

Bank ownership and firm performance

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Abstract

Does a bank's ownership matter for the performance of a firm to which it is connected, especially in the event of a crisis? I study this question through the effect of the 2008–9 crisis on Indian manufacturing firms to provide evidence on a new channel that can matter significantly for a firm's performance—bank ownership. I find that firms connected to private (domestic and foreign) banks earned around 10% and 25% less from sales and exports, respectively, during the crisis, as compared to firms having banking relationships with public-sector banks. This happened as private banks were affected differentially in terms of credit supply from the Central Bank and withdrawal of deposits. Firms connected to private banks also laid off more workers, and imported fewer capital goods. Finally, these effects are significant across the size distribution of the firms (except the smallest firms), for firms producing intermediates, and about 40% less for firms that belong to a business group.

1 | INTRODUCTION

Does a bank's ownership matter for the performance of a firm to which it is connected, especially in the event of a crisis? The role of banks in economic activities has long been investigated by policymakers and academics (Friedman and Schwarz 1963; Bernanke 1983). And there is now a sizeable body of evidence suggesting that bank health/credit/funding significantly affects several firmlevel indicators, such as exports (Amiti and Weinstein 2011; Manova 2013; Paravisini *et al.* 2014; Buono and Formai 2018; Caballero *et al.* 2018), investment (Amiti and Weinstein 2018), financial performance (Iyer *et al.* 2014; Ongena *et al.* 2015), and so on. Another part of the literature studies how differential exposure to international financial shocks of different types of banks can act as a propagation mechanism during global financial crisis (Peek and Rosengren 1997, 2000; Cetorelli and Goldberg 2012; Schnabl 2012; Acharya *et al.* 2013; Ivashina *et al.* 2015; Ongena *et al.* 2015). However, the effect on firm performance due to variation in banks' ownership patterns, especially during a crisis, has not been studied in detail, and the underlying mechanisms behind this effect are still not well understood.

In this paper, I present evidence of a new channel that can matter significantly for a firm's overall performance, especially exports, in the event of a crisis—bank ownership. Indian

manufacturing firms connected to private (major) or foreign banks earn around 10% and 25% less in terms of their overall sales and export earnings, respectively, during the 2008–9 crisis as compared to firms having banking/credit relationships with public-sector banks.

This happened for two reasons. (a) Public-sector banks were given more preference than the private banks in terms of lending by India's Central Bank (popularly known as the Reserve Bank of India, or RBI) during the crisis of 2008–9. (b) Since public-sector banks are perceived to be more resilient to a crisis (due to the explicit and implicit guarantees provided by the government), a significant amount of deposits were transferred from private banks to these banks.¹ These significantly impacted the credit flow from the private banks to the firms associated with them, which led to a negative performance of firms. To the best of my knowledge, this is one of the first papers to show how firms were affected differentially (in terms of their sales, exports, domestic sales, factors of production, imports, etc.) due to the ownership pattern of the banks to which they are connected as the identification strategy.² This is my primary contribution.

A key question arises immediately: how does being client of a private bank as opposed to a public-sector bank affect a firm's performance negatively during a crisis? Existing research highlights two possible reasons.

The first reason is that credit lending by public-sector or government-owned banks tends to be less responsive to macroeconomic shocks than that by private banks (Micco and Panizza 2006; Bertray *et al.* 2012; Cull and Martinez-Peria 2013; Acharya and Kulkarni 2019). Panel A of Figure 1 reveals a similar situation in the case of India. For public-sector banks, credit expanded during the crisis of 2008–9 by 20.4%, as compared to 22.5% in 2007–8, a drop of a mere 2 percentage points. On the other hand, for private banks and foreign banks, the numbers are 10.9% and 4%, respectively (compared to 19.9% and 28.5% in 2007–8, respectively).

Relatedly, Ivashina and Scharfstein (2010) point out that one of the reasons why public-sector banks cut their credit less is that they may have better access to deposit financing. Panel B of Figure 1 plots the growth in deposits in case of Indian public-sector, private and foreign banks. An

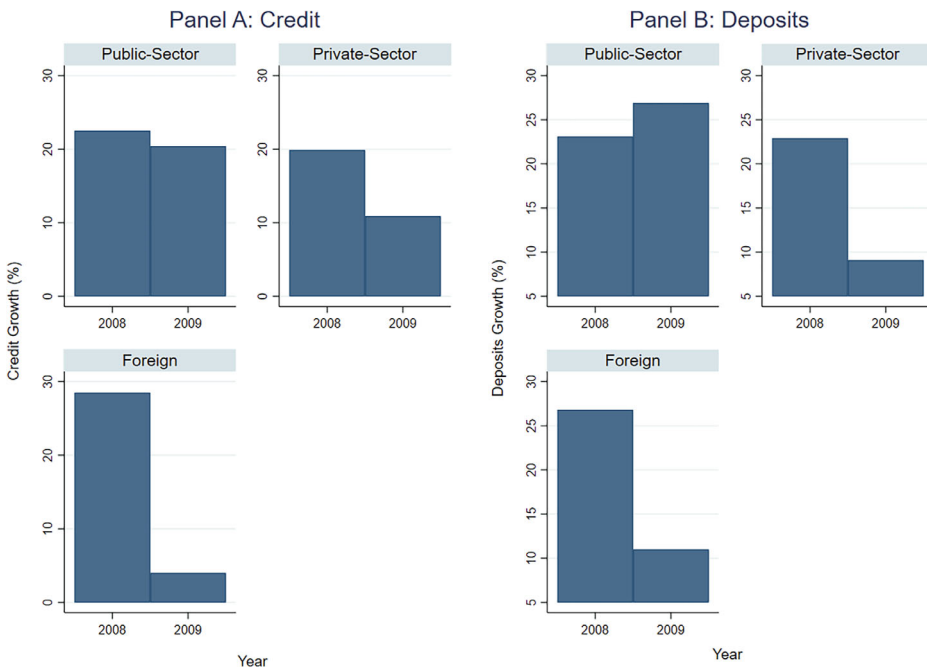


FIGURE 1 Credit and deposits growth in public-sector, private and foreign banks in India, 2008–9. *Notes:* The figure presents the yearly growth rates in different types of banks in India, 2008–9.

average public-sector bank saw an increase in deposits, whereas for the other two types, deposits declined sharply. Deposits in the public-sector bank increased to 26.9% in 2008–9 as compared to 23.1% in the previous year.³ On the other hand, private banks' deposit growth decreased from 22.3% to a meagre 9.1% for the same period. This highlights another important point: the growths in deposits for public-sector and private banks were identical before the crisis; that is, there was no susceptible difference in trends between the growths of deposits across these two kinds of banks.⁴

Utilizing branchlevel data from Indian banks, Acharya *et al.* (2019) show that there has been a reallocation of credit from private to public-sector banks. They argue that this is a result of a 'panic' channel—a depositors run on local branches—although the banks that held the deposits had no exposure to the fundamental crisis.⁵

The second reason is due to political pressure. Using plant-level data for Brazilian manufacturing firms, Carvalho (2014) provides evidence of political influence over the real decisions of firms. Firms connected with government banks expand employment in politically attractive regions before elections.⁶ However, political influences may not be of much relevance in this case as the shock was sudden and external to India.

A third reason, which may play a role and helps to identify causally the effect of bank ownership on firm performance, is the presence of an amendment undertaken in 1969 to the Banking Regulation Act 1949. Under this Amendment, 14 major private banks were nationalized, and in addition the Amendment provided an explicit guarantee that all obligations of the public-sector banks will be fulfilled by the Indian government in the event of a crisis. Acharya and Kulkarni (2019) show that it is the explicit and implicit government guarantees for the public-sector banks that helped them to tackle the financial crisis better than other banks.⁷ The presence of this Amendment might be circumstantial, but it provides some background on why the public-sector banks in India enjoy explicit and implicit guarantees in the event of a crisis, such as that of 2008–9.

Figure 2 plots the normalized average real borrowings (short-term) by a public-sector and private bank from the RBI in a given year from 2004 to 2010. The plot shows clearly that the patterns of borrowing from the RBI are very similar before the crisis, but significantly different afterwards (similar to what I found for deposits in Figure 1). The flow of money from the RBI increases almost exclusively for the public-sector banks.⁸

Given this as the background, I use the context of the financial crisis of 2008–9 to investigate the differential effects of bank ownership on Indian manufacturing firms' performance. I presume that the public-sector and other banks (private and foreign) were affected differentially during the crisis due to the implicit and explicit guarantees that come with public-sector banks, and this subsequently got reflected in the performance of the firms, especially the exporters.

I carry out the analysis at the firm–year level by exploiting information on credit relationships of firms with banks and their (banks') balance sheets, specifically borrowing by a bank from the RBI and the deposits received by the banks, to estimate the causal effect of the banks' ownership on firms' performance. Using these matched firm–bank data helps me to tackle the usual identification challenge that a lot of studies face to isolate changes in firm borrowing that are driven solely by credit supply forces instead of credit demand. But it still does not solve the problem of selection issue—the matching between a firm and a bank is endogenous.

For example, a firm may switch to a public-sector bank from its current banker (which could be a private and/or foreign bank) during the crisis to avoid the anticipated drop in credit supply, or it just stops borrowing from private and/or foreign bank(s) and borrows only from public-sector bank(s), and so on.⁹ Also, the lending pattern of banks may vary according to their ownership. For example, foreign-owned banks may lend to completely different sets of firms. These issues can significantly bias my estimated coefficients.

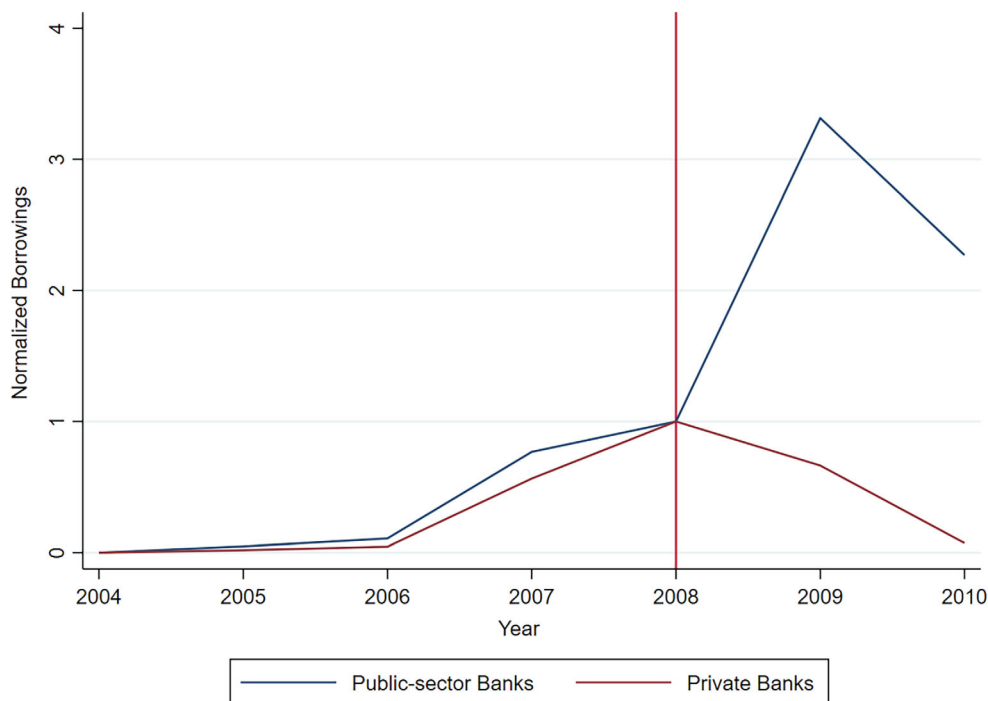


FIGURE 2 Banks' borrowing from India's Central Bank, 2004–10. *Notes:* The figure presents average real borrowing from India's Central Bank. 'Public-sector banks' include all the state-owned banks. 'Private banks' are domestic private banks and banks of foreign origin. We do not include private non-banking financial corporations and cooperative banks. All the values are deflated to Indian rupees of April 2004, and normalized to value 1 for all bank types at 2008.

To control for this, I undertake the following steps: (a) use an indicator variable that takes value 1 if a firm is a client of a private bank in and out of the sample years (which is significantly before the crisis period); (b) interact key firm characteristics with the bank ownership dummy to control for the fact that banking relationships might be correlated with borrower characteristics that might affect their credit demand.

For such exercises, I put together information from a well-known dataset on Indian manufacturing firms known as PROWESS (Chakraborty and Raveh 2018). The dataset is unique in a sense that (a) it reveals information on the names and types of banks of which each individual firm is a client (because of their credit relationships), along with the information on the balance sheet of the banks, such as the amount of borrowing (both short- and long-term) from the RBI, deposits received, total amount of loans and advances by them; and (b) it contains direct measures on borrowing by firms from different types of sources (but not by each bank), namely total borrowings summed across all domestic banks (public and private), and similarly for foreign banks, etc. The dataset also reports total sales, trade flows (divided into exports and imports), compensation to employees, expenditure on technology, capital employed, ownership category, and other important firm and industry characteristics. I use all this information for the time period 2003–10. This enables me to track a firm's banking relationships over time, thereby allowing for a dynamic specification in which changes in credit flows from different kinds of sources may influence firm performance.

I have two sets of results.

First, I exploit banking relationships of the firms to show that firms client to the domestic private (major) and foreign banks (especially banks of US origin) receive less credit (15%), earn significantly less from sales (10%), exports (25.3%) and domestic sales (6.7%), pay less wages

(4%), and import less capital goods (6.8%), as compared to firms connected to state-owned or public-sector banks. My benchmark result is robust to all other possible important controls, such as demand shock, differential trends in bank lending, interactions between firm characteristics and bank dummy, multiple banking relationships, substitutability of credit, and matching methods. This negative effect on firm performance (a) is true for firms selling intermediates, across all sizes except the smallest ones, and (b) gets mitigated by 40% for a firm that is part of a business group.

Second, I use balance sheet information of the banks (particularly, borrowing from the RBI and deposits received) to show that a drop in credit supply from the RBI and deposits for private banks significantly explains the negative performance of firms connected to these banks.

The findings contribute to three different kinds of literature.

My primary contribution is to show that bank ownership matters for a firm's performance, especially in the event of a crisis. In other words, the contribution lies in the identification and measurement of credit supply shocks and their real effects using matched firm–bank-level data, using the ownership of the banks as the source of variation. My study is closely related to that of Coleman and Feler (2015) on Brazil, who show that following the collapse of Lehman Brothers in September 2008, Brazil's government-owned banks increased lending substantially. Localities in Brazil with a high share of public-sector banks received more loans and experienced better employment outcomes in comparison to localities with a low share of government banks. The results also indicate that this lending was politically targeted and inefficiently allocated, which reduced productivity growth. My paper complements and extends the study by Coleman and Feler (2015) in terms of utilizing a matched firm–bank dataset and causally estimating the effect of the bank ownership in the context of the 2008–9 crisis on firm performance. This paper also complements the study of Amiti and Weinstein (2011) in showing that as with bank health, bank ownership can also be an important channel for firm trade, especially exports and import of intermediates.

Second, the results contribute to the macro effects of global banking (Klein *et al.* 2002; Chava and Purnanandam 2011; Claessens *et al.* 2011). I add to this literature to show that the presence of private and/or foreign banks transmits international financial shocks to an economy, and public-sector banks can act as countercyclical elements. The paper is also related to the recent literature that uses the bank lending channel as an instrument for credit shocks (Kalemli-Ozcan *et al.* 2010; Jiménez *et al.* 2012; Chodorow-Reich 2014). I find similar evidence, but my results also show that it may depend on bank ownership patterns.

Finally, the paper also contributes to a now seemingly growing literature on trade and finance, namely, the role of credit supply or shocks on export activities. This paper exploits differences in the availability of credit across different types of banks due to their ownership patterns, and measures its effect on firms' performance. The results are closely related to work that analyses the effects of credit disruptions on trade during the Great Trade Collapse of 2008–9 (Bolton *et al.* 2011; Chor and Manova 2012; Levchenko *et al.* 2010; Ahn and Sarmiento 2019) as well as the general literature on credit shocks or banks' health and performance of firms (Amity and Weinstein 2011; Bronzini and D'Ignazio 2017; Berton *et al.* 2018).¹⁰

The rest of the paper is organized as follows. Section 2 describes what happened in India during the crisis of 2008–9. The dataset is outlined in Section 3. Section 4 estimates the effect of bank ownership on banks' performance, while Section 5 evaluates the direct effect of bank ownership on firm performance. Section 6 concludes.

2 | FINANCIAL CRISIS IN INDIA DURING 2008–9

India, like Brazil and China, was relatively immune to the slowdown of the international credit flows.¹¹ However, it still witnessed a heavy sell-off by foreign institutional investors during the

TABLE 1 INDIA'S CAPITAL ACCOUNT, 2008–9.

| | 2007–8 | 2008–9 | 2008–9 1st half | 2008–9 2nd half |
|--------------------------------|--------|---------|--------------------|--------------------|
| Foreign direct investment | 15,401 | 17,496 | 13,867 | 3629 |
| Portfolio investment | 29,556 | –14,034 | –5521 | –8513 |
| External commercial borrowings | 22,633 | 8158 | 3157 | 5001 |
| Short-term trade credit | 17,183 | –5795 | 3689 | –9484 |
| Other banking capital | 11,578 | –7687 | 3747 | –11,434 |
| Other flows | 10,554 | 4671 | –1849 | 6520 |

Notes: Figures are in INR million.

Source: Reserve Bank of India.

crisis to provide the much-needed liquidity to their parents in the USA or Europe—a net expulsion of around USD 13.3 billion in 2008 through equity disinvestment (Joseph 2009; Kumar *et al.* 2009). Table 1 shows a major return flow of capital from India, especially in the second half of the year, with regard to short-term trade finance and bank borrowings to the extent of USD 9.5 billion and USD 11.4 billion, respectively.

Indian banks lost access to funds from abroad as interbank borrowing seized up in the USA and Europe. In addition, they had to send funds to their branches abroad in those countries. The drying up of funds in the foreign credit markets led to a virtual cessation of external commercial borrowing for India, including access to short-term trade finance. This led to: (a) a fall in the Bombay Stock Exchange index; (b) a rapid depreciation of the Indian rupee vis-à-vis the US dollar; (c) the call money rate breaching the upper bound of the informal liquidity adjustment facility (LAF)—overnight call money rates rose by nearly 20% in October and early November 2008;¹² and (d) a decline in the outstanding amount of certificate of deposit issued by the commercial banks as the global financial market turmoil intensified. All these happened despite (i) the majority of the Indian banking system being owned by the public sector (around 60%), and (ii) Indian banks having limited direct exposure to subprime mortgage assets (Sinha 2010).¹³

The collapse of the stock market further ruled out the possibility of companies raising funds from the domestic stock market. In addition, banks and corporations that were dependent on global markets for foreign currency suddenly found themselves facing a major liquidity crisis as credit dried up (Islam and Rajan 2011). Thus while the Indian banking sector remained largely unscathed by the global financial crisis, it still could not escape a liquidity crisis and a credit crunch. In addition, the crisis affected the Indian banks differentially.

Acharya and Kulkarni (2019) investigate the impact of ownership structure on bank vulnerability in India, and show that private banks performed worse than public-sector banks during the 2008–9 crisis. Private banks experienced deposit withdrawals, whereas state-owned banks saw the opposite. In a similar study, Eichengreen and Gupta (2013) show that Indian private banks experienced a slowdown in their deposit growth during and after the crisis; in contrast, public-sector banks did not experience any such similar situation. Both the studies conclude that one of the main reasons behind this differential effect (in terms of performance) across the two different types of banks (in terms of ownership) is the explicit and implicit guarantee by the government of India to the public-sector banks, especially during the crisis. I use this as a pretext to show that firms connected to these banks are affected differentially, in terms of their overall and export performance, using the differential treatment by the RBI or the government of India during the crisis as the identification strategy.

3 | DATASET

The sample of firms is drawn from the PROWESS database, constructed by the Centre for Monitoring the Indian Economy (CMIE), a private agency. The database contains information on a large number of publicly listed companies, all within the organized sector, of which almost 9000 are in the manufacturing sector. I use data for around 5500 firms, for which there are consolidated data on banking relationships. I use data for the years 2003–10, hence covering the crisis period (2008–9). Unlike other sources, the PROWESS data are in effect a panel of firms, enabling me to study their behaviour and banking relationships over time.

The dataset is classified according to the 5-digit 2008 National Industrial Classification (NIC) level.¹⁴ The dataset spans 310 (5-digit 2008 NIC) disaggregated manufacturing industries that belong to 22 (2-digit 2008 NIC) larger ones. It presents several features that make it particularly appealing for the purposes of this study. Below, I outline three of the most important features that are needed primarily for the paper.

The first feature is information on the banking or credit relationships of each firm. The dataset provides the names and types of banks (domestic public-sector, domestic private, foreign) with which each and every firm has a credit relationship.¹⁵ The dataset provides information on 52 public-sector banks (including state-sponsored financial institutions), 88 private banks (including cooperatives) and 53 foreign banks. For my analysis, I use only the list of major banks (excluding the financial institutions, cooperatives, etc.) as outlined by the RBI. About 36% of firms have links to only private banks, 60% of firms have connections with only public-sector banks, and 55% of firms have connections to both.

Second, the dataset also rolls out all the important information from the balance sheets of the banks. In particular, there is information on borrowing by these banks from the RBI, especially short-term borrowing.¹⁶ These short-term borrowings are part of the open market operations (OMOs) used by the RBI. And there are two types of OMO: (a) outright purchase, which is outright buying or selling of government securities (more permanent in nature); and (b) repurchase agreement, which is short term, subject to repurchase. The short-term borrowings from the RBI indicate the latter. Possibly, this could be a direct result of the explicit and implicit guarantees provided to the public-sector banks.¹⁷ This gives me the unique advantage of utilizing this information and investigating whether this is one of the key mechanisms through which the differential effect of the firms connected to private and public-sector bank materializes.¹⁸

The information on the balance sheets of the banks also gives the total amount of deposits received by the banks. I also use this variable to show that the effects are similar. Private banks experienced a significant drop in deposits during the crisis, with the opposite effect for public-sector banks. This could also have a significant effect on the performance of firms connected with them, as deposits can be used to cater to the extra credit demand (due to the crisis) by the firms. Table B1 in the Online Appendix lists summary statistics for some of the key variables at the aggregate and by ownership of the banks. On average, a public-sector bank borrows more from the RBI and has more deposits than a private and/or foreign bank.

Finally, the dataset rolls out information on a vast array of firm-level characteristics regarding total sales, imports, costs, compensation, production factors employed, other kinds of expenditures, gross value-added, assets, and other important firm and industry characteristics. The majority of the firms in the dataset are either private Indian firms or affiliated to some private business groups, whereas a small percentage of firms are either government or foreign-owned. The database covers large companies, firms listed on the major stock exchanges, and many small enterprises. Data for big companies are worked out from balance sheets, while the CMIE surveys smaller companies periodically for their data.¹⁹ The variables are measured in INR millions, deflated to 2005 using the industry-specific Wholesale Price Index. The dataset

TABLE 2 BALANCING TESTS.

| | Firms connected to | | | | Normalized difference (5) |
|------------------|--------------------|-------------|---------------------|-------------|------------------------------|
| | Private banks | | Public-sector banks | | |
| | Median (1) | S.D. (2) | Median (3) | S.D. (4) | |
| Bank borrowing | 285.1 | 4159.44 | 250 | 1418.32 | 0.22 |
| Total sales | 1909.3 | 73,859 | 1513.5 | 45,664.16 | 0.18 |
| Exports | 98.2 | 21,506.67 | 81.3 | 1335.76 | 0.14 |
| Domestic sales | 1528 | 59,914.72 | 1252.1 | 44,745.17 | 0.17 |
| Capital employed | 1784 | 40,664.5 | 1308.8 | 23,906.27 | 0.17 |
| Raw materials | 957.4 | 35,864.2 | 1031.9 | 23,898.13 | 0.17 |
| Total assets | 2363 | 65,069.96 | 1682.4 | 22,379.86 | 0.22 |
| Value-added | 1207.8 | 52,150.82 | 1050.8 | 39,197.92 | 0.16 |

Notes: The table reports median values for 2000–7. Values are expressed in INR millions. Column (5) shows the normalized difference between the two groups. Following Imbens and Wooldridge (2008), an absolute value above 0.25 would suggest an imbalance between the two groups.

accounts for more than 70% of the economic activity in the organized industrial sector, and 75% (95%) of corporate (excise duty) taxes collected by the Indian government (Chakraborty and Raveh 2018).²⁰

Table 2 compares key firm characteristics (bank borrowing, total sales, exports, domestic sales, capital employed, raw materials, total assets and value-added) based on balancing tests (Imbens and Wooldridge 2008) according to their banking relationships—firms connected to public-sector compared to private banks prior to the crisis. If the absolute value of normalized difference for any characteristic across two different sectors is more than 0.25, then this would suggest an imbalance between the two groups. Columns (1) and (2) present the median and standard deviation of the firm characteristics for firms connected to private banks, whereas columns (3) and (4) do the same for firms connected to public-sector banks. None of the eight different characteristics has an absolute value of the normalized difference exceeding the threshold 0.25. This suggests that firm outcomes did not vary systematically based on their banking relationships.²¹

4 | BANK OWNERSHIP AND BANKS' PERFORMANCE

As discussed, my main idea is to understand whether or not bank ownership plays an important role in firm performance, especially during a crisis. However, before doing so, I first check if the ownership of a bank has any leverage on its own performance in terms of deposits or credit borrowing or lending. In other words, do we see any differential effect by bank type in terms of deposits received or borrowing from the RBI or loans and advances granted? This is highlighted by Figures 1 and 2, but those do not control for the possible observables and unobservables that may play a role. For this purpose, I exploit the data from banks' balance sheets and use the following simple difference-in-differences strategy:

$$\log(x_{bt}) = \beta(D_{crisis} \times PVT_b) + \delta_b + \alpha^t + \varepsilon_{bt}, \quad (1)$$

where x_{bt} is bank-level outcome, which takes the form of three different outcome variables—total deposits, RBI borrowing, and loans and advances by bank b at time t — D_{crisis} is an indicator of the financial crisis, taking value 1 if the year is ≥ 2008 , and PVT_b takes value 1 if bank b is privately

TABLE 3 BANK OWNERSHIP AND BANK PERFORMANCE.

| | Total deposits (1) | RBI borrowing (2) | Loans & advances (3) |
|---------------------------|-----------------------|----------------------|-------------------------|
| $PVT_b \times D_{crisis}$ | -1.691*** (0.503) | -1.459*** (0.392) | -1.323*** (0.521) |
| R-squared | 0.73 | 0.70 | 0.71 |
| N | 2959 | 2959 | 2959 |
| Bank fixed effects | Yes | Yes | Yes |
| Year fixed effects | Yes | Yes | Yes |

Notes: Columns (1), (2) and (3) use total deposits received by banks, total credit received from the RBI, and total loans and advances by a bank as the dependent variable. Here, D_{crisis} is an indicator of the 2008–9 crisis that takes value 1 for the years ≥ 2008 , and PVT_b is a dummy variable that takes value 1 for a private bank. Numbers in parentheses are robust clustered standard errors at the bank level. Intercepts included but not reported.

*, **, *** indicate 10%, 5%, 1% level of significance, respectively.

owned (domestic and/or foreign). Standard errors are clustered at the bank level.²² Results are reported in Table 3.

My results reiterate what Figures 1 and 2 show. Private banks saw a drop of around 17% in their deposits: 15% in credit borrowing from the RBI, and 13% in their credit lending as a result of the crisis. Now, one problem with this result is that the private and government banks could have been on completely different trends before the crisis, and the 2008 crisis may have just aggravated the situation. In order to control for this, I regress borrowing from the RBI by the banks and deposits received on the interaction between year fixed effects and PVT_b , and plot the yearly coefficients in Figure 3. The yearly trends clearly show that for both these outcome variables, private and government banks are not on different trends before the crisis—but the differences in the coefficients are not significantly different from zero—but are significantly different after.²³

My results are very similar and provide support to Acharya and Kulkarni (2019) and Acharya *et al.* (2019). The former work analyses the performance of banks in India during the 2007–9 crisis to study the impact of government guarantees on bank vulnerability to a crisis. The authors find that private banks performed worse than state-owned banks in terms of deposits and lending growth. Acharya *et al.* (2019) use branch-level data to show that there was a deposit flight from private banks to public-sector banks during the crisis. These results are consistent with greater market discipline in private banks, and lack thereof in state-owned banks, which can obtain credit as they have access to stronger government guarantees and forbearance.

5 | BANK OWNERSHIP AND FIRMS' PERFORMANCE

5.1 | Utilizing credit relationships

5.1.1 | Empirical strategy

This section investigates the direct role of bank ownership on firms' performance. Given that the private banks are differentially affected during the crisis, due to either lending from the RBI or transfer of deposits (as confirmed by Figures 1, 2 and 3), it is now imperative to check whether or not the firms connected to those banks are also affected differentially. For this purpose, I exploit firm–bank credit relations. I follow Coleman and Feler (2015), and use a simple interaction term

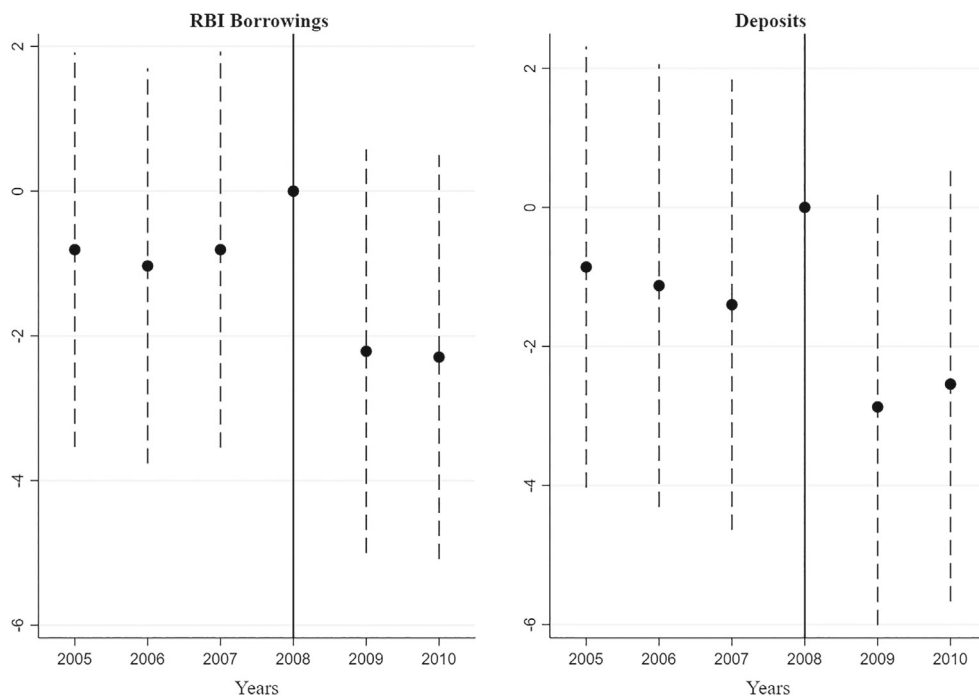


FIGURE 3 Effect of bank ownership on bank performance—borrowings from the RBI and deposits, 2005–10. *Notes:* The figure presents the OLS coefficient estimates (and their 95% confidence intervals) of the differences in the borrowings from the RBI and deposits received by private (domestic and foreign) banks in comparison to public-sector banks for the period 2005–10.

between a crisis dummy (D_{crisis}) and a dummy indicating whether or not a firm is a client to a private bank (be it domestic and/or foreign) as my variable of interest. In particular, I use the following simple ordinary least squares (OLS) reduced-form equation:

$$\log(x_{fjt}) = \beta(D_{crisis} \times PVT_{f, \leq 2002}) + \delta_f + \alpha_j' + \varepsilon_{fjt}, \quad (2)$$

where x_{fjt} is a firm-level outcome (total sales, exports, domestic sales, imports, wages, capital employed, raw material expenditure) for an Indian manufacturing firm f belonging to industry j at time t . As before, D_{crisis} is an indicator of the financial crisis, taking value 1 if the year is ≥ 2008 . Here, $PVT_{f, \leq 2002}$ takes value 1 if firm f is a client to a private (domestic and/or foreign) bank. Now, banking relationships are endogenous.

First, firms can switch to a public-sector bank, especially during a crisis, to avoid the risk associated with a private and/or foreign bank, especially if they are aware of the government guarantees, which is likely to be the case. So, in order to avoid the issue that the crisis might drive some of the firms to switch banks, $PVT_{f, \leq 2002}$ takes a value from out of the sample period.

For example, $PVT_{f, \leq 2002}$ assumes value 1 if a firm is client to a private bank in any year between 2000 and 2002. I checked for the robustness of the results by using years before the crisis, say 2003–7, and the results turned out the same.²⁴ Therefore the interaction term $D_{crisis} \times PVT_{f, \leq 2002}$ measures the impact of bank ownership given that there is a differential effect (on a private bank as opposed to a public-sector bank) during the crisis. My coefficient of interest is β , which therefore measures the relative difference between a firm's performance when it is connected to a private and/or foreign bank versus a public-sector bank.

In other words, the thought process here is that the government's guarantees provided to the public-sector banks can be thought of as an exogenous difference between private and

public-sector banks to identify the causal impact of bank ownership on firm performance. And these guarantees could be a result of the 1969 ordinance on bank nationalization. A key assumption for my identification strategy to be valid is that the cross-sectional differences in aggregate lending by the RBI (to the banks) are driven by differential guarantees provided due to their ownership patterns, but uncorrelated with unobserved firm characteristics that can affect their credit demand and performance during the same period; similarly for deposits. The withdrawal of deposits is due to the perception that they are not safe with private banks during a crisis. Acharya *et al.* (2019) present micro-level evidence on the real effects of a large-scale flight to safety by bank depositors. They show that private banks in India experienced sudden withdrawals of deposits after the 2008 financial crisis in the USA, reflecting pure panic of depositors.

I expect that $\beta < 0$. Firms having relationships with private bank(s) are expected to be impacted negatively during a crisis (maybe because of the drop in the supply of credit), therefore would have negative effects on their performance compared to firms connected with public-sector banks.

Second, it is true that the relationship between a firm and a bank even before the years of a crisis is not random. There are several reasons why a bank chooses a firm to provide credit. For example: size of a firm; or RBI lending may be linked to interference by policymakers; or government wants to lend more to vulnerable firms during the crisis; or RBI funding is endogenous to the pool of firms to which a bank is linked. In other words, the matching can happen for reasons other than the crisis. In order to control for such a range of issues, I interact few key characteristics with $PVT_{f, \leq 2002}$; my benchmark results remain the same. I explain this in detail later.

Third, relationships can change over time. Therefore, using banking relationships for firms for the 2000–2 period could bias my results in a certain way. In order to check whether there is something specific to the 2000–2 period, or there is a significant difference in the banking relationships between 2000–2 and afterwards, I calculate the mean, median and standard deviation for an average firm for all types of banking relationships, and separately for public-sector and private banks, in Table B2 of the Online Appendix. The numbers, across any type of banking relationship, do not change much over time, thereby justifying my choice of using the 2000–2 period.

A related concern is that different types of firms may choose to be linked to different kinds of banks, which in turn could drive those firms affected by shocks. Table B3 of the Online Appendix presents a frequency distribution of linkage by firm types. I divide my sample of firms into the following categories, and present the median number of banking relationships for these types of firms over time—by industry (end-use category), by ownership, by age, and by size. While there are some obvious differences in the number of banking relationships by their size—big firms, especially above the median, having a higher number of relationships than the rest—there is no systematic difference for any other category. I control for firm size in my estimations along with interaction of size with $PVT_{f, \leq 2002}$ —the results are akin to the baseline specification.²⁵

Fourth, is there political interference concerning whom banks lend to and how much they give out? This is highly unlikely as the shock was external, sudden and random. As soon as the crisis hit the Indian market (due to the withdrawal of the foreign institutional investors), the Governor of the RBI issued the following statement: ‘Measures to encourage flow of credit to sectors that are coming under pressure include extension of the period of pre-shipment and post-shipment credit for exports, expansion of the refinance facility for exports’.²⁶ Both Acharya *et al.* (2019) and Eichengreen and Gupta (2013) show that one of the main reasons behind this differential effect across banks is the explicit and implicit guarantee by the government of India, and not any kind of political pressure that is attached to the public-sector banks. Even if such is the case (maybe for a handful of the firms), the interaction between firm characteristics with $PVT_{f, \leq 2002}$ will control for such unobservables.

Fifth, the government may also care more about regional problems or employment numbers than government guarantees. And the firms located in those places just happen to be connected to public-sector firms. While this might be interesting to analyse in itself, it can definitely raise

identification challenges. I use postcodes of the firms to interact state or region fixed effects with $PSB_{f,\leq 2002}$, to possibly control for these types of issues.

Sixth, Khwaja and Mian (2008) highlight that controlling for multiple banking relationships is crucial for a firm–bank matched dataset by clustering at the bank level and using firm fixed effects. In my case, I am using a firm–year dataset in wide format, so the multiple banking relationships should not affect my estimations. One way to control for this issue would be to compare firms that have single bank relationships. However, dropping firms with multiple banking relationships from my dataset may lead to violation of the external validity theorem as I need to drop around 80–85% of observations. Nevertheless, I cluster my standard errors at the firm–bank level to control for any shocks that might transfer from a bank to all the firms connected to that particular bank. For example, say a domestic private bank was affected more than other private banks as it had higher branches/operations in the USA; then clustering at the firm–bank level will make sure that the impact of this shock will be transmitted only to the firms that are connected to those banks, and not to others.

Finally, I use interaction of industry fixed effects at the most disaggregated level (5-digit) and year fixed effects α_j^t to control for other simultaneous factors that may affect the performance of a firm, such as any fiscal policy considerations, drop in demand for products due to the crisis,²⁷ and industry exposure of banks. For example, some banks can choose to give credit only to certain set of industries. Before going on to the estimations, let me be clear in terms of the level at which I am running the regressions. Although I have a matched firm–bank dataset, the data still vary at the firm–year level rather than at the firm–bank–year level since I do not observe the credit granted by each bank to an individual firm.²⁸

However, one should still be careful in interpreting the basic estimates as conclusive evidence of the causal effect of the bank ownership on performance of firms connected to private banks, as opposed to the following couple of reasons: (a) omitted variable bias, and (b) differential time trends. I address (a) by adding sequentially various observable characteristics and interactions with the $PVT_{f,\leq 2002}$ dummy to my baseline specification. As for (b), I show that firms connected to private banks were on similar trends in the pre-crisis period as opposed to post-2008 through some checks given explicitly in the following subsection.

5.1.2 | Were the firms with different banking relationships (private and public-sector) on different pre-crisis time trends?

Before proceeding to the main estimations, one needs to address an important issue that is crucial for understanding the results: whether firms connected to private banks were on similar trends before the crisis and during the crisis. In other words, are there any significant differences in performance patterns for the two sets of firms (according to their banking relationships), which just got amplified as a result of the crisis? I use sales and exports of a firm as the performance measures (results are similar for alternative indicators). In order to understand whether or not this is the case, I use pre-crisis data from 2003 to 2007 to estimate differential time trends in performance for firms connected to private banks or not. Results are reported in Table 4.

Columns (1)–(3) of Table 4 use sales, and columns (4)–(6) use exports by a firm as the dependent variable. In columns (1) and (4), I estimate a constant linear time trend model while allowing for an interaction of the constant linear trend with the $PVT_{f,\leq 2002}$ dummy. For columns (2) and (5), I use the specification

$$\log(x_{fjt}) = \sum_{i=2003}^{2007} \delta_i [(Year = i) \times PVT_{f,\leq 2002}] + \delta_f + \alpha_j^t + \varepsilon_{fjt}, \quad (3)$$

TABLE 4 DIFFERENCES IN PRE-CRISIS TIME TRENDS, 2000–7: FIRMS CONNECTED TO PRIVATE AND PUBLIC-SECTOR BANKS.

| | log(Total sales) | | | log(Exports) | | |
|--|--------------------|---------------------|---------------------|--------------------|---------------------|---------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) |
| $PVT_{f,\leq 2002} \times TimeTrend$ | 0.006 (0.006) | | | 0.018 (0.016) | | |
| $TimeTrend$ | 30.972 (44.145) | | | 21.381 (50.539) | | |
| $PVT_{f,\leq 2002} \times Year2003$ | | 0.082* (0.049) | 0.050 (0.036) | | 0.056 (0.036) | 0.037 (0.035) |
| $PVT_{f,\leq 2002} \times Year2004$ | | -0.014 (0.034) | -0.043 (0.031) | | 0.024 (0.036) | 0.042 (0.035) |
| $PVT_{f,\leq 2002} \times Year2005$ | | -0.027 (0.036) | -0.004 (0.033) | | -0.029 (0.038) | 0.020 (0.037) |
| $PVT_{f,\leq 2002} \times Year2006$ | | 0.087 (0.062) | 0.098 (0.063) | | 0.238*** (0.035) | 0.247*** (0.035) |
| $PVT_{f,\leq 2002} \times Year2007$ | | 0.095*** (0.029) | 0.102*** (0.029) | | 0.230*** (0.031) | 0.235*** (0.035) |
| $Year2003$ | | | 0.010 (0.021) | | | 0.026 (0.018) |
| $Year2004$ | | | -0.026 (0.020) | | | 0.062 (0.042) |
| $Year2005$ | | | 0.045 (0.036) | | | 0.296*** (0.033) |
| $Year2006$ | | | 0.320*** (0.033) | | | 0.407*** (0.035) |
| $Year2007$ | | | 0.441*** (0.035) | | | 0.585*** (0.035) |
| R-squared | 0.89 | 0.89 | 0.87 | 0.90 | 0.90 | 0.87 |
| N | 80,431 | 80,431 | 80,815 | 80,431 | 80,431 | 80,815 |
| Firm fixed effects (FE) | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FE (5-digit) \times Year FE | Yes | Yes | No | Yes | Yes | No |

Notes: Columns (1)–(3) use total sales, and columns (4)–(6) use exports of a firm as the dependent variable, respectively. Here, $PVT_{f,\leq 2002}$ is a dummy variable that takes value 1 if a firm is a client to a private bank between 2000 and 2002, $TimeTrend$ is a linear time trend pre-2008, and $Year2003$, $Year2004$, $Year2005$, $Year2006$, $Year2007$ are year dummies that equal 1 for the respective years. Robust standard errors corrected for clustering at the firm–bank level are in parentheses. Intercepts included but not reported.

*, **, *** indicate 10%, 5%, 1% level of significance, respectively.

where I replace the linear time trend with a series of year dummies (for the pre-crisis period), and include the regression of each of these time dummies with $PVT_{f,\leq 2002}$. For columns (3) and (6), I run regressions similar to those for columns (2) and (5), but separately identifying for the year fixed effects.²⁹

The estimates from these groups of columns in Table 4 suggest that there is a time trend in the performance of a firm, but this trend is either identical for firms connected to private banks, or positive (i.e. firms had higher earnings from both sales and exports when connected to private bank before the crisis). It should also be noted that some of the interaction terms in columns (2), (3), (5) and (6) of Table 4 are positive, and others are negative, thereby lacking any consistent pattern. Therefore I cannot reject the hypothesis that all the interaction terms are jointly equal

to zero. I conclude that both groups of firms were on a similar time trend in terms of their overall performance or had a pattern opposite to that after the crisis.³⁰ These pre-crisis trends for firms connected to private banks show that there were no anticipatory effects for firms connected to the private banks in terms of switching to the public-sector banks in order to take advantage of the sovereign guarantees provided to the public-sector banks.

5.1.3 | First-order effects

I start by demonstrating that connection to the private banks also impacted the amount of credit received by the firms having credit relationships with those banks. This will also help me in ruling out the explanation that firms may borrow from other sources to substitute for bank credit, such as intra-business group lending, reliance on trade credit, etc. To check whether such is the case, I use the following empirical specification:

$$\log(C_{ft}) = \beta(D_{crisis} \times PVT_{f, \leq 2002}) + \delta_f + \alpha_j^i + \epsilon_{fjt}. \quad (4)$$

To estimate this equation, I match the banking information of the firms with another unique features of the dataset: information on firm-level credit issued from different sources. The dataset gives detailed information on different types of borrowing (from banks and/or private financial institutions) by different sources (domestic or foreign) done by firms, but at the aggregate level.³¹ I sum the total amount of credit received by the firms across these different sources to show that firms connected to private banks received less credit than firms connected to public-sector banks at the time of the crisis.

My outcome of interest, C_{ft} , is the sum of credit received by firm f in year t across all the different sources. The main variable of interest is the interaction term $D_{crisis} \times PVT_{f, \leq 2002}$. This estimates the difference in the credit received by a firm connected to a private (domestic private and/or foreign) bank vis-à-vis a public-sector bank. Results are reported in panel A of Table 5.

All the columns of Table 5 control for firm fixed effects, industry-year fixed effects at the 5-digit level, and cluster standard errors at the firm-bank level. In addition: column (2) uses firm important controls (age, size and technology adoption); column (3) controls for different bank-level characteristics that may influence the amount of credit lending to firms over time, using interaction of bank and year fixed effects; column (4) repeats column (1) but for firms belonging to industries of high financial dependence; and column (5) replaces the absolute value of credit received with first difference as the outcome of interest. All the estimates show that firms connected to private banks received less credit than others during the crisis of 2008–9, especially firms that are highly dependent on external finance.³² Figure C2 of the Online Appendix plots the yearly differences in the amount of credit received by a representative firm connected to a private bank compared to a public-sector bank. The estimates show that where there are no differences before 2008, there is a clear negative effect afterwards.

5.1.4 | Benchmark results

Having now established that firms connected to private banks were either on trends similar to other firms or performing better than others in the pre-crisis period, and received less credit during the crisis, I now turn to the results of my benchmark estimations. Panels B, C and D of Table 5 estimate the effects on total sales, exports and domestic sales of a firm, respectively.

Overall, my difference-in-differences estimates show that the firms connected to private banks are impacted negatively during the crisis in comparison to firms connected to public-sector banks.

TABLE 5 BANK OWNERSHIP AND FIRM PERFORMANCE: BENCHMARK RESULTS.

| | (1) | Firm controls (2) | Bank fixed effects (3) | High finance dependence (4) | First difference (5) |
|---------------------------------------|----------------------|----------------------|---------------------------|--------------------------------|-------------------------|
| <i>Panel A: ln(Credit received)</i> | | | | | |
| $PVT_{f,\leq 2002} \times D_{crisis}$ | -0.160*** (0.034) | -0.072** (0.032) | -0.149*** (0.035) | -0.194*** (0.042) | -0.111*** (0.015) |
| R-squared | 0.88 | 0.89 | 0.88 | 0.88 | 0.05 |
| <i>Panel B: ln(Total sales)</i> | | | | | |
| $PVT_{f,\leq 2002} \times D_{crisis}$ | -0.096*** (0.028) | -0.049** (0.040) | -0.099*** (0.028) | -0.175*** (0.032) | -0.044*** (0.008) |
| R-squared | 0.89 | 0.92 | 0.89 | 0.89 | 0.03 |
| <i>Panel C: ln(Exports)</i> | | | | | |
| $PVT_{f,\leq 2002} \times D_{crisis}$ | -0.249*** (0.035) | -0.186*** (0.033) | -0.253*** (0.036) | -0.278*** (0.042) | -0.227*** (0.014) |
| R-squared | 0.90 | 0.92 | 0.90 | 0.90 | 0.04 |
| <i>Panel D: ln(Domestic sales)</i> | | | | | |
| $PVT_{f,\leq 2002} \times D_{crisis}$ | -0.065** (0.028) | -0.068* (0.041) | -0.067** (0.028) | -0.142*** (0.032) | -0.018** (0.008) |
| R-squared | 0.90 | 0.92 | 0.90 | 0.89 | 0.05 |
| Firm controls | No | Yes | No | No | No |
| <i>N</i> | 80,431 | 70,488 | 80,109 | 49,687 | 56,108 |
| Firm fixed effects (FE) | Yes | Yes | Yes | Yes | No |
| Bank FE × Year FE | No | No | Yes | No | No |
| Industry FE (5-digit) × Year FE | Yes | Yes | Yes | Yes | No |
| Industry FE (5-digit) | No | No | No | No | Yes |

Notes: Panel A uses the natural logarithm of total credit received by a firm, panel B uses total sales of a firm, panel C uses total exports by a firm, and panel D uses domestic sales of a firm as the dependent variable, respectively. D_{crisis} is an indicator of the 2008–9 crisis that takes value 1 for the years ≥ 2008 , and $PVT_{f,\leq 2002}$ is a dummy variable that takes value 1 if a firm is a client to a private bank between 2000 and 2002. Firm controls include age of a firm and its squared term, technology adoption/gross value-added, and firm size (assets of a firm). Technology adoption means R&D expenditure plus royalty payments for technical know-how. Both assets and technology adoption are in real terms. Numbers in parentheses are robust clustered standard errors at the firm–bank level. Intercepts included but not reported. *, **, *** indicate 10%, 5%, 1% level of significance, respectively.

A firm connected to a private bank earns around 5–10% less than other firms from its overall sales as a result of the crisis. The result is significantly higher for firms that are highly dependent on external finance, namely 17.5%. The effect on export earnings is 2.5–3 times larger than overall sales, whereas the effect on domestic sales is smaller.

One important issue that needs to be addressed immediately is the fact that the borrowing patterns of different types of firms might be different in the pre-crisis period. In other words, there might be pre-trends that can possibly influence the results. In order to control for such an issue, I interact the year fixed effects with the private bank dummy $PVT_{f,\leq 2002}$, and plot the β coefficients for the years 2005–10 in Figure 4, for total sales and exports.³³

The plotted coefficients illustrate that the difference between the firms connected to private banks and others in terms of both sales and exports is either not significantly different from zero before the crisis of 2008 or on a positive trend (as also shown in my previous exercises in Table 4), and this is reversed completely after the crisis. The performance of firms connected to private banks was significantly worse than that of firms connected to public-sector banks.

Other outcome variables of interest: Given the consistent evidence on overall negative performance for firms connected to private banks, it is also imperative to investigate what happened

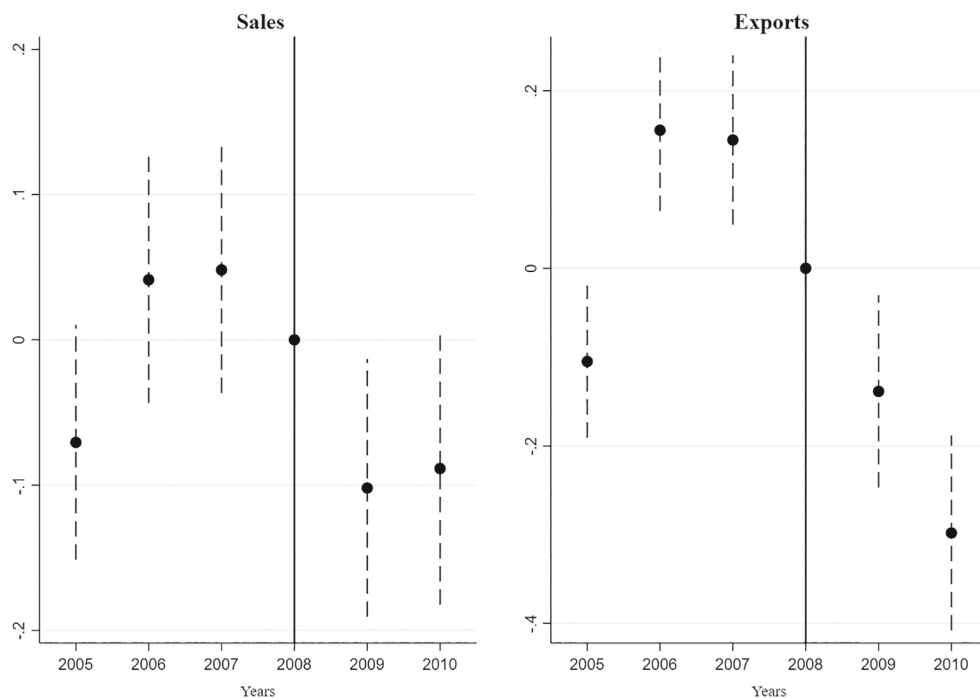


FIGURE 4 Effect of bank ownership on firm performance—sales and exports, 2005–10. *Notes:* The figure presents the OLS coefficient estimates (and their 95% confidence intervals) of the differences in the total sales and export earnings for firms connected to private (domestic and foreign) banks in comparison to public-sector banks for the period 2005–10.

to the other key characteristics of firms, namely the production factors and imports. Results are reported in Table B4 of the Online Appendix. I start by looking at the amount of capital employed by a firm in column (1). I do not find any significant evidence of lower capital employed by firms connected to the private banks as a result of the crisis, although the sign of the coefficient is negative. Following Chodorow-Reich (2014), I substitute capital by labour compensation in column (2). PROWESS is not suitable to understand the employment effects, as the number of employees data are not reported consistently both across firms and over time. But the dataset routinely reports data on the total price of labour. Therefore I concentrate only on the intensive margin of employment effect. My coefficient shows that firms connected to private banks paid about 4% less wages to their employees than firms connected to public-sector banks. This could be due to laying off workers. And this result is driven significantly by non-managerial rather than managerial compensation. (Total compensation can be divided into managerial and non-managerial compensation; results available on request.)

Next, in column (3) of Table B4, I use another important factor of production, raw material expenditure. I do not find any negative effect on the use of raw materials by firms not connected to private banks. Column (4) uses total imports, and columns (5)–(8) explore the effects on sub-categories of imports—capital goods, raw materials, stores and spares, and finished goods. I find significant negative effects only in the case of capital goods (7%) and finished products (4%).

These results evoke two important implications: (a) banking relationships during the crisis matter not only for overall performance, but also for exports, imports and use of productive factors; and (b) credit shortage for firms connected to private banks may explain this negative difference between them and other firms.

Before going ahead to check the robustness of my results, I have one concern that may affect my findings, namely the choice of the period of the banking relationships of firms. In order to

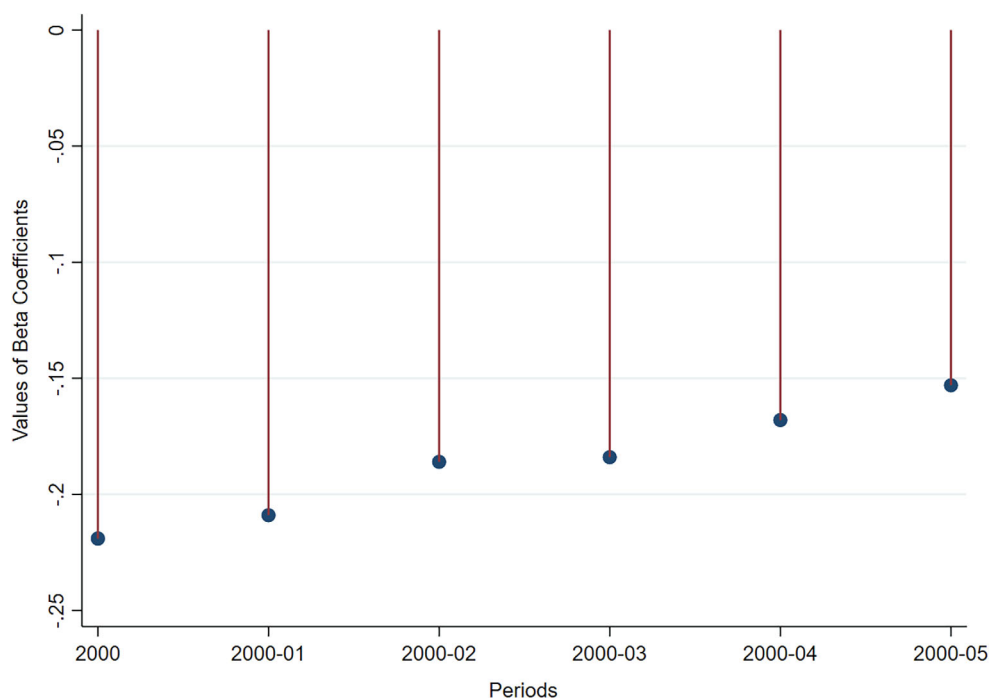


FIGURE 5 Effect of bank ownership on firm performance—beta coefficients from using different periods of lending relationships. *Notes:* The figure presents the different beta coefficients in terms of the response of the differences in the export earnings for firms connected to private (domestic and foreign) banks and public-sector banks using different periods of lending relationships.

check whether my period of choice biases my findings in any way, I estimate equation (2), using only exports as the outcome variable, by defining the banking relationships of firms across five other different time periods, and present it in Figure 5 along with my benchmark finding. The estimated β values across different periods are all significantly different from zero, and show that my benchmark finding is not influenced by my choice of time period of banking relationships. This justifies my choice of using the relationship indicator of firms with banks for out-of-sample period in order to estimate a possibly exogenous effect of banking relationships on firm outcomes.

5.1.5 | Robustness checks

From now on, I will present my results using only exports as the outcome of interest. Three reasons drive my choice: (a) the effect on exports is significantly larger than both total sales and domestic sales, especially the latter; (b) linkages between financial sector and firms' export activities have attracted significant attention in recent years (Chor and Manova 2012; Amiti and Weinstein 2011; Minetti and Zhu 2011; Bricongne *et al.* 2012; Paravisini *et al.* 2014; Bronzini and D'Ignazio 2017); and (c) during a crisis, the demand for liquidity by the exporters goes up significantly. I present my results only for exports in Table 6.³⁴

I start by controlling for different firm characteristics in panel A of Table 6 that may affect the type of banking relationships a firm has and therefore the outcome variable of interest. Even though I control for firm fixed effects, my estimates could still be affected by the following problem: foreign banks or private banks that rely on international funding may lend to different types of firms, in which case measuring the true impact of the shock on the real economy may require accounting for firm fundamentals. In other words, the variation in credit lending across these three types of banks can be driven by demand. To control for such issues, I interact the key

TABLE 6 BANK OWNERSHIP AND FIRM PERFORMANCE: ROBUSTNESS CHECKS.

| | Assets (1) | Firm characteristics $\times PVT_{j,\leq 2002}$ Age (2) | Firm characteristics $\times D_{crisis}$ Both (3) | Firm characteristics $\times D_{crisis}$ Both (4) | Predicted values $\times D_{crisis}$ Both (5) |
|--|----------------------|--|--|--|--|
| <i>Panel A</i> | | | | | |
| $PVT_{j,\leq 2002} \times D_{crisis}$ | -0.290*** (0.033) | -0.273*** (0.038) | -0.271*** (0.036) | -0.178*** (0.037) | -0.219*** (0.039) |
| R-squared | 0.92 | 0.90 | 0.92 | 0.92 | 0.90 |
| N | 76,998 | 73,588 | 70,488 | 70,488 | 70,488 |
| <i>Panel B</i> | | | | | |
| State \times $PVT_{j,\leq 2002}$ | (6) | Only domestic private (7) | Only foreign (8) | Propensity score (9) | Only one type of bank (10) |
| $PVT_{j,\leq 2002} \times D_{crisis}$ | -0.252*** (0.039) | -0.183*** (0.039) | -0.106** (0.043) | -0.589*** (0.066) | -0.057* (0.030) |
| R-squared | 0.91 | 0.88 | 0.89 | n/a | 0.72 |
| N | 65,691 | 69,463 | 61,833 | 70,488 | 12,924 |
| <i>Panel C</i> | | | | | |
| Extending until 2014 | (11) | Financial ratio (12) | Managerial preferences (13) | Export share (14) | Demand shock (15) |
| $PVT_{j,\leq 2002} \times D_{crisis}$ | -0.234 (0.368) | -0.246*** (0.035) | -0.210*** (0.039) | -0.249*** (0.036) | -0.183*** (0.039) |
| R-squared | 0.89 | 0.89 | 0.92 | 0.92 | 0.81 |
| N | 108,740 | 80,431 | 168,635 | 55,366 | 61,195 |
| Firm fixed effects (FE) | Yes | Yes | Yes | Yes | Yes |
| Industry FE (5-digit) \times Year FE | Yes | Yes | Yes | Yes | Yes |

Notes: Columns (1)–(15) use the natural logarithm of exports of a firm as the dependent variable. Here, D_{crisis} is an indicator of the 2008–9 crisis that takes value 1 for the years ≥ 2008 , and $PVT_{j,\leq 2002}$ is a dummy variable that takes value 1 if a firm is a client to a private bank between 2000 and 2002. Robust standard errors corrected for clustering at the firm–bank level are in parentheses. Intercepts included but not reported.
*, **, *** indicate 10%, 5%, 1% level of significance, respectively.

firm characteristics size (measured through average firm assets between 2000 and 2002) and age with $PVT_{f, \leq 2002}$ in columns (1) and (2). The coefficient of interest continues to remain negative and significant. Interestingly, the magnitude of the coefficient increases when controlling for firm size, highlighting that big firms were in need of more credit from the private banks during the crisis. Columns (3) and (4) interact both the firm characteristics with $PVT_{f, \leq 2002}$ and D_{crisis} dummies, respectively. The coefficient remains similar to my benchmark finding. In column (5), I first run a probit model for the period 2000–2, obtain the predicted values for those firm characteristics and interact them with $PVT_{f, \leq 2002}$ in the main estimation—I do not find any difference.³⁵

Next, it could be possible that the RBI cared more about regional problems or employment numbers than government guarantees. And the firms that are connected to public-sector banks are located where the regional numbers look relatively worse. In order to control for this situation, I match the postcodes of these firms and use the region or state fixed effects and interactions with $PVT_{f, \leq 2002}$ in column (6). My result does not change.³⁶

Columns (7) and (8) of Table 6 explore the heterogeneity within the private banks (domestic and foreign) to understand whether firms connected to domestic private or foreign banks suffered more during the crisis. For example, does a firm's export flow drop more when a firm is connected to a US-based bank (such as Bank of America) or an EU-based bank (such as Barclays)? Or when a firm is connected to a private domestic bank, ICICI? My estimates show that (a) firms connected to domestic private banks suffered around 18% more of a drop in their export earnings than firms connected to public-sector banks; and (b) firms connected to foreign banks experienced a drop of more than 10% in their export earnings than firms connected to public-sector banks. I also interacted the year fixed effects with the respective domestic private and foreign bank dummies, and plot the β coefficients in Figure 6. These plots (a) portray results similar to

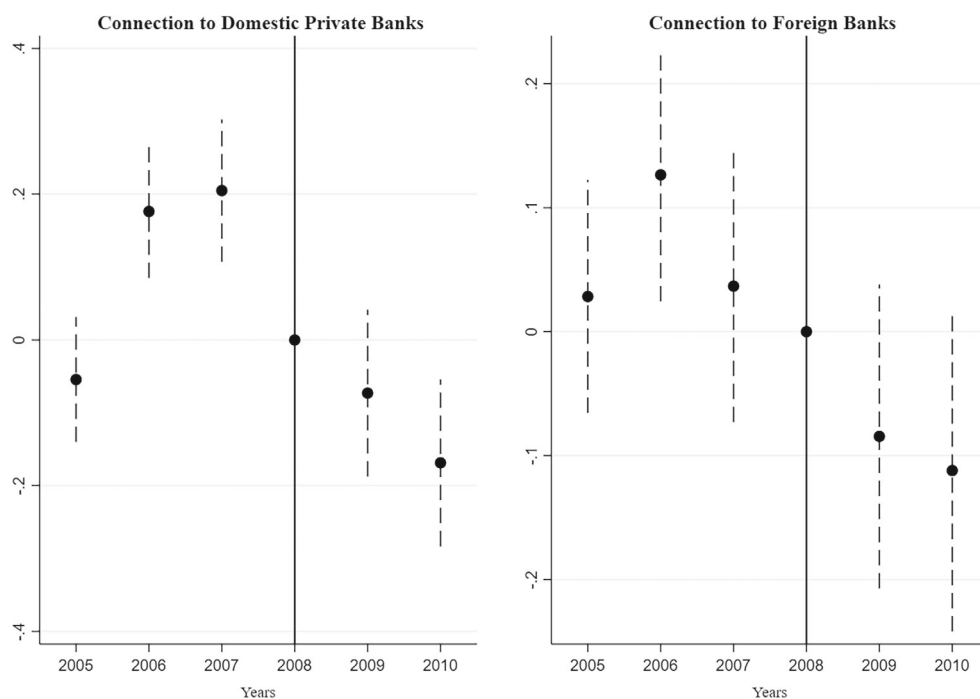


FIGURE 6 Effect of bank ownership on firm exports—divided into domestic private and foreign banks, 2005–10. Notes: The figure presents the OLS coefficient estimates (and their 95% confidence intervals) of the differences in the export earnings for firms connected to domestic private banks and foreign banks in comparison to public-sector banks for the period 2005–2010.

the overall effect of putting domestic private and foreign banks together, and (b) show that firms connected to domestic private banks were on a positive trend before the crisis, and this became quite the opposite after.³⁷

Digging deeper, I find that firms connected to major domestic private banks (six of them) suffered more than firms connected to other private banks (results available on request).³⁸ In the case of foreign banks, the negative effect on firms' export flows is due to connection with US-based banks rather than others (results available on request).³⁹

Column (9) of Table 6 uses matching methods. I compare firms using their characteristics (industry, size, age) connected to the two different types of banks (private and public-sector), and report the differences in their export earnings. Altering the estimation method does very little to my benchmark estimate; it continues to be negative and significant. However, the point estimate increases significantly.

One more concern that may affect my results is the multiple banking relationships of firms, even though I use firm fixed effects and cluster my standard errors at firm–bank level. For example, when a firm has relationships with a public-sector and a private bank, it is a part of both the treated and control groups. In order to tackle this situation, I estimate a specification in column (10) of Table 6 where I drop all the firms with multiple relationships. I lose about 80–85% of the sample of firms, and this may create external validity problems. However, my coefficient continues to be negative at the 10% level.

Column (11) of Table 6 extends the dataset to 2014. This would show that the impact during the crisis was only for the lack of funds; once the foreign funds came back, the ownership did not matter. I continue to use $PVT_{f,\leq 2002} \times D_{crisis}$ as my coefficient of interest. My estimate shows the hypothesis to be true. Once the time period is extended beyond the crisis period, the negative effect goes away.⁴⁰

Next, I control for important firm level observables that can affect export performance: financial needs in column (12) of Table 6. As the possible indicators, I use (a) cash to current liabilities ratio, (b) debt to equity ratio, and (c) net cash flow to total capital ratio (result reported only for (a)). I exploit the initial financial ratio (cash to current liabilities) of a firm and its interaction with $PVT_{f,\leq 2002}$; I do not find any evidence that controlling for internal finance hampers my benchmark result. The estimate remains robust.

Banking decisions can often be influenced by managerial preferences, especially by the managers who belong to the top management of a firm or who are the decision-makers of a firm. Bertrand and Schoar (2003) show that managers are involved in a wide range of corporate decisions, such as financial and organizational practices of firms. Therefore, using managerial fixed effects may help in controlling for such decisions, in our case banking with public-sector banks. PROWESS provides detailed information on the names and designations of directors and executive directors of a firm. I use such information to match with my firm–bank credit relationships data, and control for managerial fixed effects in my estimation in column (13) of Table 6. My estimate and standard error continue to be similar to previous estimates.⁴¹

Column (14) of Table 6 controls for export share in the pre-crisis period. Exports might decline because firms may face an increased incentive to sell domestically rather than abroad, not affecting overall firm performance. Therefore, controlling for firm-level export share before the crisis could help to control for potentially systematic differences in the extent of reallocation that firms can undergo during a crisis. However, I continue to find similar results.

Finally, I control for export demand in column (15) of Table 6. It could be possible that firms connected to public-sector banks were less exposed to trade before the crisis than the borrowers of the domestic private and foreign banks. This would mean that the results will reflect only the differences in the unobservable demand for exports across firms, rather than the causal effect of the differences in bank behaviour. I carry out the analysis for 'demand shock' in the

cases of both the USA and the EU, and putting the USA and the EU together. Demand shock has a negative and significant effect on the export flows of the Indian manufacturing firms. But the effect on exports due to differences in bank ownership continues to be unaffected. This implies that the firms that are connected to private banks were affected adversely from both the ‘demand shock’ and the supply of finance (due to the ownership pattern of banks to which they were connected).⁴²

5.1.6 | Firm characteristics

Table B5 of the Online Appendix slices the data according to different firm characteristics. Column (1) divides the firms by size (according to their quartiles) based on average assets before the crisis period. For example, a firm is classified in the 1st quartile if the average assets of a firm for the years 2003–7 are less than the 25th percentile of the assets of the corresponding industry, and so on. I find that firms of all sizes, except the smallest, connected to private banks are most affected due to the crisis. Column (2) classifies firms according to their ownership—domestic and foreign—and interaction with $PVT_{f, \leq 2002} \times D_{crisis}$. I do not find any differential effect based on the ownership of firms.

In column (3) of Table B5, I check whether firms that are a part of a business group are affected differently given that business groups play an important role in allocating finance across affiliates (Bertrand *et al.* 2002). I utilize the information on firm ownership about whether or not they are a part of a business group, and interact that dummy with my main variable of interest. Although my double interaction term continues to be negative, the triple interaction turns out to be positive, highlighting the fact that being a part of a business group partially mitigates the negative effect of the crisis. In particular, for a firm that belongs to a business group, the negative effect of the crisis drops by around 40%.

Finally, in column (4) of Table B5, I divide firms according to end use product—final (consumer durable and non-durable) and intermediate (intermediate, basic and capital)—to check for the compositional effect. The estimates show that the overall drop in export earnings is driven by firms exporting intermediate and not final goods. My findings are aligned with Levchenko *et al.* (2010) and Bems *et al.* (2010), who find that large changes in demand for intermediates significantly explain the reductions in both imports and exports.

5.2 | Testing for the mechanisms: utilizing balance sheets of banks

5.2.1 | Empirical strategy

Utilizing banking relationships in a difference-in-differences setup is important to establish a causal effect of the bank ownership on firm performance, but it may not address concern about the mechanism/channel through which bank ownership can affect the real economy. In other words, did the crisis affect the key variables in a bank’s balance sheet, measured through the amount of borrowings from the RBI, deposits received due to its ownership that led to this difference in performance between firms that are connected to public-sector and private banks?⁴³

As mentioned before, the uniqueness of the dataset allows me to test for the channel by using direct information from the balance sheets of the banks. Figures 1, 2 and 3 suggest that while there was no differential trend for private and public-sector banks in terms of their borrowing from the RBI (and deposits received before the crisis), this trend became quite different after the crisis. Given this as a background, I will now use information from the balance sheets of the banks to establish clearly that the differential performance of the firms is due to the differential effect

on banks' balance sheets. I use the following fixed effects type of OLS estimation to establish a cleaner causal effect of the bank ownership:

$$\log(x_{fjt}) = \beta_1(D_{crisis} \times B_{bf, \leq 2002}) + \beta_2(D_{crisis} \times B_{bf, \leq 2002} \times PVT_{f, \leq 2002}) + \beta_3(B_{bf, \leq 2002} \times PVT_{f, \leq 2002}) + \delta_f + \alpha'_t + \varepsilon_{fjt}, \quad (5)$$

where $B_{bf, \leq 2002}$ is a bank level indicator for bank b connected to firm f . It assumes either the amount of borrowing (short-term) done by bank b (connected to firm f) from the RBI, or the total amount of deposits received as a share of its total liabilities. If a firm is connected to multiple banks, then it would take the balance sheet information of the respective banks connected to a firm.⁴⁴ However, balance sheet information during the crisis is endogenous and therefore could overestimate the effect of bank ownership on firm performance. In order to potentially subvert this problem, I use average values of a bank for 2000–2 as a proxy for the years 2008–10.

My treated group of firms or variable of interest here is the triple interaction term $D_{crisis} \times B_{b, \leq 2002} \times PVT_{f, \leq 2002}$. This estimates the effect of, say, borrowing from the RBI by the private banks (during the crisis) on the performance of firms that have banking relationships with them. If the flow of credit from the lender of last resort drops (given that there is already a credit crunch), this can severely affect the financial health of the banks and simultaneously the flow of credit from them to the connected firms, which will then have a negative impact on those firms' performance. This could perhaps be some way of recapitalizing banks, but in the form of lending from RBI instead of straightforward capitalizations, which would show up as equity; similarly for deposits transferred/withdrawal. In other words, it estimates the absolute effect of a bank's ownership during the crisis on a firm's performance when the bank is privately and not publicly owned. Therefore I expect β_2 to be negative and significant.

I have two set of control variables here.

First, $D_{crisis} \times B_{b, \leq 2002}$ estimates the effect of the 2008–9 crisis on a firm's performance when a firm does not use a private bank—or, in other words, when it has a banking relationship with public-sector banks. In this case, my coefficient of interest is β_1 , for which I expect no effect. This is because the differential treatment by the RBI and positive growth of deposits should increase the amount of credit flows by these banks to the firms connected to them, and this should cancel out the negative effects of the crisis.

Second, the other double interaction term $B_{b, \leq 2002} \times PVT_{f, \leq 2002}$ estimates the overall effect on the performance of a firm due to a banking relationship with a private bank. In effect, this is an interaction between a private bank dummy with its balance sheet variable, say borrowing for the RBI. And this should have sign opposite to my variable of interest, the triple interaction term $D_{crisis} \times B_{b, \leq 2002} \times PVT_{f, \leq 2002}$. All the other terms remain the same.

5.2.2 | Results

Results are reported in Table 7. I start by using exports as the outcome variable of interest, in columns (1)–(8). Columns (1)–(4) exploit borrowing from the RBI, and columns (5)–(8) use total deposits received by a bank as the explanatory mechanism for the negative performance of firms connected to the private banks.

Column (1) of Table 7 starts by using a basic specification—firm and industry–year fixed effects. Column (2) adds firm controls (age, size and technology adoption). Column (3) drops firm controls and adds interactions between $PVT_{f, \leq 2002}$ and firm characteristics to control for heterogeneous firm characteristics that might influence both banking relationships and firm performance. Column (4) in addition interacts a time trend with initial bank characteristics. Overall, my results show that decrease in the supply of credit from the RBI to the private banks can significantly explain the negative performance of firms (connected to those banks) during the crisis.

TABLE 7 BANK OWNERSHIP AND FIRM PERFORMANCE: TESTING FOR THE MECHANISM.

| | In(Exports) | | | Deposits | | | In(Total sales) | | | In(Domestic sales) | | |
|--|----------------------|---------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|----------------------|---------------------|---------------------|--------------------|
| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) | (9) | (10) | (11) | (12) |
| $D_{erisis} \times B_{h \leq 2002}^{RBI}$ | 0.014 (0.011) | 0.014 (0.009) | 0.014 (0.011) | 0.007 (0.022) | | | | | 0.022 (0.016) | | 0.023 (0.016) | |
| $D_{erisis} \times B_{h \leq 2002}^{RBI} \times PVT_{f, \leq 2002}$ | -0.030*** (0.005) | -0.021** (0.005) | -0.030*** (0.005) | -0.026*** (0.006) | | | | | -0.012*** (0.004) | | -0.008** (0.004) | |
| $B_{h \leq 2002}^{RBI} \times PVT_{f, \leq 2002}$ | 0.002 (0.005) | 0.005 (0.004) | 0.002 (0.005) | 0.006 (0.004) | | | | | 0.010 (0.008) | | 0.009 (0.008) | |
| $D_{erisis} \times B_{h \leq 2002}^{Deposits}$ | | | | | 0.006 (0.014) | 0.012 (0.012) | 0.006 (0.014) | 0.001 (0.016) | | 0.003 (0.013) | | -0.004 (0.012) |
| $D_{erisis} \times B_{h \leq 2002}^{Deposits} \times PVT_{f, \leq 2002}$ | | | | | -0.018*** (0.003) | -0.013*** (0.003) | -0.018*** (0.003) | -0.018*** (0.003) | | -0.007** (0.003) | | -0.005* (0.003) |
| $B_{h \leq 2002}^{Deposits} \times PVT_{f, \leq 2002}$ | | | | | 0.006 (0.006) | 0.001 (0.005) | 0.006 (0.006) | 0.002 (0.010) | | 0.001 (0.008) | | 0.002 (0.007) |
| Firm controls | No | Yes | No | No | No | Yes | No | No | No | No | No | No |
| Firm characteristics $\times PVT_{f, \leq 2002}$ | No | No | Yes | Yes | No | No | Yes | Yes | Yes | Yes | Yes | Yes |
| Bank characteristics $\times TimeTrend$ | No | No | No | Yes | No | No | No | Yes | Yes | Yes | Yes | Yes |
| R-squared | 0.90 | 0.92 | 0.90 | 0.90 | 0.90 | 0.92 | 0.90 | 0.90 | 0.90 | 0.89 | 0.89 | 0.90 |
| N | 70,144 | 61,607 | 70,144 | 50,491 | 57,173 | 50,108 | 57,173 | 57,173 | 50,491 | 57,173 | 50,408 | 57,080 |
| Firm fixed effects (FE) | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| Industry FE (5-digit) \times Year FE | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |

Notes: Columns (1)–(8) use exports, and columns (9)–(12) use total and domestic sales of a firm as the dependent variable, respectively. D_{erisis} is an indicator of the 2008–9 crisis that takes value 1 for the years ≥ 2008 , $PVT_{f, \leq 2002}$ is a dummy variable that takes value 1 if a firm is a client to a private bank between 2000 and 2002, $B_{h \leq 2002}^{RBI}$ is the average borrowing by a bank from the RBI for the years 2000–2, and $B_{h \leq 2002}^{Deposits}$ is the average deposits received by a bank between 2000 and 2002. Firm controls includes age, age squared, technology adoption (technology transfer plus R&D expenditure), and size of a firm. Both assets and technology adoption are in real terms. Robust standard errors corrected for clustering at the firm–bank level are in parentheses. Intercepts included but not reported.

*, **, *** indicate 10%, 5%, 1% level of significance, respectively.

And this effect is absent for (a) firms connected to other (or public-sector) banks, and (b) the overall effect of connection to private banks.

Columns (5)–(8) of Table 7 substitute RBI borrowings by deposits. Private banks experienced a significant drop in the growth of deposits during the crisis, partly as a result of the transfer of deposits to the public-sector banks due to the explicit and implicit guarantees enjoyed by them from the government of India (Acharya and Kulkarni 2019).⁴⁵ I find similar negative effects of the drop in deposits for private banks during the crisis having a dampening effect on firm exports. Other estimates continue to remain the same.⁴⁶

Finally, I substitute exports by total sales and domestic sales in columns (9)–(10) and (11)–(12) of Table 7 as the outcome variable of interest. I continue to find similar effects. These results show that the drops in both deposits and borrowings from the RBI can be cited as significant explanatory mechanisms/channels through which private banks were affected significantly in terms of their financial health, and this translated into negative performance of firms that have banking relationships with them.⁴⁷

To sum up, it is the disproportionate transfer from the RBI to the private banks (and drop in deposits), after the crisis hit the Indian capital market, that resulted in adverse effect for firms connected to those private banks (possibly due to a higher drop in credit supply). My estimates also suggest that possible international exposure of the domestic private banks may have acted as a propagation mechanism during the global financial crisis (Cetorelli and Goldberg 2012), and foreign banks transmitted shocks across borders through their local affiliates (Ongena *et al.* 2015). This exposure to foreign funding interacted with few or no guarantees during the crisis has had a significant negative effect on the performance of firms connected to these type of banks.

6 | CONCLUSION

In this paper, I show bank ownership as a new channel that matters significantly for a firm's performance and exports, especially in the event of a crisis. A firm having a banking relationship with a private bank during the crisis receives 16% less credit and earns about 10% and 25% less in terms of their overall sales and export flows, respectively, than firms connected to a public-sector bank. This negative effect on firm performance is significant across all sizes of firms (except for the smallest ones) that produce intermediate goods. Firms connected to private banks also paid less wages and imported less capital goods. Finally, this negative effect on firm performance possibly can be explained by the drop in the supply of credit to the banks from the Central Bank and withdrawal of deposits. To this end, my results show that ownership of banks appears to be economically important at both the micro level (firm) and the aggregate level.

My findings provide direct evidence for a new complementary channel—bank ownership—that highlights the role of financial frictions in restricting the availability of credit to firms (Chava and Purnanandam 2011; Coleman and Feler 2015). Overall, my results show that propagation of financial shocks to the real economy can be different due to the ownership of the banks.

Finally, interpreting the performance of firms connected to public-sector banks, during the crisis, a success could be questionable as the relative stability and efficiency of the public-sector banks relative to private and/or foreign banks appear to be doubtful. This is because the perception that public-sector banks enjoy an implicit guarantee is a moral hazard problem that may limit the incentive to enhance efficiency and encourage excessive risk taking. This points to the desirability of scaling back implicit guarantees to the public-sector banks in general, whether by preventing them from becoming too large and connected to fail, or by setting up more effective mechanisms for the orderly resolution of insolvent institutions.

Raghuram Rajan (2013), in his Annual Andrew Crockett Memorial Lecture for the Bank of International Settlements (BIS), points out that the type of policy undertaken by the Central Bank after the crisis of 2008–9 ‘has truly been a step in the dark’. This is because such policies raise more questions than answers. The fundamental hope behind these policies is that as the price of risk is reduced, firms faced with lower cost of capital will have higher incentives to make real investments, thereby creating jobs and enhancing growth. Rajan points out that there are two reasons why these calculations can possibly go wrong: (a) absence of a well-capitalized banking system or policy certainty, and (b) a large reduction in the cost of capital for firms such that they prefer labour-saving capital investment to hiring labour. And in case of India, the former applies aptly.

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This paper has been circulated previously as ‘Bank ownership, monetary policy and exports: evidence from a matched firm–bank dataset’. India’s Central Bank is popularly known as the Reserve Bank of India or RBI. I have used India’s Central Bank and RBI interchangeably through the paper; both names refer to the same institution. I have also used banking and credit relationships interchangeably in the paper; both mean the same—credit relationships of firms with banks.

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ENDNOTES

- ¹ In the case of India, both of these could happen due to an ordinance passed in 1969 regarding the nationalization of Indian banks. More on this later.
- ² The results also portray that credit shocks have a negative effect on firm performance, especially exports, which is, however, not new in the literature (Chor and Manova 2012; Buono and Formai 2018). But my findings show that these negative credit shocks depend on the ownership of the banks to which the firms are connected.
- ³ The government of India also issued a directive to public-sector enterprises (firms, not banks) to deposit their surplus funds in public-sector banks (*Economic Times* 2008). Following the fall of Lehman Brothers and the subsequent credit crisis, many depositors shifted capital out of private and foreign banks, and moved to public-sector banks. Infosys, a software multinational corporation, transferred nearly INR 10 billion of deposits from ICICI (the biggest private bank in India) to the SBI just after the Lehman collapse in the third quarter of 2008 (*Economic Times* 2009).
- ⁴ I have also checked for a longer time trend by plotting the normalized value of deposits across private and public-sector banks for the years 2004–10. The trends in deposits across these two types of banks are quite similar before 2008, but significantly different afterwards.
- ⁵ The differential performance (between public-sector and other banks) could also be due to the differences in investor confidence. By analysing change in bank deposits in India during the crisis of 2008–9, Eichengreen and Gupta (2013) show that it is the expectation for an implicit and/or explicit guarantee for the public-sector banks that resulted in a significant growth in deposits during the crisis. Acharya and Kulkarni (2019) come to the same conclusion by comparing the credit default swap spreads for India’s largest public-sector bank (State Bank of India, SBI) and largest private bank (ICICI). Both the spreads were within the same range in 2007–8, but the difference increased in the SBI’s favour during 2008–9, indicating that the market possibly views a public-sector bank to be more resilient to a crisis than a private bank.

- ⁶ Similar evidence has been found by Dinç (2005) for cross-country, Cole (2009) in the case of India, Khwaja and Mian (2006) for Pakistan, and Sapienza (2004) for Italy.
- ⁷ They also highlight that this is the theme worldwide—for example, the growth of the government-sponsored enterprises (Fannie Mae and Freddie Mac) and commercial banks in the USA (both set of institutions with explicit government support and ready access to Central Bank emergency lending). These institutions expanded their holdings of mortgage-backed securities, while investment banks and hedge-funds de-leveraged and sold these type of securities (He *et al.* 2009).
- ⁸ Mihaljek (2010) provides similar evidence by looking across a range of emerging economies—the flow of credit from the Central Bank increased more towards the public-sector banks.
- ⁹ Another problem that may plague my analysis is the problem of multiple banking relationships of a firm. Although I have a matched firm–bank dataset, the variation comes at the firm–year level, not at the firm–bank–year level.
- ¹⁰ On the other hand, there is also a sizeable amount of studies showing how the global financial crisis of 2008–9 impacted trade flows (due to drop in demand or credit supply, or rise in protectionism, etc.): (i) decline in demand (Behrens *et al.* 2013; Eaton *et al.* 2016; Chakraborty 2018); (ii) drop in credit supply (Bricongne *et al.* 2012; Chor and Manova 2012; Paravisini *et al.* 2014); and (iii) rise in trade barriers (Kee *et al.* 2013).
- ¹¹ Rajan (2009) and Joseph (2009) argue that the 2008–9 global financial crisis initially hit India via the financial channel, but not through the conventional route—the subprime mortgage assets.
- ¹² Sengupta (2009) points out that between mid-September and end-October 2008, the daily weighted average call rate and the overnight weighted average money market rate exceeded the upper bound of the LAF corridor twice.
- ¹³ Indian banks are allowed to invest only 5% of their capital in subprime mortgage activities.
- ¹⁴ All monetary-based variables are measured in millions of Indian rupees (INR), deflated by the 2005 industry-specific Wholesale Price Index.
- ¹⁵ A listed Indian manufacturing firm on average has credit relationships with five banks. A firm above the 75th percentile of size distribution has four times more banking relationships with firms below the 25th percentile.
- ¹⁶ Banks borrow money from other banks as well as from the RBI. The RBI acts as a ‘lender of last resort’ to all Indian banks. Borrowing from the RBI by a bank is the amount of short-term borrowings by a bank. Banks can borrow from the RBI on the basis of eligible securities or any other arrangement. Also, in times of crisis, they can approach the RBI for any kind of financial help.
- ¹⁷ Figure 2 shows that this is the case; public-sector banks were able to borrow more money compared to other banks.
- ¹⁸ Details about the variables used in the paper are outlined in Online Appendix A.
- ¹⁹ In spite of all these advantages, there are a couple of potential limitations of the dataset (in terms of the banking information) that are worthy of mention: (a) there is no way to understand which bank is the main ‘reference bank’ for a firm therefore I treat all the banks with equal importance; (b) the dataset does not give the exact amount of loan that has been received by a firm from a particular bank, i.e. no information on an individual firm receiving a loan from a particular bank. However, I believe that this is not of such a great concern in this particular case, as I plan to utilize banks’ borrowing from the RBI and total deposits received by a bank in order to test for the mechanism through which ownership affects firm performance.
- ²⁰ Around 20% of the firms in the dataset belong to the chemical industries, followed by food products and beverages (12.81%), textiles (10.81%) and basic metals (10.46%).
- ²¹ I also compare firms in terms of their industry composition. I do not find any systematic difference between firms connected to public-sector and private banks (results available on request).
- ²² I also check my results by double clustering—bank and year level. My results do not change.
- ²³ I do the same for loans and advances in Figure C1 of the Online Appendix—the plot is akin to RBI borrowing and/or deposits.
- ²⁴ I also ran two other alternate specifications. (a) I regress being a client of a private bank during the crisis years (2008–10) on the relationship to the same bank type before the crisis, and plug the predicted value as the instrument in the second stage. (b) I regress the share of the number of private banks over the total number of borrowers. In both the cases, the results remain the same.
- ²⁵ Another concern with my choice of the period for banking relationships is that my estimations may automatically restrict the sample to firms that were active in 2002 and survived until the crisis. To see whether this is indeed a concern, I checked for the number of firms that were active during 2000–2 and present afterwards—the number is 98%. Therefore the firms that were active in the initial period were mostly active until the financial crisis.
- ²⁶ See the official statement of the Governor of the RBI, available online at <https://www.reuters.com/article/idINIndia-37674620090127> (accessed 16 October 2023). In addition, there was no anecdotal evidence to suggest that firms located in states where the central government was in power had been treated favourably.
- ²⁷ I also control explicitly for demand shocks.
- ²⁸ Note that the observations vary across different types of estimations since I add different variables to control for the omitted variable bias.
- ²⁹ The specification that I use for these two columns is $\log(x_{fjt}) = \sum_{i=2003}^{2007} \beta_i (Year = i) + \sum_{i=2003}^{2007} \delta_i [(Year = i) \times PVT_{f \leq 2002}] + \delta_f + \epsilon_{fjt}$.
- ³⁰ I have also used change in sales or exports; the result is the same.

- ³¹ For example, how much a firm has borrowed from all the domestic banks (public-sector and private) combined. Or the amount of loan taken in a currency other than Indian rupees, termed as foreign currency borrowing.
- ³² I use total borrowing by a firm as an indicator for dependence on external finance. An industrial sector that borrows more than the median borrowing of the entire manufacturing sector is classified as a sector that is highly dependent on external finance.
- ³³ I have used 2008 as the reference period when plotting the coefficients. The results and the figure are unaltered with a change in the reference period. For example, if I set the coefficient to 0 just before the crisis (in 2007), then the result does not change qualitatively.
- ³⁴ Results for both total sales and domestic sales remain the same.
- ³⁵ I have also interacted $PVT_{f, \leq 2002}$ with an industry-level dummy that classifies firms based on their end-use categories—consumer durable, consumer non-durable, basic, intermediate and capital goods—the results continue to be similar.
- ³⁶ The number of observations drops a little as there is no information on the postcodes of around 20% of firms.
- ³⁷ I also include another interaction term, $D_{crisis} \times Both_{f, \leq 2002}$, where $Both_{f, \leq 2002}$ takes value 1 when a firm has credit relationships with both a public-sector bank and a private bank (domestic and foreign), to see if there is any differential effect for firms that have links with both types of banks. I do not find any significant differential effect; my benchmark result continues to hold.
- ³⁸ The classification is done using the following rule: banks that have a share of more than 5% of all relationships with firms in the sample.
- ³⁹ Chakraborty (2018) also shows that during the crisis, the exports of Indian manufacturing firms are most affected (as a result of the drop in demand) when their trade destination is the USA rather than the EU.
- ⁴⁰ One reason for not finding the negative effect of the crisis could be that the inefficient firms that were mainly affected by the crisis may have exited the sample. However, in the case of India, the exit rates are not a big problem. The exit rates have been measured by Goldberg *et al.* (2010), and they are quite low, hovering around only 5–6%.
- ⁴¹ Note that the observations increase significantly as there are multiple managers for an individual firm.
- ⁴² For the demand shock index, I match the data at (4-digit) industry–destination–year level as the firm-level dataset does not provide firm-specific trade destinations. The main purpose of matching these two datasets is to create a measure of demand shock, which varies according to industry–time–country. It is defined as the share of exports of an industrial sector or product category directed towards countries affected by the crisis (the USA and/or the EU) to the total exports of that sector. This proportion would give us an idea about the extent of demand prevailing for any product categories in a crisis-affected zone. A primary concern with this ‘demand shock’ index is the potential endogeneity or problem of reverse causality. To avoid such factors playing a role in the estimations, I compute an average of the ‘demand shock’ index using data for the pre-crisis years 2000–2 to create a potentially more clear and exogenous measure of the ‘demand shock’. The demand shock index $demandshock_j^d$ is interacted with $PVT_{f, \leq 2002} \times D_{crisis}$.
- ⁴³ As indicated previously, the dataset also provides information on the total amount of loans and advances made by a bank. I also use this for robustness checks, and results remain the same.
- ⁴⁴ I have also experimented with my results using the average values of these indicators. For example, a private bank b will take the value of the average deposits across all private banks; the effect remains the same.
- ⁴⁵ They also argue that state-owned banks can access credit as they have access to stronger government guarantees.
- ⁴⁶ I also control for all other possible issues that may affect my estimates—differential trends of borrowing from the RBI, different banks lending to different types of firms, lending patterns of banks correlated with firm characteristics, bank health characteristics; the estimates remain the same.
- ⁴⁷ Another possible mechanism that could drive my results is the forbearance policy announced by the RBI after the global financial crisis in October 2008 (Chari *et al.* 2021). However, the variable that would supposedly capture the forbearance policy is essentially a dummy equal to 1 for the years 2008 and 2009. And this is highly correlated with the crisis variable, which would make it difficult to disentangle the effects of the policy and the crisis.

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SUPPORTING INFORMATION

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