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INTERNATIONALES

No 2012 – 22  
October

DOCUMENT DE TRAVAIL

## The Unequal Effects of Financial Development on Firms' Growth in India

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## THE UNEQUAL EFFECTS OF FINANCIAL DEVELOPMENT ON FIRMS' GROWTH IN INDIA

Maria Bas and Antoine Berthou

### NON-TECHNICAL SUMMARY

The reform of the banking sector that took place in India in the middle 90s, has reinforced the level of financial development. The expansion of credit across Indian states has improved the financial resources available for firms. In this context, we investigate the link between financial development and firms' value added and capital investment growth in India. Specifically, we asked which are the type of firms that have benefitted the most from this reform.

Banking reforms through financial development might enhance economic growth through different channels. Credit expansion increases the financial resources available for companies, therefore relaxing credit constraints. In principle, financial development should promote aggregate economic growth, as it allows firms to invest more and engage into profitable projects. A second channel through which financial development might affect aggregate economic growth is the reallocation of market shares across companies. Banking reforms in India allowed private and foreign banks to set up more branches in Indian States, which resulted into an increased competition in the credit market. Such competition can be detrimental to less profitable and smaller firms, as banks compete to attract the best performing (and less risky) ones, i.e. large companies.

Both channels could be at play after the introduction of banking sector reforms. In which case, a microeconomic analysis might reveal that financial development has unequal effects on firm' growth depending on firm and industry characteristics. We investigate this question using a survey of Indian firms in the manufacturing industry during the period 1997-2006, in a context of rapid economic growth and underlying structural changes. We examine how changes in the level credit over GDP in Indian States affected firms' value added and capital used for production. To deal with potential endogeneity issues between credit and firms' growth, we rely on instrumental variables estimations that use the monetary policy set by the Reserve Bank of India to predict the credit ratio. Our results show that financial development has boosted within-firm growth in India. Our findings also suggest that the impact of financial development on firms' growth is unequal across firms and industries. Credit expansion has a stronger impact on firms that are initially larger, more productive or profitable. When looking at industry differences, financial development has a less heterogeneous effect on firms producing in sectors relying more on external finance, where both medium-size and large firms have expanded more rapidly than small firms. Overall,

these results imply that market shares reallocation is an important channel of transmission of financial development into aggregate economic growth in the case of India.

## **ABSTRACT**

This paper investigates the microeconomic effects of financial development on economic growth. The increased availability of credit is usually expected to improve firms' growth due to the elimination of credit constraints. We investigate this question using a survey of Indian firms in the manufacturing industry during the period 1997-2006, in a context of rapid economic growth and underlying structural changes. We examine how changes in the level credit over GDP in Indian States affected firms' value added and capital used for production. The baseline estimations show that financial development has boosted within-firm growth in India. Our findings also suggest that the impact of financial development on firms' growth is heterogeneous across firms and industries. Credit expansion has a greater effect on firms that are initially larger, more productive or profitable. The effect of financial development is less heterogenous in sectors relying on external finance, where both medium-size and large firms have expanded more rapidly than small firms. These results are robust to various specifications that allow to control for other reforms taking place simultaneously, or for potential reverse causality.

*JEL Classification:* O160, G210

*Keywords:* Financial development, banking reforms, firm panel data, firm growth and capital investments.



## LES EFFETS DIFFÉRENCIÉS DU DÉVELOPPEMENT FINANCIER SUR LA CROISSANCE DES ENTREPRISES : LE CAS DES FIRMES INDIENNES

Maria Bas and Antoine Berthou

### RÉSUMÉ NON TECHNIQUE

La réforme bancaire qui a eu lieu en Inde au milieu des années 1990 a constitué une étape importante du développement financier du pays. Nous étudions l'impact de l'expansion du crédit sur la croissance de la production et des investissements en capital des entreprises indiennes et cherchons à voir si cet impact est différent selon les caractéristiques des entreprises.

La réforme bancaire peut favoriser la croissance économique par deux mécanismes. Tout d'abord, l'expansion du crédit relâche les contraintes de financement des entreprises et leur permet d'investir davantage. Le deuxième mécanisme consiste en un effet de sélection des entreprises. Ainsi, la réforme du secteur bancaire indien qui a permis aux banques privées, et notamment aux banques étrangères, de développer de nouvelles filiales a augmenté la concurrence sur le marché du crédit. Or la concurrence pour attirer les entreprises les plus performantes et les moins risquées, qui sont généralement des entreprises de taille importante, peut conduire les banques à favoriser davantage celles-ci que les petites entreprises moins rentables. Dans ce cas, l'analyse microéconomique devrait révéler un impact différencié du développement financier sur la croissance des entreprises selon leurs caractéristiques.

Nous analysons ces questions en utilisant une base de données des entreprises manufacturières indiennes sur les années 1997-2006 marquées par une croissance économique rapide et d'importants changements structurels. Nous étudions comment les changements dans le niveau du crédit rapporté au PIB dans les différents états indiens ont affecté la croissance des entreprises. Afin d'éviter l'endogénéité entre développement du crédit et croissance des entreprises, nous utilisons des variables instrumentales.

Nos résultats montrent que le développement financier a accéléré la croissance des entreprises indiennes. Ils suggèrent également que l'effet du développement financier est hétérogène : l'expansion du crédit a un effet plus important sur les entreprises initialement plus grandes, plus productives et plus rentables. Cette différenciation est moins marquée dans les secteurs faisant davantage appel aux ressources financières externes. La distinction s'opère alors entre grandes et moyennes entreprises pour lesquelles l'impact du développement du crédit est le plus fort et les petites entreprises où il est moindre. Ces résultats suggèrent qu'en Inde, la réallocation des ressources financières est une composante importante de l'impact du développement financier sur la croissance économique agrégée.

**RÉSUMÉ COURT**

Ce papier adopte une approche microéconomique pour étudier l'impact du développement financier sur la croissance. Parce qu'il réduit les contraintes de financement des entreprises, le développement du crédit est supposé favoriser la croissance de leur activité. Nous analysons cette question en utilisant une base de données des entreprises manufacturières sur la période 1997-2006 caractérisée par une croissance économique rapide et d'importants changements structurels. Nous étudions comment le développement du crédit (rapporté au PIB) dans les différents états indiens a affecté la croissance de la production et des investissements en capital des entreprises. Nos estimations principales montrent que la croissance des entreprises indiennes a été accélérée et qu'elle l'a été d'une façon différente selon les caractéristiques des entreprises et des secteurs auxquelles elles appartiennent. L'expansion du crédit a un effet plus important sur les entreprises initialement plus grandes, plus productives et plus rentables. On observe aussi que cette différenciation est moins marquée dans les secteurs faisant davantage appel aux ressources financières externes. Dans ces secteurs, les entreprises de taille moyenne et grande voient leur croissance davantage accélérée que les petites entreprises. Ces résultats sont robustes à différentes spécifications économétriques.

*Classification JEL* : O160, G210

*Mots clés* : Développement financier, réforme bancaire, données des entreprises, croissance des entreprises.

## THE UNEQUAL EFFECTS OF FINANCIAL DEVELOPMENT ON FIRMS' GROWTH IN INDIA<sup>1</sup>

Maria Bas \*      Antoine Berthou †

### 1. INTRODUCTION

The link between financial development and economic growth has been largely studied both in theoretical and empirical works. The endogenous growth literature provides theoretical grounds for the role of financial development in promoting economic growth (Greenwood and Jovanovic, 1990; Saint-Paul, 1992; Bencivenga and Smith, 1991; Pagano, 1993). Cross-country empirical studies have found that financial development is positively related to long-run economic growth (King and Levine, 1993; Levine and Zervos, 1998; Rajan and Zingales, 1998; Levine et al., 2000; Levine, 2005). Whether aggregate economic growth is improved due to within-firm performance or due to market share reallocation across firms is, however, less clear. Several recent papers have indeed emphasized that market share reallocation across firms explains substantial economic growth in emerging economies such as China or India (Hsieh and Klenow, 2009; Harrison et al., 2011).

The aim of this paper is to study the microeconomic channels through which financial development drives aggregate economic growth. In doing so, we pay a particular attention to the heterogeneous response of firms to credit expansion. The analysis relies on the Indian experience, where financial reforms in the early 1990's induced changes in the level of financial development across Indian States.<sup>2</sup> The empirical analysis identifies the effects of changes in the level of credit-to-GDP ratio by Indian States on firms' growth (value added growth and capital used) using a survey of about 4,800 firms over the period 1997-2006, controlling for other reforms that may affect firms' performance during the same period. We first look at the effect of financial development on within firm growth. Next, we explore how different firms are affected by financial development according to their characteristics, such as their size, productivity and

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<sup>1</sup>We have benefited from discussions with Jens Arnold, Gunther Capelle Blancard, Benjamin Carton, Matthieu Crozet, Olena Havrylchuk, Jean-Olivier Hairault, Jean Imbs, Amit Khandelwal, Nina Pavcnik, Lise Patureau, Romain Ranciere and seminar participants at the CEPII, the Macro workshop at Paris School of Economics, the ISI Conference in Delhi 2011, the EEA conference 2011 in Oslo and ETSG conference 2011 in Copenhagen.

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<sup>2</sup>Banking reforms began in 1994 with promotion of private banks, the removal of entry barriers for foreign banks and liberalization of the interest rate. Next section describes these reforms in detailed.

profitability. This allows us to evaluate whether the reallocation of resources across firms improved the overall performance of the Indian manufacturing industry and thereby, spurred economic growth consecutive to changes in financial development across Indian States. Last, we also consider sector heterogeneity in terms of financial development as an additional source of heterogeneity.

Financial development in India may have affected individual firms' growth mainly through two channels: relaxation of credit constraints and banking competition. On the one hand, financial development is usually expected to benefit more the most financially constrained sectors (Rajan and Zingales, 1998) or smallest firms (Aghion et al., 2007). On the other hand, banking reforms enhance competition across banks that can be detrimental for smaller firms. Fierce competition in the banking sector indeed creates incentives for banks to lend only to those firms with a greater expected surplus (Petersen and Rajan, 1995). Both channels could be at play after the introduction of banking sector reforms. In which case, a microeconomic analysis might reveal that financial development has unequal effects on firm' growth depending on firm and industry characteristics.

We provide evidence that the increase of credit supply in Indian States during our sample period has fostered the growth of firms located in these States, in terms of value added and capital used. Our estimates suggest that the average annual increase of the credit ratio (8 percentage points) is associated with 1.7 p.p. growth of value added and almost 2 p.p. increase in capital used for the average firm. These results are robust when we control for firm unobservable and observable characteristics, region-time varying and industry-time varying observable and unobservable characteristics. This strategy allows us to take into account other reforms that took place during the same period in India like trade liberalization, and product and labor market deregulation. These findings are robust to instrumental variables estimations that use the monetary policy set by the Reserve Bank of India to predict the credit ratio. We also rely on the strategy proposed by Rajan and Zingales (1998), and show that the effect of States' financial development is larger in sectors that use more external finance.

Second, the effects of financial development are found to be unequal across firms depending on their previous performance. Initially larger, more productive and profitable firms have experienced greater gains from financial development relative to the least efficient firms. This result is robust when we control for the effects of changes in output tariffs for different types of firms. Instrumental variables estimations also confirm that finding. Moreover, estimations based only on the sample of private Indian firms are in line with this finding, which implies that our results are not driven by Indian business groups or foreign multinationals. Finally, we show that in industries where firms use more external finance, the pro-growth effects of financial development are less concentrated among largest firms: both medium-size and large firms tend to benefit more from financial development than the smallest firms in our sample. Overall, our results are consistent with explanations focusing on banking competition that benefits initially more profitable firms. These results suggest that market share reallocation is an important channel of



transmission of financial development to aggregate economic growth in the case of India.

This paper contributes to the literature on the microeconomic effects of financial development on economic growth. Bertrand et al. (2007) study the effects of French banking reforms implemented in 1985, and show that bank deregulation increased asset and job reallocation towards more efficient firms. Aghion et al. (2007) study the impact of financial development on the entry of new firms and the expansion of these successful new entrants in 16 industrialized and emerging economies. Their results indicate that in sectors using more external finance, financial development promotes essentially the entry of small firms. Their findings also suggest that financial development has a positive effect on firms' post-entry growth in these sectors. Using a survey of firms located in western European countries, Constantini (2008) shows that small firms tend to grow more rapidly in countries characterized by a better development of financial institutions. Other papers - like ours - have emphasized the role of local financial development on economic growth (Petersen and Rajan, 2002; Guiso et al., 2004). More closely related to our work, Fafchamps and Schundeln (2011) show that in Morocco, small firms tend to benefit more from growth opportunities when they are located in a city with at least one bank branch. These works are based mainly on cross-section analysis.

In contrast, our study uses yearly changes in the level of financial development across Indian States that took place during the period of banking reforms. Measuring the influence of these structural changes on firms' growth, we identify that the gains of financial development were unequally distributed across firms.

The findings of this paper complete the existing evidence on structural reforms and firm performance in the case of the Indian economy. Many of these works use the same data (Prowess) over a comparable period of time (Topalova and Khandelwal (2011), Goldberg et al. (2009, 2010a,b) and Arnold et al. (2010)).<sup>3</sup> Regarding banking activity in India, Banerjee et al. (2004) show that the Indian financial system is characterized by under-lending and credit rationing due to the high presence of nationalized banks. Banerjee and Duflo (2004) use the experience of a targeted lending program and show that increase of credit supply fostered economic growth among Indian firms operating in Small Scale Industry between 1998 and 2000. Cole (2009) investigates the effects of the bank nationalization wave in 1979-80 on banks performance, as well as employment and agricultural investment across villages consecutive to the reform. Our work rather focuses on yearly changes in the level of financial development in Indian States induced by banking reforms in the mid 1990's. This approach allows us to cover a large period of time that was characterized by important structural changes in the Indian economy. The data we use also allows us to cover a large number of firms in India, and a large proportion of the manufacturing production of the country.<sup>4</sup> We are therefore able to draw conclusions regarding

<sup>3</sup>Topalova and Khandelwal (2011) and Goldberg et al. (2010a, 2009) show that input liberalization has contributed significantly to firm productivity growth and also to the ability of firms to introduce new products. Using an index of services reforms in India during the early 1990's, Arnold et al. (2010) show that these reforms have improved firm productivity in India.

<sup>4</sup>The Prowess database contains information from the income statements and balance sheets of listed companies

the evolution of the structure of the manufacturing production in India, and its contribution to aggregate economic growth.

The next section describes banking reforms in India over the nineties. Section 3 presents the firm level data, the financial development variables at the region level and the identification strategy. Section 4 describes the baseline estimation strategy and results. Section 5 investigates the unequal impact of financial development on firms' growth depending on firm and sector characteristics. The last section concludes.

## 2. BANKING REFORMS IN INDIA

After the independence in 1947, the Government introduced several reforms to nationalize private banks in India. The first wave of bank nationalization started in 1955 when the Imperial Bank of India was nationalized and became the State Bank of India. In 1959 the State Bank of India took over seven private banks as its subsidiaries. The second and third waves of nationalization occurred between 1969 and 1980 when twenty of the largest private banks in India were also nationalized. The goal was to expand the credit towards areas considered as priority by the Government. The banking system, during this period, was dominated by the presence of public banks and by a significant role of the State Bank of India. The financial regime was characterized by an administered interest rate and a pre-emption of a large proportion of bank deposit.

At the beginning of the 1990s, the government undertook a package of reforms to deregulate and liberalize the Indian economy. In this context, the aim of banking reforms was to increase competition in the banking sector and to improve the efficiency of credit allocation. The main reforms in the financial sector were implemented between 1994 and 2004. These reforms consisted in (i) an increase in the approval rate for new private banks, (ii) the liberalization of the interest rate, (iii) allowing banks the freedom to choose their deposit and lending rates, (iv) promoting the entry of foreign banks and (v) diversification of the ownership of state-owned banks.

During the reform period, the banking system was completely transformed from the domination of state-owned banks during the post-independence period, towards a predominant role of private and foreign banks. In 2004, the Indian banking system was characterized by 40 private sector banks, 33 foreign banks and 27 state-owned banks in which Government has majority ownership. At the beginning of the 90s, before the banking reforms, state-owned banks had more than 90 percent share in the assets of the banking system, while in 2004 their share decreased up to 75 percent. These figures suggest that competition across banks in India was enhanced after the reforms of the financial sector.

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comprising more than 70 percent of the economic activity in the manufacturing sector of India. Section 3 describes in detail the dataset.

### 3. DATA AND IDENTIFICATION STRATEGY

#### 3.1. Firm level data

The Indian firm-level dataset is compiled from the Prowess database by the Centre for Monitoring the Indian Economy (CMIE)<sup>5</sup>. This database contains information from the income statements and balance sheets of listed companies comprising more than 70 percent of the economic activity in the organized industrial sector of India. Collectively, the companies covered in Prowess account for 75 percent of all corporate taxes collected by the Government of India. The database is thus representative of large and medium-sized Indian firms.<sup>6</sup> As previously mentioned this dataset was already used in several studies on the performance of Indian firms.<sup>7</sup>

The dataset covers the period 1997-2006 and the information varies by year. It provides quantitative information on sales, capital stock, income from financial and non financial sources, consumption of raw material and energy, compensation to employees and ownership group.

Table A1 in Appendix provides summary statistics on the main firm, region and industry level variables used in our econometric analysis. Our sample contains information for 4,800 firms in organized industrial activities from manufacturing sector for the period 1997-2006. In order to keep a constant sample throughout the paper and to establish the stability of the point estimates, we keep firms that report information on all the firm and industry level control variables. The total number of observations firm-year pairs is 23,976. Firms are categorized by industry according to the 4-digit 1998 NIC code (116 industries). Most of the firms in our sample are private-owned firms (91%). 49% of firms are large firms belonging to local business groups and only 8% are multinational firms. Although the panel of firms is unbalanced, the number of observations remains similar between the first year (about 2,400 firms in 1997) and the last year (about 2,900 firms in 2006). Firms can be followed over time using a firm identifier.

Important changes in the distribution of firm size can be observed over time. Figure (1) reports an estimation of the distribution of wage bill, total sales, value added and capital used by firms in the sample for the years 1998 and 2006 (Kernel density estimations). We consider both the whole sample of firms in sample (panel a), as well as the sample of private firms that do not belong to an economic group (panel b). In all cases, the distribution of firm size has a log normal shape. Important changes in the distribution of firm size can be observed between the beginning and the end of the sample period: in most cases, the distribution is shifted to the right, which is in line with a process of within-firm growth. This pattern is especially observable among private firms, consistent with the idea that the structural reforms help to expand firms' size.

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<sup>5</sup>The CMIE is an independent economic center of India. For more information see: <http://www.cmie.com/database>.

<sup>6</sup>Since firms are under no legal obligation to report to the data collecting agency, the Prowess data do not allow properly identifying entry and exit of firms.

<sup>7</sup>See Topalova and Khandelwal (2011), Topalova (2004), Goldberg et al. (2010a), Goldberg et al. (2010b), (Goldberg et al., 2009) Alfaro and Chari (2009).

More surprising is the fact that the density of small firms is almost unchanged between 1998 and 2006, or even increased, in most cases. This is especially visible if we consider the capital used by the firms in the sample, where both the density of firms using a small amount of capital and those using a large amount of capital is increased, leaving the density of firms using an intermediate level of capital reduced. This pattern is in line with Hsieh and Klenow (2009). They show that reallocation across firms in China and India, corresponding to a reduction of the proportion of mid-sized firms and an increase in the proportion of small and large firms, would lead to substantial aggregate TFP gains in those countries.

The reallocation of resources from the least to the most efficient firms is expected in a context of increased competition in local markets for goods (Melitz and Ottaviano, 2008; Trefler, 2004), labor (Melitz, 2003), or capital (Petersen and Rajan, 1995). In the econometric analysis, estimations will allow to differentiate the effect of financial development for different categories of firms, according to their size, productivity, or profitability.

### 3.2. Financial development across Indian States

Our identification strategy in the baseline specification relies on exploiting the heterogeneous expansion of credit across Indian states to investigate the impact of financial development induced by banking reforms on firm growth. Our main variable of interest identifies changes in the credit over GDP ratio across 21 regions in India, reflecting the process of financial development in India in a context of banking reforms. This data is published by the Reserve Bank of India (RBI) for each Indian State and covers our sample period (1997-2006). The credit ratio was used in a number of articles that have investigated the relationship between financial development and growth in cross-country studies (Rajan and Zingales, 1998; Levine et al., 2000).

Figure 2 (Appendix) presents the distribution of credit over GDP ratio across Indian states in 1997. As can be seen, the initial level of financial development captured by the credit ratio is different across regions. Figure 3 plots the variation of the credit over GDP ratio between 1997 and 2006 across regions against the initial GDP per capita in 1997 and Figure 4 (Appendix) against the level of product market regulation.<sup>8</sup> The credit expansion after banking reforms depends on the initial characteristics of the States. These figures highlight that the greater the economic and institutional development (lower product market regulation) of the region, the higher the expansion of credit over GDP in the period.

### 3.3. Identification strategy

The descriptive statistics presented in the previous section show that initial conditions are important to explain the evolution of financial development across Indian States over the recent period (Figures 2 and 3). This evidence also implies that several biases may drive the estimation

<sup>8</sup>Product market regulation index varies across Indian states and comes from Conway et al. (2008).

results due to reverse causality between firms' performance and financial development across states. First, Indian States with more developed local institutions may have greater growth opportunities and attract more banks to settle branches in these areas. Second, the credit ratio in each State may be correlated with the quality of infrastructures or local institutions that may explain firms' growth performance.

Our econometric strategy addresses these issues in different ways. First, all estimations include firm fixed effects, which controls for the unobservable characteristics of the region in which the firm is located. All estimations also take into account differences in the economic development level and growth opportunities across states by including the GDP of the region.

Second, we specifically address the endogeneity issue by making use of monetary policy changes set by the Reserve Bank of India (the interest rate set by the RBI and cash reserve requirements for banks). These policy variables are interacted with the initial credit ratio of the region (in 1997) to predict the current credit ratio in each region. Our assumption is that Indian States with initially better developed financial institutions have a higher capacity to transmit monetary policy shocks by the RBI.

Last, region-year fixed effects are used to control for all State-wise unobserved structural changes. In these estimations, the identification strategy relies on an interaction term between the credit ratio of the region in year  $t$  and a measure of industry's dependence on external financial, following Rajan and Zingales (1998). The coefficient on the interaction term is expected to be positive: financial development should promote more the growth of firms in sectors where firms are more financially vulnerable.

#### 4. THE EFFECT OF FINANCIAL DEVELOPMENT ON WITHIN FIRM GROWTH

##### 4.1. Baseline specification

Before studying how financial development affect firms differently, we present a baseline specification using variations in the credit ratio across states to identify the average effect of changes in financial development on firm performance. We estimate the following model using a within-estimator:

$$Y_{isrt} = \beta_1 \text{Credit}_{r(t-1)} + \beta_2 \ln \text{GDP}_{r(t-1)} + \beta_3 X_{s(t-1)} + \beta_4 \text{Age}_{it} + v_t + \mu_i + \varepsilon_{it} \quad (1)$$

Here  $Y_{isrt}$  corresponds to the logarithm of value added or capital used of the firm  $i$  producing in a region  $r$  and manufacturing industry  $s$  in year  $t$ . Credit ratio $_{r(t-1)}$  represents the financial development measure proxied by the ratio of total credit over the GDP of the region  $r$  in year  $t - 1$ . Our specification shows how an expansion of credit in a region over time affects firms' performance of the average firm. We expect a positive and significant coefficient of  $\beta_1$  indicating that firms located in regions where credit allocation has improved, have expanded their production.

All explanatory variables are expressed in logarithm and they are lagged of one period. Since our variable of interest is the credit ratio of the region that varies over time, standards errors are clustered at the region-year level.

Unobserved firm characteristics could lead to inconsistent estimates. For this reason, all estimations include firm-level fixed effects ( $\mu_i$ ). The introduction of firm fixed effects is important to control for unobservable firm characteristics that do not vary over time, as well as time-invariant unobserved characteristics of the location. We introduce year fixed effects to control for other macroeconomic shocks experienced during the period ( $v_t$ ). Estimates also include controls for industry characteristics that vary over time. We introduce a set of industry level variables,  $S_{s(t-1)}$ , that take into account observable industry characteristics that might also affect firms' value added growth. First, we introduce the median sales of the industry  $s$  in year  $t - 1$  to take into account differences across industries in terms of growth. Second, we also include two proxies of competition at the sector level. Since at the beginning of the nineties India experienced a unilateral trade liberalization process, effectively applied import tariffs for final goods at the 4-digit NIC industry level are introduced. Tariffs data is provided by the World Bank (WITS).<sup>9</sup> Tariff changes capture the degree of foreign competition faced by firms at the industry level. Several studies show that competition might enhance firm efficiency and create incentives for firms to invest in R&D activities increasing their value added. This is the theoretical mechanism highlighted by Aghion et al. (2005) of an inverted U shape relationship between competition and R&D investments. To control for competition in the domestic market, we constructed a Herfindahl index at the 2-digit NIC industry level.

Since the variable of interest varies at the region level, it is important to take into account observable characteristics varying across Indian states that might be correlated with the credit ratio. The GDP of the region captures in particular heterogeneity in terms of growth opportunities across locations. Finally, we also control for the age of the firm, as it is an important determinant of firms' growth (Davis et al., 1996). In the specification introduced in the next section, we extend the set of observable firm characteristics varying over time, including firm productivity, size and profitability, that could affect firms' production and investment decisions.

## 4.2. Baseline estimation results

Before analyzing the relationship between banking reforms and firm capital accumulation, we provide some evidence on how the liberalization of the banking system in India affected within firm growth. Table 1 reports the estimation results of equation (1) using a within estimator. Column (1) shows that the coefficient of the financial development proxy is positive and significant. This finding suggests that firms located in regions that experienced an improvement of financial resources over time, have increased their value added. We next take into account the characteristics at the region level that vary over time and which could be related to our variable

<sup>9</sup>We use correspondence tables to convert tariffs into ISIC rev 3.1. that match almost perfectly with NIC 4-digit classification. This dataset is available at <http://wits.worldbank.org/wits/>.

of interest. The results are robust and stable when we control for demand changes at the region level captured by the GDP of the region in column 2. These findings remain also unchanged to the introduction of the set of industry level control variables. The estimates presented in column (3) show that the previous findings are stable when we include the median sales of the industry as well as lagged output tariffs and the Herfindhal index capturing trade liberalization policies and domestic competition, respectively. Finally, the estimated credit ratio coefficient is robust and stable to the inclusion of firm age in column (4). In non-reported estimations, available upon request, we include industry-year fixed effects that captured all other possible shocks affecting industries and varying over time. The coefficient of interest is still positive and significant. This result suggests that other reforms that took place in India during the nineties are not capturing the effect of the banking system reform on firms' production growth.

During the period under analysis the annual variation of the average credit ratio is 8 percentage points. Our estimates indicate that an increase of the credit ratio of 8 p.p. is associated with 1.7 to 1.8 p.p. increase in value added for the average firm.

The previous findings demonstrate that financial development has a positive effect on economic growth at the microeconomic level. One possible mechanism through which financial development might affect firms' production growth is by enhancing firms' investments. We look now at the effects of credit expansion on one of the determinants of economic growth: capital accumulation. The theoretical literature suggests that an increase in firms' financial resources has a positive effect on firms' investment decisions.<sup>10</sup> Credit expansion creates incentives to develop investment projects enhancing capital accumulation. Columns (5) to (8) of Table 1 report the estimation results of equation (1) using as dependent variable the logarithm of capital used of firm  $i$  producing in industry  $s$  and located in region  $r$  in year  $t$ . Similarly to the previous results, we find a positive effect of the credit ratio on firms' capital used (column (5)). Firms located in regions with a higher degree of financial development have improved their capital accumulation. Column (6) shows that the results are robust and stable when we include the region level controls capturing changes over time across the 21-regions in the GDP. This finding is also robust to the introduction of observable industry characteristics varying over time (columns (7)). In column (8) we investigate the impact of firms' age on capital accumulation. The age of the firm affects positively capital used. Finally, in non-reported estimations available upon request the coefficient of interest remains almost unchanged when we control for other reforms implemented in the period and affecting all industries in the same way by including industry-year fixed effects.

To have an order of idea of the economic effects of financial development on within firms' capital investments: our estimates suggest that the average annual increase of the credit ratio (8 percentage points) is associated with 1.8 to 2 p.p. growth of capital stock for the average firm.

Macroeconomic models and empirical works show that human capital or skilled labor is also

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<sup>10</sup>See Hubbard (1998) for a summary of this literature, and Bas and Berthou (2012) for evidence about firms' financial health and imports of capital goods in India.

an important determinant of economic growth. Unfortunately, the Prowess dataset does not report information on the number of employees neither on the skill content of workers. Only information on firms' wage-bill is available. The results from the baseline estimation using as dependent variable the wage-bill paid by firm  $i$  producing in industry  $s$  and located in region  $r$  in year  $t$  are reported in Table A2 (Appendix). These estimates indicate that once all control variables are included in this specification, the credit expansion across Indian states increases the wage-bill for the average firm (column 4). These results should be analyzed with caution, though, since the wage-bill variable does not allow distinguishing between shifts in the labor demand and variations in wages paid by firms.

Finally, since our variable of interest varies at the state level, we carry out a sensitivity analysis to test if our results are not picking up the effect of union territories. Estimations available upon request show that our previous results are robust and stable to the exclusion of union territories.

### 4.3. Instrumental variables estimations

In this section, we verify whether there is a causal effect of banking reforms, through an expansion of the credit across regions, on firm growth and capital accumulation by relying on Instrumental Variable estimations.

The empirical strategy exploits changes over time of monetary policy set by the Reserve Bank of India (RBI) during the period 1996-2006. The interest rate is an important monetary policy instrument of the RBI, which it is unlikely to be affected by firms' decisions. The interest rate used in this exercise is the RBI "monetary rate" and not the one at which firms borrow from banking institutions. It is therefore independent from banking institutions in one particular region. However, changes in the level of the RBI interest rate set by the RBI for the country can have different effects according to the characteristics and degree of financial development of banks in each State. Our assumption is that better developed financial institutions are more able to channel monetary policy shocks in terms of credit supply. To capture differences across regions we interact the real interest rate with the initial level of credit over GDP of the region in 1997. We thus instrument the credit ratio at the region level by an interaction term between the real interest rate (in  $t-1$ ) and the credit ratio of the region on the initial year (1997).

To complete our set of instruments, we construct a similar variable using the Cash Reserve Ratio established by the RBI. Indian banks are required to keep only a fraction of their deposit liabilities in the form of liquid cash in the central bank to ensure safety and liquidity of deposits. The Cash Reserve Ratio (CRR) refers to this liquid cash that banks have to maintain in the RBI as a certain percentage of their demand and time liabilities. Figure 5 shows that we have substantial variance across Indian States in terms of the evolution of our two instruments over time. We expect that these instruments will capture the variations of financial development across Indian States that are exogenous to firm's growth. We can therefore use monetary policy decisions designed at the country level, and initial heterogeneity among Indian States, to predict the evolution of financial development within each state.



A reduction of the real interest rate at which the RBI supplies money to the banking institutions, or a reduction of the cash reserve ratio, is generally expected to increase the volume of credit that circulates in the economy through the banking institutions. Our hypothesis is that the transmission of aggregate monetary policy shocks is more efficient in regions with initially more developed financial institutions (a higher credit ratio in 1997). If this is the case, we expect our instruments to be negatively related to the evolution of financial development within each Indian State. Table A3 in Appendix shows that both instruments are negatively related to the credit level in the region: a reduction of the monetary policy rate set by the RBI, or a reduction of the cash reserve requirement, tends to generate a larger increase in the supply of credit in Indian states with better developed financial institutions.

Table 2 reports the estimation results. In the IV specifications, we restrict the sample to 1999-2006 to ensure that the instruments, based on the interaction term between monetary policy and the credit ratio in 1997, will not be affected by firms' sales growth and capital investments. Thereby, we first replicate the baseline estimation for the sub-sample of firms present in 1999-2006 to provide a benchmark estimation in columns (1) and (3). These results of within fixed-effect estimations confirm previous findings that firms located in regions with higher credit expansion have a higher production and capital growth. This result is validated when the credit ratio is instrumented in columns (2) and (4) using the monetary policy variables defined above. Moreover, the Hansen tests from the IV estimations confirm that we cannot reject the validity of our instruments. These findings support a causal relationship from financial development to within firm growth in Indian States.

#### **4.4. Industry dependence on external Finance**

The empirical strategy developed by Rajan and Zingales (1998) allows to identifying an exogenous effect of financial development on firms' growth and capital accumulation based on the financial vulnerability of each industry. Banking reforms, through easing financial constraints, are expected to affect more the investments in sectors where firms rely more on the use of external finance.

We use the measure of firms' dependence on external finance ("external dependence") at the 2-digit industry level, proposed by Rajan and Zingales (1998) and updated by Braun (2002) and Braun and Larrain (2005). The measure of external dependence is interacted with our measure of financial development across Indian States. Since the external dependence measure varies across industries and is constructed with US data, it is independent of the characteristics of regions in India. The interaction term is therefore expected to be unrelated to region characteristics and unaffected by future firm growth and capital investments. The coefficient on the interaction variable is expected to be positive: in the presence of financial constraints, variations on credit expansion across regions are expected to have a stronger effect on firm growth and capital investments for firms that rely more on the use of external finance.

Columns (1) and (2) of Table 3 report estimation results for firm value added and columns (3)

and (4) for capital used. The coefficient on the interaction variable reports a positive sign, confirming that the positive impact of credit expansion of the region on firms' production growth is higher in sectors where firms require more external finance. Column (2) replicates this estimation, including region-year fixed effects. Our variable of interest, the interaction between the credit ratio of the region and the external dependence of the industry, varies at the industry-region-year level, the inclusion of region-year fixed effects allows us to test that our coefficient of interest is not picking up the effects of other region characteristics varying over time. The coefficient on the interaction term remains almost unchanged when including region-year fixed effects. Columns (3) and (4) provide similar analysis using as a dependent variable firms' capital used. The coefficient on the  $\text{Credit ratio}_{(r)(t-1)} \times \text{External Dependence}_{(s)}$  is positive and significant (column 3) and it remains robust and stable when we introduce region-year fixed effects in column (4). Firms located in regions with higher credit expansion tend to invest more in capital goods and this effect is stronger in industries that rely more on external finance. These sensitivity tests therefore provide additional evidence confirming that banking reforms have causal effects on firm growth and capital investments.

## 5. HETEROGENEITY ACROSS FIRMS

Previous results show that financial development is associated with a within increase in the size of the average firm in our sample. This average effect potentially hides a rich heterogeneity in firm-level adjustment consecutive to an increase in the availability of credit in Indian States. First, small firms are generally considered as being more credit constraints. They are consequently expected to benefit more from an increased availability of credit (Aghion et al., 2007). Second, banking competition is usually expected to benefit more to the best performing or profitable firms (Petersen and Rajan, 1995).

These two channels of transmission are important to better understand how financial development can translate into higher aggregate economic growth: a within-firm growth process due to substantial elimination of credit constraints, or a between-firm growth process due to market share reallocation towards better firms. This section investigates this question by providing estimations of the effects of financial development for different categories of firms according to their size or productivity. We also consider the effects of financial development on growth by firm-size class in sectors where firms rely more on external finance.

### 5.1. Empirical methodology

In order to identify whether the impact of credit changes across regions depends on firms' past efficiency, we rely on several measures: (i) firm size (measured by wage-bill), (ii) firm total factor productivity (TFP) and (iii) firm profitability. Firm TFP is computed using semi-parametrical estimations developed by Levinsohn and Petrin (2003). To investigate this heterogeneity, we introduce interactions between credit ratio changes and firms' past efficiency measures. Firms are divided up into four size's (TFP) quartiles, with the first quartile representing the smallest (or

least productive) firms. We then interact the credit ratio of the region with the firm's size (TFP) quartiles in year (t-1). We estimate the following specification:

$$Y_{isrt} = \sum_{\rho=1}^4 \chi^{\rho} (Credit_{r(t-1)} \times Q_{it}^{\rho}) + \sum_{\rho=2}^4 \lambda^{\rho} Q_{it}^{\rho} + \beta_2 X_{s(t-1)} + \beta_3 Age_{it} + v_t + \mu_i + \varepsilon_{it} \quad (2)$$

Here  $Y_{isrt}$  corresponds to the logarithm of value added or capital used of the firm  $i$  producing a manufacturing industry  $s$  located in region  $r$  in year  $t$ . Credit ratio $_{r(t-1)}$  represents the financial development proxy measured by the ratio of total credit in region  $r$  over the GDP of the region  $r$  in year  $t - 1$ . Firms are classified into four ( $\rho$ ) quartiles (Q) of size (TFP), where  $Q_{it}^2$  is a dummy variable for firm  $i$  belonging to the second size quartile and so on. Credit ratio $_{r(t-1)} \times Q_{it}^{\rho}$  are the interaction terms between the quartiles of size and the credit over GDP ratio of the region. In all estimations, we include the same region, sector and firm control variables that in the baseline specification. This specification also controls for observable firm characteristics that vary over time (firm size and TFP) and that affect positively firm economic growth and capital accumulation.

In alternative estimations, we include region-year fixed effects that control for all other unobservable characteristics varying over time at the state level ( $v_{rt}$ ). In this case, the omitted category is the interaction term between the credit ratio and the fourth quartile that represents the most efficient firms. Since our variable of interest, the interaction between the credit ratio of the region and firm past performance, varies at the firm-region-year level, the inclusion of region-year fixed effects allows us to test that our coefficient of interest is not picking up the effects of other region characteristics varying over time. This specification shows how an improvement of the financial system of the region over time affects firms' factor accumulation depending on past firm productivity relative to the most productive firms.

## 5.2. Estimation results

**Heterogeneity in size.** The estimation results of equation (2) are presented in table 4. The effect of credit expansion on firms' value-added and capital used in  $t$  is greater for bigger firms in  $t - 1$  relative to the smallest ones (columns (1) and (3)).<sup>11</sup> State-wise financial development tends to improve firms' value added in the third and fourth quartiles of the size distribution, and firms' capital used in quartiles 2, 3 and 4. The coefficient of financial development is in both cases increasing with firm size, while no significant effect of financial development on firms' growth can be identified for the firms in the first quartile of the size distribution.

In order to test the significance of firm-size heterogeneity in terms of growth consecutive to a change in credit availability, we introduced region-year fixed effects and excluded the interaction term between the fourth quartile of firm size and the credit ratio. The coefficients on

<sup>11</sup>This result also holds if we are using the average size of firms in t-1 and t.

the interaction terms reported in columns (2) and (4) are now interpreted relative to this omitted category (largest firms in the fourth quartile of the distribution). Confirming the previous results, the coefficients on the credit ratio is negative and significant for quartiles 1, 2 and 3, and decreasing with firm size: large firms, or SME's tend to benefit more from an increased availability of credit than small ones.

To ensure that our results do not pick-up the effects of trade reforms during the same period, we interacted in our estimations the size quartiles with output tariffs by NIC industry. A reduction of output tariffs is expected to generate a tougher competition in the domestic market. Our results confirm that increased competition due to a decline of output tariffs tend to be particularly detrimental to the smallest firms (quartiles 1 and 2) in terms of capital used by those firms, while it has no significant effect on the largest firms. This result is in line with previous work showing that foreign competition tends to be more detrimental for less productive/smaller firms in the US (Trefler, 2004). Most importantly, our result that financial development tends to benefit more to larger firms in India is independent of trade policy considerations.

**Robustness checks: endogeneity and firm ownership.** The result that larger firms in India tend to benefit more from financial development in terms of growth is confirmed by instrumental variables estimations reported in Table 5. These estimations are based on restricted sample since we use lags for firm' size as instruments. Hence, columns (1) and (3) presents the baseline within estimation for this restricted sample as a benchmark. In columns (2) and (4) interactions of the credit ratio with firm size are instrumented using our main instruments (monetary policy rate  $\times$  credit ratio in 1997 and the cash reserve requirements  $\times$  credit ratio in 1997) interacted with lags of firm size classes. The estimation results presented in Table 5 indicate that the effect of financial development on firms' growth is essentially concentrated in the 4th quartile of firm-size distribution.

One reason why we may observe this result could be that larger firms are actually State-owned firms, or multinational firms, which may be more closely linked to banks (Kornai et al., 2003; Bartel and Harrison, 2005). We provide some robustness analysis by first differentiating the effect of financial development by firm ownership, using interaction terms between the credit ratio and ownership variables. Results reported in Table 6 show that multinational firms indeed benefited the most from changes in the credit ratio in Indian States. No effect however can be identified for State-owned firms. The coefficient for private firms and Indian business groups (which represent the majority of observations in our data) is similar.

To determine whether firm ownership is driving our results of the effects of financial development on firms' growth by size category, we replicate the estimations of Equation 2 by considering only private firms or Indian business groups in the estimation (columns 1 and 3 in Table 7) or private firms only (columns 2 and 4 in Table 7). Results are mostly unchanged compared to estimations that are based on the full sample of observations: the positive effect of financial development on firms' growth concentrate on the largest firms in quartiles 3 and 4, whereas the smallest firms in quartile 1 are not affected by the changes in the credit ratio, if we consider

simultaneously all industries.

**Alternative sources of firm heterogeneity: productivity and profitability.** We explore if the effects of financial development are also different depending on firms' TFP or profitability. The estimation results using interaction terms of the credit ratio of the region with quartiles of firms' TFP in  $t - 1$  are presented Table 8. The first estimates suggest that the initially more productive firms have benefited the most from financial development (column (1) and (3)). After introducing region-year fixed effects in columns (2) and (4), this finding is confirmed.<sup>12</sup>

We use as an alternative proxy of firm profitability a dummy variable equal to one if the firm has negative profits in  $t - 1$ . This variable is interacted with the credit ratio. In the bottom part of the table, columns (1) and (3) show that the coefficient on the interaction term is negative and significant indicating that firms with negative profits in the previous period do not benefit from credit expansion in the region relative to firms making positive profits. Columns (2) and (4) confirm this result when including region-year fixed effects.

### 5.3. Firm-size and sector heterogeneity

The findings presented in the previous section suggest that the gains from financial development are concentrated mainly in initially larger and more profitable firms. These results are in line with the argument highlighting that in a more competitive context, banks are prone to lend to less risky firms. It is also in line with the evolution of firm-size distribution in Figure 1: between 1998 and 2006, the density of small firms remained unchanged (or even increased) whereas intermediate and large firms expanded.

In this section, we investigate whether this pattern is affected by the degree of dependence on external finance of the sector. Equation (2) is extended to include an interaction term between the regional credit ratio, firms' size quartiles and external dependence. The coefficients of these interaction terms capture if the effect of financial development on firms' growth by size category of the firm is affected by the degree of external dependence of the sector.

Table 9 presents the results. Columns (1) and (3) show the benchmark specification that corresponds to the results presented in Table 4. The interaction terms with external dependence are introduced in the remaining columns. In column (2), the coefficient on the triple interaction is positive and significant but decreasing with firm size: while the effect of financial development on firms' growth tends to increase with firm-size in  $t-1$ , this is less the case in sectors where firms use more external finance. Marginal effects of financial development on firms' value added growth by size category are summarized in Figure 6 for sectors with low external dependence (external dependence = 0) and in sectors with high external dependence (external dependence = 1). The panel (a) of the Figure confirms that the effect of financial development

<sup>12</sup>These findings are robust and stable when we instrument the interactions of the credit ratio with firm TFP quartiles using our main instruments of monetary policy interacted with lags of firm TFP classes. These results are available upon request.

on firms' value-added growth is increasing with firm size, but less so in sectors where firms use more external finance. This result implies that in sectors where firms are financially more vulnerable, financial constraints have been relaxed for small firms, which contributed to the aggregate growth of the sector.

In column (4) of Table 9, the capital used by firms is the dependent variable. Here the results show that the coefficient on the triple interaction is only significant for size quartiles Q2 and Q3: firms in the middle of the size distribution tend to benefit more from financial development in terms of capital used when they operate in sectors with higher needs for external finance. The total effect of financial development on capital used growth by size class is summarized in the panel (b) of Figure 6. The results indicate that in sectors with important needs for external finance, small firms do not benefit from an increased availability of financial resources to finance their capital, whereas firms in the middle of the size distribution tend to benefit more from financial development than in other sectors.

All in all, these results confirm that in the context of banking reforms in India starting in the 1990's, improvements of credit availability in Indian States benefited more to large firms rather than to small firms in terms of growth. This pattern is also observed in sectors with a high degree of external dependence, although with less heterogeneity between medium-size and large firms.

## 6. CONCLUSIONS

This paper sheds new light on the microeconomic effects of financial development on firm growth and investments. Within-firm growth due to the elimination of credit constraints and reallocation of market shares are important channels of transmission of financial development into aggregate economic growth.

This paper investigates the effects of financial development on firms' growth measured by value-added growth and capital accumulation. Our data cover a survey of Indian firms during the period 1997-2006. This period was characterized by important structural changes, in a context of banking reforms and rapid credit expansion in Indian States. The increased availability of credit is expected to have fostered individual firms' growth, whereas banking competition may have created incentives to finance essentially more profitable firms.

Our findings show that financial development has a positive effect on within firm' value added and capital growth for the average firm. These results are robust to alternative specifications that control for industry and firm characteristics and that address directly potential reverse causality concerns.

The effects of financial development are found to be unequal across firms depending on their previous performance. Initially larger, more productive and profitable firms have experienced greater gains from financial development relative to the least efficient firms. This result is robust to various specifications controlling for other types of reforms, ownership, or addressing specifically the issue of reverse causality. In industries where firms use more external finance,

our findings indicate that the pro-growth effects of financial development are less concentrated among largest firms: both medium-size and large firms tend to benefit more from financial development than the smallest firms in our sample.

Overall, our results are consistent with a more intense competition in banking that benefited to initially more profitable firms. These results imply that market shares reallocation is an important channel of transmission of financial development into aggregate economic growth in the case of India.

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**7. APPENDIX**

Appendix Table A1: Descriptive statistics of Indian manufacturing firms (1997-2006)

	Mean	Median	Std. Dev.
<b>Percentage of firms</b>			
Private firms	0.91		
Indian Business groups	0.42		
Foreign	0.08		
<b>Firm-level characteristics</b>			
Log Sales(it)	3.40	3.41	1.71
Log Value Added (it)	2.43	2.43	1.86
Log Capital Used (it)	2.81	2.67	1.69
Log Wage Bill (it)	0.58	0.56	1.73
Log TFP (it)	1.32	1.23	0.51
<b>Industry-level controls</b>			
Effectively applied output tariffs (NIC 4-digits)	0.29	0.29	0.13
Herfindahl index (NIC 2-digits)	0.94	0.98	0.79
Log median sales (NIC 2 digits)	3.17	3.15	0.35
<b>Region-level controls</b>			
Credit over GDP in 1997	0.37		0.13
Credit over GDP in 2006	0.94		0.78

Appendix Table A2: The effect of financial development on firms' wage bill

Dependent variable	(1)	(2)	(3)	(4)
	log(wage bill <sub>it</sub> )			
Credit/GDP(r)(t-1)	0.190*** (0.044)	0.204*** (0.040)	0.198*** (0.039)	0.189*** (0.033)
GDP (r)(t-1)		0.220*** (0.078)	0.196** (0.076)	0.212*** (0.057)
Output tariff(s)(t-1)			-0.027 (0.084)	-0.004 (0.085)
Herfindhal index(s)(t-1)			0.003 (0.003)	0.003 (0.003)
Median sales (s)(t-1)			0.171*** (0.029)	0.175*** (0.029)
Age(i)(t)				0.448*** (0.034)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	23,951	23,951	23,951	23,951
R-squared	0.058	0.059	0.062	0.080
Number of firms	4,813	4,813	4,813	4,813

*Notes:* The dependent variable is the logarithm of the wage-bill of firm  $i$  producing in a region  $r$  and manufacturing industry  $s$  in year  $t$ . The description of control variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

Appendix Table A3: First stage estimates for Instrumental Variables Estimations

Dependent variable	(1)	(2)	(3)
	Credit/GDP(r,t)		
Monetary Policy Rate(t) × Credit/GDP(r,1997)	-5.351*** (0.077)		-2.268*** (0.129)
Cash Reserve Requirement(t) × Credit/GDP(r,1997)		-13.585*** (0.116)	-10.187*** (0.254)
Observations	20,703	20,703	20,703
R-squared	0.818	0.861	0.875
Year dummies	yes	yes	yes
Firm fixed effects	yes	yes	yes

*Notes:* Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*\* and \*\*\* indicate significance at the 5 and 10% levels. The first stage estimation controls for all variables included in second stage estimations.

**Table 1 – Financial development and firms' value added and capital used**

Dependent variable	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	log(value added <sub>it</sub> )				log(capital used <sub>it</sub> )			
Credit/GDP(r)(t-1)	0.218*** (0.062)	0.229*** (0.059)	0.221*** (0.059)	0.216*** (0.057)	0.231*** (0.044)	0.250*** (0.039)	0.247*** (0.039)	0.245*** (0.038)
GDP (r)(t-1)		0.178 (0.121)	0.151 (0.120)	0.161 (0.109)		0.287*** (0.066)	0.263*** (0.065)	0.267*** (0.064)
Output tariff(s)(t-1)			-0.122 (0.124)	-0.109 (0.123)			0.266** (0.109)	0.271** (0.110)
Herfindhal index(s)(t-1)			0.005 (0.005)	0.004 (0.005)			0.003 (0.004)	0.003 (0.004)
Median sales (s)(t-1)			0.187*** (0.038)	0.189*** (0.038)			0.171*** (0.033)	0.172*** (0.033)
Age(i)(t)				0.260*** (0.046)				0.092*** (0.033)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,976	23,976	23,976	23,976	23,976	23,976	23,976	23,976
R-squared	0.023	0.024	0.025	0.028	0.033	0.034	0.036	0.037
Number of firms	4,817	4,817	4,817	4,817	4,817	4,817	4,817	4,817

*Notes:* In columns (1) to (4) the dependent variable is the logarithm of value added and in columns (5) to (8) is the logarithm of capital used of firm  $i$  producing in a region  $r$  and manufacturing industry  $s$  in year  $t$ . Credit ratio (r)(t-1) is the financial development measure proxied by the ratio of total credit over the GDP of the region  $r$  in year  $t - 1$ . Output tariffs(s)(t-1) are available at the industry level ISIC (rev 2) 4-digit and provided by the World Bank (WITS). The herfindahl index(s)(t-1) is constructed from Prowess dataset at the 2-digit NIC industry level. Median sales (s)(t-1) of the industry are computed as the median of total sales of firms across sectors. Age(i)(t) corresponds to the age of the firm. The Prowess dataset provides the year of incorporation of the firm. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*\* and \*\*\* indicate significance at the 5 and 10% levels.

Table 2 – Instrumental variables estimation (1999-2006)

Dependent variable	(1)	(2)	(3)	(4)
	Benchmark Within	IV	Benchmark Within	IV
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
Credit/GDP(r)(t-1)	0.218*** (0.077)	0.217*** (0.070)	0.257*** (0.061)	0.265*** (0.055)
GDP (r)(t-1)	0.205 (0.141)	0.205* (0.105)	0.258** (0.121)	0.260*** (0.085)
Output tariff(s)(t-1)	-0.210 (0.161)	-0.210 (0.132)	0.255* (0.131)	0.256** (0.104)
Herfindhal index(s)(t-1)	0.007 (0.006)	0.007 (0.006)	0.002 (0.004)	0.002 (0.004)
Median sales (s)(t-1)	0.217*** (0.047)	0.217*** (0.035)	0.176*** (0.036)	0.176*** (0.026)
Age(i)(t)	0.206*** (0.068)	0.207*** (0.049)	0.127** (0.056)	0.127*** (0.038)
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	20,833	20,833	20,833	20,833
R-squared	0.029	0.029	0.041	0.041
Number of firms	3,908	3,908	3,908	3,908
Number of groups	3908	3908	3908	3908
Hansen statistic	.	0.299	.	0.781
p-value of Hansen	.	0.585	.	0.377

Notes: In columns (1) to (2) the dependent variable is the logarithm of value added and in columns (3) to (4) is the logarithm of capital used of firm  $i$  producing in a region  $r$  and manufacturing industry  $s$  in year  $t$ . Columns (1) and (3) show the within-firm estimation over the period 1999-2006. Columns (2) and (4) report the instrumental variables estimation using as instruments the interaction term between the real interest rate (cash reserve ratio) and the credit over GDP ratio in 1997. The description of control variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 3 – Financial vulnerability of industries**

Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
Credit/GDP(r)(t-1)	0.072 (0.063)		0.188*** (0.047)	
Credit/GDP(r)(t-1) × External dep.(s)	0.348*** (0.062)	0.366*** (0.061)	0.152** (0.070)	0.149** (0.070)
Basic control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	
Region-year fixed effects		Yes		Yes
Observations	23,118	23,118	23,118	23,118
R-squared	0.029	0.041	0.037	0.047
Number of firms	4,679	4,679	4,679	4,679

*Notes:* External dep.(s) is the external dependence measure at the 2-digit industry level, proposed by Rajan and Zingales (1998) and updated by Braun (2002) and Braun and Larrain (2005). The basic control variables (GDP(r,t-1), output tariffs(s)(t-1), Herfindhal index(s)(t-1), median sales(s)(t-1) and age(i)(t-1)) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 4 – Financial development and firms' growth by firm size classes**

Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
Credit/GDP(r,t-1) × Size Q1(i,t-1)	-0.133 (0.101)	-0.495*** (0.107)	0.046 (0.060)	-0.274*** (0.067)
Credit/GDP(r,t-1) × Size Q2(i,t-1)	0.087 (0.064)	-0.271*** (0.056)	0.140*** (0.043)	-0.177*** (0.049)
Credit/GDP(r,t-1) × Size Q3(i,t-1)	0.201*** (0.064)	-0.155*** (0.049)	0.207*** (0.044)	-0.114*** (0.039)
Credit/GDP(r,t-1) × Size Q4(i,t-1)	0.331*** (0.055)		0.332*** (0.047)	
Output tariff(s, t-1) × Size Q1(i, t-1)	-0.050 (0.193)	0.150 (0.189)	0.467*** (0.112)	0.481*** (0.111)
Output tariff(s, t-1) × Size Q2(i, t-1)	-0.118 (0.144)	0.091 (0.132)	0.307*** (0.113)	0.332*** (0.098)
Output tariff(s, t-1) × Size Q3(i, t-1)	-0.129 (0.124)	0.065 (0.080)	0.147 (0.129)	0.154* (0.092)
Output tariff(s, t-1) × Size Q4(i, t-1)	-0.270* (0.146)		0.065 (0.169)	
Basic control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	
Region-year effects		Yes		Yes
Observations	23,976	23,976	23,976	23,976
R-squared	0.071	0.081	0.088	0.095
Number of firms	4,817	4,817	4,817	4,817

*Notes:* Size quartiles are based on wage-bill in t-1. Controls for size quartiles Q1 to Q3 are included. Interactions with Size Q4 excluded when region-year fixed effects are included in the specification. The basic control variables (GDP(r,t-1), output tariffs(s)(t-1), Herfindhal index(s)(t-1), median sales(s)(t-1) and age(i)(t-1)) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.



**Table 5 – Instrumental variables with firm size interactions**

	(1)	(2)	(3)	(4)
	Benchmark	IV	Benchmark	IV
	Within		Within	
Dependent variable	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
	Quartiles Size (i, t-1)			
Credit/GDP(r,t-1) × Size Q1(i,t-1)	-0.272 (0.188)	0.165 (0.506)	-0.180* (0.098)	-0.428 (0.453)
Credit/GDP(r,t-1) × Size Q2(i,t-1)	-0.054 (0.106)	-0.493* (0.297)	0.009 (0.077)	-0.060 (0.272)
Credit/GDP(r,t-1) × Size Q3(i,t-1)	0.136 (0.096)	0.309 (0.315)	0.161** (0.076)	-0.132 (0.299)
Credit/GDP(r,t-1) × Size Q4(i,t-1)	0.294*** (0.086)	0.382** (0.158)	0.322*** (0.077)	0.542*** (0.142)
Basic control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	14,257	14,257	14,257	14,257
R-squared	0.058	0.010	0.082	-0.320
Number of firms	2,814	2,814	2,814	2,814
Hansen statistic		0.785		5.853
p-value of Hansen		0.940		0.210

Notes: The description of basic control variables is reported in Table 1. Size quartiles are based on wage-bill in t-1. Controls for size quartiles Q1 to Q3 are included. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 6 – Financial development and firms' growth: influence of firm ownership**

Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
Credit/GDP( $t-1$ ) $\times$ Private(i)	0.186*** (0.061)	0.188*** (0.062)	0.241*** (0.046)	0.259*** (0.047)
Credit/GDP( $t-1$ ) $\times$ Group(i)	0.144*** (0.055)	0.151*** (0.055)	0.148*** (0.041)	0.155*** (0.042)
Credit/GDP( $t-1$ ) $\times$ Foreign(i)	0.830*** (0.103)	0.794*** (0.105)	0.876*** (0.115)	0.742*** (0.139)
Credit/GDP( $t-1$ ) $\times$ State(i)	0.043 (0.098)	0.020 (0.103)	-0.086 (0.088)	-0.148* (0.080)
Basic control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Tariff interactions	No	Yes	No	Yes
Observations	23,976	23,976	23,976	23,976
R-squared	0.030	0.030	0.042	0.044
Number of firms	4,817	4,817	4,817	4,817

*Notes:* The estimation controls for interaction terms between output tariffs and firms' ownership status. The basic control variables (GDP( $t-1$ ), output tariffs( $s(t-1)$ ), Herfindhal index( $s(t-1)$ ), median sales( $s(t-1)$ ) and age( $i(t-1)$ )) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 7 – Financial development and firms' growth by firm size classes: robustness**

Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
	Private & groups	Private only	Private & groups	Private only
Credit/GDP(r,t-1) × Size Q1(i,t-1)	-0.113 (0.115)	-0.005 (0.112)	0.065 (0.066)	0.069 (0.075)
Credit/GDP(r,t-1) × Size Q2(i,t-1)	0.065 (0.062)	0.001 (0.067)	0.173*** (0.050)	0.172*** (0.057)
Credit/GDP(r,t-1) × Size Q3(i,t-1)	0.225*** (0.070)	0.134 (0.106)	0.182*** (0.049)	0.246*** (0.076)
Credit/GDP(r,t-1) × Size Q4(i,t-1)	0.254*** (0.062)	0.295*** (0.095)	0.354*** (0.053)	0.565*** (0.079)
Observations	19,081	11,599	19,081	11,599
R-squared	0.113	0.087	0.117	0.133
Number of firms	4,342	2,892	4,342	2,892

*Notes:* Size quartiles are based on wage-bill in t-1. Controls for size quartiles Q1 to Q3 are included. Interactions with Size Q4 excluded when region-year fixed effects are included in the specification. The basic control variables (GDP(r,t-1), output tariffs(s)(t-1), Herfindhal index(s)(t-1), median sales(s)(t-1) and age(i)(t-1)) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 8 – Financial development and firms' growth by classes of TFP and profitability**

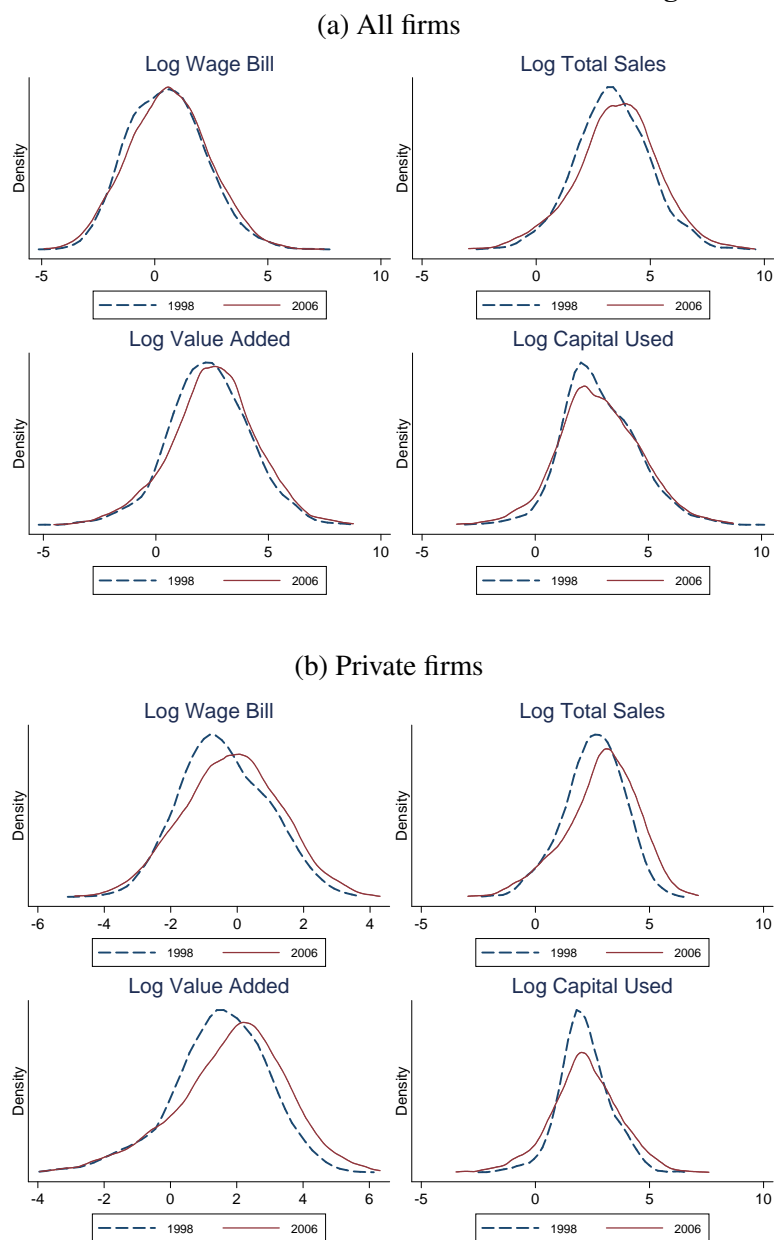
Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
	Quartiles productivity (TFP)			
Credit/GDP( $r,t-1$ ) $\times$ TFP Q1( $i,t-1$ )	0.173*** (0.065)	-0.148** (0.065)	0.125*** (0.046)	-0.237*** (0.060)
Credit/GDP( $r,t-1$ ) $\times$ TFP Q2( $i,t-1$ )	0.220*** (0.056)	-0.090* (0.053)	0.263*** (0.041)	-0.090** (0.043)
Credit/GDP( $r,t-1$ ) $\times$ TFP Q3( $i,t-1$ )	0.248*** (0.062)	-0.066 (0.044)	0.277*** (0.042)	-0.080** (0.034)
Credit/GDP( $r,t-1$ ) $\times$ TFP Q4( $i,t-1$ )	0.298*** (0.073)		0.350*** (0.051)	
R-squared	0.042	0.052	0.047	0.056
	Profitability			
Credit/GDP( $r, t-1$ )	0.263*** (0.060)		0.295*** (0.042)	
Credit/GDP( $r,t-1$ ) $\times$ Profits( $i,t-1$ ) < 0	-0.306*** (0.063)	-0.308*** (0.064)	-0.360*** (0.075)	-0.362*** (0.077)
Basic control variables	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes		Yes	
Region-Year effects		Yes		Yes
Observations	23,976	23,976	23,976	23,976
R-squared	0.072	0.082	0.089	0.097
Number of firms	4,817	4,817	4,817	4,817

Notes: TFP quartiles (Q1 to Q3), interactions of TFP quartiles and of profitability dummy with tariffs are included in the estimation and non reported in the table. The basic control variables (GDP( $r,t-1$ ), output tariffs( $s$ )( $t-1$ ), Herfindhal index( $s$ )( $t-1$ ), median sales( $s$ )( $t-1$ ) and age( $i$ )( $t-1$ )) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Table 9 – Heterogeneity in size and external dependence**

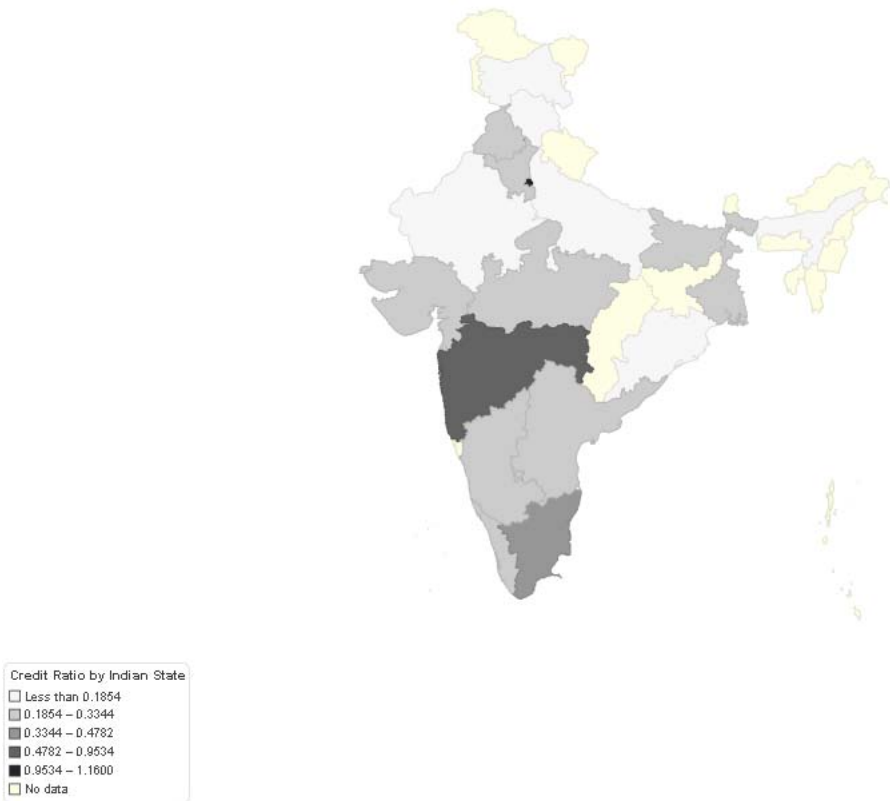
Dependent variable	(1)	(2)	(3)	(4)
	log(value added <sub>it</sub> )		log(capital used <sub>it</sub> )	
Credit/GDP(r,t-1) × Size Q1(i,t-1)	-0.133 (0.101)	-0.280*** (0.098)	0.046 (0.060)	0.062 (0.084)
Credit/GDP(r,t-1) × Size Q2(i,t-1)	0.087 (0.064)	-0.054 (0.067)	0.140*** (0.043)	0.074 (0.050)
Credit/GDP(r,t-1) × Size Q3(i,t-1)	0.201*** (0.064)	0.140** (0.070)	0.207*** (0.044)	0.145*** (0.049)
Credit/GDP(r,t-1) × Size Q4(i,t-1)	0.331*** (0.055)	0.274*** (0.065)	0.332*** (0.047)	0.367*** (0.064)
Credit/GDP(r,t-1) × Size Q1(i,t-1) × Ext.Dep.(s)		0.450** (0.208)		-0.075 (0.174)
Credit/GDP(r,t-1) × Size Q2(i,t-1) × Ext.Dep.(s)		0.423*** (0.103)		0.191** (0.081)
Credit/GDP(r,t-1) × Size Q3(i,t-1) × Ext.Dep.(s)		0.193*** (0.070)		0.150** (0.062)
Credit/GDP(r,t-1) × Size Q4(i,t-1) × Ext.Dep.(s)		0.148** (0.073)		-0.056 (0.070)
Basic control variables	Yes	Yes	Yes	Yes
Tariff interactions	Yes	Yes	Yes	Yes
Firm fixed effects	Yes	Yes	Yes	Yes
Year fixed effects	Yes	Yes	Yes	Yes
Observations	23,976	23,118	23,976	23,118
R-squared	0.071	0.073	0.088	0.089
Number of firms	4,817	4,680	4,817	4,680

Notes: Size quartiles are based on wage-bill in t-1. The estimation controls for interaction terms between output tariffs and firms' size quartiles. The basic control variables (GDP(r,t-1), output tariffs(s)(t-1), Herfindhal index(s)(t-1), median sales(s)(t-1) and age(i)(t-1)) are included and the description of these variables is reported in Table 1. Heteroskedasticity-robust standards errors are shown in parentheses. Errors are corrected for clustering at the region-year level and \*, \*\* and \*\*\* indicate significance at the 1%, 5% and 10% levels.

**Figure 1 – Evolution of firm size distribution in manufacturing sectors in India**

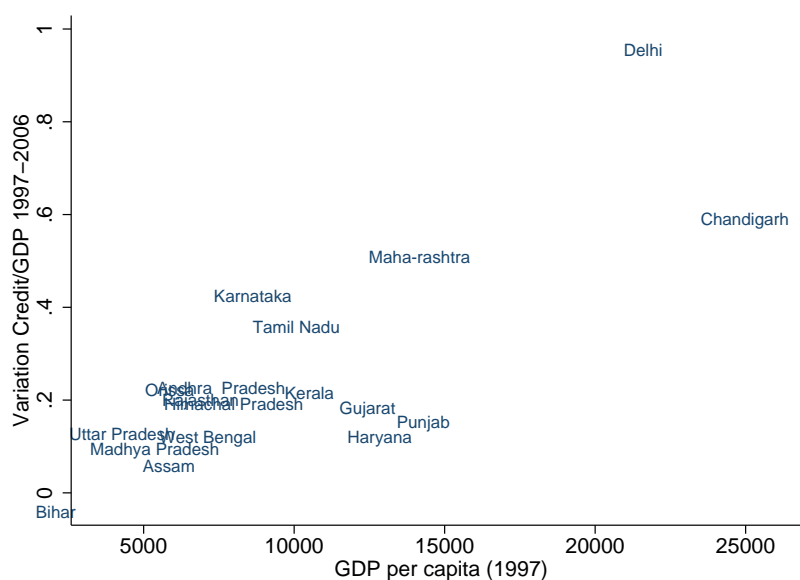
Source: Kernel density estimations using the full sample of manufacturing firms in Prowess in 1998 and 2006. Sample : 2,426 firms in 1998 and 2,875 firms in 2006. Private firms sample excludes firms that belong to Indian Business Groups.

Figure 2 – Credit / GDP in Indian States and Union Territories (1997)



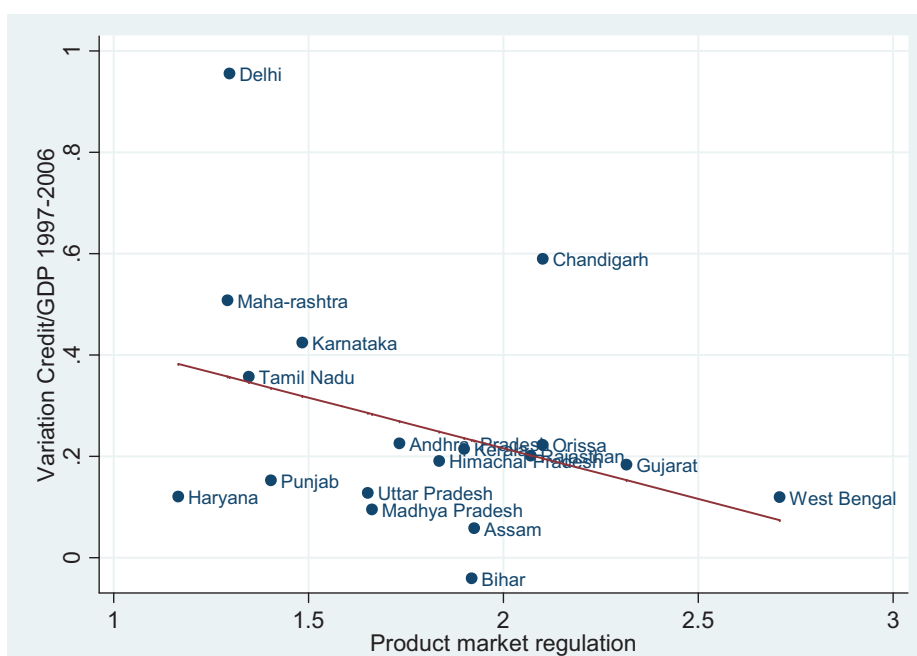
Source: Authors' calculation using credit over GDP ratios for 19 Indian States and Union Territories from the Reserve Bank of India.

**Figure 3 – Evolution of Credit / GDP in Indian States and initial GDP per capita**



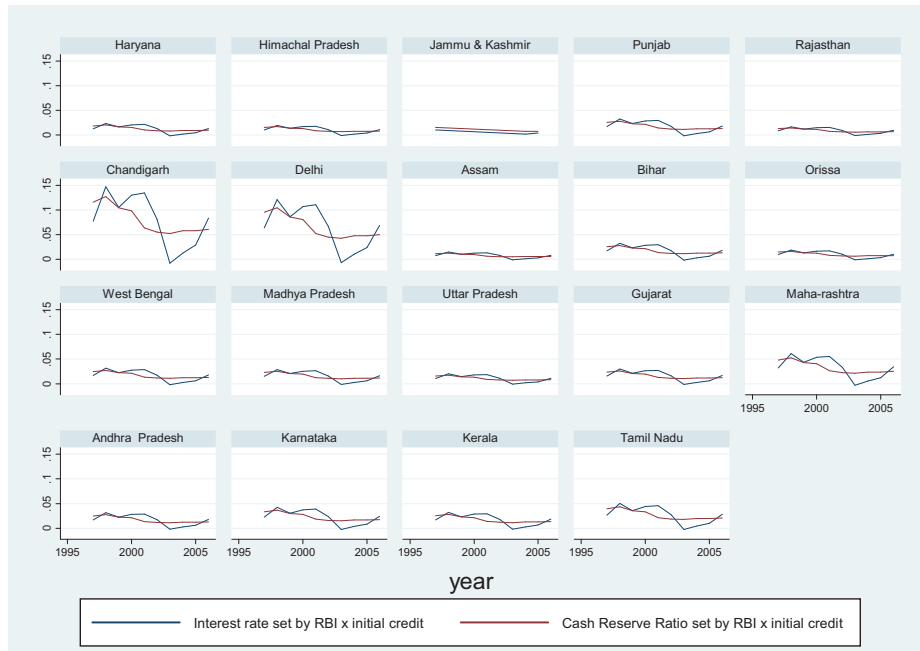
Source: Authors' calculation using credit over GDP ratios and GDP per capita for 19 Indian States and Union Territories from the Reserve Bank of India.



**Figure 4 – Evolution of Credit / GDP in Indian States and Product Market Regulation**

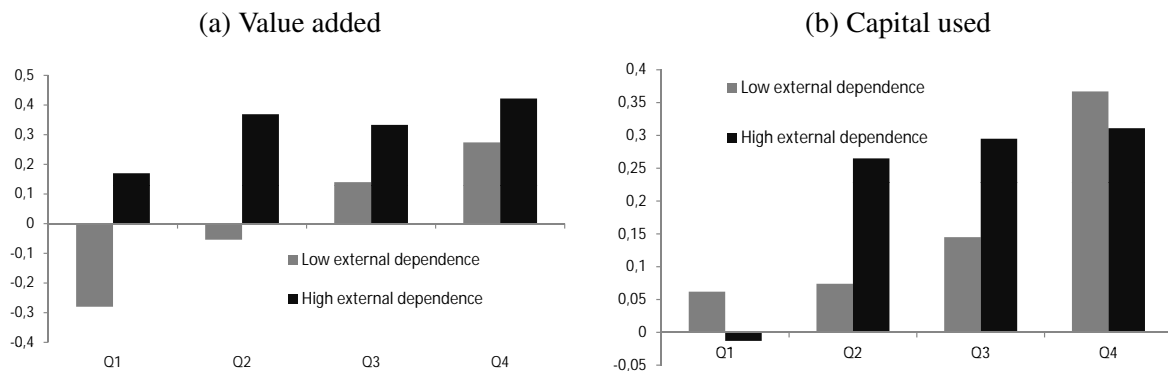
Source: Authors' calculation using the change in credit over GDP ratios between 1997-2006 from the Reserve Bank of India and Product market regulation index from Conway et al. (2008).

**Figure 5 – Instruments**



Source: Authors’ calculation using credit over GDP ratios in 1997, real interest rate and The Cash Reserve Ratio (CRR) from the Reserve Bank of India.

**Figure 6 – Effect of financial development by firm size and external dependence of the sector**



Source: Authors’ calculation using estimated coefficients in Table 9. In this exercise, high external dependence corresponds to external dependence == 1; low external dependence corresponds to external dependence == 0.