:

$$Bank_borrowing_growth_{i,t} = \ln(Bank_borrowing_volume_{i,t+1}) - \ln(Bank_borrowing_volume_{i,t}) \quad (2)$$

Panel (a) supports our RD design and expectation that during the pre-treatment period,

there is no discontinuity in the borrowing levels in the neighborhood of the PSL eligibility cutoff. The growth of bank borrowing is visually indistinguishable below and above the cutoff and this result is confirmed by the RD test in column (1) of Panel B in Table 3. The situation changes following the PSL reform in 2015. In Panel (b) of Figure 3 illustrates that firms classified as medium-sized that are marginally below the PSL cutoff exhibit a significantly higher growth in bank lending than firms marginally larger than the eligibility cutoff. This discontinuity is also confirmed in column (1) of Panel A in Table 3. We also note that the slopes of the regression on both sides of the PSL eligibility cutoff are essentially the same for the growth in bank borrowing.

In our opinion, this is a convincing evidence of success of the PSL program and on the validity of our design using the PSL as a credit supply shock. Importantly, the lack of discontinuity in the pre-treatment period reaffirms that the policy change was largely unanticipated and that no other credit market incentives were in place potentially distorting our results.

The estimates for different types of bank borrowing are reported in columns (2) to (4) Table 3. The results indicate that the discontinuity was the strongest for growth in short-term bank borrowing, with a slightly lower effect for the growth in secured bank borrowing and no effect on the growth in long-term borrowing.¹⁰ Unsurprisingly, banks prefer to lend using secured lending or with short-term maturity. Secured lending allows banks to have higher recovery rates (see for example (Vig, 2014)) if the loan goes bad. Short-term lending gives banks the flexibility of adjusting loan conditions (interest, collateral) or tackles the need for collateral. Strategically, it is a better option to hedge borrower risk if the borrower is new with short lending relationship, or in general considered more risky. In fact, in section 4.5 we show that following the PSL reform, banks are more prone to extend larger loans to firms with which they had no previous lending relationship. Importantly, Panel B columns (2) to (4) show that such effect does not exist for firms in the neighborhood of INR 100 million prior to the PSL reform.

4.2 Credit risk and relaxing financial constraints

While Figure 3 corroborates that newly eligible firms responded to the PSL reform in 2015 with increasing their bank borrowing, it is still possible that firms on both sides of the PSL eligibility cutoff made similar decisions with respect to their creditworthiness. Imagine a case in which firms maintain their credit risk profiles, but the relaxing of financial constraints allows them to

¹⁰Due to missing data, we are unable to run the RD tests for the growth in secured bank debt.

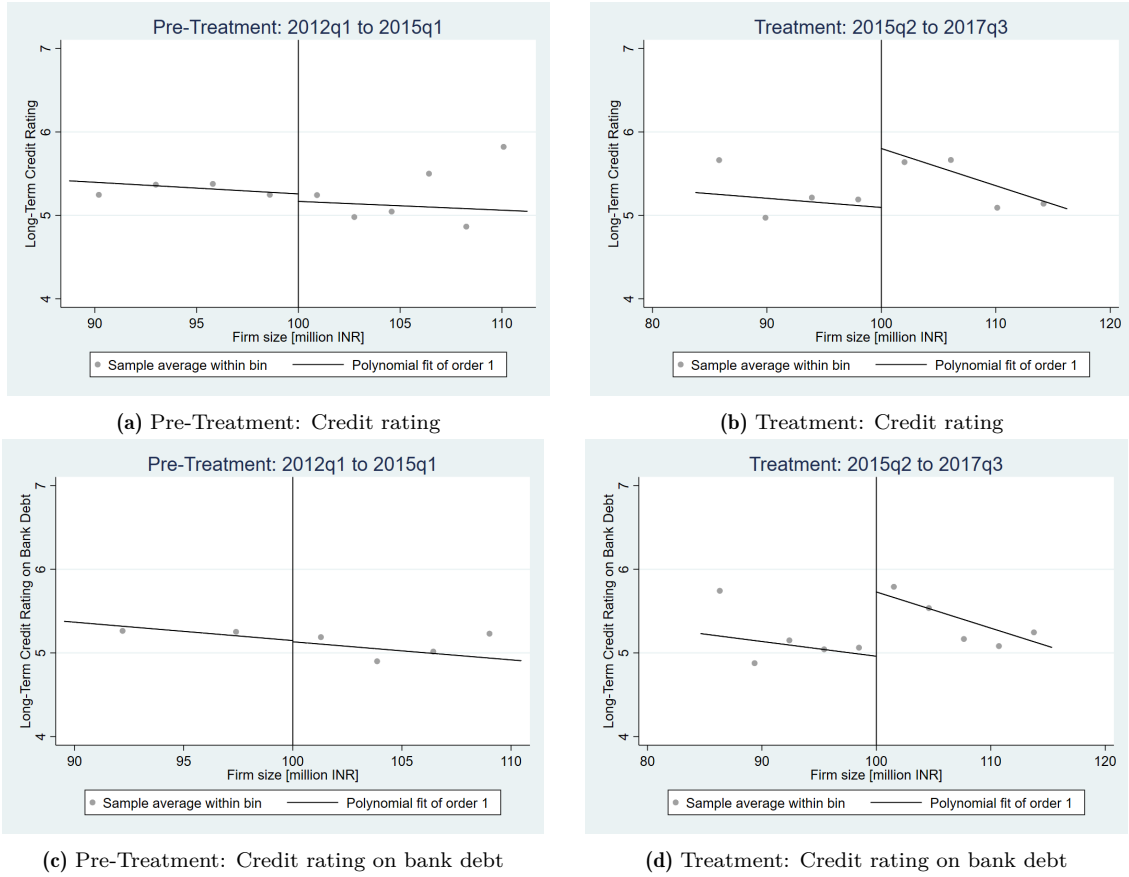


Figure 4: Credit rating and relaxing credit constraints - discontinuity at the INR 100 million firm size cutoff after the PSL reform. Firms eligible for PSL have lower quality credit rating. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) present the average credit rating. Panel (c) and (d) present the the average credit rating for bank debt. The observations are pooled for the pre-treatment period (2012q1 to 2015q1) in Panels (a) and (c) and for the treatment period (2015q2 to 2017q3) in Panel (b) and (d).

finance larger amount of equally risky projects. In this case, the newly eligible firms below the INR 100 million PSL cutoff borrow more from banks, but no change in their credit rating or credit risk is observed.

Therefore, in this section, we exploit the exogenous variation in firm financial constraints generated by the PSL cutoff to estimate their effect on firm credit rating, credit rating movements and credit risk. Specifically, we use the RD design from previous sections and apply it to CRISIL dataset containing history of firm credit ratings.

We begin with the graphical representation of the effect on credit rating in Figure 4 and corresponding Table 4 entries in column (1) and (2). Panels (b) and (d) of Figure 4 show that firms marginally below the INR 100 million cutoff for the PSL program have significantly lower credit rating following the regulatory change in 2015. The effect is economically significant and amounts to an almost full credit rating drop in creditworthiness, whether measured by overall

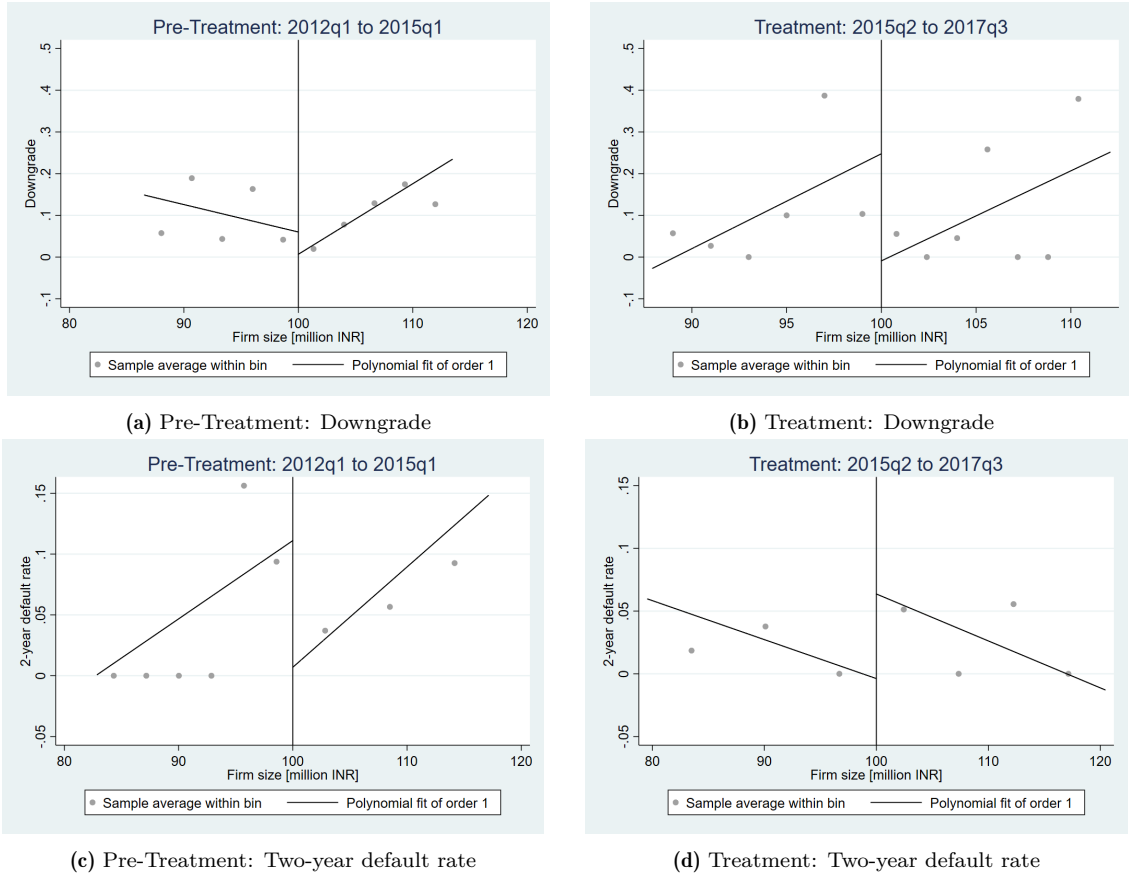


Figure 5: Credit risk and relaxing credit constraints - discontinuity at the INR 100 million firm size cutoff after the PSL reform. Firms eligible for PSL have lower two-year default rate. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) present the average one-year downgrade frequency. Panel (c) and (d) present the the average two-year default rate. The observations are pooled for the pre-treatment period (2012q1 to 2015q1) in Panels (a) and (c) and for the treatment period (2015q2 to 2017q3) in Panel (b) and (d).

credit rating or credit rating on bank debt, for firms marginally eligible for PSL relative to firms marginally above the eligibility cutoff. This effect matches about a half of a standard deviation in credit rating for firms in our local sample. Importantly, Panel (a) and (c) show that such effect does not exist for those firms prior to the PSL reform. In the next section, we delve deeper on which firm populations in cross section are driving the apparent deterioration in credit rating following relaxing financial constraints. Those further investigations uncover a fuller, more complex picture of the reasons behind apparent deterioration in credit rating in support of the PSL program.

Moving on to the effect of PSL reform on a one-year credit rating downgrade, Panel (b) of Figure 5 and the corresponding Table 4 entry in column (3) illustrate a discontinuity in the neighborhood of the INR 100 million PSL cutoff following the PSL reform in 2015.¹¹ The one-

¹¹Panel (a) of Figure 5 and the corresponding Table 4 entry in column (3) show some evidence of

year credit rating downgrade is indicated by a dummy variable equal to one if within a window of one year, a firm has a change in its credit rating higher or equal to 0.5 in our numerical scale. The effect is of considerable size, with firms marginally below the PSL eligibility cutoff experiencing downgrade on average 29% more often relative to firms marginally above the cutoff. The size of the effect corresponds to a one standard deviation in credit rating downgrade for firms in our local sample.

Panels (c) and (d) of Figure 5 and the corresponding Table 4 entries in column (4) present results that, the deterioration in credit rating and increase in downgrade propensity touches the surface of the changes to firm credit risk profiles at best. Remarkably, results in column (4) show that the deterioration in credit rating is accompanied by improved credit risk outcomes. We measure the credit risk outcomes by the two-year default rate.¹² The two-year default rate measures the rate at which firms with credit rating “C” or higher are downgraded to credit rating “D” (default) within two-year time window. The data suggest a sizable reduction in two-year default rate once firms become eligible for PSL program which amounts to almost 8%.

From policy perspective, this is an important finding. The common fear of opponents of credit market interventions is that in an economy with many market failures, policymakers by trying to resolve some market failures end up reducing welfare (theory of second best by Lipsey and Lancaster (1956)). The PSL program aims at reducing the market failure in SMEs access to finance. Such relaxing SMEs financial constraints can lead to debt overhand (Myers (1977), Krugman (1988)), or raising non-performing loans (The Economist (2008)). Indeed at first sight, by relaxing credit constraints in Indian SMEs, the PSL program decreases their credit rating and seems to drive them to adopt more risky profiles. Further investigation, however, yields that a drop in credit rating is matched with a simultaneous decrease in two-year default rates. From bank and policy perspective, the overall lower failure rates and possibly lower rates of non-performing assets are of greater importance than an average rating.

discontinuity also prior to the PSL reform. It might be an indication of some information spillovers prior to PSL for example related to the short period in 2013 when RBI made the medium-sized firms temporarily eligible for PSL. The effect goes in the same direction but its magnitude corresponds to only about 20% of the post 2015 magnitude.

¹²In unreported results, similar discontinuity is observed in the one-year default rate as well.

Table 4: Credit risk and relaxing credit constraints. This table shows that firms have lower credit rating, higher downgrade propensity, and at the same time lower two-year default rate, if they are eligible for the PSL. Panel A shows a discontinuity in credit risk at the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel B shows no such discontinuity in the pre-treatment period (2012q1 to 2015q1). The table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: credit rating, credit rating on bank debt, one-year downgrade frequency, and two-year default rate. Credit rating is on a scale from 1 corresponding to default (D) to 9.5 corresponding to best credit rating (AAA+). For more details on credit rating please refer to Appendix A. The running variable of the estimation is firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)	(4)
VARIABLES	Credit rating	Credit rating on bank debt	Downgrade	Two-year default rate
<i>Panel A: Treatment:2015q2 to 2017q3</i>				
Robust	-0.776*** (0.232)	-0.849*** (0.231)	0.289*** (0.070)	-0.078** (0.039)
Bias-corrected	-0.776*** (0.199)	-0.849*** (0.199)	0.289*** (0.065)	-0.078** (0.032)
Conventional	-0.706*** (0.199)	-0.769*** (0.199)	0.257*** (0.065)	-0.067** (0.032)
Observations	2,269	2,269	2,203	1,016
Eff. N: Left of c	236	231	192	144
Eff. N: Right of c	264	246	173	139
BW (h)	16.221	15.338	12.080	20.436
<i>Panel B: Pre-Treatment:2012q1 to 2015q1</i>				
Robust	0.035 (0.168)	-0.048 (0.164)	0.058* (0.032)	0.120*** (0.035)
Bias-corrected	0.035 (0.147)	-0.048 (0.145)	0.058** (0.028)	0.120*** (0.035)
Conventional	0.090 (0.147)	0.015 (0.145)	0.053* (0.028)	0.104*** (0.035)
Observations	3,895	3,895	3,809	1,299
Eff. N: Left of c	279	271	351	151
Eff. N: Right of c	338	320	388	188
BW (h)	11.243	10.468	13.463	17.130

4.3 Financial intermediation quality

The finding that the eligibility for PSL program spurs bank borrowing among firms might not be surprising, particularly considering that the program is targeting firms traditionally considered deprived of bank financing. In this section, we explore if the increase in bank

borrowing is accompanied by less diligent financial intermediation. The mandated lending under PSL program might subject banks to a choice between missing PSL targets and good quality intermediation. This choice often makes headlines in popular press (see for example The Economist (2008), and Ananth and Mor (2012)) and influences policy discussions.

In this section, we go a step further and try to contribute to this discussion by establishing which type of borrowers increased their borrowing under the PSL program. We begin by studying the bank borrowing volumes at different points of firm credit rating distribution. This approach resembles the approach proposed by Tang (2019). On one hand, if banks compelled by the PSL targets approve poor quality loans, we should observe an increase in bank borrowing among firms with poor credit rating. On the other hand, if banks continue a diligent financial intermediation, then we should observe increase in bank borrowing volumes among firms in the top of the credit rating distribution that is the firms with high credit rating.

In the assessment of this hypothesized behavior, we use a difference-in-difference setting of the following form:

$$Bank_borrowings_volume_{i,t} = \alpha_i + \beta PSL_i \times Post_2015_t + \gamma PSL_i + \sigma Post_2015_t + \varepsilon_{i,t} \quad (3)$$

where PSL is a dummy that takes value of one if firm is eligible for PSL program (below the INR 100 million cutoff) and zero otherwise, $Post_2015$ is a dummy that takes value of one following the PSL reform in second quarter 2015. The subscript i denotes the firm, and t the fiscal year. The coefficient of interest, β , denotes a differential change in $Bank_borrowings_volume$ for firms below the PSL eligibility cutoff following the PSL reform in 2015. We run this regression sequentially for all the credit ratings. We group the observations with a “-” and a “+” sign into one rating category.

Table 5 shows the resulting coefficients. As it turns out, banks not only conduct a diligent financial intermediation, lending to the higher credit rating borrowers (credit rating 7 = A), but even contract the volumes to the lower credit rating borrowers (credit rating 4 = B). Following the PSL reform, the credit expansion to the higher credit rating borrowers reaches an average of INR 395 millions, while the contraction to the lower credit rating borrowers is less substantial and amounts on average INR 120 million. This result is a clear indication, that banks favor more creditworthy borrowers even if faced with strict PSL targets.

Table 5: Relaxing credit constraints and financial intermediation quality. This table shows the distributional effects of relaxing credit constraints on the firm level of borrowing from banks. Firms which are at the low end of the credit rating distribution (credit rating = 3 or 3.5) received less bank borrowing following the 2015 PSL reform, while firms at the high end of credit quality (credit rating = 7 or 7.5) received more bank borrowings (for a similar application please refer to Tang (2019)).

$$Bank_borrowings_volume_{i,t} = \alpha_i + \beta PSL_i \times Post_2015_t + \gamma PSL_i + \sigma Post_2015_t + \varepsilon_{i,t}$$

where PSL is a dummy that takes value of one if firm is eligible for PSL program (below the INR 100 million cutoff) and zero otherwise, $Post_2015$ is a dummy that takes value of one following the PSL reform in second quarter 2015. The dependent variables is: *bank borrowings*. All regressions include firm fixed effects. Robust standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

Credit rating	3	4	5	6	7	≥ 8
VARIABLES	Bank Borrowings					
$PSL \times Post_2015$	-535.685 (752.740)	-119.963* (65.286)	-11.189 (33.357)	-71.051 (51.224)	395.203*** (141.036)	-2,660.178 (2,146.718)
PSL	9.240 (7.061)	16.734 (38.117)	-26.130 (28.282)	-97.571 (70.404)	-369.513** (146.811)	686.425 (1,798.046)
$Post_2015$	537.512 (752.698)	132.658** (66.242)	72.717** (32.815)	193.772*** (40.957)	62.090 (89.394)	3,475.953* (1,797.376)
Constant	508.141* (265.563)	389.275*** (34.618)	380.609*** (19.507)	619.374*** (34.380)	1,500.923*** (68.985)	12,065.534*** (1,334.733)
Observations	69	1,017	1,946	2,525	1,040	641
R-squared	0.947	0.984	0.968	0.917	0.964	0.949
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes

4.3.1 Responses of good quality borrowers

Having confirmed that extending the pool of PSL eligible firms does not mean a deterioration of financial intermediation quality, we aim now to expose mechanisms behind our results. One potential explanation is that the PSL incentivized borrowing is channeled to a different population of firms than those, which experience drop in credit rating. For example, it might be that banks execute diligent lending policies and to fill their PSL targets in the first order extend their credit to firms with good economic outlook. Firms with poor economic outlook will find themselves in a pre-PSL situation, where the PSL reform fails to relax their credit constraints. Then, the firms with poor economic outlook are at a relative disadvantage to the firms with good economic outlook, driving their credit rating down.

In this subsection, we address the borrowing and credit rating outcomes for firms with good economic outlook, vs. poor economic outlook. We split the CRISIL-CMIE matched sample of firms into good and poor outlook borrowers based on their sales and profitability growth. Firms qualify to the good (poor) economic outlook group if their sales grow above (below) the annual median sales growth in any year prior to 2015q1, and if their profitability grows above (below)

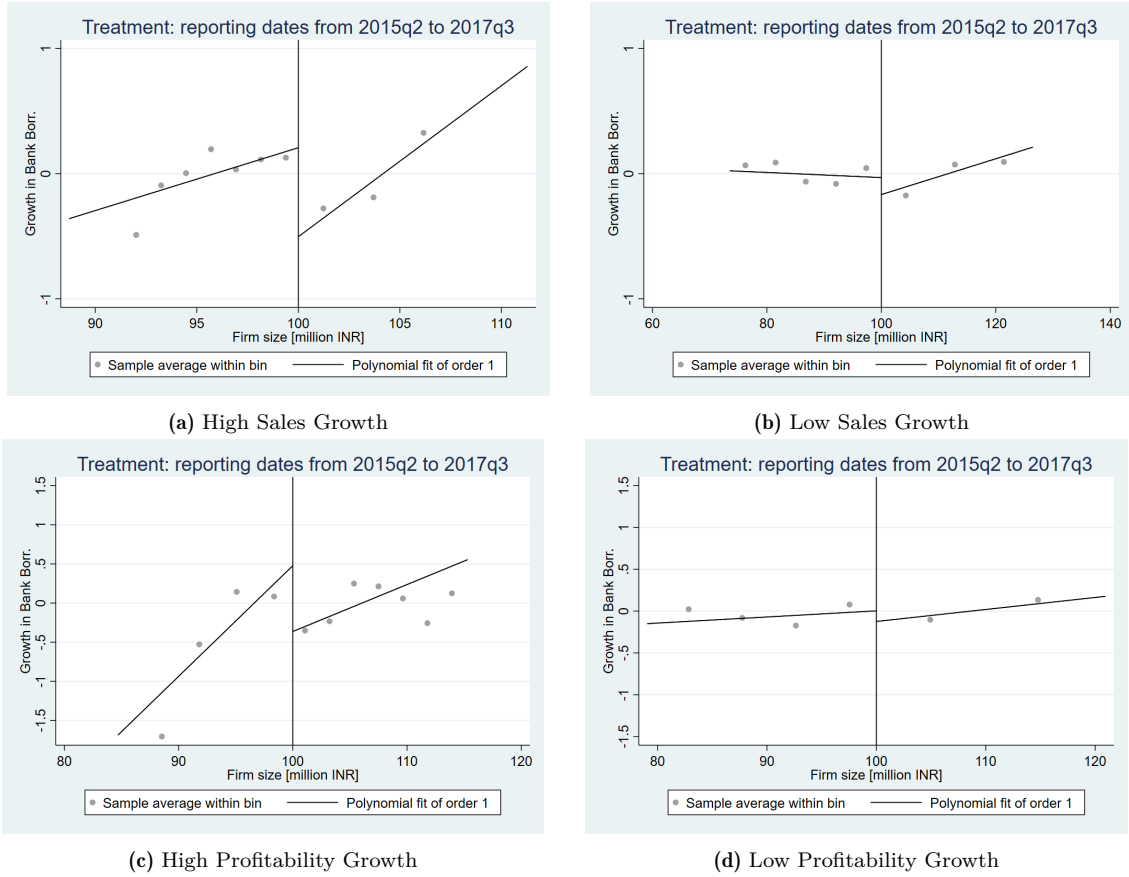


Figure 6: Economic outlook and relaxing credit constraints - bank borrowing. This figure shows that bank borrowing increases for firms eligible for PSL and with better economic outlook. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) split the sample according to sales growth. Firms qualify to the high (low) sales growth group if their sales grow above (below) the annual median sales growth in any year prior to 2015q1. Panel (c) and (d) split the sample according to profitability growth. Firms qualify to the high (low) profitability growth group if their profitability grows above (below) the annual median profitability growth in any year prior to 2015q1. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3).

the annual median profitability growth in any year prior to 2015q1. We use our RD design on those populations of firms, where the dependent variable is still growth in bank borrowing and credit rating.

Figure 6 together with the accompanying point estimates in Table 6 Panel A suggest that it is the firms with a good economic outlook (high sales and profitability growth) prior to the change in PSL cutoff that are among those, which borrow more. Reassuringly, firms with poor economic outlook prior to the change do not show any difference in the borrowing levels. In all these cases, the results consistently point to the fact, that even though we observe a deterioration in credit rating, the lending issued under the PSL program is received by the better performing firms with a history of high sales and profitability growth.

Table 6: Quality of financial intermediation and relaxing credit constraints: Firms with good economic outlook. This table shows that bank borrowing increased for firms with better economic outlook (Panel A), and that credit rating deteriorated for firms with poor economic outlook (Panel B). Panel A decomposes the results from Table 3 column (1) based on the firm's pre-PSL reform economic outlook. First, column (1) and (2) decompose the results into firms with high and low sales growth. Second, columns (3) and (4) decompose the results into firms with high and low profitability growth. In a similar fashion, Panel B decomposes the results from Table 4, Panel A column (1) based on the firm's pre-PSL reform economic outlook. Observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3). Firms qualify to the high (low) sales growth group if their sales grow above (below) the annual median sales growth in any year prior to 2015q1. Firms qualify to the high (low) profitability growth group if their profitability grows above (below) the annual median profitability growth in any year prior to 2015q1. This table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: *growth in bank borr.* (Panel A), and *credit rating* (Panel B). The running variable is the firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)	(4)
	Sales Growth		Profitability Growth	
	High	Low	High	Low
<i>Panel A: Growth in Bank Borr.</i>				
VARIABLES	Growth in Bank Borr.			
Robust	0.835*** (0.233)	0.183 (0.287)	0.978** (0.407)	0.171 (0.311)
Bias-corrected	0.835*** (0.213)	0.183 (0.232)	0.978*** (0.336)	0.171 (0.253)
Conventional	0.711*** (0.213)	0.136 (0.232)	0.841** (0.336)	0.127 (0.253)
Observations	225	379	207	368
Eff. N: Left of c	20	82	20	55
Eff. N: Right of c	19	67	25	51
BW (h)	11.271	26.448	15.287	20.918
<i>Panel B: Credit rating</i>				
VARIABLES	Credit rating			
Robust	1.136*** (0.401)	-3.237*** (0.686)	-0.418** (0.166)	-1.555*** (0.417)
Bias-corrected	1.136*** (0.363)	-3.237*** (0.602)	-0.418*** (0.153)	-1.555*** (0.386)
Conventional	0.972*** (0.363)	-3.077*** (0.602)	-0.395*** (0.153)	-1.387*** (0.386)
Observations	584	967	555	915
Eff. N: Left of c	58	66	105	111
Eff. N: Right of c	44	57	82	107
BW (h)	12.125	9.907	24.220	18.340

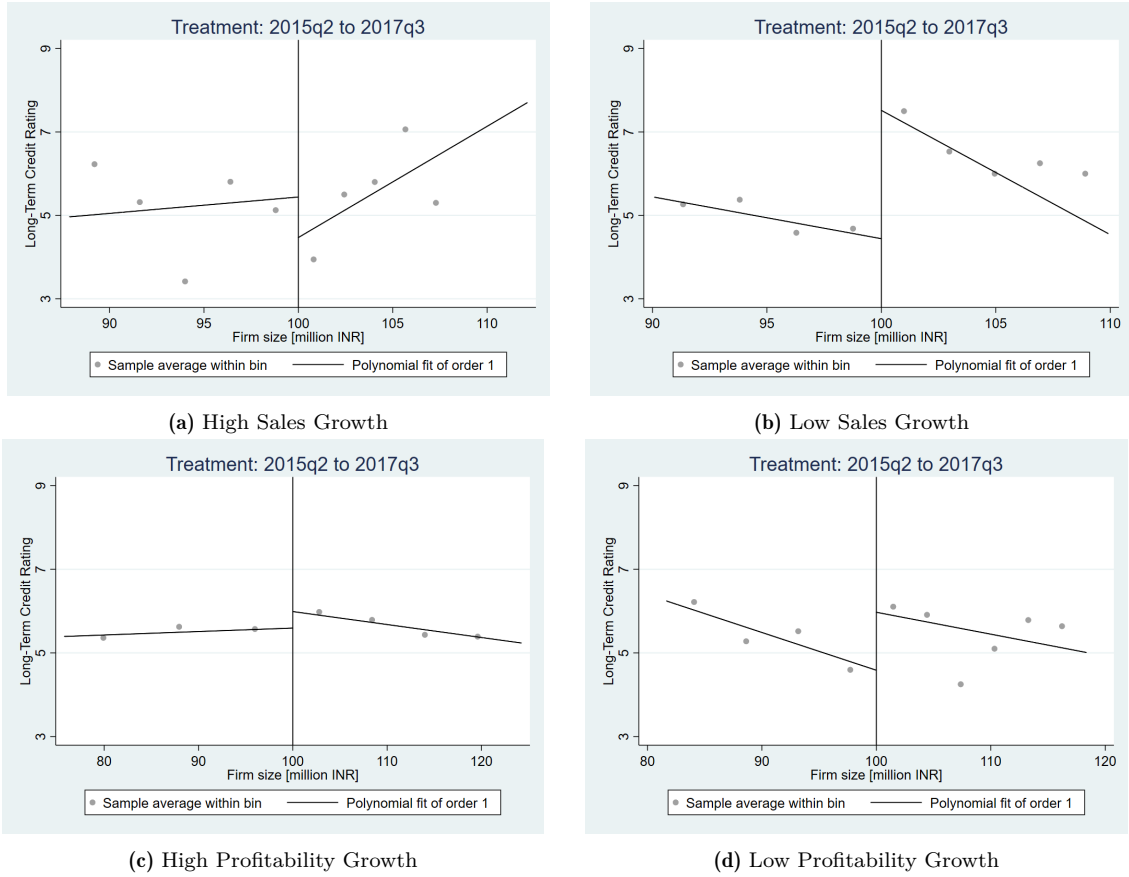


Figure 7: Economic outlook and relaxing credit constraints - credit rating. This figure shows that credit rating decreases for firms eligible for PSL and with worse economic outlook. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) split the sample according to sales growth. Firms qualify to the high (low) sales growth group if their sales grow above (below) the annual median sales growth in any year prior to 2015q1. Panel (c) and (d) split the sample according to profitability growth. Firms qualify to the high (low) profitability growth group if their profitability grows above (below) the annual median profitability growth in any year prior to 2015q1. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3).

In support of the PSL program, Figure 7 together with the accompanying point estimates in Table 6 Panel B show that firms with good economic outlook are not responsible for the overall observed deterioration in credit rating. In fact, the deterioration in the credit rating is exclusively observed among firms with poor economic outlook. This strongly suggests that the borrowing and credit rating responses affect two different populations and that the apparent deterioration of the credit quality among eligible firms is unrelated to the intermediation quality of banks. It turns out that, even under the tight PSL targets, banks do business as usual, giving preference to good quality borrowers, i.e. with high sales growth and high profitability growth.

The point estimates in Table 6 Panel B indicate a very strong response in credit rating to being excluded from the benefits of PSL reform due to firm's history of low sales growth or low

profitability growth. Firms with below median sales growth prior to the PSL reform loose on average three full credit rating grades. This drop in credit rating is further exacerbated by the fact that the firms with above median sales growth prior to the PSL reform received on average a full credit rating upgrade. Regarding firms with below median profitability growth prior to PSL reform, they as well loose almost two full credit rating grades, compared to a half a point drop for the firms with above median profitability growth.¹³

4.3.2 Responses of financially constrained borrowers

The second possibility is that the PSL reform generated drop in credit rating because it failed to relax credit constraints for firms conventionally considered as financially constrained. The distinguishing feature of financially constrained firms is the presence of a profitable investments opportunity, which due to market failure does not receive financing. Thus, if PSL program is unable to overcome the market failure and stimulate banks to lend to financially constrained SMEs, banks may need to turn to non-constrained borrowers to fill their targets. Potentially this expands the pool of less profitable investments resulting in overall drop in credit rating.

Why would financially constrained SMEs forgo the benefits of the PSL program? International Finance Corporation (2018) indicates that SMEs in India are highly dependent of informal sourced of financing. These correspond to 84% of SME finance and include family, friends, moneylenders, and chit funds. Only 13% of financing flows from banking sector. Financially constrained SMEs may have relationship with the informal lenders and stick to it out of habit. They may also be averse to formal sources of finance because of recent bad experiences (loan denial or default). Alternatively, banks might continue with their old preferences impairing access to finance for financially constrained SMEs because of their lack of historical records on credit rating, balance sheet, or a generally more opaque nature.

Figure 8 and the corresponding point estimates in Table 7 show that this is an unlikely explanation behind the overall drop in credit rating. We find that banks choose to lend to firms traditionally considered as more financially constrained (private and young) at the expense of less financially constrained firms (public and old). This increase in borrowing is matched by no response on the side of credit rating.

To the contrary, it is the firms deprived of banks relaxed credit supply, which respond with

¹³The difference between the high and low sales growth groups and the high and low profitability groups are statistically significant at 0.01%.

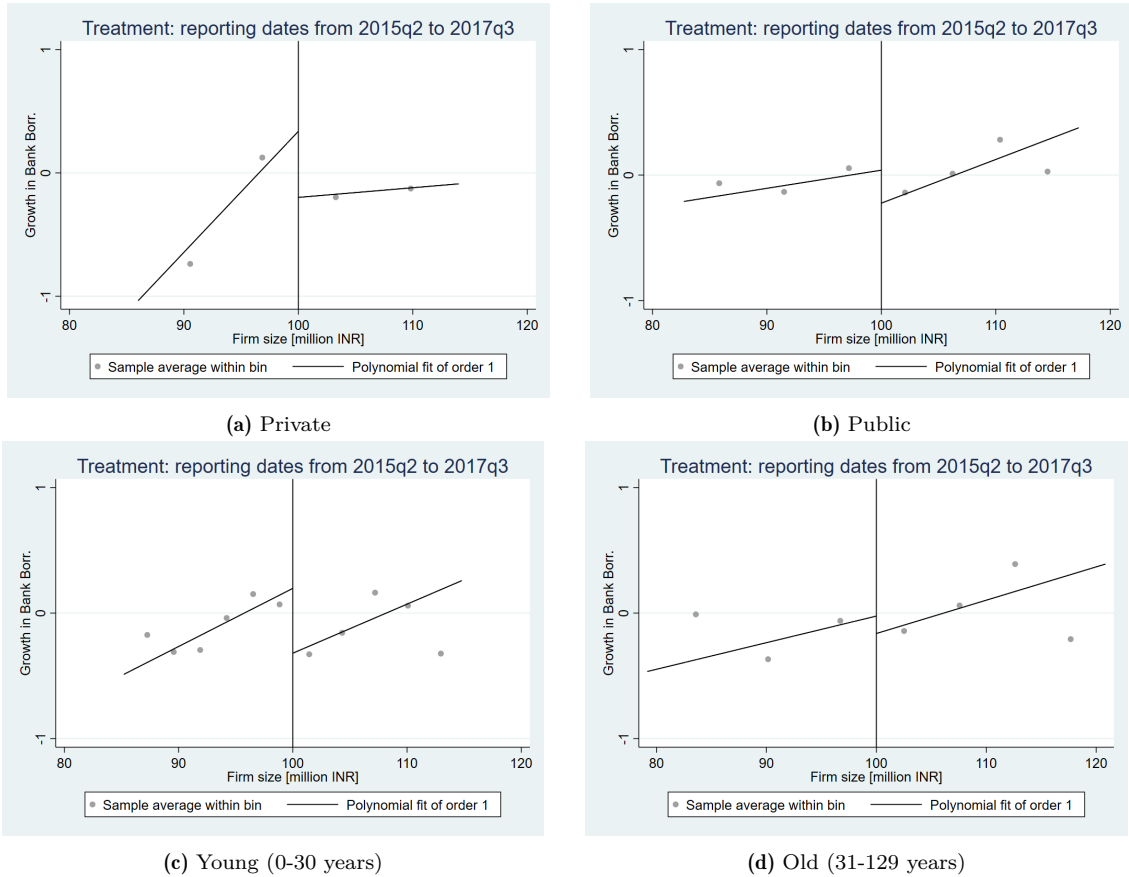


Figure 8: Financial constraints and relaxing credit constraints - bank borrowing. This figure shows that bank borrowing increases for firms that are eligible for PSL and are more financially constrained. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) split the sample into private and public firms. Panel (c) and (d) split the sample into young (0-30 years) and old (31-129 years) firms. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3).

Table 7: Quality of financial intermediation and relaxing credit constraints: Financially constrained firms. This table shows that bank borrowing increased for more financially constrained firms (Panel A), and that credit rating deteriorated for less financially constrained firms (Panel B). Panel A decomposes the results from Table 3 column (1) based on the firm’s pre-PSL reform financial constraints. First, column (1) and (2) decompose the results into private and public firms. Second, columns (3) and (4) decompose the results into into young (0-30 years) and old (31-129 years) firms. In a similar fassion, Panel B decomposes the results from Table 4, Panel A column (1) based on the firm’s pre-PSL reform financial constraints. Observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3). This table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: *growth in bank borr.* (Panel A), and *credit rating* (Panel B). The running variable is the firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)	(4)
	Private vs. Public		Age	
	Private	Public	Young (0-30 years)	Old (31-129 years)
<i>Panel A: Growth in Bank Borr.</i>				
VARIABLES	Growth in Bank Borr.			
Robust	0.619** (0.290)	0.378 (0.314)	0.599*** (0.212)	0.232 (0.419)
Bias-corrected	0.619*** (0.224)	0.378 (0.268)	0.599*** (0.184)	0.232 (0.345)
Conventional	0.536** (0.224)	0.263 (0.268)	0.517*** (0.184)	0.139 (0.345)
Observations	273	337	392	218
Eff. N: Left of c	24	49	41	36
Eff. N: Right of c	18	55	32	39
BW (h)	13.984	17.232	14.770	20.819
<i>Panel B: Credit rating</i>				
VARIABLES	Credit rating			
Robust	3.869*** (0.417)	-2.535*** (0.311)	-0.004 (0.268)	-2.419*** (0.407)
Bias-corrected	3.869*** (0.395)	-2.535*** (0.287)	-0.004 (0.220)	-2.419*** (0.341)
Conventional	3.604*** (0.395)	-2.361*** (0.287)	0.028 (0.220)	-2.283*** (0.341)
Observations	1,052	1,217	1,442	827
Eff. N: Left of c	47	109	112	81
Eff. N: Right of c	50	126	74	111
BW (h)	7.205	11.789	12.402	11.952

lower credit rating as illustrated by Figure 9 and Panel B of Table 7. In particular, we find evidence of lower credit rating among less financially constrained firms (private and old). The

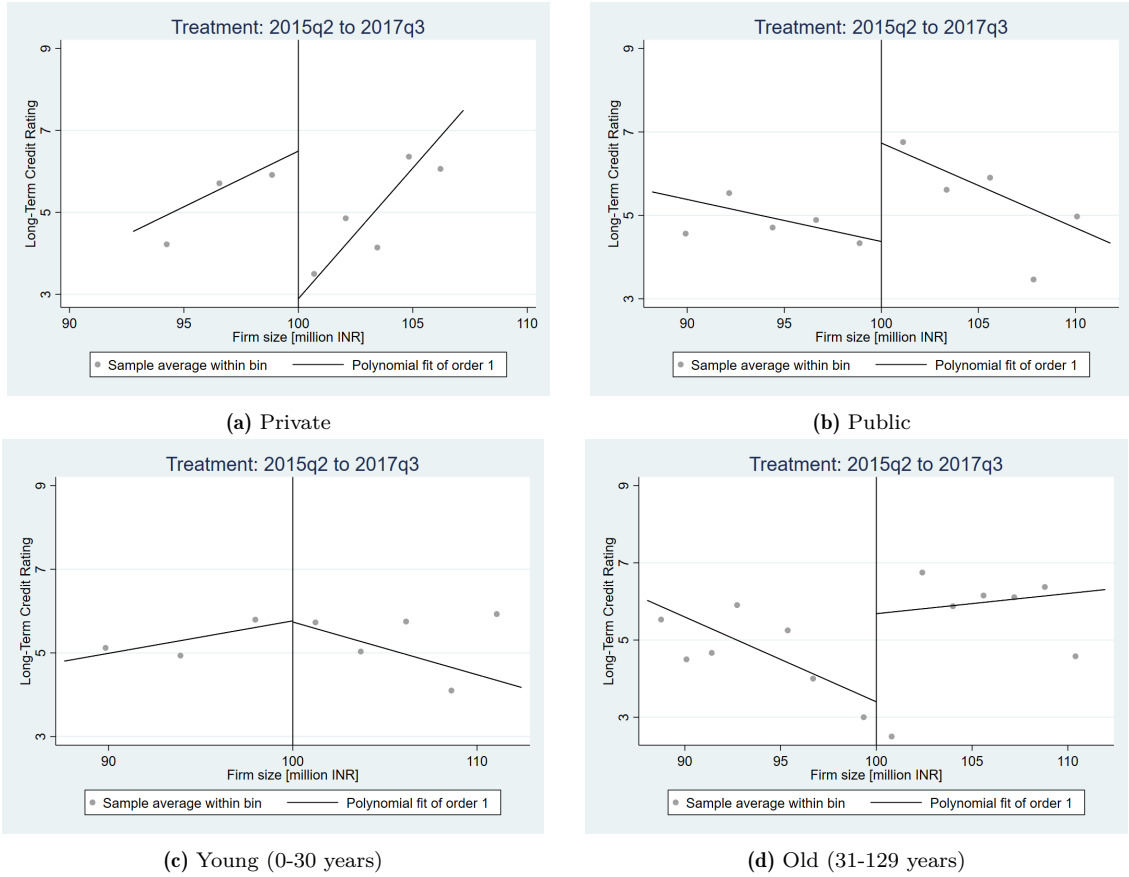


Figure 9: Financial constraints and relaxing credit constraints - credit rating. This figure shows that credit rating decreases for firms that are eligible for PSL and are less financially constrained. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (a) and (b) split the sample into private and public firms. Panel (c) and (d) split the sample into young (0-30 years) and old (31-129 years) firms. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3).

effect is of considerable size, with an un-constrained firm losing about 2.5 credit rating grades following the PSL reform in 2015. Moreover, credit ratings of private firms improve substantially by almost four full rating credit grades.

Overall, our results suggest that the PSL program reaches its goals in removing barriers to financing for small- and medium-sized financially constrained firms. The increase in financing to financially constrained firms opens up a greater number of profitable projects and investment opportunities, which effectively improves the asset allocation in the economy and drives firm credit rating higher. The financial intermediation remains diligent and favors better quality projects. Ultimately, the results suggest that the overall deterioration of credit rating among PSL eligible firms is related to their inability to benefit from the relaxed credit constraints as opposed to less diligent lending policies of the banks.

Table 8: Non-bank borrowing, cost of debt and relaxing credit constraints. This table shows a substitution effect between bank borrowing and non-bank borrowing following the PSL reform. At the same time, there is no discontinuity in the cost of debt as measured by interest rate and bank charges/bank borrowings. Observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3). This table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: *growth in non-bank borr.* (column (1)), *interest rate* (column (2)), and *bank charges/bank borrowings* (column (3)). The running variable is the firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

	(1)	(2)	(3)
VARIABLES	Growth in Non-Bank Borr.	Interest rate	Bank charges / Bank borrowings
Robust	-0.601* (0.363)	0.022 (0.015)	-0.011 (0.026)
Bias-corrected	-0.601** (0.296)	0.022* (0.013)	-0.011 (0.020)
Conventional	-0.491* (0.296)	0.019 (0.013)	-0.005 (0.020)
Observations	510	982	548
Eff. N: Left of c	56	168	54
Eff. N: Right of c	57	161	56
BW (h)	16.319	24.480	15.932

4.4 Substitution between bank and non-bank borrowing

Next, we are interested if the PSL reform cleanly identifies the shock to firm financial constraints. For example, firms with constraints on their access to bank financing may turn to other more expensive firms of financing. Once they become eligible for the PSL program they may decide to substitute this more expensive form of financing with the bank borrowings. Cost of such non-bank financing might be hidden in a higher interest rate but also terms of borrowing, i.e. maturity, renegotiation conditions, and short-term lending relationship.

In Table 8 we study a discontinuity at the PSL cutoff for the non-bank borrowings, interest rate, and bank charges. In column (1), we see that one of the outcomes of the PSL reform is a shift in the way firms finance their investments. Firms marginally eligible for PSL program resort to borrowings from other sources than banks less often following the PSL reform in 2015. Moreover, in column (2) and (3), we find no evidence of higher interest rates or bank charges as they shift in favor of bank borrowing. Remarkably, the last two results are of great importance, because they indicate that the bank financing is indeed a matter of market failure in the SME

credit market. If appropriately stimulated, banks do lend to SMEs, and they do it at the market prices.

4.5 Extensive vs. intensive margin in bank borrowing

To deepen our understanding of the banks' role in asset allocation in the economy and, it is helpful to detail some facts about their financial intermediation strategies. For example, the observed increase in bank borrowing may emerge from banks extending larger loans to existing borrowers (extensive margin) or from extending loans to new borrowers with which banks have no prior history of lending relationship (intensive margin).¹⁴ Understanding, which firms in the economy receive the credit flow, helps in assessing if new projects are unlocked in parts of the economy so far deprived of access to credit.

Which strategy banks adopt to fill their PSL targets is answered in Table 9. To establish a baseline, in column (1) we estimate the following difference-in-difference (DiD) specification:

$$Bank_borr._volume_{ib,t} = \alpha_b + \nu PSL_i \times Post_2015_t + \gamma PSL_i + \sigma Post_2015_t + \lambda X_{i,t} + \zeta Z_{b,t} + \tau_t + \varepsilon_{ib,t} \quad (4)$$

where $Bank_borr._volume_{ib,t}$ is the bank borrowing volume in INR per firm weighted by the number of relationships with banks the firm reports in the CMIE database. PSL is a dummy which takes value of one if the firm is newly eligible for PSL program (firm size from 50 to 100 million INR). $Post_2015$ is a dummy which takes value of one following the change in PSL cutoff. The X matrix stands for firm level controls and Z matrix for bank level controls. The specification includes bank and year fixed effects. The firm level controls include a dummy if the firm is eligible for PSL program prior to 2015 (firm size up to INR 50 million). The bank level controls include $Borrowing_bank$ which is a sum over all firms of their weighted bank borrowing volume; $\ln(Assets_bank)$ which is a natural logarithm of the bank's total assets; $Profitability_bank$ which is the ratio of bank's PBDITA to total assets; and ROA_Bank which is the bank's return on assets.

The results reported in column (1) of Table 9 indicate that the PSL program does indeed relax credit constraints of the firms newly eligible for PSL program. Those firms following the change in PSL cutoff borrow on average INR 111 million more from their banks, which

¹⁴Due to data limitation we cannot identify the number of loans, just the volume of bank borrowing per firm.

Table 9: Extensive vs. intensive margin in bank borrowing. Banks fill their PSL targets with new large loans (intensive margin) as opposed to extending larger loans to existing borrowers (extensive margin). Column (1) shows that the newly eligible firms (50 to 100 million INR in firm size) borrow more following the PSL reform. Column (2) shows that the newly eligible firms borrow less following the PSL reform if they have history of a relationship with the bank prior to 2015q2. Column (3) shows that firms with no prior relationship with the banks receive higher lending volumes from the banks. Column (4) shows that the newly eligible firms borrow less if their bank has a high share of pre-2015q2 lending to small firms (0 to 50 million INR in firm size). Robust standard errors are clustered at bank level and reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

VARIABLES	(1)	(2)	(3)	(4)
		Bank_borr._volume		
PSL x Post_2015 x Relationship_pre_PSL		-471.472** (205.201)		
PSL x Relationship_pre_PSL		-256.839*** (64.209)		
Post_2015 x Relationship_pre_PSL		119.595** (46.931)		
Relationship_pre_PSL		253.460*** (43.642)		
PSL x Post_2015 x No_relationship			819.525** (365.596)	
PSL x No_relationship			170.314*** (24.458)	
Post_2015 x No_relationship			-247.176*** (74.021)	
No_relationship			-146.841*** (41.861)	
PSL x Post_2015 x Bank_high_0-50				-257.333*** (84.834)
PSL x Bank_high_0-50				105.379 (80.320)
Post_2015 x Bank_high_0-50				38.395 (28.502)
Bank_high_0-50				21.613 (25.128)
PSL x Post_2015	111.228** (54.970)	425.230** (190.858)	66.746* (36.956)	177.263** (67.912)
PSL	-812.320*** (62.928)	-580.689*** (53.532)	-892.187*** (70.326)	-838.193*** (77.703)
Firms with size 0-50	-589.889*** (60.428)	-574.143*** (58.841)	-583.447*** (59.610)	-589.805*** (60.424)
Borrowing_Bank	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)	0.003*** (0.001)
ln(Assets_Bank)	-74.345 (99.593)	13.957 (100.832)	-32.728 (100.635)	-61.489 (102.250)
Profitability_Bank	-1,861.435 (2,199.101)	-1,626.239 (2,060.334)	-1,970.798 (2,142.787)	-1,492.449 (2,309.070)
ROA_Bank	-3.797 (6.520)	-3.384 (6.474)	-2.440 (6.000)	-3.154 (5.956)
Constant	1,610.131 (1,658.159)	-44.776 (1,699.034)	1,041.441 (1,689.534)	1,368.746 (1,710.307)
Observations	22,103	22,103	22,103	22,103
R-squared	0.013	0.014	0.013	0.013
Bank F.E.	Yes	Yes	Yes	Yes
Year F.E.	Yes	Yes	Yes	Yes

corresponds to about 10% of their total assets.

Shifting focus to bank's strategies in meeting their PSL targets, in column (2) we aim to identify if a firm-bank relationship existed prior to change in the PSL cutoff spurred a more generous lending following the PSL reform. To this end, we estimate variants of the following triple DiD specification:

$$\begin{aligned}
Bank_borr._volume_{ib,t} = & \alpha_b + \beta Relationship_pre_PSL_{ib} \times PSL_i \times Post_2015_t \\
& + \sigma Relationship_pre_PSL_{ib} \times PSL_i \\
& + \phi Relationship_pre_PSL_{ib} \times Post_2015_t + \eta Relationship_pre_PSL_{ib} \\
& + \nu PSL_i \times Post_2015_t + \gamma PSL_i + \sigma Post_2015_t + \lambda X_{i,t} + \zeta Z_{b,t} + \tau_t + \varepsilon_{ib,t}
\end{aligned} \tag{5}$$

where *Relationship_pre_PSL* is a dummy variable which takes value of one if the firm reported the bank as its bank in the CMIE database prior to 2015q2.

If banks choose to fill their PSL targets by lending more to their existing borrowers (extensive margin), we should observe here a positive and significant coefficient on the triple interaction term. The estimates presented in column (2) of Table 9 provide evidence that banks choose not to pursue this path. Following the PSL reform, the existing borrowers borrow significantly less relative to firms, which established relationship with the bank only after the PSL reform. It seems that banks choose to fill their PSL targets by lending to new borrowers (intensive margin). This is also confirmed by results in column (3) of Table 9. Here, we estimate a variant of the equation 4.5, in which we interact the DiD terms with a contemporaneous indicator if firm becomes a brand new borrower from a given bank (*No_relationship*). The *No_relationship* variable is a dummy which takes value of one if firm has reported the bank as its financier for the first time. Indeed, such firms borrow considerably more than firms which reported the bank as their financier in previous year.

In the last column, we analyze if banks decide to fill their PSL targets by replacing the existing small borrowers (firm size below INR 50 million) with the newly eligible firms (firm size from 50 to 100 million INR). If this were indeed the case, the benefits of the PSL program would have been limited to the extent that the medium-sized enterprises in the economy see their credit constraints relaxed but at the expense of the micro- and small-sized enterprises. Such a potential policy failure would unlock some profitable projects pursued by the medium-

sized enterprises, but no longer provide the micro- and small-sized enterprises in their efforts to develop some of their profitable project. Reassuringly, column (4) provides evidence that banks with a high share of pre-2015q2 lending to small firms (0 to 50 million INR in firm size) do not shift as eagerly their PSL lending to the newly eligible firms.

4.6 Climate risks

In this section, we discuss the effect of relaxing financial constraints on firm environmental risks. Although energy-efficient processes have a great potential to reduce production costs and limit environmental impacts, there seem to be a market failure limiting their adoption. Gerarden et al. (2015) discuss three likely reasons contributing to the market gap in energy-efficient processes. The explanations include: (1) imperfections in energy, capital and innovation markets, (2) behavioral biases (i.e. myopia, reference dependence), and (3) measurement errors (i.e. unobserved costs).

We provide empirical evidence on the first explanation for the market gap in energy-efficient processes. We find that relaxing capital flow to firms, which operate firms in industries with high environmental impact, can be used potentially toward reducing their environmental risks and lowering their environmental impact. Those firms seem to adopt cost minimizing energy-fuel- and water-efficient processes shifting toward the less socially costly solutions and technologies.

We classify firms into the high vs. low environmental impact industries based on their industry environmental score. We adopt the environmental score from GIZ (2013), which provide an evaluation of Indian industries ¹⁵ with respect to five categories: water use, energy use, supply chain (are inputs susceptible to climate change?), strategic implications (climate impact on operating processes and demand), and environmental impact (release of waste due to climate weather catastrophes). The first four categories are evaluated on a scale from 0 to 5, with 5 corresponding to the most severe implication. The fifth category is evaluated on a scale 0 to 10, with 10 corresponding to the most severe implication.

Among the manufacturing industries, pulp and paper have the highest environmental impact with 22 points out of 30, while ceramic and glass industry has the lowest with only 7 points out of 30 possible. We sort the firms with respect to their industry environmental impact and split

¹⁵We hand-match GIZ (2013) industry classification to NIC codes and later to our CRISIL-CMIE matched sample.

Table 10: Environmental impact and relaxing credit constraints. This table shows that bank borrowing increases for firms in industries with high environmental impact. The increase in bank borrowing is accompanied by a drop in power, fuel & water charges, and a drop in packaging & packing expenses. Observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3). The environmental impact of an industry is given by the GIZ (2013) and is constant over time. Then, firms qualify to the high (low) environmental impact group if their industry’s environmental impact is above (below) the annual median environmental impact in any year. This table reports local linear estimates (robust, bias corrected coefficients, and the conventional) of the regression coefficient following the bias-corrected procedure in Calonico et al. (2017). The dependent variables are: *growth in bank borr.* (column (1) and (4)), *power, fuel & water charges \ Total expenses* (column (2) and (5)), and *Packaging & packing exp. \ Total expenses* (column (3) and (6)). The running variable is the firm size defined according to MSMED Act 2006 as the value of investment in plant and machinery excluding the value of land and buildings. The optimal bandwidth (BW) is selected in accordance to Calonico et al. (2017) around the cutoff of INR 100 million. We use triangular kernel function to construct the local-polynomial estimator. The order of the local-polynomial used to construct the point-estimator is $p = 1$. The order of the local-polynomial used to construct the bias-correction is $q = 2$. Standard errors are reported in parenthesis. Significance levels are denoted by *** at 99% level, ** at 95% level, and * at 90% level.

VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
	High environmental impact			Low environmental impact		
	Growth in Bank Borr.	Power, fuel & water charges \ Total exp.	Packaging & packing exp. \ Total exp.	Growth in Bank Borr.	Power, fuel & water charges \ Total exp.	Packaging & packing exp. \ Total exp.
Robust	0.839*** (0.231)	-0.063** (0.027)	0.088* (0.051)	0.465 (0.490)	0.022 (0.018)	-0.121*** (0.034)
Bias-corrected	0.839*** (0.207)	-0.063*** (0.025)	0.088** (0.041)	0.465 (0.379)	0.022 (0.015)	-0.121*** (0.027)
Conventional	0.696*** (0.207)	-0.054** (0.025)	0.083** (0.041)	0.371 (0.379)	0.017 (0.015)	-0.097*** (0.027)
Observations	181	304	132	170	279	103
Eff. N: Left of c	22	32	14	23	40	10
Eff. N: Right of c	10	25	15	24	50	12
BW (h)	13.482	16.679	16.479	17.316	23.252	9.628

them into high and low environmental impact firms based on the median industry environmental impact.

In the next step, we assess if there is any discontinuity in the borrowing behavior and resource efficiency for the two groups of firms following the PSL reform in 2015. Table 10 reports the results. We find that firms, which operate in industries with high environmental impact, reduce their power, fuel, and water consumption (as captured by the power, fuel, and water charges). This result indicates a move toward more energy and resource efficient production processes. At the same time, we observe a make steps towards more expensive packaging, which might signal a more sustainable packaging - often more costly packaging option.

The results are also illustrated in Figure 10. The Panels on the left show a discontinuity

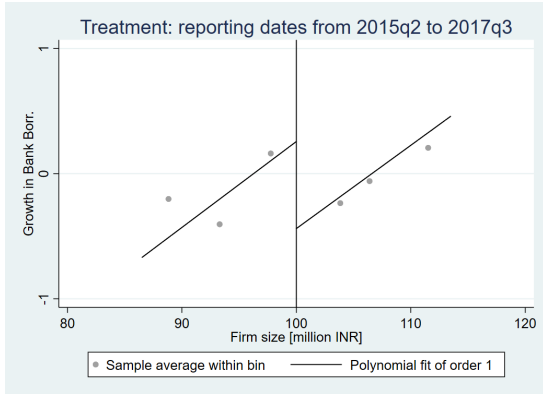
for the firms in industries with high environmental impact. In fact, the bank borrowing is significantly higher for the PSL eligible firms in industries with high environmental impact (Panel (a)). At the same time, no such discontinuity is observed for the PSL eligible firms in industries with low environmental impact (Panel (b)). Similarly, although not obvious there is some evidence of discontinuity in power, fuel, and water changes, as well as packaging for the PSL eligible firms in industries with high environmental impact (Panels (c) and (e)). The PSL eligible firms tend to reduce their power, fuel, and water consumption, while increase their packaging cost.

5 Conclusion

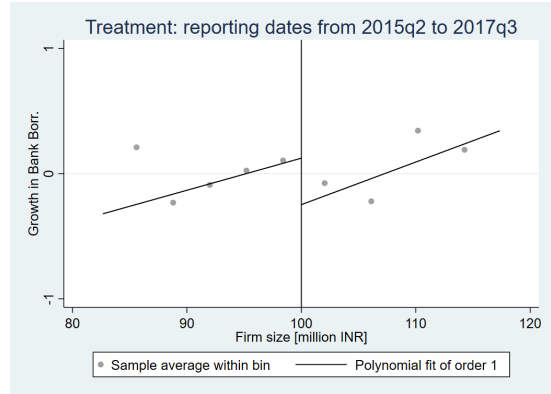
Our paper refines and pushes forward the question originally asked by Banerjee and Duflo (2014): Do firms want to borrow more? We find that the relaxing of financial constraints leads to higher borrowing, lower credit risk, and lower environmental risks, even within horizon of two years only. At the same time, we find empirical evidence of banks pursuing a good quality financial intermediation, which means extending credit to firms with good economic outlook (high sales and profitability growth), and to firms conventionally considered constrained (private and young). Moreover, the superficial deterioration of firm credit rating is driven by firms which are deprived of the more liberal lending policies under PSL program, that is firms with worse economic outlook (low sales and profitability growth) and less financially constrained (public and old).

Our empirical design exploits an exogenous variation in firm credit access due to a regulatory change, which created a positive credit supply shock to a narrow set of firms. In particular, the Reserve Bank of India extended the “priority sector lending” program to medium-sized firms (firms with firm size between INR 50 and 100 million) generating a sharp discontinuity in credit access for firms in the neighborhood of the INR 100 million cutoff. Owing to this regulatory change, our identification strategy relies only one few assumptions likely to be satisfied.

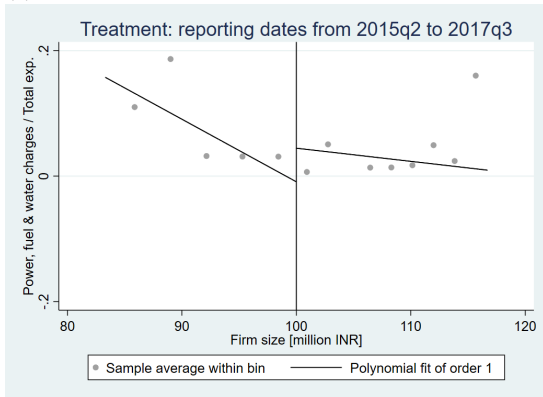
Liberalization of credit supply is often viewed by the lens of a theory of second best by Lipsey and Lancaster (1956). In particular, there is an expectation, that in an economy with many market failures, policymakers by trying to resolve one market failure, in fact reduce welfare. In our setting Indian policymakers aim at reducing the market failure in SMEs access to finance



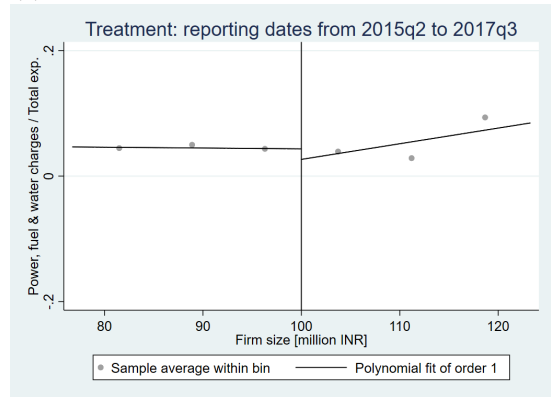
(a) High environmental impact: Growth in Bank Borr.



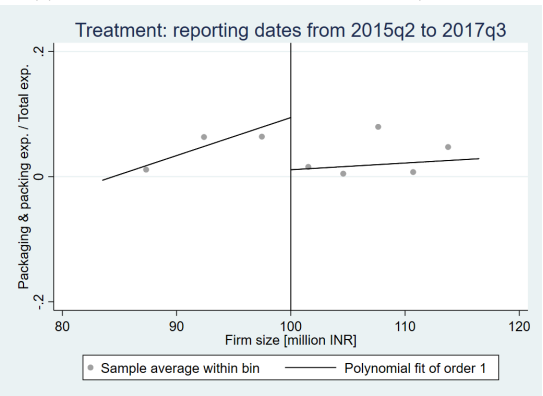
(b) Low environmental impact: Growth in Bank Borr.



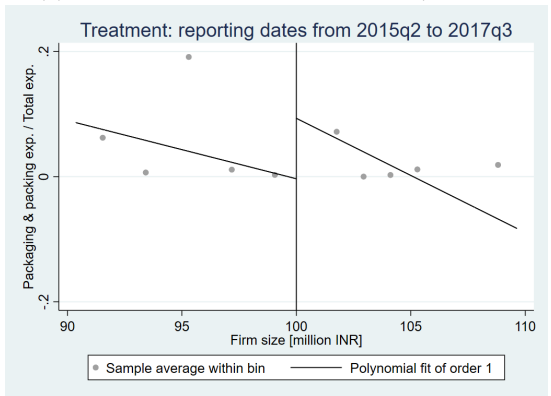
(c) High environmental impact: PFW \ Total exp.



(d) Low environmental impact: PFW \ Total exp.



(e) High environmental impact: Packaging \ Total exp.



(f) Low environmental impact: Packaging \ Total exp.

Figure 10: Environmental impact and relaxing credit constraints. This figure shows that bank borrowing increases for firms that are eligible for PSL and operate in industries with high environmental impact. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (2015q2 to 2017q3). Panel (1), (3) and (5) plot results for firms that operate in industries with high environmental impact. Panel (2), (4) and (6) plot results for firms that operate in industries with low environmental impact. The environmental impact of an industry is given by the GIZ (2013) and is constant over time. Then, firms qualify to the high (low) environmental impact group if their industry's environmental impact is above (below) the annual median environmental impact in any year. The observations are pooled for the treatment period (reporting dates from 2015q2 to 2017q3).

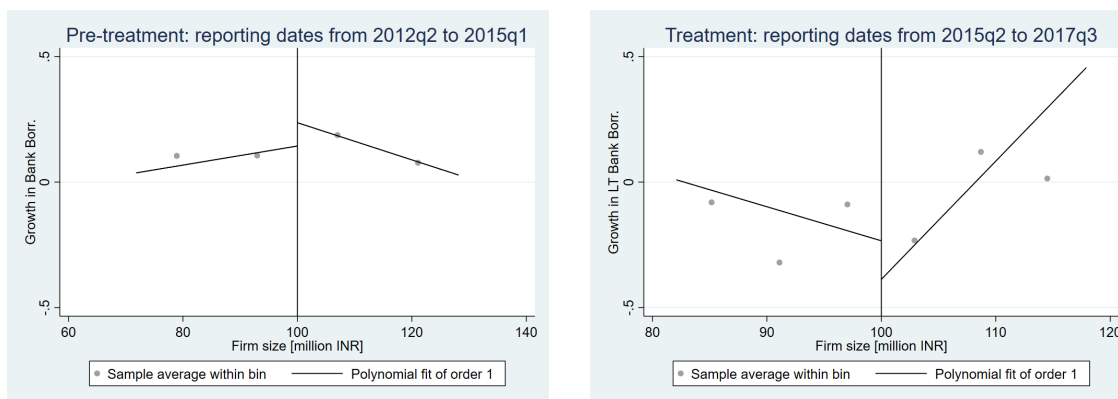
and relax their financial constraints. Such an intervention can lead to debt overhand in firms (Myers (1977), Krugman (1988)), or poor financial intermediation with raising non-performing loans (The Economist (2008)). Our results show that, this story although not inaccurate, it might be incomplete. We find that easing the market failure in SMEs access to finance leads to SMEs deterioration in credit quality, but only for those firms which could not benefit from the new policy (although eligible for it). Thus, an important part of the policy solutions to market failure in SMEs access to finance might be inclusion (or distribution) criteria including the entire population of SMEs and not only the better performing ones.

A Appendix A: CRISIL rating codes

Table A1: CRISIL rating codes.

9	A+/ AAA(SO), AA+/ AAA, AA-/ AAA(SO), AA/ AAA, AA/ AAA(SO), AAA, AAA(SO), AAA(SO)/ AAA, AAAr, PP-MLD AAAr/ AAA, Provisional AAA(SO), Provisional AAA(SO)/ A-
8.5	A+/ AA+, A+/ AA+(SO), A+/ AA-, A+/ AA-(SO), A+/ AA-/ AA, A/ AA+(SO), AA+, AA+(SO), AA+r, AA+r(SO)/ AA+(SO), AA-/ AA+, AA-/ AA/ AA+, AA/ AA+, AA/ AA+(SO), BBB+/ AA+(SO), PP-MLD AA+r, PP-MLD AA+r(SO)/ AA+r(...), PP-MLD AA+r/ AA+, Provisional AA+(SO)
8	A+/ AA, A+/ AA(SO), A-/ A+/ AA-, A-/ AA-(SO), A-/ AA-/ AA, A/ AA-, A/ AA-/ AA, AA, AA(SO), AA-, AA-(SO), AA-/ AA, AA-r/ A+/ AA-, AAr/ AA-/ AA, PP-MLD AA-r/ AA-, PP-MLD AAr, PP-MLD AAr/ AA, Provisional AA(SO)
7.5	CCR A+/ A+, A+, A+(SO), A+r/ A/ A+, A-/ A+, A/ A+, A/ A+(SO), BBB+/ A/ A+
7	CCR A/ A, A, A(SO), A(SO)/ A, A-, A-(SO), Ar, BBB+/ A, BBB-/ A-(SO), BBB/ A-, BBB/ A-(SO), PP-MLD A-r, Provisional A(SO)/ A(SO)
6.5	BBB+, BBB+(SO), BBB+(SO)/ BBB+, BBB-, BBB-(SO), BBB-/ BBB+(SO), BBB/ BBB+(SO), Suspended/ BBB+, BBB+
6	B-(SO)/ BBB(SO), BB+/ BBB(SO), BB+/ BBB-(SO), BBB, BBB(SO), BBB(SO)/ BBB, BBB-/ BBB(SO), Suspended/ BBB, BBB
5.5	BB(SO)/ BB+(SO), BB+, BB+(SO), Suspended/ BB+, BB+(SO)
5	B-/ BB-, BB, BB(SO), BB(SO)/ BB, BB-, BB-(SO), BB-(SO)/ BB(SO)
4.5	B+, B+(SO)
4	B, B(SO), B-, B-(SO), C/ B-, D/ B, D/ B-, Suspended/ B, Suspended/ B-
3	C, D/ C
2	D, D/ Suspended
1	Suspended

B Appendix B: Growth in long-term bank borrowing



(a) Pre-Treatment: Growth in LT Bank Borr.

(b) Treatment: Growth in LT Bank Borr.

Figure B1: Relaxing credit constraints: Growth in LT Bank Borr. There is no significant difference in the long term borrowing after the PSL reform. Firms eligible for PSL are all the firms below the INR 100 million firm size cutoff after the PSL reform (reporting dates from 2015q2 to 2017q3). This figure plots the growth in long term bank borrowings.

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