

博士論文

Doctoral Thesis

Essays on Households Credit Constraints,  
Manufacturing Productivity and  
Business Reforms in India

インドにおける家計の信用制約、製造業の生産性、  
そしてビジネス関連の制度改革

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## ABSTRACT

In this dissertation, I investigate credit and business constraints that households and firms face in India, empirically using microeconomic surveys.

In Chapter 1, I examine the credit constraints of the households in general, and then especially from formal financial institutions, in India. This study is based on the All-India Debt and Investment Survey (a household survey) from January to December 2013 with sample size of 110,800. I find that household leverage, age, size, employment, and education are important to determine the household's participation in the credit market in general. On the other hand, assets, education, employment, and more bank branches are found to ease the credit constraints from the formal institutional sources.

In Chapter 2, I look into credit and capital misallocations in India among medium and large manufacturing firms by examining the dispersion of the marginal product of capital (MPK). This study is based on the Annual Survey of Industries panel data from 2000-01 to 2015-16 with sample size of 288,804. I find that the increase in credit availability to the manufacturing sector is associated with greater dispersion of MPK, indicating a worse capital allocation. The MPK dispersion is more pronounced in the states where the share of public sector banks in industrial credit is high. Better infrastructure is shown to improve capital allocation, while bad judicial conditions appear to worsen it.

In Chapter 3, I find that the business reforms led to an improvement in the productivity of unincorporated manufacturing enterprises (i.e., micro-enterprises) in India. This study is based on the Unincorporated Non-Agricultural Enterprises (Excluding Construction) of years 2010-11 and 2015-16 with sample size of 176,380. The reforms are taken state by state between 2010 and 2015 and consist of six categories, that is, single-window systems, tax simplifying reforms, construction permit reforms, environment and labour regulation reforms, inspection reforms, and commercial disputes reforms. All of these reforms are shown to increase the total factor productivity of unincorporated manufacturing enterprises. Moreover, implementing a larger number of business reforms brings higher total factor productivity.

## DEDICATION

This dissertation is dedicated to my wife, Ranjeeta, without whose unwavering support in every aspect would not have been possible.

This is also dedicated to my daughters Ira and Swara who are always at the back of my mind in whatever I do. They have made my life full of fun.

To my parents, who provided me with the best of the education they could have afforded.

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## Executive Summary

I study three crucial areas relating to the Indian economy in this dissertation, namely households, registered manufacturing sector and unincorporated manufacturing sector. The research questions relating to each of these areas addressed in this dissertation are distinct. From the policymakers' perspective addressing the issues highlighted in each of these chapters would help in the overall development of the Indian economy.

In the first chapter, using the nationally representative sample survey conducted by the National Sample Survey Office (NSSO), I look into the institutional credit constraint of the household when they borrow new loans. Following the theoretical findings of the literature on borrowing and savings behaviour, I conduct an empirical analysis. In doing so, I address the issue of self-selection in the presence of two levels of selections. I find that leverage, age of head of the household, education, and nature of employment are essential factors which are associated with the household's probability of taking new loans. Findings suggest that education eases the constraints faced by the households. Bank branch expansion decreases the probability of a household being institutional credit-constrained as the households may get easier access to the formal financial institutions. Addressing these issues requires policy measures from both the government and the financial authority. As popular development literature suggests, easing of institutional constraints would help in greater welfare of the households by improving their borrowing and saving behaviour.

The second chapter throws light on credit availability and the misallocation of capital in the manufacturing sector. To do this analysis, I follow the popular literature relating to the measurement of marginal product of capital (MPK) and measurement of misallocation. I use different indicators ranging from broad indicators to narrow indicators of credit availability. These indicators take into account the available limit of credit as well as actual credit taken by the manufacturing sector. I find the evidence of greater misallocation as a result of greater availability of credit. The misallocation is more where the share of public

sector banks in manufacturing credit is more. Findings of this chapter suggest that targeted credit supply, based on broad classification of priority sector may result into misallocation of credit in which greater credit flows to less productive firms and lesser credit follows to high productivity firms. Credit allocation needs to be deregulated gradually, and the system of credit allocation needs to be made more transparent rather than sticking to the broad definition of priority sector.

The third chapter of this dissertation, using the similar literature that I use in Chapter 2, I estimate the total factor productivity (TFP) of unincorporated manufacturing enterprises in India. Following the technique of propensity score matching as well as difference-in-difference methods, I find the impact of business reforms carried out during 2010-11 to 2015-16 on the TFP of unincorporated manufacturing enterprises in India. Findings of this chapter suggest that a greater number of reforms are associated with greater improvement in the TFP. It is generally believed that business reforms help bigger companies and the formal sector. I find that the business reforms also help in improving the total factor productivity of small and micro-firms. The business reforms, which make the business environment better and increase the ease of doing business, are beneficial and in the long-term may help in greater formalization.

# Chapter One

## Institutional Credit Constraint of Households in India

### 1.1 Introduction

Consumer's current debt is a result of a decision process which include his/her desire for credit translating into the actual demand for credit from different sources and supply of credit from the lender. Once there is a desire to take credit, consumers usually have choices to borrow from different sources depending on their own socio-economic condition and the requirements of the lending sources. Generally, there are two broad sets of lending sources— institutional sources such as banks, cooperative credit societies, self-help groups, financial corporations and companies or non-institutional sources such as professional money lenders, traders, relatives and friends, etc. These sources can be classified as formal sectors (institutional sources) and informal sectors (non-institutional sources). The credit extended by institutional sources constitutes a 'formal sector' of credit. The Reserve Bank of India and other regulatory institutions supervise the functioning of the institutional sources. The credit obtained from the non-institutional sources constitutes the 'informal sector' of credit. The regulatory and supervisory institutions do not have any control over the functioning of such informal sources. The informal lenders can lend money at any rate of interest and adopt

any means to recover back the loan amount from the borrowers. The consumer's decision to borrow from the institutional sources may depend on several factors which can be classified as demand factors and supply factors. Consumers' socio-economic conditions, such as age, education, demographic condition, indebtedness, the purpose of the loan, etc. determine their demand for new loans. From the supply side, the formal sector lenders, based on their assessment, again based on the socio-economic factors which they observe, may decide whether and how much to lend. On the application of loans from the institutional sources, there are chances that the loan application may get rejected. The formal requirements by the institutional sources may act as a cost and therefore may discourage few potential borrowers from seeking loans from the institutional sources and taking loans from the non-institutional sources which are easier to access. So, in reality, there are certain factors which constrain the individuals to borrow from the institutional sources.

By formal definition, a consumer would be credit constrained if he/she is not able to obtain any credit that he/she desires or not able to obtain as much credit as he/she wants. An understanding of existing credit constraints and the factors determining them can unveil necessary policy implications, both at the microeconomic and macroeconomic levels. At the microeconomic level, the determinants of credit constraint can help understand the behaviours of lenders and borrowers in the economy. At the macroeconomic level, borrowing constraints may result in the adjustment of consumption and savings by the individuals, which may alter the impact of policy decisions. So, from the point of view of the monetary authority, it is essential to understand the nature and extent of credit constraints of the households.

In the literature of development economics, access to financial institutions is considered to be welfare improving. In the developed countries where the financial markets are well developed, the non-institutional sources are either non-existent or very small as compared to the

developing countries like India. So, in the developed countries, the question of people being credit constrained relates to people not being able to borrow money mainly from the institutional sources. In contrast, developing countries have a large network of non-institutional sources, so, the question of financial constraint is not restricted to borrowing money but also borrowing money from the institutional sources in the presence of non-institutional sources.

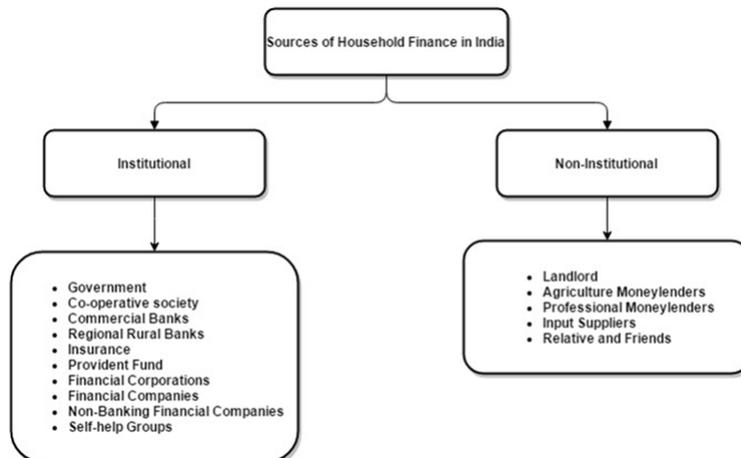
In the above background, I first seek to find out the factors which may constrain the households to borrow from the institutional sources. Secondly, I correct for the self-selection bias and estimate the determinants of new institutional loans. The self-selection bias mainly arises because in the observed data only the households who have actually taken new loans are reported to have positive new loans, and this does not represent the true demand for new loan as many of the households who would potentially have a positive demand for a new loan have zero observed new loans in the data. To overcome the self-selection problem, I use the Heckman's two-step procedure with two selection equations.

### **1.1.1 Sources of Household Finance in India**

Sources of household finance can broadly be classified into institutional and non-institutional sources, as follows(Fig. 1.1):

#### **Institutional Finance**

In India, the need for development and the need to provide access to the poor resulted in the establishment of an extensive network of institutional finance. During the 1950s, rural cooperative credit banks were established and commercial banks were nationalized in 1969. The nationalized banks during 1970s and 1980s were given the leading role to alleviate the people from the grip of informal-sector moneylenders, through targeted low-interest lending. Partial deregulation of the interest rate happened during the 1990s, leading to increased



**Figure 1.1** Sources of Household Finance in India

competition in the banking sector. Formal-sector financial institutions dominate the financial landscape in India, in terms of the network. As at the end of 2013, there were 106,479 scheduled commercial bank<sup>1</sup> branches in India, of which 39,368 were in rural areas, 28,798 were in semi-urban areas, 19,971 were in urban areas, and 18,342 were in the metropolitan area. In 2016, it has increased to a total of 132,834 of which 50,554 were in the rural area, 35,959 were in the semi-urban area, 24,363 were in the urban area, and 21,958 were in the metropolitan area. India also has an extensive network of district central cooperative banks (DCCB). There were around 13,750 branches of DCCBs in 2013 and 13,473 in 2016. The Regional Rural Banks (RRBs) initially came into existence in 1975. They were established in different states of India as local level banks.

In contrast to the cooperative banks, RRBs are similar to the commercial banks created to help in the development of the rural economy. The number of RRBs have come down

<sup>1</sup>According to Reserve Bank of India (RBI) Act 1934, there are some banks which satisfy the criteria laid down vide section 42(6)(a) of the said Act, they are listed in the Second Schedule of the Act. These banks are called Scheduled Commercial Banks. There were 21 public sector banks, 21 private sector banks and 44 foreign banks as on October 8, 2018.

over time as a result of several mergers reducing from 196 in 1990 to 56 in 2016. They have around 14,494 branches across India.

The post office system in India also is a part of institutional finance. There are more than 154,000 post office branches in India which administer around 114 million savings accounts. Mutual funds and insurance companies are other sources of institutional finance in India. They have a moderate reach in rural areas; however, their reach is gradually expanding. Formal financial institutions are directly or indirectly regulated by the Reserve Bank of India (RBI).

The National Bank for Agriculture and Rural Development (NABARD) provides the supervision of rural cooperative banks and RRBs. NABARD and the Small Industries Development Bank of India (SIDBI) are the two agencies which provide support to both formal and semi-formal segments of finance, through funding and refinancing arrangements. India has also been home to many microfinance innovations. The most popular microfinance initiative has been the Self-Help Group (SHG) programme. Few SHG's are linked to the commercial bank branches, RRBs, or cooperative banks, which are refinanced by the NABARD.

### **Non-Institutional Finance**

Besides the institutional sources, non-institutional sources also coexist in India. The non-institutional sources include professional moneylenders, landlords, shopkeepers, traders, friends and relatives etc. There are no definite and reliable estimates of the number of informal-sector loan providers, however, these are spread widely across the country. Poor households depend heavily on the informal sector loan providers for their financing needs such as consumption, current and capital business expenditures, emergency financing, investment loans, etc.

### 1.1.2 Household Borrowing in India

The National Sample Survey Organization (NSSO) conducts a periodic stratified sample survey called the All India Debt Investment Survey (AIDIS). The latest round of this survey was conducted during 2012 and 2013. It covers 110,800 households—62,135 in rural India and 48,665 in urban India. The tables (1.1 and 1.2) show the percentage of households borrowing from institutional and non-institutional sources of finance in 2012-13 (Table 1.1). Using the weights given in the AIDIS survey we can estimate the national-level situation (Table 1.2)<sup>2</sup>. These weights have been given in the survey (based on the sampling techniques used in the survey) to convert the sample averages to the national averages.

	Institutional	Non-Institutional	Both
Rural	58.5	60.72	19.23
Urban	63.5	50.35	13.85
Total	60.66	56.26	16.92

**Table 1.1** Percentage of households having access to Institutional and Non-Institutional Finance (Sample)

Table 1.3 presents the percentage of indebted households out of total surveyed households (also called incidence of indebtedness). It also presents the average amount of debt per household as on as at end-June 2012 for rural and urban areas in India. According to the latest AIDIS survey, the incidence of indebtedness in India was about 31.4 per cent among rural households, which was higher compared to urban households (22.4 per cent). Incidence

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<sup>2</sup>To calculate the proportion of institutional and non-institutional borrowing in the rural area we take the total number of rural households borrowing from the credit market (both institutional and non-institutional). We divide the number of households borrowing from the institutional sources in the rural area by the total number of households borrowings in the rural area. Analogously, I estimate the proportion of rural non-institutional borrowings and the proportion of institutional and non-institutional borrowing by the urban households.

Institutional Credit Constraint of Households in India

	Institutional	Non-Institutional	Both
Rural	57.36	66.03	23.4
Urban	65.21	54.09	19.3
Total	59.48	62.81	22.29

**Table 1.2** Percentage of households having access to Institutional and Non-Institutional Finance (Overall)

of indebtedness has increased in 2013 as compared to 2002 (among rural households it was 26.5 per cent and among urban households it was 17.8 per cent). The urban households are found to be holding more debt with Rs.378,238 per urban households compared with Rs.103,457 per rural households (AIDIS Key Indicators 2013).

On dividing the households into decile classes, based on the value of assets owned by them, we observe that both in rural and urban areas, incidence of indebtedness increases among the households as we move up from the lower asset holding households to higher asset holding households. However, among a few decile classes, we observe some drops, for example, between 6th and 7th, and 9th and 10th decile classes. Incidence of indebtedness varies more among the households in rural areas (from a low value to 20 percent to a high value of 43 percent over the decile classes) compared to urban areas (9 percent to 32 percent). Average amount of debt increases steadily in rural as well as in urban area we move up from lower to higher decile classes. The higher decile classes also hold more debt in terms of magnitude—in the rural area the top decile households hold on an average 5.5 times more debt than the bottom decile class while in the urban area it is 21 times.

The average amount of debt held by per household also vary according to the social group in (Table1.4). We see that the average debt held by the scheduled tribes (ST) households was lowest - Rs. 9,610 per household in the rural areas and Rs. 48,048 per household in the

Institutional Credit Constraint of Households in India

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Decile class of HH holding	Incidence of Indebtedness (percent)	Rural		Urban		
		Average amount of debt per HH (Rs.)	Average amount of debt per indebted HH (Rs.)	Incidence of Indebtedness (percent)	Average amount of debt per HH (Rs.)	Average amount of debt per indebted HH (Rs.)
1	19.62	9705	49478	9.34	5587	59808
2	22.3	8819	39554	14.63	11934	81587
3	27.05	13811	51053	20.16	20075	99572
4	27.46	15673	57077	24.16	28430	117662
5	30.95	18800	60746	21.67	29915	138076
6	32.99	23441	71047	23.44	36751	156807
7	32.69	28770	88006	23.77	55519	233609
8	37.33	37662	100877	25.42	91069	358212
9	42.64	56658	132867	29.41	168470	572822
10	41.32	111884	270747	31.74	398457	1255405
All	31.44	32522	103457	22.37	84625	378238

Source: AIDIS Survey Report, December 2014

**Table 1.3** Percentage of households having access to Institutional and Non-Institutional Finance (overall)

## Institutional Credit Constraint of Households in India

Social Group	Average amount of debt per HH (Rs.)	
	Rural	Urban
ST	9610	48048
SC	24458	48556
OBC	36091	77809
Others	44565	106964
All	32522	84625

Source: AIDIS Survey Report, December 2014

**Table 1.4** Average debt per household by social group (All India)

urban areas whereas the ‘Others’ social group households hold average debt of Rs. 44,565 per household in the rural areas and Rs. 106,964 per household in the urban areas.

## 1.2 Literature Review

The theoretical explanation of borrowing and savings behaviour of people originate in the life-cycle hypothesis, (Ando and Modigliani, 1963). According to the life cycle hypothesis, borrowing and saving are used as a tool by consumers for smoothing their consumption over a period of time to maximize their lifetime utility. The factors which may affect borrowing and saving decisions of consumers are current income, expected future income, stage of the life cycle (usually captured by age) and the rate of preference of time (whether an individual is an early-consumer or a late-consumer). Consumers whose expect their future income to be high or have a high rate of time preference are likely to borrow more compared to the consumers who expect their future income to be low or have low rate of time preference. Consumer’s infinite horizon utility optimization problem can be represented as follows:

$$\max_{C_t} \sum_{t=0}^{\infty} \beta^t U(C_t) \quad (1.1)$$

Subject to budget constraint:

$$b_{t+1} = (1 + r_t)b_t + y_t - C_t$$

Upon solving this intertemporal utility maximization problem, we arrive at the following Euler's equation:

$$U'(C_t) = \beta E_t(1 + r_t)U'(C_{t+1}) \quad (1.2)$$

In the above utility maximization problem,  $U(C_t)$  is the utility obtained from consumption ( $C_t$ ) at period  $t$ .  $\beta$  is the discount rate which shows the preference for time.  $r_t$  is the rate of interest in the time period  $t$ .  $b_t$  is the borrowing at period  $t$ . Equation 1.2 is the Euler's equation which explains the optimal inter-temporal consumption decision. Here, we can see that if the rate of preference for time is higher, the consumer would consume less in period  $t$  by saving more compared to the situation where the rate of preference for time is more.

When consumers are young they generally have higher expected future income compared to the old consumers. As a result of this difference in expected of future income, economic theory predicts that younger people would borrow more compared to young people at present. The likelihood of borrowing is expected to go down as the age of the consumer increases as the expected future income goes down. Several studies such as (Cameron and Golby, 1991) which used household-level data, have confirmed these theoretical predictions. Some people show greater time preference to current consumption while some other give more importance to future consumption. Much research on the sociological and psychological aspects of borrowing behavior look into these aspects. They suggest that tolerant attitudes towards personal debt, lack of self-control, sensation seeking, external locus of control (i.e., blaming external factors for their financial difficulties), have a significant impact of consumer debt

(Lea et al., 1993). From the perspective of the life-cycle hypothesis and the sociological and psychological behaviour of consumers, decisions regarding savings and borrowing are determined based on socio-economic factors, such as education, personal characteristics, and locational characteristics. These factors determine the rate of time preference of consumers and, therefore, their saving and borrowing behaviour.

Several empirical studies have shown that consumption closely follows income over the life cycle and, therefore, reject the strong hypothesis that all consumption is governed by the life-cycle-permanent income of the individuals (Hall and Mishkin, 1982). This rejection is possible if there are borrowing constraints as a result of which consumers are not able to borrow as much or at the desired rate or as freely as necessary to smooth their consumption. Early empirical works on credit constraints do not observe it directly as a result of which they estimate the gap between desired level of consumption and the actual level of consumption of households. They use the cross-sectional data and take a simplifying assumption that individuals having specific characteristics could probably be credit constrained (e.g., (Hayashi, 1985) and (Jappelli et al., 1988)). Some studies examine the nature of credit constraints of the individuals by focusing on who are more likely to be credit constrained and find possible characteristics which may explain the credit constraint. These studies rely mainly on the survey data in which the individuals directly report on whether their loan application was rejected by the lenders. These are called self-reporting credit constrained consumers. For example, (Jappelli et al., 1988) use Survey of Consumer Finances (SCF) US data drawn from 1983. The SCF data also has information on individuals whose request for loans have been rejected by financial intermediaries. Their model accounts for consumer and lender behaviour by jointly determining the probability that a consumer is rationed (or constrained) in the credit market. They take the estimated probability as the probability of being credit constrained and then estimate the demand for household credits.

(Crook, 2001) uses the Survey of Consumer Finance data for the period 1990-1995 and looks into the factors which determine the likelihood of households to be rejected or discouraged from applying for credit. He also looks at factors which explain the household demand for the amount of debt. To estimate the likelihood of applying for credit, he uses a univariate probit model with standard errors corrected for sampling weights. To evaluate the demand for debt, he uses a two-stage least squares selection model. In his study, he finds that higher-income households, households owning their own home, having a large family size and with working head of house demands more debt. He also finds that if the household has a higher expected future income, their demand for debt now is high.

(Magri et al., 2002) use the Survey of Household Income and Wealth of the Bank of Italy. Using this household-level data, they analyse the factors which determine the households' participation in the debt market by accounting for both the demand and supply effects. They find that age has a positive influence on the probability of participation in the debt market; this essentially can be classified as the demand factor. Income also plays an important role. Income uncertainty is associated with less demand for loans, except for the self-employed workers, who are usually subject to rigorous evaluation by the financial intermediaries. They also find that households located in smaller municipalities are less likely to participate in the loan market. This is because of the higher entry costs associated with the debt market. Education affects both the demand side, as well as the supply side of credit market participation. It mainly works through entry costs, and banks' evaluation.

(Chen and Chivakul, 2008), in their study on the household data of Bosnia and Herzegovina (BiH), analyse the factors which determine household credit demand and credit constraints. They examine the behaviour of borrowers and lenders in the post-conflict and transitional society. They find that the socio-economic factors such as age, income, wealth and education qualifications are essential determinants of credit market participation. They

also find that households having high income and high wealth are less credit constrained. In their estimation, they find that in BiH, the probability of households participation in the debt market increases with the age of the heads of households, and it peaks at 45 years of age. They underscore that the structural nature of unemployment, as well as the mismatch between education qualifications and earning prospects in BiH, have no significant effect on the likelihood of being credit constrained.

(Kochar, 1997) in her sector-specific study using India's household-level survey data, attempts to find the extent of credit rationing in the agricultural sector in India. She distinguishes the demand for credit from the lender's decision on access. Her methodology assesses the degree of formal sector rationing and also describes the determinants of the demand and supply schedules underlying in credit market outcomes.

(Kumar, 2013), in his paper analyses the impact of caste and other characteristics of the households which impede their access to the formal sector agricultural credit. He finds that there is discrimination based on the caste in borrowing from cooperative banks. In the case of commercial banks, he finds weaker evidence of discrimination. He also compares the organizational structures of the cooperative banks and the commercial banks to find discrimination based on interest groups. He captures the bias at the district level by showing that it takes place in those districts where higher castes dominate.

### 1.3 Methodology

In the observed data on the loans taken by the households, to estimate the demand for new loans from the institutional sources econometrically, one could have run the following OLS regression:

$$\text{New Institutional Loan} = X'\beta + \epsilon \tag{1.3}$$

Where,  $X$  is a vector explanatory variables which include the socio-economic characteristics of the households like—age, location, leverage ratio, size of the household, type of employment, educational attainment, social group etc. To estimate this OLS regression as demand for new institutional loan, I would have to assume that all those households for whom observed new institutional loan is zero, have no demand for new institutional loan. I would also have to assume that all those households who have borrowed new loans only from the non-institutional sources have zero demand for institutional loan.

### 1.3.1 Methodological Challenges

Estimating an OLS by assuming that zero-new-loan households and households borrowing from non-institutional sources as zero would give rise to a classic case of self-selection bias. If I use OLS, I would only be looking at the positive new-institutional-loan-households as having demand for new institutional loans. The estimated coefficients, in that case, would be biased and hence incorrect.

To overcome the problem of sample selection bias, I use Heckman’s two-step estimation technique. In Heckman’s original problem—if one tries to estimate the reservation wage of the female workers by assuming that all the zero wage workers have no wage, then that estimation would be biased. To overcome this, Heckman suggested first to estimate the probability of working by estimating a probit regression using dependent variable  $w = 1$ , if the female is working and  $w = 0$  otherwise. We can correct for self-selection by incorporating a transformation of these predicted individual probabilities as an additional explanatory

variable in the wage determinant equation. This way of treating for self-selection bias using transformations of predicted individual probabilities are called Inverse Mill's Ratio and is due to (Heckman 1976) for which he got the Nobel's prize in the year 2000.

Different from the Heckman's single self-selection problem in which he finds the probability of female work participation, I have two levels of self-selection—probability of household having a new loan and probability that household take the new loan from the institutional source if they choose to take a new loan.

To overcome this double selection problem, I use the estimation procedure as used in the existing literature. For example, Krishnan (1990) in her paper find the labour supply functions of moonlighters (people who hold two jobs) uses double sample-selection equations to explore the husband's decision to moonlight together with his wife's decision to work. For this, Krishnan first finds out the probability of wife working and then out of the sample of working wives finds the probability of husband moonlighting. She uses these two selection equations to estimate the labour supply function of the moonlighters.

Wetzel and Zorlu (2003) find the wage differential between mothers and childless women using the double selection method. In their approach, they first find the probability that women chose to become a mother, and then they find out the probability they chose to work. Based on these two selection equations, they find the wage of the working mother. They compare this with the wage of the childless mothers.

Bairagya(2020) find the returns to education in case of self-employment in India. His regression equation of the determinants involves double sample selections. The first stage of sample selection captures participation in the labour force, while the second stage of selection includes the choice of self-employment types.

Analogous to these problems of double self-selection, I need first to find the households which are likely to take new loans and in the second stage find out the households which are able to obtain new institutional loan give that they take new loans (either from the institutional or non-institutional sources). For the second stage, I need to restrict the sample to households who have actually borrowed new loans (either from the institutional or non-institutional sources).

### 1.3.2 Estimation Strategy

#### Probability of Having a New Loan

The households would have positive debt if either of the following sub-cases hold true (let us take dummy  $d = 1$  for this situation):

- sub-case 1: demand for loan  $> 0$  and supply of loan from institutional source  $> 0$
- sub-case 2: demand for loan  $> 0$ , supply of loan from institutional = 0 and supply of loan from non-institutional sources  $> 0$

In both the sub-cases above the demand for loan is greater than zero, whatever be the supply condition from the institutional sources.

The second case is when the households have zero debt (dummy  $d = 0$ ). It is possible if either of the following sub-cases hold:

- sub-case 1: demand for loan  $> 0$  and supply of loan = 0 (loan application rejected or feel discouraged to apply for loan)
- sub-case 2: demand for loan = 0

Using probit estimation with  $d = 1$  if the households have taken new loans either from institutional or from the non-institutional sources. This probit estimation would give me the econometric estimation of probability of having a new loan.

### **Institutional Credit Constrained Households**

To find the determinants of new institutional credit constraint, I use another probit regression on the restricted sample of households which have taken new loans either from the institutional or non-institutional sources. On this restricted sample, I estimate another probit regression with the dependent variable as:

- $s = 1$  (if the household have a loan only from non-institutional sources)
- $s = 0$  (if the household has loan only from institutional sources)

I call this as estimated probability of the households being institutional credit constrained. Note that Probability( $1 - s$ ) gives me the probability of households not being institutional credit constrained.

### **1.3.3 Determinants of New Institutional Loan**

To find the determinants of new loans, we use OLS estimations as well as Heckman selection models. As explained earlier, the OLS estimations would give us biased results due to the presence of self-selection problem. The Heckman self-selection model takes into account two selection equations that identify the probability of households having new loans and the probability of the households not being institutional credit constrained. In the original Heckman's self-selection model, Heckman looks only at the non-zero wages, controlling for other explanatory variables and the Inverse Mills Ratio (IMR) estimated from the participation probit estimation. In my estimation for determinants of new institutional loans, I control

for other explanatory variables and take into account two IMRs estimated from—probability of households taking new loans and probability that households are not institutional credit constraint when they take new loans.

## 1.4 Data and Results

We use the household level survey data conducted by National Sample Survey Office (NSSO), called the All India Debt Investment Survey (AIDIS). The NSSO surveys are mainly conducted through household interviews, using a random sample of households selected through a scientific design, and cover practically the entire geographical area of India. AIDIS survey is generally conducted as one of the main enquiries of an NSS round at decennial intervals. The data used for this study is cross-section data taken from the AIDIS which was carried out as a part of the 70th round survey of NSSO, during January to December 2013. This AIDIS covers mainly the key indicators of assets, debt and investment in India during 2012-13. The visit for the survey was done during seven months, from January to July 2013. The reference period for the survey was June 30, 2012. In my analysis, I have taken data for all the states with exception of Telangana, Tripura, Manipur, Meghalaya, Nagaland, Jammu and Kashmir, Andaman and Nicobar and Sikkim as most of these states are remote states and Telangana is a newly formed state for which the data is not available. I also use the district-level number of bank branches data and district level deposit data from the Reserve Bank of India.

## Institutional Credit Constraint of Households in India

	HHs	Mean	Std. Deviation	Min.	Max.
Rural	41,995	25916.03	82071.26	0	4000000
Urban	31,724	53651.01	262135.2	0	13000000
Total	73,719	37851.41	183291.1	0	13000000

Source: Author's own calculations using AIDIS data

**Table 1.5** New Loans Taken by the Households (Rs.)

### 1.4.1 Variables

#### Probability of Having Positive Debt

I take into account the new loans taken by the surveyed household during June 30, 2012 to the survey date. The new loans taken by the households are described below (Table 1.5).

The households borrow loans from several formal, as well as informal sources. The formal sources are classified as government, commercial banks, cooperative societies, Regional Rural Banks, insurance, provident fund, financial companies, non-bank financial companies, self-help groups (both bank linked or otherwise) and other formal sources. The informal sources include- landlord, agriculture moneylenders, professional moneylenders, input suppliers, traders, friends and relatives and other informal sources. For my analysis, I drop all the households who have borrowed from friends and relatives, as these loans do not incur any rate of interest to be paid by the borrower (as defined in the survey)<sup>3</sup> as I want to concentrate on that part of informal loans which are comparable to formal loans.

We group the above sources as formal and informal sources, as explained in the survey. In the table below (Table 1.6), we take the agencies serial number 1 through 11 as formal sources and serial number 11 through 17 as informal sources. On dropping households borrowing

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<sup>3</sup>If a loan is received from one of the relatives or friends free of interest, it will be considered as a loan taken from 'relatives and friends'. If the loan bears interest, it will be considered as taken from an 'agriculturist moneylender', 'input supplier', etc., depending upon the type of business carried out by the relative or friend.

Institutional Credit Constraint of Households in India

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Sl. No	Agencies of Borrowing	HHs	Percent
1	government	1,335	1.81
2	cooperative society/bank	12,030	16.32
3	commercial bank including regional rural banks	16,002	21.71
4	insurance	265	0.36
5	provident fund	235	0.32
6	financial corporation/institution	852	1.16
7	financial company	1,360	1.84
8	self-help group–bank-linked (SHG-BL)	3,516	4.77
9	others	2,144	2.91
10	self-help group–non-banking financial companies (SHG-NBFC)	1,841	2.5
11	other institutional agencies	1,113	1.51
12	landlord	303	0.41
13	agricultural moneylender	1,753	2.38
14	professional moneylender	14,603	19.81
15	input supplier	148	0.2
16	relatives and friends	15,920	21.6
17	doctors, lawyers and other professionals	298	0.4
	Total	73,718	100

**Table 1.6** Sources of Household Borrowing

## Institutional Credit Constraint of Households in India

	Rural	Urban	Total
Formal sources	9,800 (30.67)	7,120 (31.45)	16,920 (30.99)
Informal sources	6,852 (21.45)	3,526 (15.57)	10,378 (19.01)
No borrowing	15,299 (47.88)	11,996 (52.98)	27,295 (50)
Total	31,951 (100)	22,642 (100)	54,593 (100)

Note: Figures in parentheses are in percentage

**Table 1.7** Sector-Wise Household New Borrowing

from friends and relatives, and grouping the sources of borrowing as formal and informal, we find the following as per (Table 1.7):

In order to segregate households with positive debt we use a dummy variable as follows:

$d = 1$  if the household has a non-zero amount of institutional or non-institutional new loans

$d = 0$  if the household has a zero amount of new loans

We can see from the table below (Table 1.7) that around 52 percent of rural households and 50 percent of urban households have taken non-zero new loans during the period of June 30,2012 to the survey date. Overall around 51 percent of the household in the sample taken by me show non-zero new loans.

### Leverage Ratio of Households

In order to calculate the leverage of households, I first obtain the total loan outstanding (including interests) of households as at June 30, 2012. To estimate the total asset of the household, I had to take the sum of the values of financial and non financial assets

Institutional Credit Constraint of Households in India

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	HHs	Mean	Std. Dev.	Min	Max
Rural	31,951	0.128	0.511	0	24.889
Urban	22,642	0.276	1.142	0	24.375

**Table 1.8** Leverage Ratio of Rural and Urban Households

owned by the household. Financial assets are included—shares and debentures owned by the household in co-operative societies and companies and financial assets other than shares and debentures owned by the household, as at June 30, 2012. Financial assets, other than shares and debentures, include certificates/securities issued by the government or banks, namely National Savings Certificate (NSC), Indira Vikas Patra, Kisan Vikas Patra, RBI Bonds, and deposits in post office, cooperative banks, commercial banks, companies and insurance companies, etc. The non-financial assets of the households include the values of land and buildings owned by the households and the value of agricultural and non-agricultural business equipment owned by households. Using the total outstanding debt of households and total assets, I use the following formula to obtain the leverage ratio of the households.

$$\text{Leverage Ratio} = \frac{\text{Total Outstanding Debt}}{\text{Total Asset}} \quad (1.4)$$

High leveraged households are expected to be less likely to have new debt, as it would mean that they may not be able to pay it back.

A household is taken to have access to the institutional network if any member of the household has a bank account, post office account or it has had a valid Kisan credit card over the last year. Households' access to the institutional network is described in the table below (Table 1.8:

**Purpose of Loan**

The purpose for which a loan is taken has been divided into four major categories, as follows:

Institutional Credit Constraint of Households in India

	Rural	Urban	Total
Bank Account, Post Office Account or Kisan Credit Card	27,075 (84.74)	20,216 (89.29)	47,291 (86.62)
Neither	4,876 (15.26)	2,426 (10.71)	7,302 (13.38)
Total	31,951 (100)	22,642 (100)	54,593 (100)

Note: Figures in parentheses are in percentage

**Table 1.9** Household Access to Institutional Network

- Non-business purposes—for expenses for litigation, repayment of debt, financial investment, education, medical treatment and other household expenditures which includes marriages, parties etc.
- Capital expenditure on business—capital expenditure on farm business or capital expenditure on non farm business.
- Current expenditure on business - capital expenditure on farm business or capital expenditure on non-farm business.
- Expenditure on housing—expenditure incurred by household relating to purchase of residential plots, purchases, repairs, additions and alterations, and the construction of new buildings for residential purposes.

We see that the majority of new household borrowing, in both rural and urban areas, are for non-business purposes. However, we see that in urban areas that bias is even more. We also see that the borrowing for current and capital expenditure have a larger share in rural areas compared with urban areas.

## Institutional Credit Constraint of Households in India

	Rural	Urban	Total
Non-business	16,300 (51.02)	16,068 (70.97)	32,368 (59.29)
Capital Expenditure on Business	5,122 (16.03)	2,709 (11.96)	7,831 (14.34)
Current Expenditure on Business	8,134 (25.46)	2,471 (10.91)	10,605 (19.43)
Housing	2,394 (7.49)	1,394 (6.16)	3,788 (6.94)
Total	31,950 (100)	22,642 (100)	54,592 (100)

Note: Figures in parentheses are in percentage

**Table 1.10** Purpose of Borrowing

### Number of Bank Branches

We obtain the district-wise number of bank branches data from the Reserve Bank of India. We find the number of new bank branches opened in the financial year prior to the survey. In our case, we take the number of new bank branches opened during July 2011 to June 2012. We expect that the number of bank branches in the district would improve the access of the people living in that area, hence, remove constraints in borrowing. However, new bank branches are not expected to have any impact on households having positive debt, as it is decided by other characteristics of the borrowers.

### District-wise Deposit

District-wise deposits are obtained with quarterly frequency from the Reserve Bank of India. We obtain the standard deviation of average, year-on-year deposit growth for the last five years and take the standard deviation for the period preceding the survey as an estimation

of deposit shock. As we do not have the district-wise GDP data for all the districts, we take this deposit shock as the income shock of the district. We believe that if the GDP shock is positive, it means that there is a positive shock to the economic activity of the region and people may save rather than borrow during the period. In other words, positive deposit shock is expected to have a negative impact on the household's probability of having a new debt. The deposit shock, however, is not expected to have any impact on the lending decision made by the institutions.

### **Other Socio-economic Variables**

Other socio-economic variables which may have an impact on the household's probability of having new loans, or may affect their credit constraints, include household size, gender, type of household, whether the household is rural or urban, region, caste, education of the head of the household and age of the head of household. A large family size may mean that the household may have many earning members and, hence, may be less likely to have a new loan. On the other hand, a large household size may mean a higher dependency ratio, making the household more likely to borrow. In order to capture the impact of gender on probability of having new loans we include a dummy variable for a female headed household ( $d = 1$  if male headed,  $d = 0$ , otherwise). We also take into account the type of households—self-employed, regular wage/salary earners (rural/urban), casual labour or others. We expect that people who are regular wage/salary earners are less likely to have new loans, as they have a definite source of income. On the other hand, self-employed, casual labour and others may need money to smoothen their consumption, hence, they are more likely to borrow. We take a dummy for household location in rural or urban areas ( $d = 1$  if rural,  $d = 0$  otherwise). We believe that an urban household may have better access to formal finance and, therefore, more likely to borrow when there is a need. Similarly, a household's probability of having new loans may be characterized by the region it belongs to. A high economically-active region may have some impact on the borrowing pattern of households in that region. An educated

household head may have more financial awareness than an uneducated one, therefore, a household with more education may be more likely to have new loans. On the other hand, an educated household head may be better employed hence, a better flow of income, thereby, decreasing the likelihood of having new loans. The age of the household head may also affect the likelihood of having new loans and that likelihood may decrease with age as expected future income goes down. However, in a country like India, there may be a need for a larger amount of borrowing when the age increases, due to health concern, expenditure on marriages etc.

## 1.4.2 Estimation Results

### Probability of Having Positive New Loans

The likelihood of having new loans is estimated via a probit model. The major interest here is to find the factors which explain households' decision to borrow. To examine the magnitude of the impact, we also estimate the marginal impacts if the independent variables on the probability of having new loans. The probit model that we estimate takes the following form:

$$Pr(d = 1|X) = \Phi(X' \beta) \tag{1.5}$$

Here, we include a set of explanatory variables representing the characteristics of the households and proxy for economic activity in the region namely deposit shock. The results are given in the table below Table 1.13.

#### *Leverage Ratio*

As expected, we see that the households with a higher leverage ratio are less likely to borrow to have new loans. However, we also notice that the coefficient for *Leverage Ratio*<sup>2</sup> (square of leverage ratio) is statistically, significantly different from zero. So, after reaching a certain level of leverage ratio, the probability of having new loans starts increasing.

#### *Household Size*

## Institutional Credit Constraint of Households in India

Socioeconomic Characteristics of Households					
	Obs	Mean	Std. Dev.	Min	Max
Household Size	54,592	4.91	2.28	1	36
Age of the Head of HH	54,591	47.99	12.67	13	110

Gender of the HH head			
	HHs	Percent	
Male Headed HHs	49,297	90.3	
Female Headed HHs	5,294	9.7	
Total	54,591	100	

Literacy of the HH head			
	HHs	Percent	
Illiterate	15,141	27.73	
Literate without formal education	466	0.85	
Formal education primary to middle	21,553	39.48	
Secondary and above	17,432	31.93	
Total	54,592	100	

Type of HH			
	HHs	Percent	
Self-employed	29,295	53.66	
Regular wage/salary earners	12,788	23.42	
Casual labour	10,675	19.55	
Others	1,834	3.36	
Total	54,592	100	

Social Group of HH			
	HHs	Percent	
Scheduled Tribe	6,375	11.68	
Scheduled Caste	9,387	17.19	
Other Backward Class	22,825	41.81	
Others	16,005	29.32	
Total	54,592	100	

**Table 1.11** Socioeconomic Characteristics of Households

We find that households which are bigger in size are less likely to have new borrowings. It may be the case that the bigger households may have a higher level of family income, as they may have more working family members due to which they may not need to borrow from outside sources.

*Gender*

It is found that female-headed households are more likely to have new loans, as it may be the case that a female head may have an uncertain source of income, as a result of which for smoothening consumption overtime it may need to borrow from the credit market.

*Household Head Age*

A high-age household head is less likely to have new loans but the likelihood of borrowing increases as the age increases above the threshold of 42 years. This is counter-intuitive to the life-cycle hypothesis model of consumption and previous empirical works, as the probability of having new loans should be a concave function of age according to the life-cycle hypothesis.

*Locality*

As urban households are expected to have easier access to the institutional sources of loans and they may have greater financial awareness as compared to the rural households, we find an intuitive result that urban households are more likely to have new loans compared with rural households.

*Education*

We expect the relationship between education and probability to have new loans to be positive, as higher educated individuals are expected to have greater financial awareness compared to less educated individuals. We find an intuitive result here. We see that households with household heads having formal education from primary to middle are more likely to have new loans compared to households with illiterate household heads. Also, we see that households with household heads educated to more than a secondary level of education are less likely to have new loans, as highly educated individuals may enjoy high income and assets, and, therefore, have little need to borrow.

*Household Type*

We find that regular wage/salary earning households are less likely to have new loans compared to self-employed households which is intuitive as regular wage/salary earning households have a definite source of income compared to the self-employed households. We also find that casual labour households are more likely to have new loans as compared to self-employed households.

*Institutional Access*

Households having access to formal institutions, which is captured by having bank account, post office account or Kisan credit card are found to be more likely to have new loans. This result is also intuitive as having access to institutional sources may mean that an individual may have greater financial knowledge compared to the ones who do not have any access to institutional sources.

*Deposit Shock*

The proxy variable which we took as a representation of income in the region that is, a deposit shock tends to have a negative impact on the likelihood of having new loans. If the income is high, an individual may not borrow from the credit market and may finance from the current income.

*Social Group*

Households belonging to the scheduled castes and other backward castes are more likely to have new loans, as compared with scheduled tribe households. It may be because of the government policies and programmes for providing subsidized loans to the weaker section of society.

**Institutional Credit Constraint**

For estimating the institutional credit constraint, we do not have the data on the loan applications rejected by institutional sources. In such a case, we estimate institutional-credit constrained households. In doing so, we take all those households having a positive

Institutional Credit Constraint of Households in India

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	Coefficients	Base Unit
<i>LeverageRatio</i>	-1.017*** (-52.940)	
<i>LeverageRatio</i> <sup>2</sup>	0.048*** (45.710)	
<i>HouseholdSize</i>	-0.015*** (-6.040)	
<i>FemaleHead</i>	0.056** (2.840)	Male
<i>HHHeadAge</i>	-0.018*** (-6.370)	
<i>HHHeadAge</i> <sup>2</sup>	0.00012*** (4.290)	
<i>Urban</i>	0.050*** (4.000)	Rural
<i>LiteratewithoutFormalEducation</i>	0.043 (0.710)	Illiterate
<i>Formaleducationprimarytomiddle</i>	0.047** (3.290)	Illiterate
<i>Secondaryandabove</i>	-0.174*** (-10.480)	Illiterate
<i>SouthernRegion</i>	0.359*** (5.380)	Eastern, Western and Northern Region
<i>CentralRegion</i>	0.343*** (6.070)	Eastern, Western and Northern Region

t Statistics in Parenthesis

\*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001

**Table 1.12** Probability of Having Positive New Debt Regression Results: Part 1

Institutional Credit Constraint of Households in India

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	Coefficients	Base Unit
<i>Regularwage/salaryearners</i>	-0.166*** (-10.530)	Self-employed
<i>Casuallabour</i>	0.076*** (4.780)	Self-employed
<i>Others</i>	-0.072* (-2.200)	Self-employed
<i>CapitalExpenditureonBusiness</i>	-0.177*** (-10.380)	Non-business
<i>CurrentExpenditureonBusiness</i>	0.056*** (3.580)	Non-business
<i>Housing</i>	0.113*** (5.010)	Non-business
<i>InstitutionalAccess</i>	0.056** (3.270)	No Institutional Access
<i>DepositShock</i>	-0.004*** (-6.380)	
<i>ScheduledCaste</i>	0.047* (2.190)	
<i>Other Backward Class</i>	0.102*** (5.510)	Scheduled Tribe
<i>Other Castes</i>	-0.028 (-1.360)	Scheduled Tribe
<i>Constant</i>	0.421*** (4.580)	
N = 54591		Prob > chi2 = 0.000
t Startistics in Parenthesis		Pseudo R2 = 0.066
*: p<0.05, **: p<0.01, ***: p<0.001		Log likelihood = -35357.115

**Table 1.13** Probability of Having Positive New Debt Regression Results: Part 2

amount of new loans from the institutional sources as having access to institutional sources and all those households which have borrowed from the non-institutional sources or have not borrowed at all as institutional credit constrained households. We take dummy variable as households having non-zero new loans from the institutional sources as 1 and the households having loans from non-institutional sources 0. More formally,  $s = 1$ , if no institutional borrowing,  $s = 0$ , otherwise. However, if we take these estimates as the estimates of the probability of households being institutional credit constrained, we would be committing an error, as these estimates would be biased because only those households may participate in borrowing from institutional sources who are likely to have new loans. We use a probit model with the sample selection. On running the probit regression with the sample selection we notice that the Wald test statistics do not indicate a significant correlation (Appendix B, Table B.3), therefore, we should use a simple probit technique. To estimate the likelihood of institutional credit constrained households, we run a simple probit regression with  $1 - s$  as the dependent variable.

$$Pr(1 - s = 1|X) = \Phi(X'\beta) \tag{1.6}$$

The results for this probit regression are presented below (Table 1.15).

In the constrained regression, the explanatory variables are similar with few exceptions. In the constrained regression equation, instead of a leverage ratio we use 'log of assets' as the institutions can observe the assets of the individuals but cannot completely observe the liabilities, as individuals may have borrowed from several other institutional and non-institutional sources. Also, we use the number of new bank branches opened in the districts as we expect that availability of more bank branches in the locality removes the constraints in the access to the institutional sources. We have not taken the household size into account as institutions generally do not observe the size of the households while extending loans.

*Log Assets*

We see that households with higher assets are less likely to be institutional credit constrained as compared to the households with low assets. High asset households are considered

Institutional Credit Constraint of Households in India

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	Coefficients	Base Unit
<i>LogTotalAsset</i>	-0.143*** (-19.94)	
<i>Female</i>	-0.142*** (-4.65)	Male
<i>HHHeadAge</i>	-0.0249*** (-5.78)	
<i>HHHeadAge</i> <sup>2</sup>	0.000179*** (4.21)	
<i>Urban</i>	-0.229*** (-11.46)	Rural
<i>LiteratewithoutFormalEducation</i>	-0.0207 (-0.22)	Illiterate
<i>FormalEducationPrimarytoMiddle</i>	-0.231*** (-10.82)	Illiterate
<i>SecondaryandAbove</i>	-0.366*** (-13.44)	Illiterate
<i>NorthernRegion</i>	0.232*** (5.38)	Eastern Region
<i>WesternRegion</i>	0.152*** (5.01)	Eastern Region
<i>SouthernRegion</i>	0.253*** (9.83)	Eastern Region
<i>CentralRegion</i>	0.232*** (8.20)	Eastern Region

**Table 1.14** Constrained Regression Results: Part 1

Institutional Credit Constraint of Households in India

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	Coefficients	Base Unit
<i>Regularwage/salaryearners</i>	-0.337*** (-12.46)	Self-employed
<i>Casuallabour</i>	-0.226*** (-9.51)	Self-employed
<i>Others</i>	-0.233*** (-4.42)	Self-employed
<i>InstitutionalAccess</i>	0.515*** (19.76)	No-institutional Access
<i>NewBankBranches</i>	-0.00284*** (-4.85)	
<i>ScheduledCaste</i>	0.136*** (3.73)	Scheduled Tribes
<i>OtherBackwardClass</i>	0.136*** (4.08)	Scheduled Tribes
<i>OtherCastes</i>	-0.0451 (-1.25)	Scheduled Tribes
<i>CapitalExpenditureonBusiness</i>	-0.695*** (-23.34)	Non-business
<i>CurrentExpenditureonBusiness</i>	-0.781*** (-31.06)	Non-business
<i>Housing</i>	0.478*** (14.24)	Non-business
<i>Constant</i>	2.619*** (19.59)	
N = 24569		Prob > chi2 = 0.000
t Startistics in Parenthesis		Pseudo R2 = 0.1549
*: p<0.05, **: p<0.01, ***: p<0.001		Log likelihood = -13577.463

**Table 1.15** Constrained Regression Results: Part 2

to be more credible so they suffer lesser borrowing constraint from institutional sources.

*Gender*

We also find that female headed households are less credit constrained compared to male-headed households.

*Household Head Age*

Household head age does not seem to affect the probability of households being institutional credit constrained, as the coefficients of both age and age squared are seen to be statistically insignificant.

*Locality*

Urban households are less likely to face institutional credit constraint as they have a larger number of institutional sources available within their reach compared to the rural households. Also, the urban households may be better monitored as compared to rural households.

*Education*

We find that the higher educated households are less likely to be institutional credit constrained as compared to the illiterate households. It may be because those households may have stable sources of income and higher income compared to the illiterate households.

*Household Type*

Regular wage/salary characteristic does not seem to have any impact on the credit constraint probability of the households as its coefficient is found to be statistically insignificant. On the other hand, we also find that casual labour households are less institutional credit constrained.

*Institutional Access*

As expected, households having access to institutional sources are less likely to be institutional credit constrained compared to the households who do not have any access. This is quite intuitive and self explanatory.

*New Bank Branches*

The higher the number of bank branches in the districts is associated with lesser probability of the households being institutional credit constrained when they take new loans. As more number of bank branches in the locality provide better access to the households to the institutional sources and also removes the constraints in the borrowing from institutional sources.

*Social Group*

The households belonging to the scheduled castes and other backward castes are less likely to be institutional credit constrained as they belong to the weaker section of the society and there are several government policies and programmes for providing subsidised loans to the weaker section of the society which make access of these households to institutional sources easier.

*Purpose*

We find that borrowing purpose affects the probability of institutional credit constraints faced by the households. We can see that households borrowing for current and capital expenditure on business are less likely to face institutional credit constraint compared to the households seeking loans for non-business expenditures. Surprisingly, we see that the households seeking loans for housing purpose are more likely to be credit constrained compared to the non-business expenditure.

**Determinants of institutional credit**

To find the determinants of new loans we use OLS estimations as well as Heckman selection models. As the OLS estimations only take into account the households with non-zero new loans, they do not take into account the households which may have a positive demand for loans but were discouraged to borrow from the institutional sources due to fear of rejection or the households whose loans application may actually have been rejected. The Heckman selection model takes into account two selection equations as explained above in the methodology that identifies the probability of households having new loans and the probability of

the households being institutional credit constrained. In the regression results we find that that the coefficients of the Inverse Mill's Ratios (IMRs) of the probability of having new loans and the institutional credit constrained equation are significant . We therefore focus on the Heckman model for the estimations (Table 1.17). However, results of the OLS regression are also presented in the Appendix B (Table B.6).

The regression equation takes the following form:

$$\begin{aligned}
 \text{Log}(\text{New Loan}) = & \text{Constant} + \beta_1 \text{Leverage Ratio} + \beta_2 \text{Leverage Ratio}^2 + \beta_3 \text{HH Size} \\
 & + \beta_4 \text{HH Head gender dummy} + \beta_5 \text{HH Head Age} + \beta_5 \text{HH Head Age}^2 \\
 & + \beta_6 \text{Rural Urban dummy} + \beta_7 \text{Literacy dummies} \\
 & + \beta_8 \text{regional dummies} + \beta_9 \text{hhtype dummies} + \beta_{10} \text{purpose dummies} \\
 & + \beta_{11} \text{institutional access dummies} + \beta_{12} \text{deposit shocks} \\
 & + \beta_{13} \text{social group dummy} + \beta_{14} \text{IMR1} + \beta_{15} \text{IMR2}
 \end{aligned}
 \tag{1.7}$$

The demand for new institutional debt amount decreases significantly with increase in the household leverage ratio. However, the demand for new loans increases after increase in the household leverage ratio to certain threshold. The larger size households desire less amount of institutional debt. Compared to male headed household, female headed households desire larger amount of institutional credit. Institutional credit demand decreases with age but after certain age the demand for institutional credit starts increasing again. Urban households demand larger institutional credit compared to the rural households. The level of education also affects the desire for institutional credit. Compared to the illiterate households, the households with literate households without formal education and households with primary up to middle school education desire more debt. On the other hand, households with education higher than secondary school desire less amount of institutional debt compared to the illiterate households. Households in the southern and central region demand larger institutional credit compared to the eastern, western and the northern regions. Regu-

Institutional Credit Constraint of Households in India

	[1]	Base Unit
<i>LeverageRatio</i>	-0.906** (-3.14)	
<i>LeverageRatio</i> <sup>2</sup>	0.0407** (3.00)	
<i>HHSize</i>	0.0280*** (6.88)	
<i>HHHeadSex</i>	-0.181*** (-5.70)	Male
<i>HHHeadAge</i>	-0.0539*** (-8.41)	
<i>HHHeadAge</i> <sup>2</sup>	0.000403*** (7.73)	
<i>Urban</i>	0.0155 (0.68)	Rural
<i>LiteratewithoutFormalEducation</i>	0.0363 (0.36)	Illiterate
<i>FormalEducationPrimarytoMiddle</i>	-0.0212 (-0.85)	Illiterate
<i>SecondaryandAbove</i>	0.00713 (0.13)	Illiterate
<i>NorthernRegion</i>	0.900*** (15.80)	Eastern Region
<i>WesternRegion</i>	0.541*** (11.84)	Eastern Region
<i>SouthernRegion</i>	1.325*** (15.99)	Eastern Region
<i>CentralRegion</i>	0.363*** (6.71)	Eastern Region

t Statistics in Parenthesis  
\*: p<0.05, \*\*: p<0.01, \*\*\*: p<0.001

**Table 1.16** Determinants of New Institutional Loans: Heckman Regression: Part 1

Institutional Credit Constraint of Households in India

	[1]	Base Unit
<i>Regularwage/salaryearners</i>	-0.539*** (-12.84)	Self-Employed
<i>Casuallabour</i>	-0.495*** (-17.89)	Self-Employed
<i>Others</i>	-0.355*** (-6.40)	Self-Employed
<i>CapitalExpenditureonBusiness</i>	-0.759*** (-16.82)	Non-business
<i>CurrentExpenditureonBusiness</i>	-0.906*** (-19.07)	Non-business
<i>Housing</i>	0.405*** (7.39)	Non-business
<i>InstitutionalAccess</i>	0.243*** (6.06)	No-institutional Access
<i>DepositShock</i>	0.000336 (0.21)	
<i>ScheduledCaste</i>	0.0848* (2.21)	Scheduled Tribe
<i>OtherBackwardClass</i>	0.251*** (7.21)	Scheduled Tribe
<i>OtherCastes</i>	0.113** (3.17)	Scheduled Tribe
<i>IMR1</i>	1.392*** (3.60)	
<i>IMR2</i>	-4.967*** (-33.53)	
<i>Constant</i>	12.20*** (57.32)	
Observations	15704	
Adjusted R-squared	0.337	
t statistics in parentheses		
* p<0.05, ** p<0.01, *** p<0.001		

**Table 1.17** Determinants of New Institutional Loans: Heckman Regression: Part 2

lar wage/salary earning households desire lesser amount of institutional credit compared to the self-employed households. On the other hand, casual labour households demand larger credit compared to the self-employed households. Compared to the household demanding credit for the non-business expenditure, households demanding credit for capital expenditure for business demand lesser amount of credit. However, households demanding credit for current expenditure for business and credit for housing demand more amount of credit than the household demanding credit for the non-business expenditure. The households who have access to institutional sources demand less amount of new loans compared to the households having no access to institutional sources. Proxy for regional income viz. deposit shock shows that when the regional income is high the demand for credit is less. Compared to the tribal households scheduled castes and other backward caste households desire for more amount of new loans.

## 1.5 Conclusion and Policy Implications

In this chapter I examined the determinants of Indian households' probability of having new loans, determinants of the institutional credit constraints faced by the households and the determinants of new loans by the households using the household level All India Debt and Investment Survey (AIDIS) cross-section data of the National Sample Survey Office (NSSO) conducted during 2012-13. We find that the indebtedness of households play an important role in the households probability of having new loans. We find that higher the level of debt relative to the assets owned by the household, the lesser is the probability of having new loans. We also find that the probability of household borrowing from the credit market decreases with the age of the head of household and after 42 years of age it starts increasing again. This implies that at the young age when the head of the household is in the working age probability of taking new loans is less but when he enters the older age there may be

various expenditure needs due to which the probability of borrowing starts increasing again. We also find that education of the head of the household is an important determinant of the probability of household's having new loans. Whether the household head belongs to self-employed, regular wage earning or casual labour affects household's decision to have new loans. We find that regular wage earning households are less likely to have new loans compared to the self-employed and casual labour households. The results of the determinants of institutional credit constrained households show that the households who have more assets are less likely to be institutional credit constrained as their likelihood of default may be less compared to the low asset households. Education eases the constraints faced by the households in the institutional borrowing but this impact is more likely to be indirect, as the households which are more educated are more likely to be better financially aware compared to the illiterate ones. Also, the better educated individuals may have better income than the others due to which they face less institutional credit constraints. Bank branch expansion decreases the probability of household being institutional credit constrained as the households may get easier access to the formal financial institutions. Nevertheless, a more detailed data on bank branch distance from the household would present a better picture.

From the policymakers' point of view the above findings are important especially when one of the primary motives of the government of India and the Reserve Bank of India is to ensure seamless and universal access to financial services to everyone in the country. To achieve the same it is important to understand the characteristics and the determinants of new loans taken by the households. As leverage, age of head of the household, education, and nature of employment are important factors which are associated with the household's probability of taking new loans, the financial institutions and the government agencies should design their loan products which address these issues. As we find that very high leverage households have a tendency to borrow more, the institutions should be careful in lending to high leverage households which would help in reducing the non-performing loans. As

probability of taking new loans first decreases with age and then increases after 42 years of age, the financial institutions should design pension and insurance products which addresses the demand for loans at higher age.

Education is also an indicator of financial literacy. The higher educated households are likely to have new loans as compared to lower or illiterate households also with higher education the probability of being constrained for new institutional loans decreases. To address these issues, the Reserve Bank of India's Financial Literacy Programs are already taking steps to enhance the financial knowledge of the individuals in the rural and remote areas.

Another important finding of this Chapter is that more number of bank branches result into the lesser institutional credit constraint. As a policy implication, this means that the bricks and mortar branches (i.e. branch offices) still play an important role even when the banking correspondent<sup>4</sup> mechanism are being employed by the banks in India. The branch licensing and new banks entry restrictions should be prudentially eased so that the institutional credit constraints are further eased.

One of the research areas, in the future, is to assess the loan application rejections of the households directly. The national-level household surveys should also include the questions related to loan application rejections. This would be useful in understanding the impact and transmission of government policies related to financial inclusion.

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<sup>4</sup>Banking Correspondents (BCs) are individuals/entities engaged by a bank in India (commercial banks, Regional Rural Banks (RRBs) and Local Area Banks (LABs)) for providing banking services in unbanked/under-banked geographical territories. A banking correspondent works as an agent of the bank and substitutes for the brick and mortar branch of the bank.

# Chapter Two

## Credit Availability and Capital

### Misallocation in India: A Study of Medium and Large Manufacturing Enterprises in India

1

#### 2.1 Introduction

Often the period of high and easy availability of credit results into misallocation if there are distortions that prevent efficient allocation of factors of production. There can be several distortions in the real world which may lead to such misallocations. These distortions have also been highlighted in the literature. They are as follows:

- Capital adjustment costs: As firms may be at different stages of adjustment. Installing of new capital is a time taking process and it requires such costs. There are also lags

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<sup>1</sup>This chapter has been written with continuous feedback and discussions with the doctoral advisor Prof. Kenichi Ueda.

in deliveries and learning (e.g., Cooper and Haltiwanger (2006)).

- Informational frictions: Firms may receive imperfect signals about the future business environment. Also, lenders may not have perfect information about borrowers which leads to information frictions.
- Financial frictions: Firms may have difficulties in conducting transactions due to differential access to credit. This may arise due to differential access to credit, uncertainty, high monitoring costs, moral hazard, etc. Differential access to credit results into non-optimal allocation of capital and lower TFP (e.g., Aoki et al. (2007), Moll (2014) and Buera et al. (2011)).
- Policy related distortions: There can be many subsidies or taxes which may result into misallocation.
- Unobserved heterogeneity in production technology: Production technology is not fully observed by the firms which makes efficient allocation of factors of production difficult.

The economic theory says that if firms operate under perfect competition or monopolistic competition (Dixit and Stiglitz (1977)) without any friction, assuming identical production function within the industry, the profit maximisation problem of the firms results in the equalisation of the marginal revenue product of capital and labour across firms in an industry. If there are firm-specific frictions, the marginal revenue products would not be equalised and can differ among firms.

Differential access to credit may lead to greater dispersion of the marginal revenue product of capital if greater availability credit is to the firms which are less financial constrained and vice versa. Based on this theory, I test the hypothesis that whether the increased availability of credit adds to the dispersion of marginal product of capital of manufacturing firms in India. Marginal product of capital depends on many other factors, for example, business

environment, human development and state specific conditions. For this, I use a variety of variables from other databases to control for the factors which may affect the marginal product of capital.

## 2.2 Literature Review

There have been many studies which look into the role of policy distortions which affect the Total Factor Productivity (TFP) and output. Schmitz Jr (2001) finds that low TFP, especially in the investment sector, results in low capital accumulation. He finds that low TFP is the result of government policy which supports inefficient public enterprises. In a similar vein, Hsieh and Klenow (2007) find that low TFP in the investment good sector is the cause of low real investment in the underdeveloped countries. Hsieh and Klenow (2009) show that the TFPs of India and China are lower than that of the U.S., and this can be explained by the difference in allocation efficiency. They also find and conclude that government regulation and public ownership of firms are the significant causes of resource misallocation in India and China.

Several cross-country studies have found that the small firms in the financially deprived industries grow faster as compared to the small firms in the financially developed markets (Rajan and Zingales (1998), Wurgler (2000), Caselli (2005), Restuccia and Rogerson (2008), Hsieh and Klenow (2009), and Bartelsman et al. (2013)). In their study Beck et al. (2008) find that financing constraints affect firm's productivity growth. Beck et al. (2005), Banerjee et al. (2005), Aghion et al. (2007), Ayyagari et al. (2008), Hsieh and Klenow (2014), Kalemli-Ozcan et al. (2012) and Midrigan and Xu (2014) have identified in their studies that financing constraint is a major source of distortion which results in misallocation and loss of productivity across firms.

Theoretically, in perfect competition and in the absence of any informational inefficiency, the dispersions in the marginal product of capital (MPK) and the marginal product of labour (MPL) do not exist. Also, in more competitive markets, the dispersion tends to come down over time. If dispersion exists, the output can be increased through reducing the misallocation of inputs, in other words, by reallocating the inputs from inefficient firms (usually with low marginal revenue products) to more efficient firms (with high marginal revenue productivities) (e.g., Malkiel and Fama (1970), Grossman (1976) and Grossman and Stiglitz (1976)). In reality, due to the presence of several kinds of market imperfections and asymmetry of information (Stiglitz and Weiss (1981), Hughes et al. (2007), and Lambert and Verrecchia (2010)), the firm's cost of capital gets affected which in turn affects productivity growth, market selection and reallocation of inputs (Hopenhayn (1992), Erosa and Hidalgo Cabrilana (2008)).

Buera et al. (2011) observe substantial productivity differences arising from financial frictions that distort the allocation of capital across heterogeneous firms, causing misallocation and losses to TFP. Gopinath et al. (2017), in their study on Southern Europe using the Spanish manufacturing firms data from 1999 to 2012, find that financial frictions result into a significant dispersion of returns to capital across firms. They also find that the misallocation of capital results in a significant loss of TFP. Moll (2014), in his study, finds that financial frictions are associated with greater losses in productivity. There are other studies, for example, Fazzari et al. (1988), Jeong and Townsend (2005) and Jeong and Townsend (2007), which show that capital market-imperfections, which results in financing constraints, impair firms' investment decisions and result in more significant productivity losses. Albuquerque and Hopenhayn (2004) and Clementi and Hopenhayn (2002) in their studies also find that financing constraints affect investment decisions and result in losses in productivity. Fazzari et al. (1988) and Evans and Jovanovic (1989) examine the effect of financial constraints and

credit market imperfection on a firm's investment decisions and the cost of capital. They also find that financial constraints play a significant role. Piketty (1997), Banerjee and Newman (1993) and Banerjee and Duflo (2005) in their study show that credit market imperfections affect income distribution and inequality especially in the presence of borrowing constraints. Hurst and Lusardi (2004) and Evans and Jovanovic (1989), in their study show that liquidity constraints and capital market imperfections affect entrepreneurship and result into inequality among individuals, firms and across countries through selection and entry in production.

So far there little work has been done on effects of credit availability and capital misallocation, especially, in the case of India. Martin et al. (2017) work on dereservation reform is on staggered removal of small-scale industry (SSI) reservation policy. They look into the effect of dereservation on employment growth, investment, output, productivity, and wages. Allcott et al. (2016) in their paper look at the effect of electricity shortages on the average plant's revenues and producer surplus and average productivity losses in India.

My work in this chapter adds to the literature of financial constraints and misallocation in the following two ways:

I address two issues in the literature on misallocation. Firstly, I make use of the observed cross-sectional dispersion in the marginal revenue product of capital (MRPK) across the region using the annual survey of industries data. Secondly, I provide a broad link between the credit availability using available credit limit to industry and misallocation which can be used by the policy-makers to address the issue to efficiently channelizing and allocating credit to the firms which can give more return for an additional amount of capital.

## 2.3 Methodology

### 2.3.1 Marginal Product of Capital Dispersion: Misallocation of Capital

First, we need to establish why the marginal product of capital would vary if there are constraints (usually financial constraints) which limit the use of optimal capital. We prove it here using a mathematical example. Let us assume that firms production function is homogeneous of degree one - Cobb-Douglas production function:

$$Y = f(k, l) = A_i k_i^\alpha l_i^{1-\alpha} \quad (2.1)$$

where  $k_i$  is the amount of capital utilized by the firm  $i$  and  $l_i$  is the amount of labor utilized by the firm  $i$ .  $0 < \alpha \leq 1$  denotes the elasticity of output with respect to capital. If  $r$  is the price of capital and  $w$  is price of labor then the profit maximization problem of the firm can be written as:

$$\max_{k, l} \pi(k, l) = f(k, l) - rk - wl. \quad (2.2)$$

The first order condition with respect to the capital, is

$$f_k = \frac{\partial A_i k_i^\alpha l_i^{1-\alpha}}{\partial k} = A_i \alpha k_i^{\alpha-1} l_i^{1-\alpha} = MPK = r. \quad (2.3)$$

$$f_l = \frac{\partial A_i k_i^\alpha l_i^{1-\alpha}}{\partial l} = A_i k_i^\alpha l_i^{-\alpha} = MPL = w. \quad (2.4)$$

However, suppose there are firms which face financial constraints and are not able to achieve the optimal capital  $k_i^*$ . The maximum amount of capital which a firm can employ is denoted by  $K$  Then, those firms will invest capital up to  $K$ . Where,

$$K \leq k_i^*. \quad (2.5)$$

In such a case,

$$MPK(K) \geq MPK(k_i^*). \quad (2.6)$$

We can deduce from the above result that if there are financial constraint, greater availability of credit would result into greater dispersion of  $MPK$  if the credit is channeled more into the firms with lower marginal product of capital compared to the higher marginal product of capital firms. This is also the hypothesis of Gopinath et al. (2017) which looks into the European firms. Hence, greater dispersion in the marginal product of capital of firms is an indication of greater misallocation of capital across the firms.

### 2.3.2 Measurement of Marginal Product of Capital

If we assume that firms utilize all their assets efficiently, we can use the return on assets (ROA) as a proxy for the average and marginal products of capital (Ueda et al. (2019) and Ueda and Sharma (2020)). We estimate the ROA by earnings before interest and tax payments (EBIT) divided by Total Assets(TA). I estimate that as following:

$$ROA = \frac{Net\ Value\ Added}{Total\ Assets} \quad (2.7)$$

In the productivity literature, in usual practice (for example, (Foster et al., 2008) and (Hsieh and Klenow, 2009)) industry-level deflators are used as plant-level deflators are sometime difficult to obtain in many countries. (Foster et al., 2008) emphasize that, when industry-level deflators are used, differences in plant-specific prices show up in the customary measure of plant-level Total Factor Productivity (TFP). They stress the distinction between “physical productivity,” which they denote TFPQ, and “revenue productivity,” which they call TFPR. I use industry-level deflators which gives me TFPR.

To estimate TFPR, MRPK and MRPL I follow Hsieh and Klenow (2009). I set the rental price of capital as  $R = 0.1$  (assuming real interest rate of 5 percent and depreciation of 5 percent). I take elasticity of substitution between the plant value added as  $\sigma = 3$ . Elasticity

of substitution may range between 3 to 10 ((Broda and Weinstein, 2006)) but I take it as 3 as has been done in most of the empirical literature.

We consider an industry  $s$  at time  $t$  populated by a large number  $N_{st}$  of monopolistically competitive firms. We define industries in the data by their three-digit industry classification (NIC-87)<sup>2</sup>. Following (Hsieh and Klenow, 2009), total industry output is given by a CES production function:

$$Y_{jt} = \left[ \sum_{i=1}^{N_{jt}} (y_{ijt}^{\frac{\sigma-1}{\sigma}}) \right]^{\frac{\sigma}{\sigma-1}} \quad (2.8)$$

where  $y_{ijt}$  denotes firm  $i$ 's real output, in industry  $j$  at time  $t$ ,  $\sigma$  denotes the elasticity of substitution between different kinds of output. Firms' output is given by a Cobb-Douglas production function:

$$y_{ijt} = A_{ijt} k_{ijt}^{\alpha_{jt}} l_{ijt}^{1-\alpha_{jt}} \quad (2.9)$$

where  $k_{ijt}$  is capital of firm  $i$  in industry  $j$  and time  $t$ ,  $l_{ijt}$  is labor,  $A_{ijt}$  is physical productivity, and  $\alpha_{jt}$  is the elasticity of output with respect to capital in industry  $j$ . We estimate the wage-to-value-added as the ratio of labour cost to the net value added. We estimate the labour share in each industry  $\alpha_{jt}$  as the average of wage-to-value-added within each industry.

$$\alpha_{j,t} = \text{mean} \left( \frac{\text{labour cost}_{jt}}{\text{net value added}_{j,t}} \right) \quad (2.10)$$

We measure the nominal net value added,  $p_{ijt}y_{ijt}$ , as the difference between total output and the value of total input net of total fixed asset depreciation during the year. We take the output,  $y_{ijt}$ , as nominal value added. We measure the labor input,  $l_{ijt}$ , as the total labour

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<sup>2</sup>In India manufacturing establishments are classified using the National Industrial Classification (NIC), which is similar to industrial classifications used in other countries. The NICs were revised on several occasions, i.e., in 1987, 1998, 2004, and 2008. Using the concordance tables provided by the Ministry of Statistics and Programme Implementation (MOSPI), I convert all industry classifications to the NIC-1987 scheme.

cost. We measure the capital stock,  $k_{ijt}$ , as the average book value of the opening fixed capital and the closing fixed capital during the year. In fixed assets we include both tangible and intangible fixed assets.

Firms choose their price, capital, and labor to maximize their profits as follows:

$$\max_{p_{ijt}, k_{ijt}, l_{ijt}} \Pi_{ijt} = (1 - \tau_{ijt}^y) p_{ijt} y_{ijt} - (1 + \tau_{ijt}^k) (R_t + \delta_{jt}) k_{ijt} - w_{jt} l_{ijt} \quad (2.11)$$

where  $w_{jt}$  denotes the wage,  $R_t$  denotes the real interest rate,  $\delta_{jt}$  denotes the depreciation rate,  $\tau_{ijt}^y$  denotes a firm-specific wedge that distorts output, and  $\tau_{ijt}^k$  denotes a firm-specific wedge that distorts capital relative to labour.

The first-order conditions with respect to labor and capital are given by:

$$MRPL_{ijt} = \left( \frac{(1 - \alpha_{jt})(\sigma - 1)}{\sigma} \right) \left( \frac{p_{ijt} y_{ijt}}{l_{ijt}} \right) = \left( \frac{1}{1 - \tau_{ijt}^y} \right) w_{jt} \quad (2.12)$$

$$MRPK_{ijt} = \left( \frac{\alpha_{st}(\sigma - 1)}{\sigma} \right) \left( \frac{p_{ijt} y_{ijt}}{k_{ijt}} \right) = \left( \frac{1 + \tau_{ijt}^k}{1 - \tau_{ijt}^y} \right) (R_t + \delta_{jt}) \quad (2.13)$$

Following Hsieh and Klenow (2009), I define the revenue-based total factor productivity (TFPR) at the firm level as the product of price  $p_{ijt}$  times physical productivity  $A_{ijt}$ :

$$TFPR_{ijt} = p_{ijt} A_{ijt} = \frac{p_{ijt} y_{ijt}}{k_{ijt}^{\alpha_{jt}} l_{ijt}^{1 - \alpha_{jt}}} = \frac{\sigma}{\sigma - 1} \left( \frac{MRPK_{ijt}}{\alpha_{jt}} \right)^{\alpha_{jt}} \left( \frac{MRPL_{ijt}}{1 - \alpha_{jt}} \right)^{1 - \alpha_{jt}} \quad (2.14)$$

If there are no idiosyncratic distortions in output or capital relative to labour (i.e. distortions are same across industry  $\tau_{ijt}^y = \tau_{jt}^y$  and  $\tau_{ijt}^k = \tau_{jt}^k$ ). in other words, if there are idiosyncratic distortions there would exist dispersion of marginal revenue products and a lower sectoral TFP.

## 2.4 Data

For this paper, I collect comprehensive data on state-wise industrial credit limit, number of industrial accounts, actual industrial credit, NIC-87 commodity-wise price indices, net

state domestic product infrastructure development (road length, railways length), state-wise number of shelved and outstanding industrial projects, human development indicators from 2000 to 2015 from many different sources.

### **2.4.1 Annual Survey of Industries**

I use Annual Survey of Industries (ASI) data published by Ministry of Statistics and Programme Implementation (MOSPI). It is an establishment-level microdata. ASI provides data on registered factories with over 100 workers (the “census scheme”) which are surveyed every year, while smaller establishments (the “sample scheme”) are surveyed every three to five years. I use the ASI sample weights to produce estimates valid for the population of registered factories in India. The publicly available ASI data is a cross-sectional data but I use the panel data version of the ASI which is a paid version. The panel data format has establishment identifiers which allows us to construct a plant-level panel for the entire 2000–2015 sample. I provide the detailed information on cleaning and preparing a panel dataset from 2000-2015 in the Appendix. Final number of enterprises after merging and cleaning the data from 2000-2015 is given below in the Table 2.1.

### **2.4.2 Data on Industrial Credit, Net State Domestic Product, Gross Fixed Capital Formation, Road Length, Railways Length and Price**

I obtain the industrial credit data from Basic Statistical Returns (BSR) of Scheduled Commercial Banks in India published by the Reserve Bank of India from 2000–01 to 2015–16. The pdf version of the BSR is available till 2001–02. Data after 2001–02 is available in excel format. I take the data on Net state domestic products and Gross Fixed Capital Formation from 2000-01 to 2015-16 from the Handbook of Statistics on Indian States. I take three-digit commodity price deflators (with base 2004-05) as available in the commodity-based table “In-

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States	Number of Enterprises	Percent	Cumulative Frequency
ANDHRA PRADESH	49,885	7.64	7.64
ASSAM	14,117	2.16	9.8
BIHAR	9,962	1.53	11.33
CHHATTISGARH	9,950	1.52	12.85
DADRA AND NAGAR HAVELI	6,540	1	13.85
DELHI	15,863	2.43	16.28
GOA DAMAN AND DIU	13,029	2	18.28
GUJARAT	60,673	9.29	27.57
HARYANA	28,111	4.31	31.88
HIMACHAL PRADESH	9,706	1.49	33.37
JHARKHAND	9,513	1.46	34.82
KARNATAKA	41,139	6.3	41.12
KERALA	24,406	3.74	44.86
MADHYA PRADESH	18,902	2.9	47.76
MAHARASHTRA	79,504	12.18	59.94
ORISSA	11,511	1.76	61.7
PUNJAB	36,192	5.54	67.24
RAJASTHAN	28,735	4.4	71.64
TAMIL NADU	91,435	14.01	85.65
UTTAR PRADESH	51,115	7.83	93.48
UTTARANCHAL	11,716	1.79	95.27
WEST BENGAL	30,860	4.73	100
Total	652,864	100	

For cleaning and merging the ASI data from 2000-15, I use Allcott et al. (2016)

**Table 2.1** Number of Enterprises

produced by the Office of the Economic Adviser-Ministry of Commerce and Industry.

### **2.4.3 Data on Business Projects and number pending civil cases**

I use the CapEx database of Centre for Monitoring Indian Economy (CMIE). It provides information and insights on the new capacities coming up in India in the near or medium-term future. Using this database, I find state-wise number of outstanding and shelved business projects in India from 2000 to 2015. I take the number of pending civil cases (as a measure of contract enforcement) from Indiatat.

## **2.5 Stylized Facts**

### **2.5.1 Commercial Financing in India**

As in other countries there are several modes of financing in India. During the pre-reform period i.e., before 1991 Indian industrial financing was dominated by the nationalized banks also known as the Development Financial Institutions. In the post-reform period, as a result of many financial sector reforms Indian industrial sector moved to alternative sources of financing. Other sources of finance include non-bank domestic resources such as public issues, private placements, commercial papers, credit by housing finance companies, or the LIC's (Life Insurance Corporation) net investment in corporate debt. Foreign sources account for nearly one fifth of aggregate resources (Table 2.2).

Bank financing to the commercial sector is one of the major sources of finance. It constitutes around 50 percent of the total financing. In 2015, 26 public sector banks (PSBs), 25 private sector banks, 43 foreign banks, 56 development focused regional rural banks, 1,589 urban cooperative banks and 93,550 rural cooperative banks. In 2019-20 many of the PSBs have been merged. All commercial banks in India are mandated to direct 40% of their total

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	2009-10	2010-11	2011-12	2012-13
<b>Adjusted Bank Credit</b>	<b>4786</b>	<b>7110</b>	<b>6773</b>	<b>6849</b>
	(45.0)	(57.4)	(55.7)	(48.3)
Non-food credit	4670	6815	6527	6335
Non-SLR investment by commercial banks	117	295	246	51,400
<b>Non-bank Credit (Domestic+External)</b>	<b>5850</b>	<b>5286</b>	<b>5383</b>	<b>7335</b>
	(55.0)	(42.6)	(44.3)	(51.7)
<b>Domestic sources</b>	<b>3652</b>	<b>2956</b>	<b>3079</b>	<b>4212</b>
	(34.3)	(23.8)	(25.3)	(29.7)
Public issues by non-financial entities	320	285	145	119
Gross private placements by non-financial entities	1420	674	558	1038
Net issuance of CPs subscribed to by non-banks	261	172	36	52
Net credit by housing finance companies	285	384	539	859
RBI-regulated AIFIs*	338	400	469	515
Systemically important non-deposit-taking NBFCs (net of bank credit)	607	679	912	1188
LIC's net investment in corporate debt	422	361	419	441
<b>External Sources</b>	<b>2198</b>	<b>2330</b>	<b>2304</b>	<b>3123</b>
	(20.7)	(18.8)	(19.0)	(22.0)
External commercial borrowings/FCCBs	120	555	421	466
ADR/GDR issues, excluding banks and financial institutions	151	92	27	10
Short-term credit from abroad	349	502	306	1177
Foreign direct investment to India	1578	1181	1550	1470
<b>Total flow of resources (A+B)</b>	<b>10636</b>	<b>12396</b>	<b>12156</b>	<b>14184</b>
	(100.0)	(100.0)	(100.0)	(100.0)

Figures here are in Rs. billion. Figures within brackets are percentages to total.

\* NABARD, NHB, SIDBI and EXIM Bank

CP: Commercial Papers, AIFI: All India Financial Institutions, NBFC: Non-banking Financial Companies

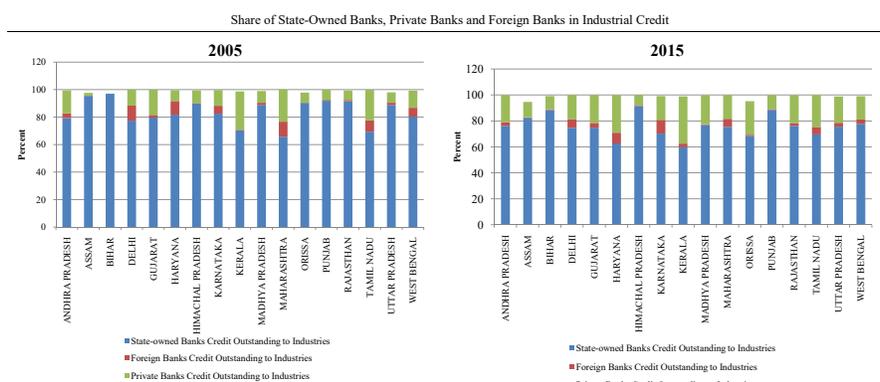
FCCB: Foreign Currency Convertible Bond, ADR/GDR: American/Global Depository Receipt

Source: RBI and Ray (2015)

**Table 2.2** Commercial Finance in India

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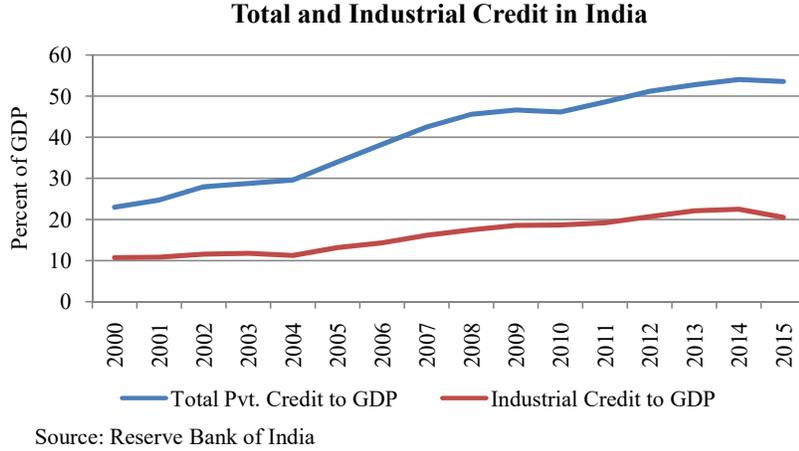
annual credit to the priority sectors. Priority sector includes agriculture, manufacturing, and micro and small enterprises. In addition to the 40 % targets the commercial banks can also have their internal targets for the fiscal year. Shortfalls from announced targets are closely monitored by the regulatory and supervisory authority i.e. Reserve Bank of India.



**Figure 2.1** State-wise Public Sector Bank’s Share in Industrial Credit

### 2.5.2 Credit Growth in India

Credit to GDP has steadily increased from 2000 to 2015 in India thanks to its booming economy (Table 2.2). The industrial credit to GDP has grown at a lower pace compared to the Credit to GDP. As we know industrial sector still contributes lesser share compared to the services sector. As of 2018-19 the share of industry to gross value added (GVA) is 29.6 percent as compared to more than 50 percent of GVA by the services sector.



**Figure 2.2** Pvt. Credit to GDP and Industrial Credit to GDP

## 2.6 Empirical Strategy and Econometric Specification

In this section I describe my strategy and econometric specification to check my hypothesis that increased credit limit leads to greater dispersion of MRPK. I use two alternative measures of MPK, the Ueda et al. (2019) and Ueda and Sharma (2020) way of taking ROA as the MPK and the Hsieh and Klenow (2009) way of estimating MRPK as below:

$$MRPK_{ijt} = \left( \frac{\alpha_{jt}(\sigma - 1)}{\sigma} \right) \left( \frac{p_{ijt}y_{ijt}}{k_{ijt}} \right) \quad (2.15)$$

$\alpha_{jt}$  is estimated as given in equation 2.10 above.

I measure the dispersion of MPK in two statistical ways— as coefficient of variation of MPK and as Theil’s index of MPK. The mathematical expressions for both are given below:

$$Coefficient\ of\ Variation_{st} = \frac{Standard\ Deviation\ of\ MPK_{st}}{MPK_{st}} \quad (2.16)$$

And,

$$Theil's\ Index_{st} = \frac{1}{N} \sum_i \frac{MPK_i}{MPK_{st}} \ln \left( \frac{MPK_i}{MPK_{st}} \right) \quad (2.17)$$

Here  $s$  stands for state and  $t$  stands for time.

Each of the enterprises generally have loan accounts with the banks with the maximum amount of credit available to them for borrowing. The maximum limit on each loan accounts are increased from time-to-time by the banks on negotiations with the enterprises. It is generally set by the banks at the beginning of the fiscal year. Using the industrial credit limit information, we estimate the following ratios for per enterprise credit availability.

$$\text{per enterprise credit limit}_{st} = \frac{\text{industrial credit limit}_{st}}{\text{number of industrial accounts}_{st}} \quad (2.18)$$

Analogously, I estimate per-enterprise actual industrial credit as follows:

$$\text{per enterprise actual credit}_{st} = \frac{\text{outstanding industrial credit}_{st}}{\text{number of industrial accounts}_{st}} \quad (2.19)$$

### 2.6.1 Regression Specification

My interest here is to test the the initial hypothesis I made, i.e.,to see if expansion in industrial credit results into greater dispersion of the MPK (measured as the coefficient of variation and as Theil's index). In other words, whether increased credit availability results into greater misallocation of capital. Please note that my method of testing this hypothesis is indirect as I look at the dispersion of MPK at the state-level as I do not have the firm-level availability of credit. I present the regression specification below. As a measure of increased credit availability, I take per-enterprise industrial credit limit as my benchmark indicator. For robustness, I also take other measures of credit availability viz. per-enterprise actual industrial credit, total manufacturing credit limit of the state to manufacturing sector

gross value added of the state and credit to net state domestic product ratio (percent). I control for other factors which may affect the MPK dispersion, they are— electricity deficit, road density, share of stalled projects to total projects in the state, per industry number of pending civil cases in the state and infant mortality.

## Variable Explanations

### *Electricity Deficit*

Electricity is one of the important inputs in the manufacturing sector. Unavailability or uneven electricity supply affects the output of the manufacturing plants. The availability of proper electricity supply to a locality is measured by an indicator called electricity deficit. This deficit is estimated by examining the total supply of electricity in the state and the total demand for electricity in the state. If the demand is more than the supply of electricity, we call it electricity deficit. It is estimated in percentage terms. High deficit means bad supply of electricity in the state.

### *Road Density or Railway Density<sup>3</sup>*

Road density (Railway density) is estimated as total length of roads (in meters) divided by the total area of the state (meter-squares). It is one of the indicators of infrastructure development in the state. More density means better availability of connection to the markets where the produce of the manufacturing enterprises can be supplied to.

### *Share of Stalled Projects to Total Projects*

This variable is one of the indicators of business environment in the states. It is calculated as a ratio of the stalled commercial projects to the total number of running commercial projects. If the number of stalled commercial projects is high compared to the total running projects, it means that there are some discrepancies in the business condition in the state

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<sup>3</sup>The estimation result using Railway Density is provided in the Appendix

which is hindering the progress of commercial projects.

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This variable is one of the indicators of business environment in the states. It is calculated as a ratio of the stalled commercial projects to the total number of running commercial projects. If the number of stalled commercial projects is high compared to the total running projects, it means that there are some discrepancies in the business condition in the state which is hindering the progress of commercial projects.

#### *Per-Industry Number of Pending Civil Cases*

Civil cases are all the cases excluding the criminal cases. Civil cases also include commercial dispute cases, contract breaking, cheating, etc. If the pending civil cases are high in the state, it means that the courts are overburdened and the resolution of commercial disputes would take time. As a result, if manufacturing enterprises fall into any dispute, they will have to engage their resources and money to resolve such cases. Per-industry number of pending civil cases are calculated as a ratio of total pending civil cases in the state at a particular time and total number of manufacturing enterprises in the state at that time.

#### *Infant Mortality*

Infant mortality rate is calculated as the number of deaths of infants in the state under one year of age in a given year per 1,000 live births in the same year in the same state. This is often used as an indicator of human development, especially, health in the state. There can be several other indicators of human development such as, school enrollment ratio or other indicators related to education. States having better human development are considered to have better labour force. I take here one of the most basic measure of health indicator. Good health of the labour means they would be more productive in the work they do.

$$\begin{aligned}
 MPKDispersion_{s,t} = & \alpha_s + \gamma_t + \beta_1 IndustrialCreditLimit_{s,t} \\
 & + \beta_2 IndustrialCreditLimit_{s,t} * psbshare_{s,t} \\
 & + \beta_3 ElectricityDeficit_{s,t} \\
 & + \beta_4 RoadDensity_{s,t} \\
 & + \beta_5 ShareofStalledProjects_{s,t} \\
 & + \beta_6 PerEnterprisePendingCivilCasess,t \\
 & + \beta_7 InfantMortality_{s,t} + \nu_{s,t}
 \end{aligned} \tag{2.20}$$

where  $s$  denotes states and  $t$  year, and  $\alpha_s$  represents the state-level fixed effect. I control for the state-level and time fixed effects and clustering the standard error at state-level.

In another formulation, I take the alternative measure of credit availability viz. manufacturing sector credit limit to total manufacturing gross value added ratio:

$$\begin{aligned}
 MPKDispersion_{s,t} = & \alpha_s + \gamma_t + \beta_1 ManufacturingCreditLimittoManufacturingGVA_{s,t} \\
 & + \beta_2 ManufacturingCreditLimittoManufacturingGVA_{s,t} * psbshare_{s,t} \\
 & + \beta_3 ElectricityDeficit_{s,t} \\
 & + \beta_4 RoadDensity_{s,t} \\
 & + \beta_5 ShareofStalledProjects_{s,t} \\
 & + \beta_6 PerEnterprisePendingCivilCasess,t \\
 & + \beta_7 InfantMortality_{s,t} + \nu_{s,t}
 \end{aligned} \tag{2.21}$$

I also take another measure of credit availability for robustness check viz. per-enterprise

actual credit as follows:

$$\begin{aligned}
 MPKDispersion_{s,t} = & \alpha_s + \gamma_t + \beta_1 perEnterpriseActualCredit_{s,t} \\
 & + \beta_2 perEnterpriseActualCredit_{s,t} * psbshare_{s,t} \\
 & + \beta_3 ElectricityDeficit_{s,t} \\
 & + \beta_4 RoadDensity_{s,t} \\
 & + \beta_5 ShareofStalledProjects_{s,t} \\
 & + \beta_6 PerEnterprisePendingCivilCases_{s,t} \\
 & + \beta_7 InfantMortality_{s,t} + \nu_{s,t}
 \end{aligned} \tag{2.22}$$

And,

$$\begin{aligned}
 MPKDispersion_{s,t} = & \alpha_s + \gamma_t + \beta_1 LogCreditoNSDPRatio_{s,t} \\
 & + \beta_2 LogCreditoNSDPRatio * psbshare_{s,t} \\
 & + \beta_3 ElectricityDeficit_{s,t} \\
 & + \beta_4 RoadDensity_{s,t} \\
 & + \beta_5 ShareofStalledProjects_{s,t} \\
 & + \beta_6 PerEnterprisePendingCivilCases_{s,t} \\
 & + \beta_7 InfantMortality_{s,t} + \nu_{s,t}
 \end{aligned} \tag{2.23}$$

## 2.7 Results

I present here the regression estimations based on the above regression specifications using ROA as the measure of MPK and coefficient of variation and Theil's index as the measures of MPK dispersion. The corresponding estimations using the MRPK estimates are presented in the Appendix.

Table 2.3 reports the effects of increased credit availability to firms on the dispersion of MPK. Column [1] represents the result of the benchmark regression 2.20. Column [2] represents the results of regression 2.21. And, Column [3] represents the results of the regression

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	(1)	(2)	(3)	(4)
	roa cv	roa cv	roa cv	roa cv
per enterprise ind credit limit	0.850*			
	(1.96)			
per ent credit limit*psb share	0.0129			
	(1.15)			
manuf cl to manufsdp		0.497*		
		(2.40)		
manuf cl to manufsdp*psb share		-0.00516		
		(-1.15)		
per enterprise act ind credit			2.718	
			(1.64)	
per ent act credit*psb share			0.0378*	
			(1.83)	
ln credi nsdp ratio				17.31***
				(4.70)
ln credi nsdp ratio*psb share				0.0167
				(0.67)
Elec def perc	0.388***	0.329**	0.399***	0.385***
	(3.68)	(2.87)	(3.76)	(3.57)
road density	-4.085**	-3.943**	-4.326**	-2.307*
	(-3.17)	(-2.86)	(-3.33)	(-1.96)
share stalled	-0.0602	0.00451	-0.0565	-0.179
	(-0.28)	(0.02)	(-0.26)	(-0.86)
PC Pending cases	1.848***	2.140***	1.844***	1.428**
	(3.61)	(4.31)	(3.55)	(3.12)
Infant Mort	0.710***	0.837***	0.698***	0.0266
	(8.64)	(9.37)	(8.26)	(0.14)
Constant	31.13***	34.59***	30.05***	-76.25**
	(5.20)	(5.88)	(4.73)	(-2.87)
Observations	234	204	234	234
Adjusted R-squared	0.530	0.571	0.531	0.586

**Table 2.3** Regression: Results using Coefficient of Variation

2.23. And, Column [4] represents the results of regression 2.24

From the regression results we find that the increased availability of credit to the industries did result into a greater dispersion of MPK during 2000-2015 as the coefficients of the availability of credit indicators are positive and statistically significant, except for the per-capita actual credit variable. This can be due to greater availability of credit to the manufacturing enterprises which had lower MPK and relatively lower allocation of credit to the enterprises with higher MPK.

We find that greater deficit of electricity results into greater dispersion of MPK as the coefficient of electricity deficit is positive. The better infrastructure measured as the road density results into lesser dispersion of MPK as the coefficient of road density is found to be negative and statistically significant.

The share of stalled projects to total commercial projects in the states which is an indicator of better governance is not found to be significant. While the bad judicial condition which is measured as per-enterprise number of pending civil cases are increases the dispersion of MPK. We find that increase in infant mortality which is a rough measure of human development indicator (greater infant mortality means bad human development condition) results into greater dispersion of MPK.

We further check the robustness of our results by taking a more precise measure of MPK dispersion, i.e., Theil's index of MPK. Results are presented in the table (2.4). We find that the result of our benchmark specification holds with the change in the measurement of the dispersion of MPK. Additionally, we find that the states in which the public sector bank's share is more in the manufacturing sector credit, the dispersion as a result of increased availability of credit is even bigger.

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	(13)	(14)	(15)	(16)
	roa theil	roa theil	roa theil	roa theil
per enterprise ind credit limit	0.162*			
	(2.60)			
per ent credit limit*psb share	0.00216**			
	(2.85)			
manuf cl to manufsdp		0.00192		
		(0.08)		
manuf cl to manufsdp*psb share		0.0000783		
		(0.28)		
per enterprise act ind credit			0.316**	
			(2.75)	
per ent act credit*psb share			0.00409**	
			(2.94)	
ln credi nsdp ratio				1.079***
				(4.99)
ln credi nsdp ratio*psb share				0.000926
				(0.68)
road density	-0.178*	-0.206*	-0.224**	-0.0436
	(-2.00)	(-2.37)	(-2.66)	(-0.54)
share stalled	0.0157	0.0143	0.0160	0.00793
	(1.38)	(1.21)	(1.41)	(0.69)
PC Pending cases	0.129***	0.140***	0.125***	0.0864***
	(4.33)	(5.25)	(4.39)	(3.77)
Infant Mort	0.0631***	0.0710***	0.0628***	0.0160
	(13.97)	(15.24)	(13.49)	(1.60)
Constant	4.521***	4.805***	4.493***	-2.452
	(13.85)	(15.57)	(13.24)	(-1.91)
Observations	221	204	221	221
Adjusted R-squared	0.631	0.651	0.628	0.700

**Table 2.4** Regression: Results using Theil's Index

In Appendix D, I also present the results of alternative regression specification in which I measure the MPK as the MRPK estimated using the formulation of Hsieh and Klenow (2009). We find that our results that greater availability of credit results into greater dispersion of MPK holds true for alternative measures of credit availability and alternative measure of MPK and MPK dispersion.

Better infrastructure which is measured by road density has a negative impact on MRPK dispersion. Note that the road density is total road length deflated by the area of the state. Higher road density is a popular measure better of connectivity to the markets. This validates out intuition that with better connectivity the frictions in the operation of business reduces and this results into lesser dispersion in MRPK. I also use an alternative measure of market connectivity infrastructure—railway density Table D.12. The results are presented in the Appendix D. Alternative measure of business condition—shelved to outstanding projects ratio does not have any impact of MRPK dispersion.

## 2.8 Conclusions and Policy Implications

In this chapter, I address two issues in the literature on misallocation. Firstly, I make use of the observed cross-sectional dispersion in the marginal product of capital (MPK) across the region using the annual survey of industries data. In this I use two alternate measures of MPK i.e., ROA and MRPK. Secondly, I provide a broad link between the credit availability using available credit limit to industry and misallocation which can be used by the policy-makers to address the issue to efficiently channelizing and allocating credit to the firms which can give more return for an additional amount of capital.

I find that increase in the availability of industrial credit to the manufacturing sector is associated with greater dispersion of MPK. As the state-owned banks in India are also

driven by the development objectives in addition to the profit maximization, targeted credit supply may result into greater flow of credit to low productive firms and lesser to the highly productive firms. This may add to greater misallocation of capital.

Better infrastructure results into improvement in the allocation of capital. While bad judicial condition which is measured here as the per-enterprise pending civil cases, is associated with greater dispersion of MPK.

One of the caveats that I would like to mention while presenting my policy implication here, is that, in this study I do not take into account the asymmetry of information and moral hazard problem on the part of the enterprises.

The findings of this chapter suggest that targeted credit supply, based on broad classification of priority sector may result into misallocation of credit in which greater credit flows to less productive firms and lesser credit follows to high productive firms. Credit allocation needs to be deregulated gradually, and the system of credit allocation needs to be made more transparent rather than sticking to the broad definition of priority sector. The greater transparency in the system would lead to a more efficient allocation of credit.

Better assessment of firm productivity by the lenders can ensure efficient allocation of credit to the firms. Better allocation of credit can help in increasing the manufacturing sector efficiency and output.

As better infrastructure development and better business environment can help in reducing the misallocation, the state governments should focus on improving the availability of electricity and roads connectivity. Reducing the burden on civil courts can help in improving the business condition in the states and contribute to the improvement in allocation of

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capital.

# Chapter Three

## Business Reforms and Informal Manufacturing Sector Productivity

1

### 3.1 Introduction

Micro, Small and Medium Enterprises (MSMEs) are essential for any developing economy. Much of the manufacturing output depends on the MSMEs. In India, the MSMEs contribute around 33.4 percent to manufacturing output. It is also a sector which employs around 120 million workers and contributes about 45 percent of the overall exports from India. These MSMEs also include the enterprises which are not formally registered as companies under the Companies Act, 1956<sup>2</sup> of India. In the Indian economy, the unincorporated sector is vital because of the large number of establishments in this sector (3.1) and the magnitude of employment it provides to unskilled/semi-skilled/skilled persons, besides its contribution to Gross Domestic Product of the country.

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<sup>1</sup>This chapter has been written with continuous feedback and discussions with the doctoral advisor Prof. Kenichi Ueda

<sup>2</sup>Companies Act 1956 details the procedures necessary for setting up a company. This act also explains practices essential for winding up of business and liquidation of the business.

At the same time, when the unincorporated enterprises are essential, their presence in large numbers may pose several challenges. It may result in a low tax base, poor working conditions of labour, unavailability of social security to labour and inefficiency. Therefore, policymakers across the world aim to reduce the share of unincorporated enterprises by providing incentives for greater formalization. Business reforms, which aim to improve the ease of doing business, may impact the overall productivity of the informal enterprises and push them towards greater formalization.

Enterprises	Registered	Unregistered	Total	% of Unregistered Enterprises
Proprietary	1409	32745	34154	0.959
Partnership	63	365	428	0.853
Private Company	43	6	49	0.122
Co-operatives	5	116	121	0.959
Others	44	765	809	0.946
Not recorded	0	615	615	1
Total	1564	34612	36176	0.957

Source: Latest All India Census of MSME, Fourth Round, 2006-2007

**Table 3.1** Distribution of active MSMEs by type (in '000)

In the above background, in this chapter, I look at the impact of business reforms which tend to ease regulatory burdens on business on the total factor productivity of the unincorporated enterprises. States in India have been carrying out business reforms with a greater vigour since 2010-11 which has brought India up from the rank of doing business from 140 in 2010 to 100 in 2016 (World Bank). In December 2014, State governments in India came together and agreed upon a 98-point action plan for business reforms to all the States and Union Territories in India. These action plans sought to lay out a series of recommendations which would help increase the transparency and improve the efficiency and effectiveness of government regulatory functions and services for business in India. An assessment to take

stock of these reforms was carried out in June 2015.

Based on the two latest rounds of unincorporated enterprise surveys of India, I estimate the productivity of the small manufacturing enterprises. To the best of my knowledge, no such exercise in India has been carried out, which estimates the total factor productivity of the unincorporated enterprises. I use the assessment report of 2015 to identify the reforms carried out by the states until 2014-15. To determine the impact of the business reforms on the total factor productivity, I use propensity score matching and match the firms controlling for the other firm characteristics along with the border districts of two states, one of which has carried out the reform while the other has not. I estimate the difference in the estimated total factor productivity of the matched enterprises along the bordering districts of those two states and finally evaluate the impact of reforms on the total factor productivity improvement. Using the Difference-in-Difference (DID) method on the overall sample and matched firms, I also examine whether more reforms mean greater improvement in the total factor productivity. I find that business reforms lead to an improvement in the total factor productivity of the firms.

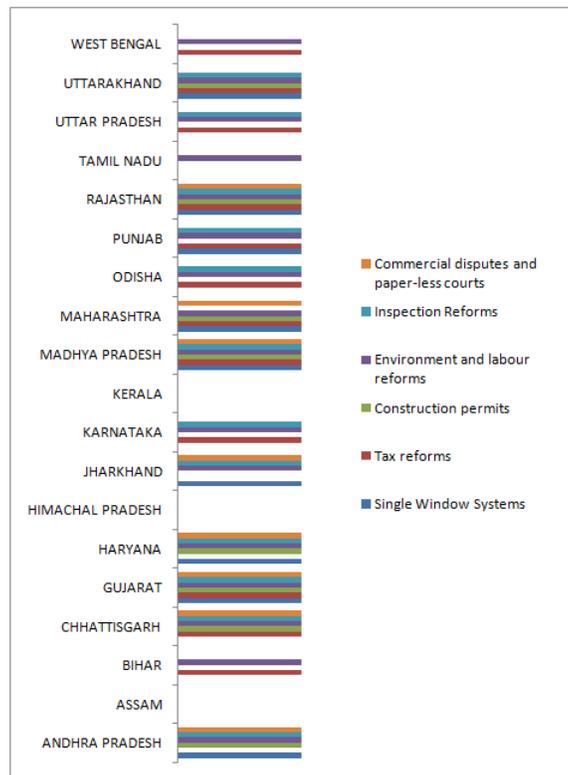
## 3.2 Highlights of Business Reforms 2014-15

On 29th December 2014, Chief Secretaries (the secretaries to the political head of the States in India) of States participating in the “Make in India” workshop finalized a 98-point Action Plan on “Ease of Doing Business.” An evaluation of these action plans to assess the implementation and progress of the reforms until 2014-15 was done in June 2015. The highlights of the implemented reforms during this period are as follows:

- Single Window Systems

- Tax reforms
- Construction permit reforms
- Environment and labour reforms
- Inspection reforms
- Commercial disputes reforms

The details of the reforms and the states carrying out these reforms (3.1) between November 2014 to June 2015 are given below:



**Figure 3.1** Business Reforms in India

**Single Window Systems:** A few States created bodies or bureaus which act as a one-stop system for approval of the State-level regulatory and fiscal incentive. The online

Single Window System provides a dedicated window for the filing of applications, payment of charges, tracking of the application and online scrutiny and approval of applications. The officials of such bodies and bureaus are also given powers to grant approvals.

States that carry out the reforms include Andhra Pradesh, Chhattisgarh, Jharkhand, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Rajasthan, Telangana, Punjab and Uttarakhand.

**Tax reforms:** Some states have made progress in tax reforms. The tax reforms include—making the e-registration mandatory for Value Added Tax (VAT), Central Sales Tax (CST), Professional Tax, Entry tax, etc.. The reforms also allow for online payment of taxes, filing of returns, e-filing through service centres support and helpline. It also provides for risk-based tax compliance inspections.

States carrying out the tax reforms include Bihar, Karnataka, Madhya Pradesh, Chhattisgarh, Gujarat, Maharashtra, Odisha, Uttar Pradesh, Punjab, Rajasthan, Uttarakhand and West Bengal.

**Construction permit reforms:** Many States allowed applicants to apply online and upload building plans for automated construction permit approval. In addition, several states developed software-based systems that automatically scan building plans and monitor compliance with the building bye-laws and building codes in force.

States which carried out these reforms include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Rajasthan, Telangana and Uttarakhand.

**Environment and labour reforms:** Some states also implemented environmental and

labour reforms in the form of automated solutions. These automated solutions deal with the online approval of environmental and pollution-related applications. These solutions provide 24 x 7 access to businesses to apply online, track their applications and file returns and statements. They also get online permissions under various acts and regulations.

States carrying out these reforms include: Andhra Pradesh, Bihar, Chhattisgarh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Maharashtra, Jharkhand, Odisha, Punjab, Rajasthan, Tamil Nadu, Telangana, Uttar Pradesh, Uttarakhand and West Bengal

**Inspection reforms:** Some states have introduced inspection reforms related to labour, tax and environment compliances. These reforms help businesses to comply with inspection requirements in a user-friendly manner. States have also published comprehensive procedures and checklists for various inspections. A few states have also implemented online systems for allocation of inspectors to increase efficiency and effectiveness of the procedure.

States which carried out these reforms include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Karnataka, Madhya Pradesh, Odisha, Jharkhand, Punjab, Rajasthan, Punjab, Telangana, Uttar Pradesh and Uttarakhand

**Commercial disputes and paperless courts:** Some states made significant progress in the area of judicial reforms, mainly due to the passage of the Commercial Courts, Commercial Divisions and Commercial Appellate Divisions Act. A few States filled up vacancies in District Courts and Commercial Courts to ensure availability of adequate capacity for dealing with various cases. E-filing of cases and e-summons have also been started in the District Courts to address the concern of the time and costs associated with the legal processes.

States include Andhra Pradesh, Chhattisgarh, Gujarat, Haryana, Madhya Pradesh, Maharashtra, Jharkhand, Rajasthan and Telangana.

### 3.3 Literature Review

Governance problems are widely recognized as the main cause of the poor performance of firms, especially in developing countries (Shleifer and Vishny (1997)). Improvement in corporate governance, neoliberal policies and the establishment of rule of law (Kikeri et al. (1994), Varshney (1998)) result in better performance by firms. As pro-market reforms help in reducing both primary and secondary agency problems, these reforms improve firm performance (Dyck and Zingales (2004)).

Cuervo-Cazurra and Dau (2009) find that reforms directly improve the institutional environment in any country. Reforms also help in reducing the asymmetry of information between the institutions and economic agents through better disclosure norms. Reforms help in creating a better environment for business and also help in improving the behaviour of the firms. For example, reforms which will enhance the labour market, through the increase in the supply of a trained workforce, managers are compelled to focus on firm profitability to secure their employment (Gersbach and Schmutzler (2014)). Similarly, with capital market improvements, the owners feel discouraged to indulge in discretionary behaviour as they face a higher risk of low equity valuations and high cost of debt. Such modifications help in improving the firm profitability (Jain and Kini (1999)).

It has been discussed widely in the literature that an overburdened regulatory system, lack of external finance, lack of competition and weak property rights enforcements affect the informal sector performance. Chakrabarti and Ray (2018) find that judicial reforms make it difficult for the concentrated owner to expropriate private benefits which help in reducing

secondary agency problems as well.

Obstacles which impede the growth of small firms are inadequate enforcement of property rights, inefficient regulation and taxation, political instability, insufficient provision of infrastructure and underdeveloped financial system (Beck and Demirgüç-Kunt, 2006). Other issues which affect the informal sector are related to labour market segmentation, inequality, human capital accumulation, the consequences of trade reform, optimal audit policies and rent-seeking bureaucracies (Schneider and Enste (2000), Perry et al. (2007)).

Labour-market restrictions, heavier regulation of entry and the tax burden lead to the increase in the size of the informal sector and decreases with the enforcement of legal obligations. Being informal, the firms can avoid getting into the fulfilment of the regulatory obligations (Djankov and Freund (2002), Antunes and Cavalcanti (2007), Perry et al. (2007) and Ordonez (2014)). There is also a sizable literature that analyzes the determinants of the size of the informal sector, that may be classified as the size of the informal sector decreases as credit availability improves in the formal sector (Straub (2005), Antunes and Cavalcanti (2007)).

In this paper, I add to the literature of reforms and manufacturing productivity in several important ways. I estimate the productivity of the small and micro-enterprises accounting for the self-employed labour by using the statewise minimum wage as the imputed wage. I estimate the total factor productivity differences using the matching technique and identify the treatment and controlled group by using the firms located closer to administrative boundary by only comparing the firms in the bordering districts of the states. In this way, my contribution to this literature is unique. Also, I add to the argument of the positive impact of pro-business reforms on the productivity backed by empirical evidences.

## 3.4 Data

I primarily use the National Sample Surveys (NSS) on the Unincorporated enterprises<sup>3</sup> Unincorporated enterprise include proprietary, partnership (excluding limited liability partnership), Self-Help Groups<sup>4</sup>, Non-Profit Institutions (NPIs)<sup>5</sup> etc. Non-Agricultural Enterprises (excluding construction) in India. National Sample Survey Office (NSSO) conducts periodic random stratified sample surveys on unincorporated non-agricultural enterprises. These surveys are the primary source of data on indicators of economic and operational characteristics of such enterprises. These data are also used for planning, policy formulation, decision support and as a necessary input for further economic and statistical analysis by various Government organizations and the academia. These surveys are nationally representative. I take the two most comparable rounds of these sample surveys—67th Round (covering July 2010 to June 2011) and 73rd Round (covering July 2015 to June 2016).

Out of the total enterprises surveyed, I take the manufacturing enterprises into account. I present the total number of enterprises surveyed in the 67th Round and the 73rd Round of the surveys in Table 3.2

I extract the variables of my interest to estimate the Total (revenue) Factor Productivity (TFPR) from the raw datasets of these two surveys. The details of data extraction and compilation are provided in the Appendix.

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<sup>3</sup>By definition, the unincorporated enterprises are those enterprises which are not registered under the Companies Act 1956.

<sup>4</sup>Units formed as an SHG and engaged in non-financial activities are considered as a partnership enterprise with members not all from the same household. For our purpose, since we are only taking into account the manufacturing units, the non-financial SHGs are already included as partnerships. Rest of the SHGs are dropped.

<sup>5</sup>Non-profit institutions are legal or social entities created for the purpose of producing goods and services whose status does not permit them to be a source of income, profit or other financial gains for the units that establish, control or finance them. For our purpose, we drop the NPIs from the analysis.

Rounds	Period	Total Enterprises	Manufacturing Enterprises
67th Round	July 2010–June 2011	334,475	96,414
73rd Round	July 2015–June 2016	288,676	79,966

**Table 3.2** National Sample Survey Data on Unincorporated Enterprises

One of the issues faced in handling the data on micro and small enterprises is that many of these enterprises would be run as self-employed units for which the wage cost data would not be available. Also, many of the enterprises would have the number of employees which does not include the owner who is self-employed. For estimating the TFPR, we need to find out the total labor cost of the enterprise therefore, I take the state-wise minimum daily wage rate data for the unskilled labor for 2010 and 2015 from Indiastat (paid data source) and then approximate the daily wage rate data to monthly data assuming 20 workdays in a month. The details for this is provided in the Appendix.

## 3.5 Methodology

### 3.5.1 Estimation of TFPR

Following the similar method as I followed in Chapter 2 of this thesis, I estimate the enterprise-level TFPR of the manufacturing enterprise in the year 2010-11 and 2015-16. The estimates of state-wise TFPR for 2010-11 and 2015-16 are given below.

We find that between 2010-11 and 2015-16 there is an improvement in the overall total factor productivity across the states. To delineate the impact of one single reform and graphically see the improvement in TFPR in the states where there is a difference of only one reform, I plot the Kernel density plot of the TFPR below. The greater dispersion of the TFPR means greater misallocation while a shifting of the density curve towards the right mean a positive improvement in the TFPR.

## Business Reforms and Informal Manufacturing Sector Productivity

States	Mean log(TFPR) 2010-11	Std. Dev	Min.	Max.
ANDHRA PRADESH	-0.847	2.617	-11.891	18.975
BIHAR	0.425	2.369	-11.482	28.344
CHHATTISGARH	-0.237	2.219	-10.634	10.168
GUJARAT	-0.685	2.443	-15.965	16.406
HARYANA	-1.312	2.573	-12.933	15.321
HIMACHAL PRADESH	-1.400	2.672	-13.022	15.769
JHARKHAND	0.802	2.473	-7.528	24.875
KARNATAKA	-0.260	2.581	-13.273	14.146
KERALA	0.167	2.865	-11.380	25.826
MADHYA PRADESH	0.073	2.681	-10.776	26.998
MAHARASHTRA	-0.676	2.916	-17.654	29.009
ODISHA	1.520	2.794	-7.888	27.815
PUNJAB	-1.293	2.652	-13.933	24.675
RAJASTHAN	-1.158	2.301	-12.544	9.632
TAMIL NADU	-0.916	2.528	-14.634	14.300
UTTAR PRADESH	-0.457	2.717	-12.471	29.203
UTTARAKHAND	-1.180	2.317	-10.027	8.320
WEST BENGAL	0.762	2.944	-13.232	28.592

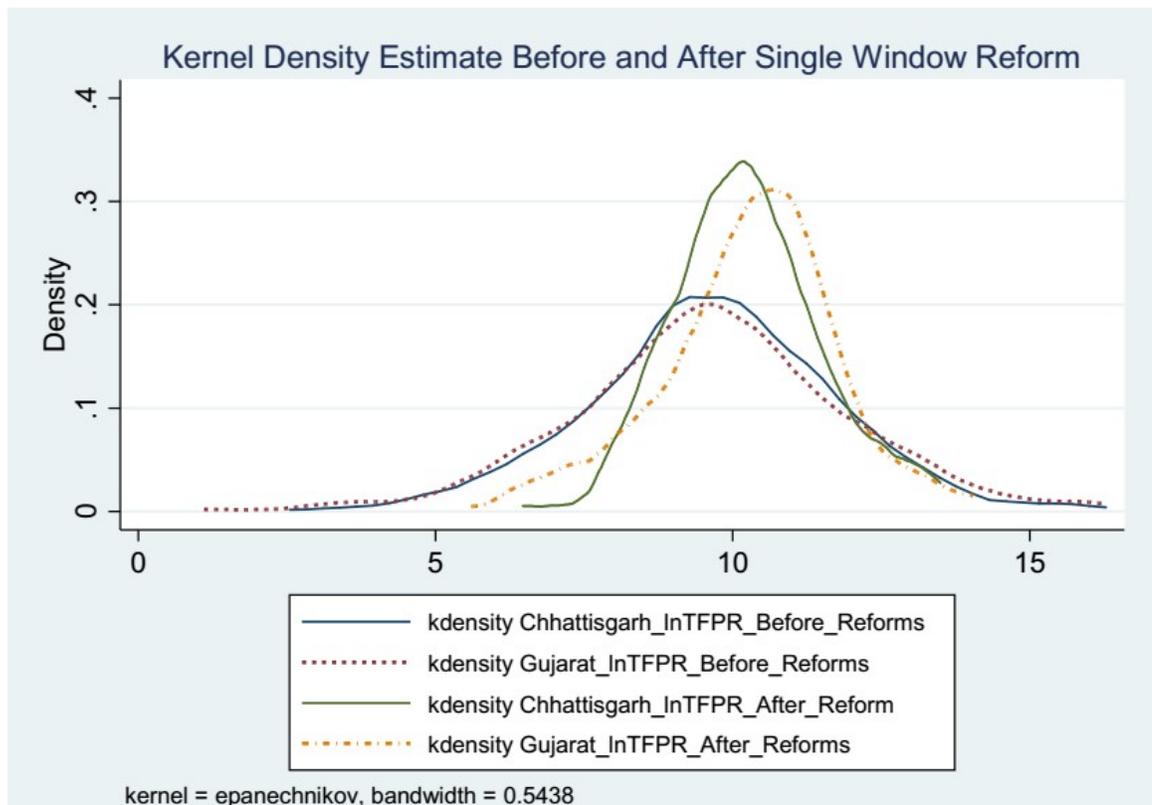
**Table 3.3** State-wise Average Per Enterprise Estimated TFPR 2010-11

States	Mean log(TFPR) 2015-16	Std. Dev	Min.	Max.
ANDHRA PRADESH	0.320	1.791	-7.703	10.101
BIHAR	1.047	1.604	-7.611	12.861
CHHATTISGARH	0.288	1.438	-5.788	5.032
GUJARAT	-0.219	1.583	-6.720	6.595
HARYANA	0.707	1.306	-4.883	4.689
HIMACHAL PRADESH	0.074	1.929	-15.345	6.051
JHARKHAND	0.676	1.376	-6.437	6.397
KARNATAKA	0.317	1.525	-6.146	7.276
KERALA	0.549	1.667	-5.868	8.800
MADHYA PRADESH	0.318	1.833	-7.412	12.872
MAHARASHTRA	0.041	1.770	-8.664	9.336
ODISHA	1.083	1.430	-4.724	9.605
PUNJAB	0.430	1.368	-6.912	5.298
RAJASTHAN	0.363	1.472	-6.639	4.453
TAMIL NADU	0.326	1.652	-7.351	10.215
UTTAR PRADESH	0.309	1.508	-6.448	12.270
UTTARAKHAND	0.369	1.285	-5.457	4.260
WEST BENGAL	1.276	1.835	-6.233	12.773

**Table 3.4** State-wise Average Per Manufacturing Enterprise Estimated TFPR 2015-16

**Difference of Only Single Window Reforms or Only Tax Reforms**

In the state of Gujarat all six reforms were carried out (Figure 3.1) while in the state of Chhattisgarh five reforms were carried out, however, Single Window Reform was not carried out. I plot the TFPR Kernel density of Gujarat and Chhattisgarh below:



**Figure 3.2** TFPR Density Gujarat and Chhattisgarh

In the above figure we find that compared to 2010-11, in 2015-16 both Gujarat and Chhattisgarh saw an improvement in allocation as the dispersion of the TFPR has come down.<sup>6</sup> At the same time, the TFPR improvement in Gujarat is more than that of Chhattis-

<sup>6</sup>The comparison drawn here is based on the matched firms data where the firms are matched using the Propensity Score Matching technique discussed in the later section.

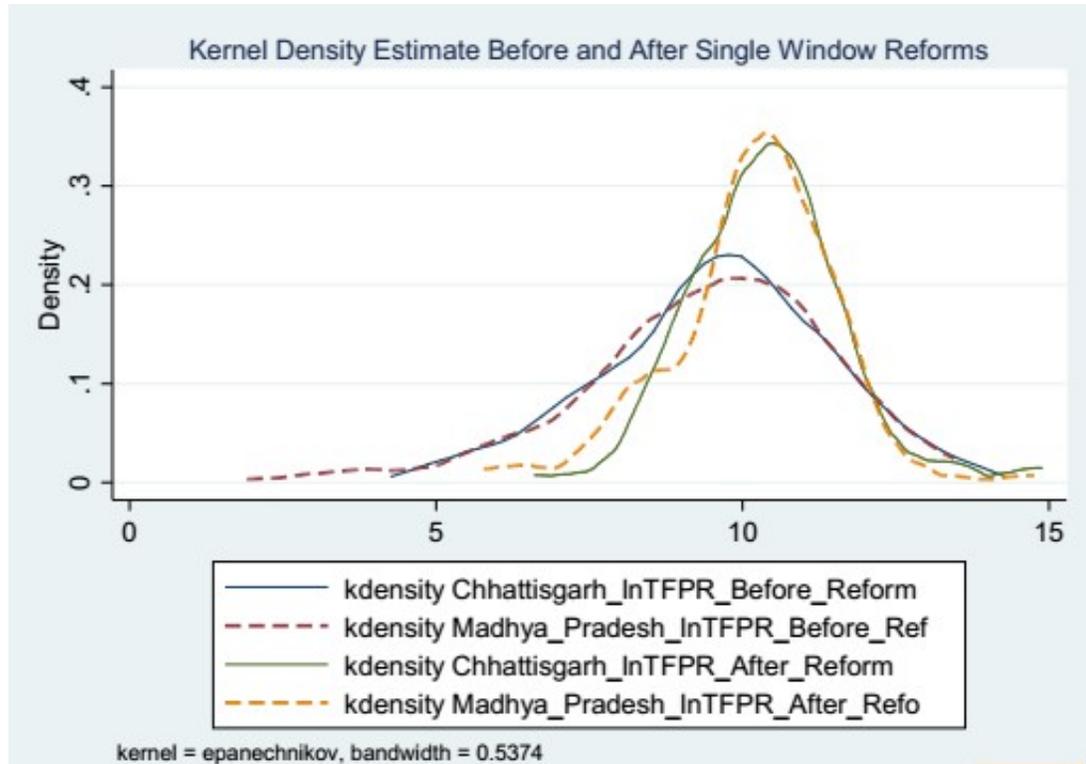
garh, as the shift in the mean TFPR is greater in Gujarat than in Chhattisgarh. This may be because of the Single Window Reform in Gujarat, as there is only one reform which has not been carried out in Chhattisgarh. However, we cannot claim that it is solely because of the Single Window Reforms. We do an extensive analysis later in the Chapter to confirm that it is due to reforms.

We also compare the states of Madhya Pradesh and Chhattisgarh. In Madhya Pradesh all six reforms were carried out and there is only one difference of reform between Madhya Pradesh and Chhattisgarh, that is, the Single Window Reform. We again find that there is an improvement in TFPR, in both Madhya Pradesh and Chhattisgarh. The improvement in TFPR is greater than that of Madhya Pradesh, as the dispersion of TFPR in Madhya Pradesh was more than that of Chhattisgarh before reforms. The dispersion of TFPR in Madhya Pradesh has decreased by a greater amount than that of Chhattisgarh.

Analogously, we also plot the TFPR kernel density of Gujarat-Andhra Pradesh, Madhya Pradesh-Andhra Pradesh and Madhya Pradesh-Haryana where there is only one reform difference, that is, tax reforms. If we compare the TFPR distribution of the states with only one reform difference, we find that the states implementing the reforms are better off in terms of total factor productivity.

### 3.5.2 Difference-in-Difference Estimation

As there are six broader set of reforms which have been carried out across states, I use the simple scoring method to find out the impact of greater number of reforms. I put Reform=0 if no reform, Reform=1 if any one reform out of the six reforms has been carried out, Reform=2 if two reforms have been carried out and so on (Reform=6 if all the six reforms have been carried out. I use the D-I-D method using the empirical specification in (Duflo (2001)). I use the natural log of the TFPR estimated using the method I adopted in Chapter 2 as the



**Figure 3.3** TFPR Density Madhya Pradesh and Chhattisgarh

dependent variable and control for firm size, age, ownership, location, State fixed effects and 3-digit level industry fixed effects. The empirical specification for the D-I-D estimation is as follows:

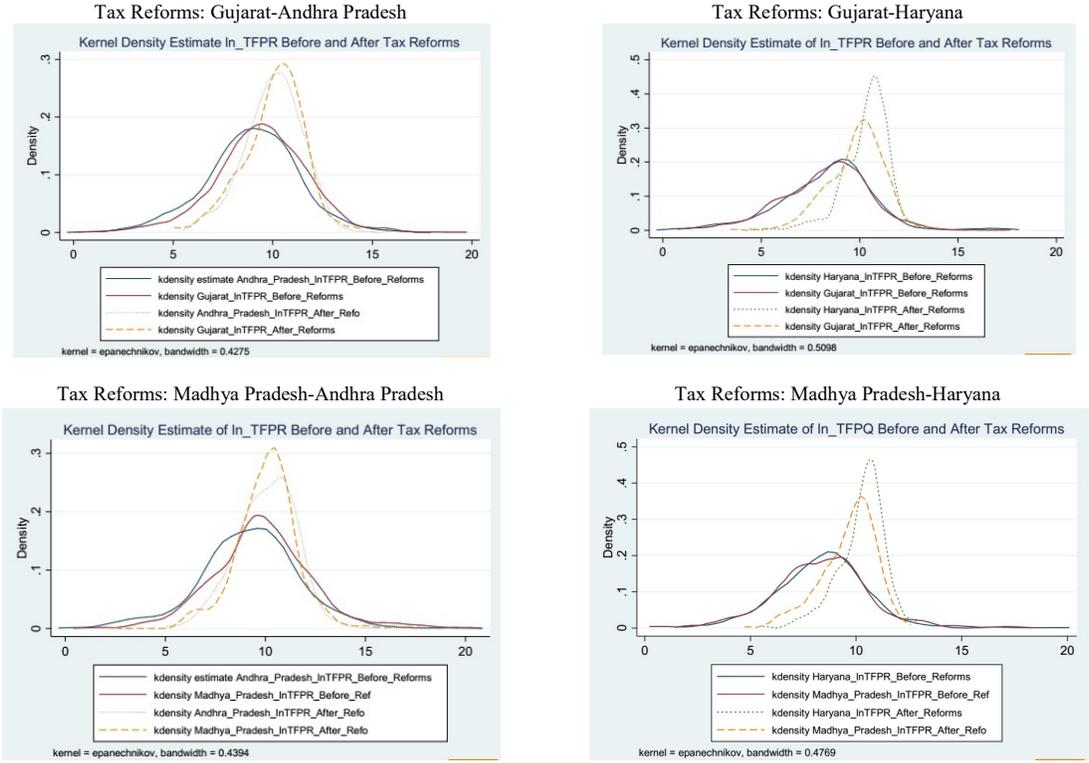


Figure 3.4 TFPR Density Gujarat, Madhya Pradesh and Haryana

$$\begin{aligned}
 \ln TFPR_{i,j,s,t} = & \alpha + \gamma_j + \phi_s + \beta_1 Size_{i,t} \\
 & + \beta_2 Age_{i,t} \\
 & + \beta_3 Ownership_{i,t} \\
 & + \sum_{k=1}^6 D_k I[k]_{s,t} \\
 & + D_7 Location_{s,t} \\
 & + \nu_{i,j,s,t}
 \end{aligned} \tag{3.1}$$

where,

- $i$  refers to enterprise,  $j$  refers to industry,  $s$  refers to State and  $t$  refers to year.
- $\ln\text{TFPR}$  is natural log of TFPR
- size is measured as the log of total assets
- ownership refers to the type of ownership (i.e., 1 is for male ownership, 2 for female, 3 for transgender, 4 for partnership in the same household, 5 for partnership in different household, 6 for self-help groups, 7 for trusts and 8 for others)
- $I[1] = 1$  if 1 reform,  $I[2] = 1$  if 2 reforms,  $I[3] = 1$  if 3 reforms,  $I[4] = 1$  if 4 reforms,  $I[5] = 1$  if 5 reforms and  $I[6] = 1$  if 6 reforms.
- location stands for rural or urban.

I control for State and 3-digit industry fixed effects in the above regression and estimate the robust standard errors clustered at the state-level.

Also, to check the robustness of my results, I run the same regression using the matched sample of the firms using the propensity score matching technique controlling for firm size (log of assets), age (years), location (rural/urban), state and 3-digit industrial classification, as described in the later section.

### 3.5.3 Propensity Score Matching Estimation

#### Finding Information on Bordering Districts of Two States

In Figure 3.5, I provide the political map of India which shows the state boundaries. Using the state-wise political maps, I find the information of the districts along the shared border of two states. The reason why I do that is along the neighboring districts almost all the spatial characteristics are similar. The differences can only arise due to the governance issues, laws and business conditions on the two sides of the border.



Figure 3.5 Map of India Showing State Boundaries

### Randomness of Reforms

I find that the implementation of reforms has broadly been random across the states and it has nothing to do with the development of states, if we take per-capita state gross domestic product (SGDP) as the measure of development. We run an OLS regression of the number of reforms on the per-capita state GDP and find that the coefficient of per-capita SGDP is not statistically significant (Table 3.5). This randomness of reforms implementation allows me to use reforms as treatment and do the propensity score matching.

### Propensity Score Matching Estimation Strategy

I prepare pairs of neighbouring states in which reforms have been carried out in one but not in the other. I filter in the firms located along the bordering districts of these two states. Out of the firms along the bordering districts, I estimate the probability of the firm to be located in the state in which a particular reform has been carried out. Match the firms based on

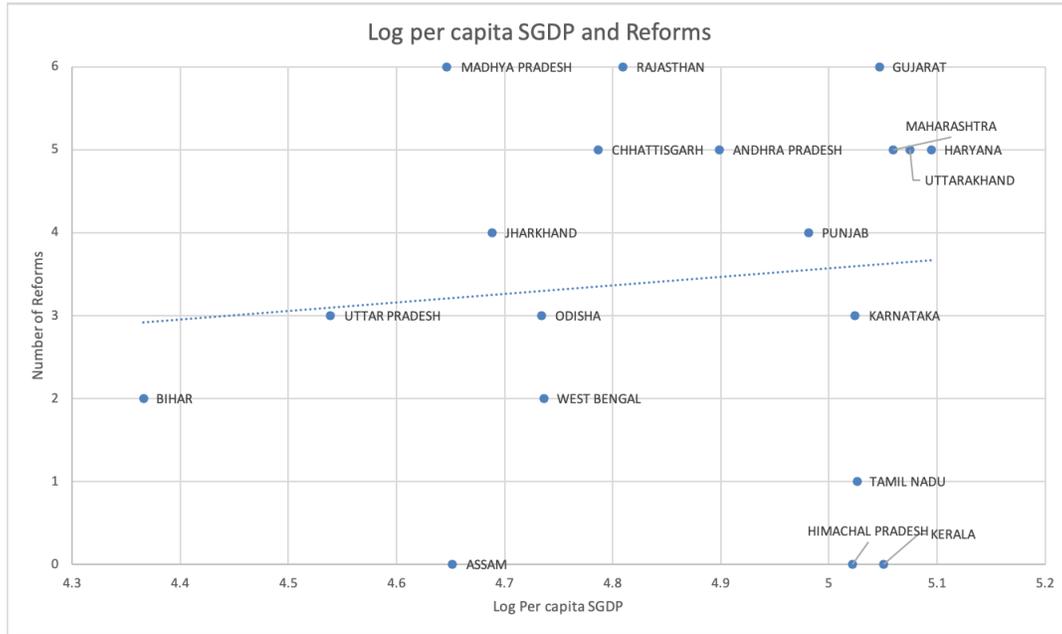


Figure 3.6 Log per-capita SGDP and Reforms

	Reforms
Log Per-capita SGDP	1.036 (0.440)
Constant	-1.606 (-0.140)
N	19
adj. R-sq	-0.047

Table 3.5 OLS Regression of Number of Reforms on Per-capita SGDP

propensity scores, controlling for firm size (log of assets), age (years), location (rural/urban), state and 3-digit industrial classification. Based on the PSM, I estimate the difference in the TFPR of the firms in the bordering districts of the two paired states before the reforms (2010-11) and after the reforms (2015-16). I do one-to-one matching if they share the (almost) same probability of being on the side of the border where the reform has been carried out.<sup>7</sup> I also confirm that covariates were well balanced in matched samples.

<sup>7</sup>I use STATA 14 command `psmatch2` with caliper 0.1.

I present here the maps of a few pairs of neighbouring states (Maps 3.7)<sup>8</sup>. The rest of the maps are provided in Appendix E.

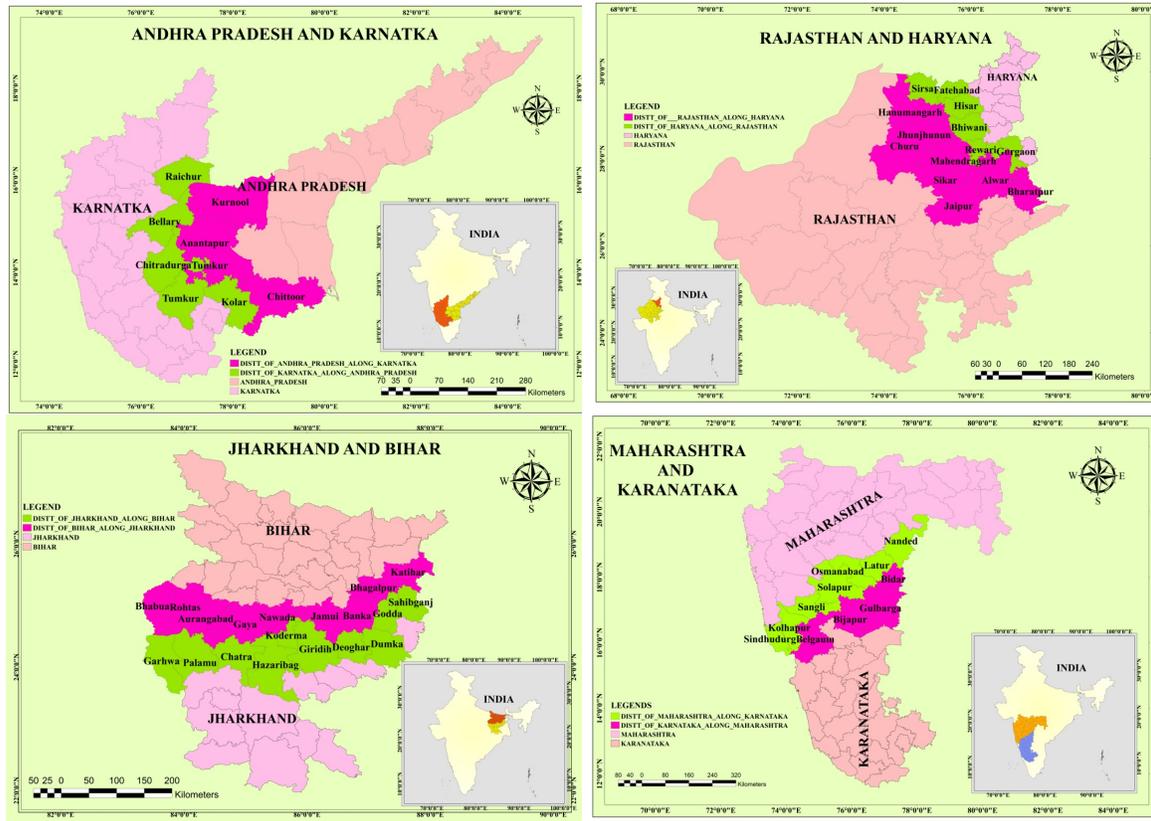


Figure 3.7 Bordering Districts Maps

Finally, I collect the average treatment effect on the treated (ATT) Log TFPR (treatment here is reform) of the firms along the bordering districts of the neighbouring states. Using these ATT estimates, I run the following OLS regressions to establish the impact of more reforms on the Log TFPR.

<sup>8</sup>I am grateful to Dr Ramanuj Kaushik, Assistant Professor of Geography and Geopolitics, D.A.V. (PG) College, Siwan, Bihar for providing me the neighbouring districts map of the states.

$$ATTLOGTFPR = \alpha + \beta ReformDifference + \epsilon \quad (3.2)$$

And,

$$ATTLOGTFPR = \alpha + \beta ReformDifference + \gamma ReformDifference^2 + \nu \quad (3.3)$$

## 3.6 Results

### 3.6.1 Difference-in-Difference Estimation Results

I find that, compared to the no reform case, the enterprises in the states where some or all the reforms have been carried out are better in terms of the TFPR, as presented in the regression table (Table 3.6). In this table, I also present the results in which only matched firms based on the propensity scores of more than 50 per cent are taken. The matched firms results show that the enterprises located in the states which have carried out all six reforms do better compared to all other states in terms of TFPR.

The impact of reforms on Log TFPR are presented below in Figure 3.8.

I estimate the TFPR difference (ATT TFPR Difference) using the pairs of states, such that the treated one is the one in which a particular reform has been carried out. I explain the results below one by one.

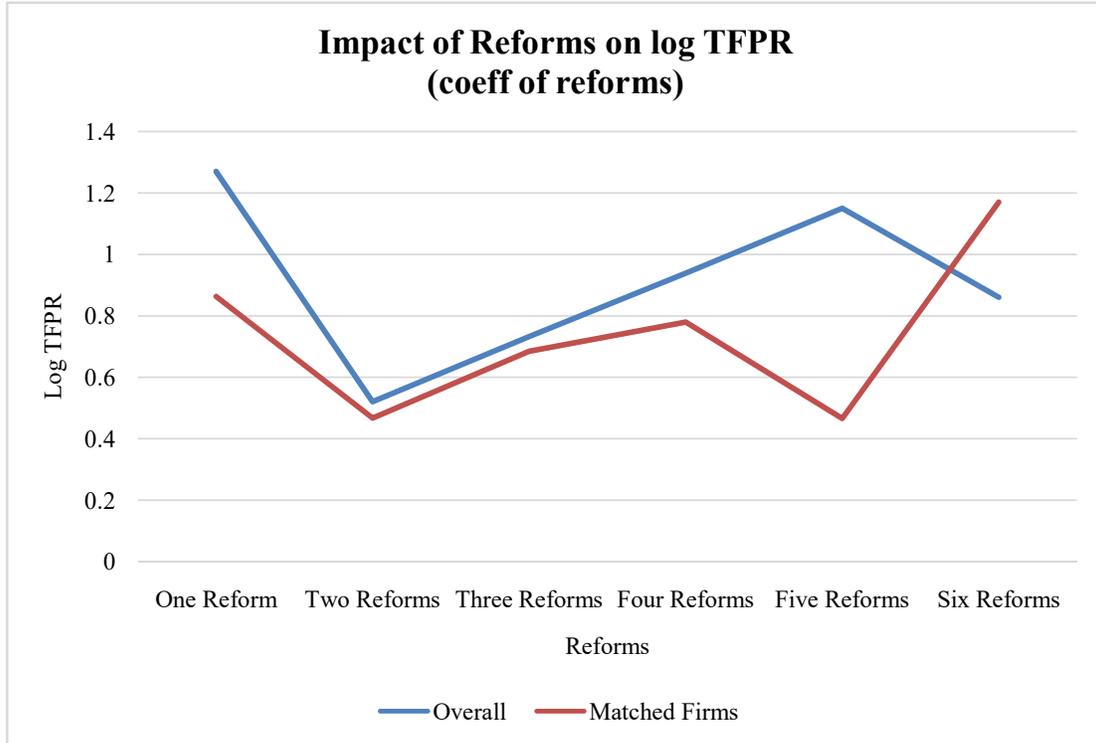
### 3.6.2 Single Window Reforms

Using the Business Reform Assessment Report of 2014-15, I prepare pairs of neighboring states, such that the Single Window Reforms were carried out in one but not in the other. Using the propensity score estimates based on logit estimation (with probability of the enterprise being in the state where Single Window Reforms were carried out), I match the enterprise. Then I estimate the TFPR difference in 2010-11 and 2015-16 (after the reform). The results are presented below:

## Business Reforms and Informal Manufacturing Sector Productivity

	[1]	[2]	
	Overall	Matched Firms	Base
One Reform	1.270*** (42.97)	0.863** (2.90)	Zero Reform
Two Reforms	0.521*** (19.99)	0.467* (1.78)	Zero Reform
Three Reforms	0.733*** (36.49)	0.685** (2.85)	Zero Reform
Four Reforms	0.939*** (26.72)	0.780* (2.11)	Zero Reform
Five Reforms	1.150*** (59.25)	0.466 (1.62)	Zero Reform
All Six Reforms	0.861*** (38.34)	1.170*** (5.27)	Zero Reform
Size	-1.110*** (-245.28)	-1.077*** (-95.91)	
Age	-0.001* (-1.68)	0.001 (1.33)	
Female Ownership	-0.592*** (-45.01)	-0.503*** (-13.82)	Male Owner
Transgender Ownership	0.570*** (12.44)	-0.063 (-0.62)	Male Owner
Partnership Same HH	1.057*** (22.37)	0.662*** (7.58)	Male Owner
Partnership Different HH	1.365*** (18.12)	1.080*** (10.27)	Male Owner
SHGs	-1.067 (-1.07)	-1.699* (-1.68)	Male Owner
Trusts	0.353 (0.51)	0.0892 (0.14)	Male Owner
Others	0.348 (1.00)	0.625 (0.86)	Male Owner
Urban	-0.0992*** (-10.42)	0.0607** (2.4)	Rural
Constant	12.41*** (191.04)	12.80*** (26.63)	
N	128737	20289	
adj. R-sq	0.577	0.579	

**Table 3.6** D-I-D Regression Results



**Figure 3.8** Impact of Reforms on Log TFPR

On plotting the difference in the TFPR differences post-reform and pre-reform on Y-axis and the pre-reform difference in TFPR, we find that if the pre-reform TFPR difference between the treated state and untreated state was negative the benefits from Single Window Reform was higher. Whereas, if the pre-reform difference was positive, the benefits from reform was lower (Figure 3.9). This result becomes more pronounced when we remove the outlier pair of states (Figure 3.10).

## Business Reforms and Informal Manufacturing Sector Productivity

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Andhra Pradesh-Karnataka	-0.489	-0.424
Andhra Pradesh-Odisha	-0.850	-0.514
Andhra Pradesh-Tamil Nadu	-0.357	-0.292
Haryana-Himachal Pradesh	0.194	0.411
Haryana-Uttar Pradesh	-0.139	0.417
Jharkhand-Bihar	0.440	0.288
Jharkhand-Chhattisgarh	0.400	-0.361
Jharkhand-Odisha	-0.120	-0.178
Jharkhand-West Bengal	-0.378	-0.387
Madhya Pradesh-Uttar Pradesh	-0.215	0.054
Madhya Pradesh-Chhattisgarh	0.071	-0.279
Maharashtra-Chhattisgarh	0.447	0.714
Maharashtra-Karnataka	0.377	0.287
Punjab-Himachal Pradesh	0.183	0.231
Rajasthan-Uttar Pradesh	-0.071	0.127
Uttarakhand-Himachal Pradesh	-0.022	0.604
Uttarakhand-Uttar Pradesh	0.262	0.280

Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.7** Effect of Single Window Reforms

### 3.6.3 Tax Reforms

In the table below (Table 3.8), I present the pre-reform and post reform differences in TFPR due to tax reforms. On plotting the difference in the TFPR difference after the reform and before the reform against the TFPR difference before the reform (Figure 3.11), we find that gains from tax reform is higher if the TFPR pre-reform was lower than the control state (the state in which tax reforms were not carried out). This is also reflected in Figure 3.12 after we remove the outlier pair of states.

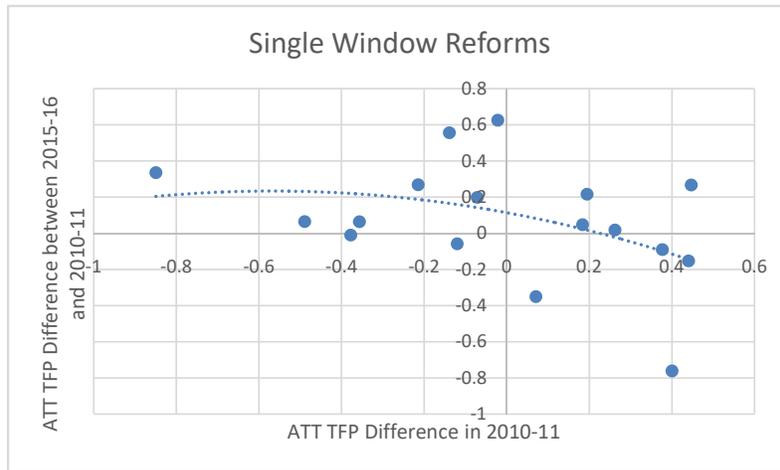


Figure 3.9 Single Window Reforms

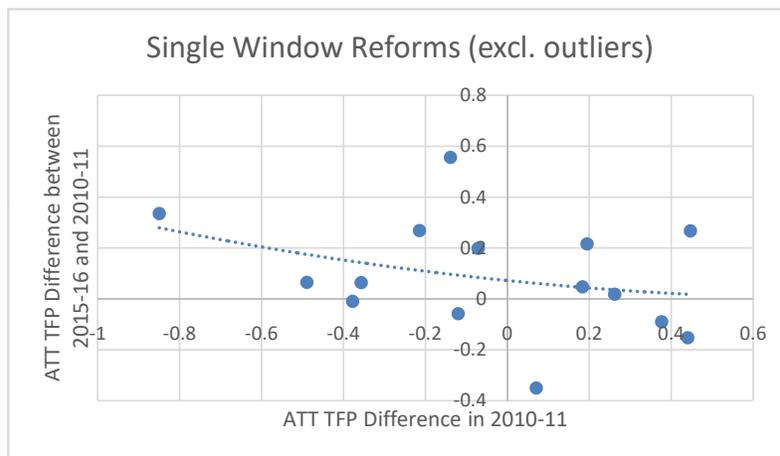


Figure 3.10 Single Window Reforms Excluding Outliers

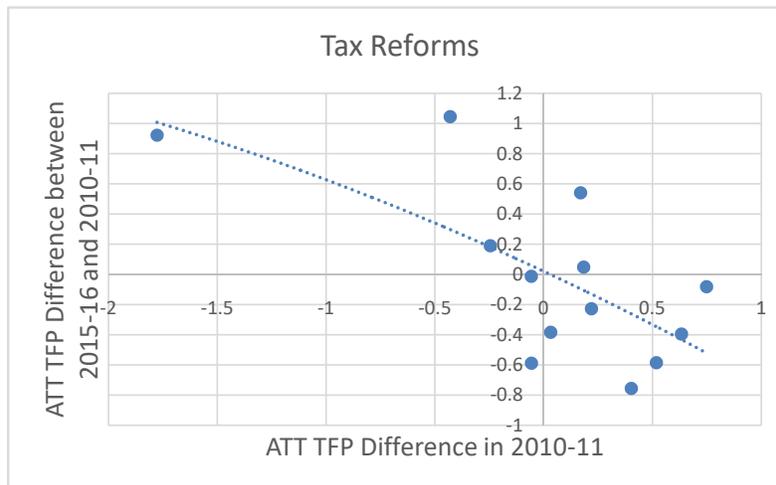
## Business Reforms and Informal Manufacturing Sector Productivity

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Bihar-Jharkhand	-0.246	-0.056
Chhattisgarh-Jharkhand	-0.430	0.615
Karnataka-Tamil Nadu	0.518	-0.068
Karnataka-Kerala	-1.777	-0.855
Odisha-Jharkhand	0.403	-0.354
Karnataka-Andhra Pradesh	0.170	0.710
Odisha-Andhra Pradesh	0.749	0.666
Punjab-Haryana	-0.057	-0.070
Punjab-Himachal Pradesh	0.183	0.231
Rajasthan-Haryana	-0.057	-0.646
Uttar Pradesh-Haryana	0.032	-0.352
Uttarakhand-Himachal Pradesh	0.219	-0.009
West Bengal-Jharkhand	0.633	0.237

Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.8** Effect of Tax Reforms



**Figure 3.11** Tax Reforms

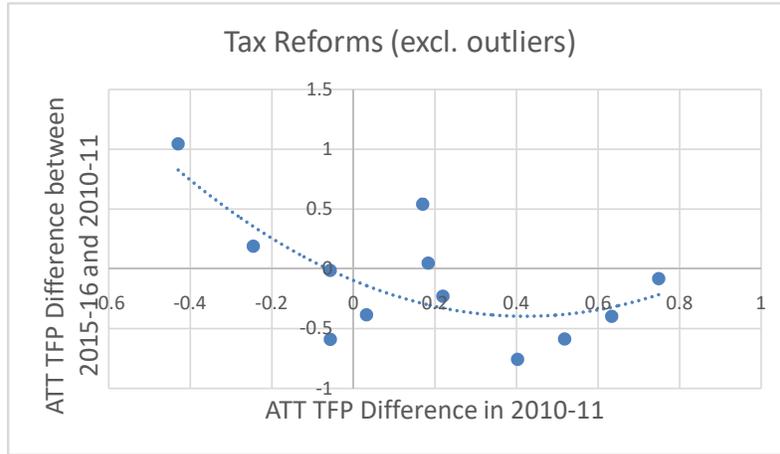


Figure 3.12 Tax Reforms Excluding Outliers

### 3.6.4 Construction Permit Reforms

We find the similar TFPR gains on an average due to construction permit reforms. We plot the difference of the differences in TFPR before and after the reforms in treated versus control states in Figure 3.13 and after removing the outliers in Figure 3.14.

### 3.6.5 Environment and Labour Reforms

In my sample, only two states did not carry out the environment and labour reforms, namely Himachal Pradesh and Kerala. The ensuing analogous table is presented below (Table 3.10).

### 3.6.6 Inspection Reforms and Commercial Disputes and Paperless Courts

Inspection reforms and the reforms for commercial disputes and paperless courts also brings down the differences in TFPR if the treated state had lesser TFPR compared to the TFPR

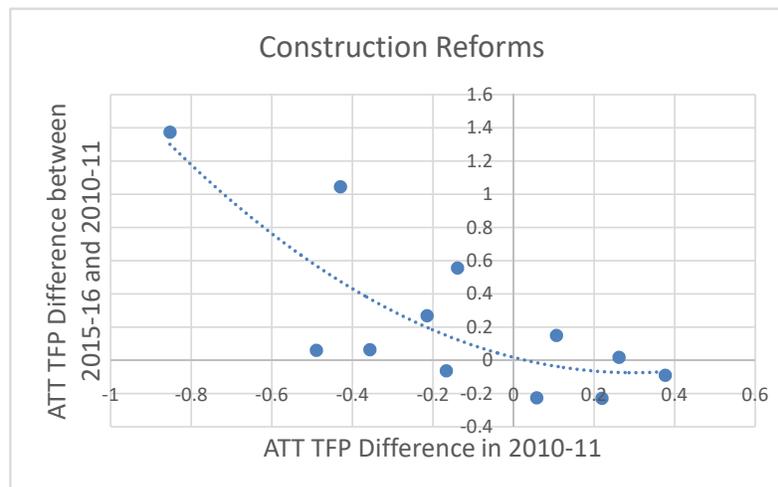
## Business Reforms and Informal Manufacturing Sector Productivity

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Andhra Pradesh-Karnataka	-0.489	-0.428
Andhra Pradesh-Odisha	-0.853	0.521
Andhra Pradesh-Tamil Nadu	-0.357	-0.292
Chhattisgarh-Jharkhand	-0.430	0.615
Chhattisgarh-Odisha	0.058	-0.168
Haryana-Punjab	0.107	0.257
Haryana-Uttar Pradesh	-0.139	0.417
Madhya Pradesh-Uttar Pradesh	-0.215	0.054
Maharashtra-Karnataka	0.377	0.287
Rajasthan-Punjab	-0.167	-0.230
Uttarakhand-Himachal Pradesh	0.219	-0.009
Uttarakhand-Uttar Pradesh	0.262	0.280

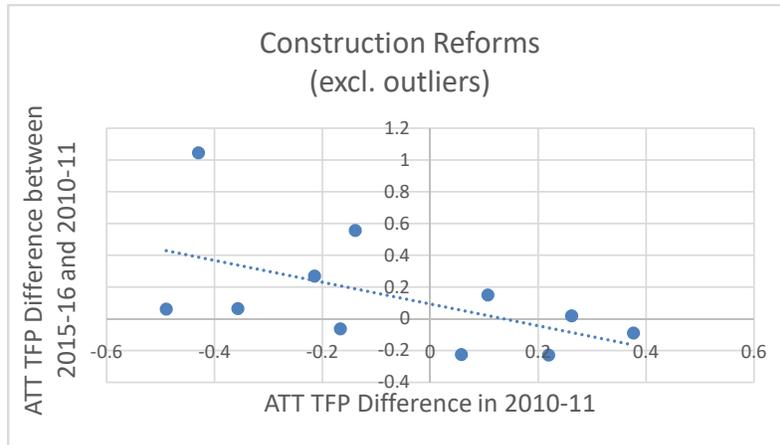
Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.9** Effect of Construction Permit Reforms



**Figure 3.13** Construction Reforms



**Figure 3.14** Construction Reforms Excluding Outliers

control state post-reform.

## Business Reforms and Informal Manufacturing Sector Productivity

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Haryana-Hamachal Pradesh	0.194	0.411
Karnataka-Kerala	-1.777	-0.855
Punjab-Himachal Pradesh	0.183	0.231
Tamil Nadu-Kerala	-0.322	-0.126
Uttarakhand-Himachal Pradesh	0.219	-0.009

Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.10** Effect of Environment and Labor Reforms

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Andhra Pradesh-Tamil Nadu	-0.357	-0.292
Gujarat-Maharashtra	0.445	-0.250
Haryana-Himachal Pradesh	0.194	0.411
Jharkhand-Bihar	0.246	0.056
Jharkhand-West Bengal	-0.633	-0.237
Karnataka-Maharashtra	-0.377	-0.287
Karnataka-Kerala	-1.777	-0.855
Karnataka-Tamil Nadu	0.518	-0.068
Madhya Pradesh-Maharashtra	0.254	-0.182
Punjab-Himachal Pradesh	0.183	0.231
Odisha-West Bengal	0.766	0.280
Uttarakhand-Himachal Pradesh	0.219	-0.009
Uttar Pradesh-Bihar	0.282	-0.457

Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.11** Effect of Inspection Reforms

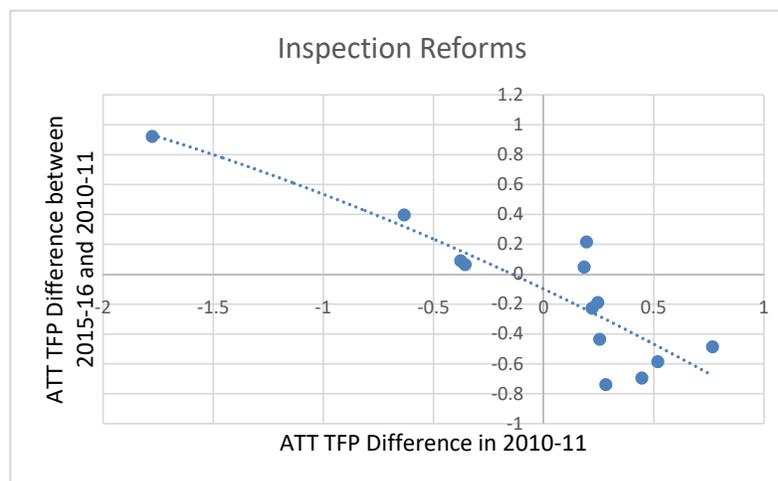
## Business Reforms and Informal Manufacturing Sector Productivity

Pairs of Neighbouring States	Before reform TFPR Difference(2010-11)	After Reform TFPR Difference (2015-16)
Andhra Pradesh-Tamil Nadu	-0.357	-0.292
Andhra Pradesh-Odisha	-0.850	-0.514
Andhra Pradesh-Karnataka	-0.489	-0.424
Haryana-Uttar Pradesh	-0.139	0.417
Haryana-Himachal Pradesh	0.194	0.411
Haryana-Punjab	0.057	0.070
Jharkhand-Bihar	0.440	0.288
Jharkhand-West Bengal	-0.378	-0.387
Jharkhand-Odisha	-0.120	-0.178
Madhya Pradesh-Uttar Pradesh	-0.215	0.054
Maharashtra-Karnataka	0.377	0.287

Note: The first state in the pair refers to the one in which the reform was carried out.

The ATT TFPR differences presented here are significant at at least 10% level of significance.

**Table 3.12** Effect of Commercial Dispute Paper-less Courts Reforms



**Figure 3.15** Inspection Reforms

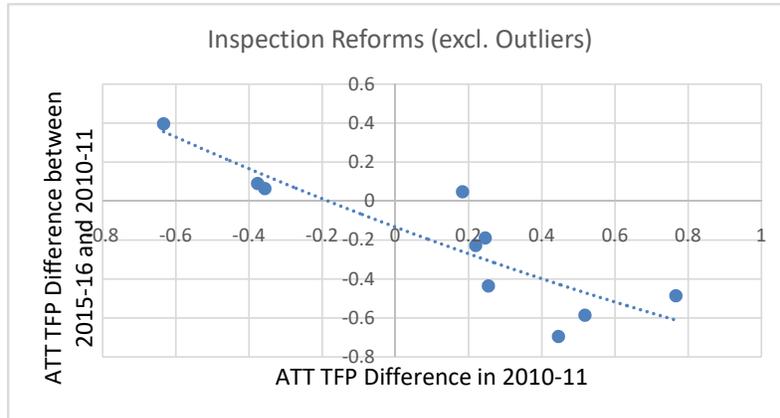


Figure 3.16 Inspection Reforms Excluding Outliers

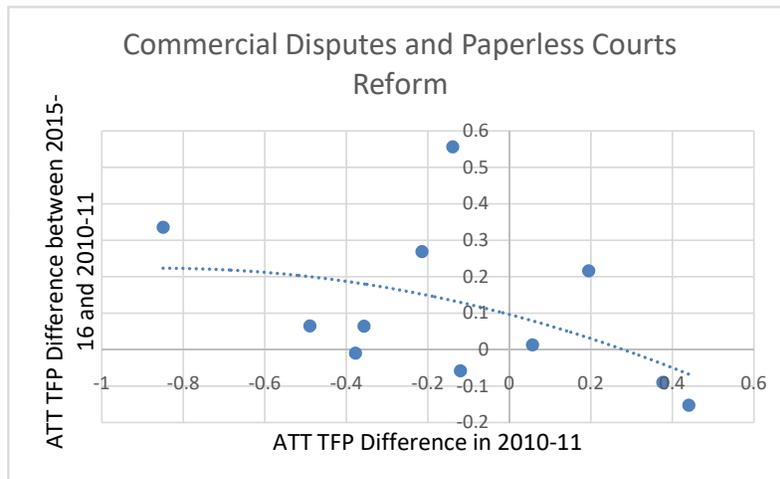


Figure 3.17 Paperless Court Reforms

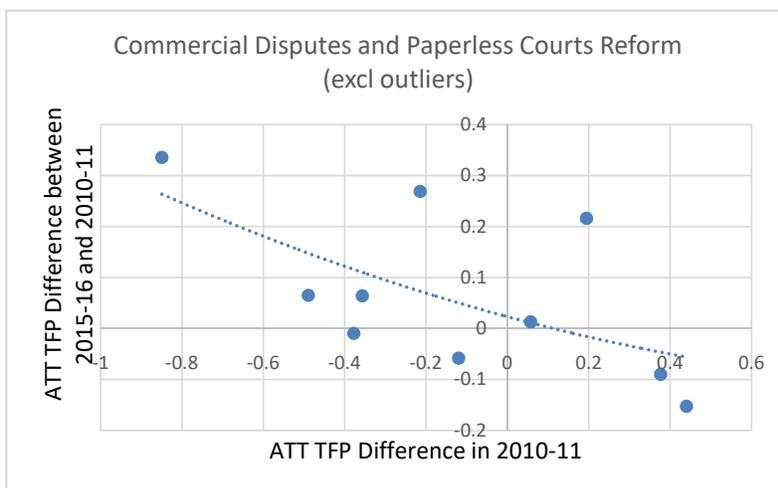
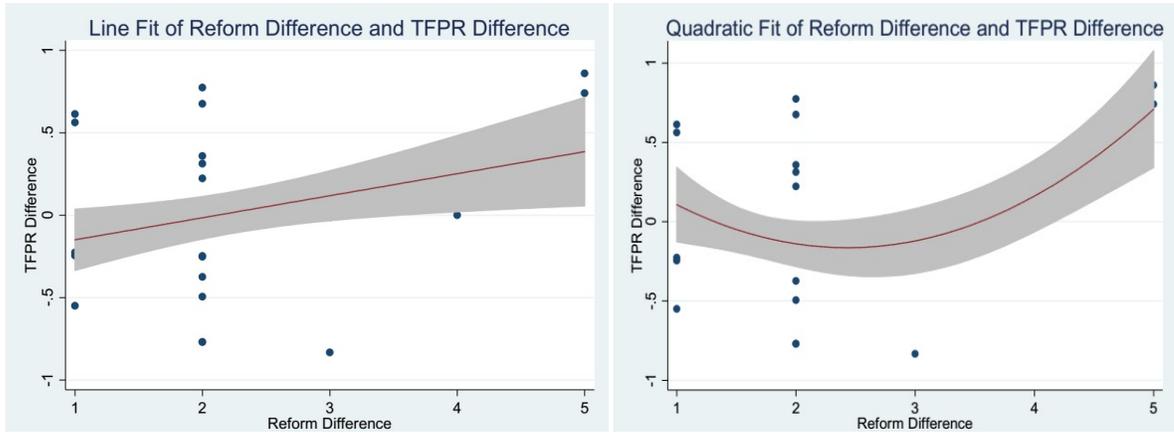


Figure 3.18 Paperless Court Reforms Excluding Outliers

### Impact of Reforms Difference on Log TFPR

On plotting the ATT Log TFPR on the difference of reforms, we find that the linear fit is not significantly different from zero, while the quadratic fit is significant (Figure3.19). This implies that the increasing reform difference have positive impact on the TFPR differences.



**Figure 3.19** Reform Difference and TFPR Difference

The regression results of the equations (3.2 and 3.3) are presented below.

In the result table (3.13) we find that model [2] is a better fit as the adjusted R-square is more than model [1]. The states have more reforms compared to the less reforms ones gain increasingly more in terms of TFPR. The marginal effects of reform differences on the Log TFPR are presented below.

We find that one reform difference on average results in an 0.132 percent increase in TFPR and this increases to 1.584 percent if there are six reforms difference, that is compared to the states with no reform, the TFPR is 1.584 percent more in the states which have carried out all the reforms.

	[1]	[2]
Reform Difference	0.134 (1.30)	-0.644 (-1.43)
Reform Difference Square		0.132* (1.77)
Constant	-0.283 (-1.09)	0.619 (1.09)
N	21	21
adj. R-sq	0.033	0.131

**Table 3.13** OLS Regression of ATT TFPR on Reforms

Reform Difference	ATT TFPR Difference (%)
1	0.132
2	0.528
3	0.792
4	1.056
5	1.32
6	1.584

**Table 3.14** Effect of Reforms on Log TFPR

### 3.7 Conclusion and Policy Implications

The business reforms, which were undertaken in India as a part of improvement in doing business during 2010-11 and 2014-15, were aimed at providing an improved business environment helped in improving the productivity of small and micro-manufacturing enterprises. This chapter adds to the literature of reforms and productivity in three distinct ways. Firstly, using the cross-section data of two rounds of nationally representative survey data, I estimate the total factor productivity of the unincorporated manufacturing enterprise in India. Secondly, using the matching technique (controlling for other firms characteristics) and Difference-in-Difference methods, in this paper, I identify the effect of business reforms on

the small and the micro-manufacturing enterprises. Finally, I empirically examine whether increasing the difference in reforms imply a better TFPR outcome.

I find that the reforms such as single window systems, tax reforms, construction permit reforms, environment and labour reforms, inspection reforms and commercial disputes reforms had a positive impact on the total factor productivity of unincorporated manufacturing enterprises in India. On assessing the differences in the total factor productivities in the treated (in which reforms have been carried out) and control states (in which the reforms were not carried out), pre-reforms and post-reform I find that the total factor productivities of the firms improved after the reforms. Finally, the greater the difference in business reforms, the greater the difference in total factor productivity.

These findings have wide-ranging implications for policymaking. Usually, it is believed that business reforms help bigger companies and the formal sector. I find that the business reforms also help in improving the total factor productivity of small and micro-firms. The business reforms, which make the business environment better and increase the ease of doing business, are beneficial and in the long-term may help in greater formalization. As these reforms can have positive spillover effects of other businesses, it is imperative on the states to carry out these reforms sooner than later.

The states which have carried out more reforms do better in terms of their manufacturing firms productivity compared to the states which have carried out less or no reforms. These benefits in total factor productivities would act as an incentive and encourage the states to make their business environment better. As these reforms simplify the otherwise lengthy and complicated business processes, it is imperative on the states to identify the areas where changes are needed and reform to ease doing of business.

The states which have carried out reforms can act as the role models for the states which have not carried out the reforms. There should be area-specific knowledge sharing among the states in order to understand the hurdles and solutions in implementation of reforms.

As these reforms are wide in their definition and are generally sets of small reforms, one of the essential areas of research in future is to focus on specific reforms within the broader sets and analyse their impact on productivity. The productivity impact of quality of reforms is also a critical research area, going forward.

## Concluding Remarks

Chapter 1 provides essential findings regarding a primary motive of the government of India and the Reserve Bank of India to ensure seamless and universal access to financial services to everyone in the country. To achieve these goals, it is important to understand the characteristics and the determinants of new loans taken by the households.

Household leverage, age of head of the household, education, and nature of employment are important factors associated with the household's probability of taking new loans. Hence, the financial institutions and the government agencies should design their loan products that address these issues. As the probability of taking new loans first decreases with age and then increases after a certain age, the financial institutions should design pension and insurance products which address the demand for loans at a higher age. As education eases the institutional credit constraints of the households, Reserve Bank of India's Financial Literacy Programs are well established to take steps to enhance the financial knowledge of the individuals in the rural and remote areas. As more bank branches result in the lesser institutional credit constraint, the bricks and mortar branches (i.e. branch offices) still play an important role even when the banks in India are employing the banking correspondent mechanism. The branch licensing and new banks' entry restrictions should be prudentially eased to further alleviate the institutional credit constraints.

In the future, one of the research areas is to assess the loan application rejections of the households directly. The national-level household surveys should be designed to include the questions related to loan application rejections. This would be useful in understanding the impact and transmission of government policies related to financial inclusion.

Chapter 2 finds that targeted credit supply, based on broad classification of the priority

sector, may result in misallocation of credit. Greater credit flows to less productive firms, and lesser credit flows to more productive firms.

In this regard, credit allocation needs to be deregulated gradually. The credit allocation system needs to be made more transparent rather than sticking to the broad definition of priority sector. Better assessment of firm productivity by the lenders can ensure efficient allocation of credit to the firms and increase the manufacturing sector efficiency and output. As better infrastructure development and better business environment help reduce the misallocation, the state governments should focus on improving the availability of electricity and roads connectivity. Reducing the burden on civil courts can also help improve the states' business condition and contribute to the improvement in the allocation of capital.

Going forward, one of the critical areas of research in this field is to look into the asymmetry of information and the problem of moral hazard which the banks face in India on the part of the enterprises. This would throw light on why misallocation happens as a result of greater credit availability.

Chapter 3 finds that the reforms such as single window systems, tax reforms, construction permit reforms, environment and labour reforms, inspection reforms and commercial disputes reforms positively impacted the total factor productivity of unincorporated manufacturing enterprises in India. Usually, it is believed that business reforms help bigger companies and the formal sector. This chapter finds that the business reforms also help improve the total factor productivity of small and micro-firms.

The business reforms, which make the business environment better and increase the ease of doing business, are beneficial and in the long-term may help in greater formalisation. The states which have carried out more reforms do better in terms of their manufacturing

firms productivity compared to the states which have carried out less or no reforms. These benefits in total factor productivities would act as an incentive and encourage the states to make their business environment better. In future, one of the essential areas of research in this field is to analyse the impact of the quality of reforms on the total factor productivity.

## APPENDICES

# Appendix A

## Household's credit market participation

Households decision to borrow from institutional sector depends on both, his demand for loans and the supply of loan by the institutional sector. The household debt that we observe can be considered to be the result decision process which involves many stages, where demand may be potentially rationed by supply. In the decision making process, when the household decides to borrow (i.e. participate in the credit market), it may apply to the institutional sources for loan or it may take the loan from the non-institutional sources thinking that his application for loan may be rejected by the institutional source or it may not apply for a loan at all. If the household is not discouraged to apply to the institutional source for loan his application has a chance of getting rejected by the lender as a result of which the household may decide to take loan from the non-institutional sources. The household may get discouraged to apply for loans does not take any loan at all. Therefore, the households that are not rejected by the institutional agencies or borrow from the informal sources after rejection from the institutional sources would have positive debt. Therefore, the household's observed debt is the result of a decision process and there are many possible ways in which the observed debt held by the household take a value zero.

As the household decision to participate in the institutional sector for credit involves many stages, we would have to use estimation models in which we can account for such decision process of household credit demand. This methodology has been adopted partly from Chen and Chivakul (2008). But, in their case they directly observe the data on rejected loan applications. In our case we do not observe the rejection of loan applications by the institutional sources. In our estimation process, we first estimate the outcome of following

two decision processes:

1. the probability of having a positive new debt (either institutional or non-institutional);
2. the probability of the household being institutional credit constraint. In the end, we estimate the following.
3. the desired amount of institutional debt.

In order to account for the decision process of the household we use the following “latent” demand and supply equations:

$$Loan_{Demand} = X_1' \alpha + \varepsilon_D \quad (A.1)$$

$$Loan_{Supply} = X_2' \gamma + \varepsilon_S \quad (A.2)$$

## Household's probability of having a positive debt

Household's desired amount of loan can be explained by a set of variables denoted by vector  $X_1$ . The household demand for debt and can be represented by the latent demand function  $Loan_{Demand}$  in the above equation[A.1].  $Loan_{Demand}$  cannot be observed in the dataset. In other words, it is a an unobservable continuous random variable.  $X_1$  is a vector of variables that determine whether a household would desire to hold positive debt (institutional or non-institutional), and  $\varepsilon_D$  is a random error term.

We only observe whether households have positive debt through observable information information in the data. We define a binary random variable  $d$  as follows:

$$d = 1 \text{ if the household desires debt i.e. } Loan_{Demand} > 0 \text{ and } Loan_{Supply} > 0$$

$$d = 0 \text{ if the household does not desire debt i.e. } Loan_{Demand} > 0 \text{ and } Loan_{Supply} = 0 \text{ or } Loan_{Demand} = 0$$

Here,  $d$  can be observed. We identify  $d = 1$  if the household has borrowed from the institutional and the non-institutional sources. The reason why it is logical to assume that the

households borrowing from the non-institutional sources is that these are the households who have positive demand for loans but are either rejected from borrowing from the institutional sources or have been discouraged because they believed they would be refused, or they had inadequate collateral. We define  $d = 0$  if the household does not take any loan. As we do not have the data which says whether household's application for loan was accepted or rejected, we can assume that the household whose demand for loan has been rejected by the institutional sources may turn towards non-institutional sources, thereby, still have positive amount of debt. Therefore, we can logically assume that the households who have not taken loan, have no demand for loan.

To estimate the probability of a household having a positive debt we estimate a probit model in which we use  $d$  as a dependent variable and a set of explanatory variables explained by vector  $X_1$ .

## Institutional Credit Constraint of the Households

A household may desire to have positive debt from the institutional sources, but, it may be subject to various evaluations in the above supply equation[A.2]  $Loan_{SupplyInstitutional}$  is continuous and unobservable.  $X_2$  is a vector of variables that affect the institutional lender's decision to provide loan to the household or not.

If  $Loan_{Demand} > Loan_{SupplyInstitutional}$ , such household are institutional credit constrained.

We define a corresponding binary variable  $s$  as follows:

$s = 0$  if the household is not institutional credit constrained i.e.  $Loan_{SupplyInstitutional} > 0$

$s = 1$  if the household is credit constrained i.e  $Loan_{SSupplyInstitutional} < 0$

We define  $s = 1$  if the household has either borrowed from non-institutional sources or has not borrowed any loan. We identify  $s = 0$  if household was able to obtain a loan from the institutional sources. We estimate a probit model with  $s$ , i.e. the probability of household being institutional credit constrained, as a dependent variable.

## Determinants of institutional credit

Let us assume that household requirement of debt -  $DD$  can be explained by variables which is indicated by vector  $X$ :

$$DD = X'\beta + \epsilon_{DD} \quad (\text{A.3})$$

where  $\epsilon_{DD}$  is the disturbance term.

Above equation can be estimated by

- (a) OLS (ordinary least squares); and
- (b) Two-step Heckman selection method.

As the demand for institutional debt  $DD$  is not directly observable in our dataset and we only observe the amount of positive institutional or non-institutional debt that each household has borrowed and is not completely credit constrained. We may be committing a self-selection bias if we estimate the above equation by only using the observed amount of institutional debt as the dependent variable. As for many households would either have borrowed from the non-institutional sources or would not have borrowed at all (amount of loan taken would be zero), it would not be desirable to estimate the demand in this way. If we estimate the demand for the institutional debt in this way, we would be likely underestimating the demand for the institutional loan. Heckman selection model (Heckman 1976) is the suitable estimation technique for such kind of problem. We account for the two selection mechanisms using two inverse Mills ratios (IMRs). In our two step estimation procedure—estimates from the two selection equations of demand and supply to include every individual who wants to participate in the institutional credit market and then estimate the desired stock of debt given the extra information obtained from the first step. Our Heckman estimation is slightly different as we include the two inverse Mills ratios (IMRs) into the desired debt function. First, the conditional expectation of desired debt can be expressed as follows:

$$E(DD | d = 1, s = 1) = \beta' X + E(\varepsilon_{DD} | d = 1, s = 1) \quad (\text{A.4})$$

If  $(\varepsilon_{DD}, \varepsilon_D, \varepsilon_S)$  follow normal distribution with variance  $(\sigma, 1, 1)$ . The variance-covariance matrix can be written as follows:

$$V = \begin{pmatrix} \sigma^2 & \sigma_{DD,D} & \sigma_{DD,S} \\ \sigma_{DD,D} & 1 & \sigma_{D,S} \\ \sigma_{S,DD} & \sigma_{S,D} & 1 \end{pmatrix}$$

Therefore,  $E(\varepsilon_{DD} | d = 1, s = 1) = E(\varepsilon_{DD} | \varepsilon_D > -X_1' \alpha, \varepsilon_S > -X_2' \gamma) = \sigma_{DD,D} M_{DD,D} + \sigma_{DD,S} M_{DD,S}$

If  $\varepsilon_S$  and  $\varepsilon_D$  are uncorrelated, then  $M_{DD,D}$  and  $M_{DD,S}$  are the IMRs from the demand and supply equations and and DD equation. In our estimation, we assume that  $\varepsilon_S$  and  $\varepsilon_D$  are not correlated. Therefore, we can directly compute  $M_{DD,D}$  and  $M_{DD,S}$  from the selection equations. Hence, we can include the two inverse Mills ratios into the desired debt function as follows:

$$DD = X' \beta + \varepsilon_{DD} + \sigma_{DD,D} M_{DD,D} + \sigma_{DD,S} M_{DD,S} + \varepsilon \quad (\text{A.5})$$

We use the method adopted by Crook (1996) and Chen and Chivakul (2008), and assume that variables determining the participation of a household into the credit market are the same variables which determine the amount of borrowing by the households. This is due to that fact that the variables affecting the borrowing decision also affect the amount of borrowing. We use both simple ordinary least squares technique (without any selection model) as well as Heckman's sample selection method to estimate the demand for loan by the household.

# Appendix B

## Probit Regression Performance and Heckman's Formulation

Table B.1 Participation Probit Regression Performance

Probit model for participation

Classified	True		Total
	D	~D	
+	19980	11862	31842
-	7318	15431	22749
Total	27298	27293	54591

Classified + if predicted Pr(D) >= .5  
True D defined as participation != 0

Sensitivity	Pr( +  D)	73.19%
Specificity	Pr( - ~D)	56.54%
Positive predictive value	Pr( D  +)	62.75%
Negative predictive value	Pr(~D  -)	67.83%
False + rate for true ~D	Pr( + ~D)	43.46%
False - rate for true D	Pr( -  D)	26.81%
False + rate for classified +	Pr(~D  +)	37.25%
False - rate for classified -	Pr( D  -)	32.17%
Correctly classified		64.87%

Table B.2 Marginal Effects of Participation Probit Regression

	Delta-method				[95% Conf. Interval]	
	dy/dx	Std. Err.	z	P> z		
leverage	-.3972908	.0074626	-53.24	0.000	-.4119173	-.3826643
b3q1	-.0060734	.0010059	-6.04	0.000	-.008045	-.0041018
2.head_sex	.0223419	.007878	2.84	0.005	.0069013	.0377825
head_age	-.0025793	.0001898	-13.59	0.000	-.0029514	-.0022073
2.Sector	.0200339	.0050127	4.00	0.000	.0102093	.0298586
literacy						
2	.0171714	.0241012	0.71	0.476	-.0300661	.0644089
3	.0185679	.0056508	3.29	0.001	.0074925	.0296433
4	-.0687896	.0065514	-10.50	0.000	-.08163	-.0559491
region						
4	.1385362	.0250768	5.52	0.000	.0893865	.1876859
5	.1323394	.0207368	6.38	0.000	.091696	.1729829
hhtype						
2	-.0657797	.0062083	-10.60	0.000	-.0779477	-.0536116
3	.0301634	.0063032	4.79	0.000	.0178093	.0425175
4	-.0287341	.0129912	-2.21	0.027	-.0541964	-.0032718
purpose						
2	-.0695461	.0066324	-10.49	0.000	-.0825453	-.0565469
3	.0221533	.0061928	3.58	0.000	.0100156	.0342911
4	.0450754	.0089877	5.02	0.000	.0274599	.0626908
2.institutional_access	.0223525	.0068342	3.27	0.001	.0089577	.0357474
deposit_shock	-.001562	.0002447	-6.38	0.000	-.0020416	-.0010824
social_group						
2	.0185211	.0084398	2.19	0.028	.0019795	.0350628
3	.0407079	.0073612	5.53	0.000	.0262802	.0551356
9	-.0105634	.0077776	-1.36	0.174	-.0258071	.0046803

Note: dy/dx for factor levels is the discrete change from the base level.

Table B.3 Institutional Borrowing Constraint Probit Performance

Probit model with sample selection	Number of obs	=	54,031
	Censored obs	=	27,013
	Uncensored obs	=	27,018
Log likelihood = -50378.14	Wald chi2(21)	=	4411.23
	Prob > chi2	=	0.0000

	Coef.	Std. Err.	z	P> z	[95% Conf. Interval]
<b>formal_borrowing</b>					
log_Total_Asset	.1233408	.0067648	18.23	0.000	.110082 .1365997
2.head_sex	.1225757	.0287405	4.26	0.000	.0662454 .178906
head_age	.021567	.0041553	5.19	0.000	.0134227 .0297114
c.head_age#c.head_age	-.0001523	.0000412	-3.70	0.000	-.0002331 -.0000715
2.Sector	.1551782	.0186379	8.33	0.000	.1186486 .1917078
<b>literacy</b>					
2	.0221436	.0870384	0.25	0.799	-.1484486 .1927358
3	.2084958	.0204021	10.22	0.000	.1685085 .2484831
4	.3059937	.0257188	11.90	0.000	.2555858 .3564016
<b>region</b>					
4	-.8949707	.1550935	-5.77	0.000	-1.198948 -.590993
5	-.7865794	.1439384	-5.46	0.000	-1.068694 -.5044653
<b>hhtype</b>					
2	.3620237	.0248529	14.57	0.000	.313313 .4107344
3	.2090751	.0226031	9.25	0.000	.1647738 .2533764
4	.2624181	.0519518	5.05	0.000	.1605944 .3642418
<b>2.institutional_access</b>					
new_branches	-.5377402	.0239738	-22.43	0.000	-.584728 -.4907523
<b>social_group</b>					
2	-.0173976	.0314455	-0.55	0.580	-.0790296 .0442345
3	-.0460013	.0277526	-1.66	0.097	-.1003954 .0083928
9	.1850758	.0303797	6.09	0.000	.1255327 .244619
<b>purpose</b>					
2	.6551782	.0277055	23.65	0.000	.6008764 .7094799
3	.7780835	.0238478	32.63	0.000	.7313427 .8248244
4	-.4752129	.0317557	-14.96	0.000	-.5374528 -.4129729
_cons	-1.712157	.196621	-8.71	0.000	-2.097527 -1.326787
<b>participation</b>					
leverage	-1.013913	.0192701	-52.62	0.000	-1.051682 -.9761446
c.leverage#c.leverage	.0485238	.0010697	45.36	0.000	.0464273 .0506202
dependency_ratio	-.0346051	.0093916	-3.68	0.000	-.0530123 -.0161979
2.head_sex	.0731711	.0198349	3.69	0.000	.0342955 .1120467
head_age	-.0220907	.0029696	-7.44	0.000	-.0279109 -.0162704
c.head_age#c.head_age	.0001529	.0000291	5.26	0.000	.0000959 .0002099
2.Sector	.0471779	.0126568	3.73	0.000	.022371 .0719848
<b>literacy</b>					
2	.0348135	.0607774	0.57	0.567	-.084308 .1539351
3	.0467025	.0142668	3.27	0.001	.0187401 .074665
4	-.1697111	.0166647	-10.18	0.000	-.2023734 -.1370488
<b>region</b>					
4	.3517789	.0669089	5.26	0.000	.2206399 .4829179
5	.3430701	.0567386	6.05	0.000	.2318645 .4542756
<b>hhtype</b>					
2	-.1640155	.0158367	-10.36	0.000	-.1950548 -.1329762
3	.0807894	.0158404	5.10	0.000	.0497427 .1118361
4	-.0497633	.0341178	-1.46	0.145	-.116633 .0171064
<b>purpose</b>					
2	-.1807695	.0170693	-10.59	0.000	-.2142247 -.1473144
3	.05254	.0156267	3.36	0.001	.0219123 .0831678
4	.1164443	.022752	5.12	0.000	.0718511 .1610374
<b>2.institutional_access</b>					
deposit_shock	.0592977	.0172757	3.43	0.001	.025438 .0931575
<b>social_group</b>					
2	.0520302	.0213369	2.44	0.015	.0102108 .0938497
3	.1083239	.0186082	5.82	0.000	.0718525 .1447953
9	-.0189439	.0196965	-0.96	0.336	-.0575484 .0196606
_cons	.4817091	.0972544	4.95	0.000	.291094 .6723242
/athrho	-.0371751	.0381461	-0.97	0.330	-.1119401 .0375899
rho	-.037158	.0380934			-.1114749 .0375722

LR test of indep. eqns. (rho = 0):	chi2(1) =	0.95	Prob > chi2 = 0.3291
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Table B.4 Institutional Borrowing Constraint Heckman Probit Regression Result

	Delta-method				[95% Conf. Interval]	
	dy/dx	Std. Err.	z	P> z		
log_Total_Asset	-.0064654	.0016087	-4.02	0.000	-.0096184	-.0033124
2.head_sex	-.0391625	.0073453	-5.33	0.000	-.053559	-.0247659
head_age	-.0001973	.0001769	-1.12	0.265	-.0005441	.0001495
2.Sector	-.0239115	.0045944	-5.20	0.000	-.0329164	-.0149066
literacy						
2	-.0078643	.0216585	-0.36	0.717	-.0503143	.0345856
3	-.0565254	.0051383	-11.00	0.000	-.0665962	-.0464545
4	-.017201	.0060396	-2.85	0.004	-.0290384	-.0053637
region						
4	-.0404426	.023524	-1.72	0.086	-.0865488	.0056635
5	-.0179214	.0195451	-0.92	0.359	-.0562291	.0203864
hhtype						
2	-.0034267	.0056646	-0.60	0.545	-.0145291	.0076757
3	-.0371015	.0060293	-6.15	0.000	-.0489188	-.0252842
4	-.0216411	.0119737	-1.81	0.071	-.0451091	.0018269
.institutional_access	.110288	.0057085	19.32	0.000	.0990996	.1214764
new_branches	-.0004846	.0001014	-4.78	0.000	-.0006833	-.0002859
social_group						
2	-.0030588	.0077067	-0.40	0.691	-.0181636	.012046
3	-.0212483	.0067365	-3.15	0.002	-.0344516	-.0080451
9	-.0189711	.0071662	-2.65	0.008	-.0330166	-.0049257
purpose						
2	-.071567	.006246	-11.46	0.000	-.0838089	-.0593251
3	-.1759645	.0059812	-29.42	0.000	-.1876874	-.1642417
4	.0808803	.0070553	11.46	0.000	.0670521	.0947085

Note: dy/dx for factor levels is the discrete change from the base level.

**Table B.5** Marginal Effects of Institutional Borrowing Constrained Probit Regression

Probit model for formal\_credit\_constrained

Classified	True		Total
	D	~D	
+	37147	16395	53542
-	524	525	1049
Total	37671	16920	54591

Classified + if predicted Pr(D) >= .5  
True D defined as formal\_credit\_constrained != 0

Sensitivity	Pr( +  D)	98.61%
Specificity	Pr( - ~D)	3.10%
Positive predictive value	Pr( D  +)	69.38%
Negative predictive value	Pr(~D  -)	50.05%
False + rate for true ~D	Pr( + ~D)	96.90%
False - rate for true D	Pr( -  D)	1.39%
False + rate for classified +	Pr(~D  +)	30.62%
False - rate for classified -	Pr( D  -)	49.95%
Correctly classified		69.01%

Table B.6 New Debt Demand Regression: OLS

Source	SS	df	MS	Number of obs	=	54,031
Model	92442.5737	23	4019.24234	F(23, 54007)	=	156.81
Residual	1384239.94	54,007	25.6307505	Prob > F	=	0.0000
				R-squared	=	0.0626
				Adj R-squared	=	0.0622
Total	1476682.52	54,030	27.3307887	Root MSE	=	5.0627

log_max_loan_new	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]
leverage	-2.760047	.0540719	-51.04	0.000	-2.866028 -2.654065
c.leverage#c.leverage	.1436692	.0036209	39.68	0.000	.1365722 .1507663
dependency_ratio	-.1518481	.0368159	-4.12	0.000	-.2240075 -.0796887
2.head_sex	.2816741	.0777604	3.62	0.000	.129263 .4340851
head_age	-.0798997	.0116015	-6.89	0.000	-.1026386 -.0571607
c.head_age#c.head_age	.0005896	.0001138	5.18	0.000	.0003665 .0008126
2.Sector	.2521725	.0497313	5.07	0.000	.1546988 .3496463
literacy					
2	.0714501	.2399053	0.30	0.766	-.3987661 .5416663
3	.2502109	.0562745	4.45	0.000	.1399124 .3605094
4	-.3615482	.0657074	-5.50	0.000	-.4903351 -.2327612
region					
4	1.545016	.2597665	5.95	0.000	1.035872 2.05416
5	1.079133	.2188463	4.93	0.000	.6501923 1.508073
hhtype					
2	-.6128587	.0621117	-9.87	0.000	-.7345981 -.4911192
3	.0752704	.0622198	1.21	0.226	-.046681 .1972217
4	-.1666358	.1336462	-1.25	0.212	-.4285834 .0953118
purpose					
2	-.5153717	.0673293	-7.65	0.000	-.6473377 -.3834058
3	.3069681	.0620354	4.95	0.000	.1853783 .428558
4	.3061914	.0887231	3.45	0.001	.1322934 .4800894
2.institutional_access	-.0919541	.0675435	-1.36	0.173	-.22434 .0404318
deposit_shock	-.010439	.0024013	-4.35	0.000	-.0151456 -.0057325
social_group					
2	.1746133	.0839847	2.08	0.038	.0100026 .3392241
3	.5664796	.0733398	7.72	0.000	.422733 .7102262
9	.0689331	.0775557	0.89	0.374	-.0830767 .2209428
_cons	6.681881	.3782144	17.67	0.000	5.940578 7.423184

# Appendix C

## Preparation of ASI Data

In this appendix I present the additional information on the Annual Survey of Industry Data. I extract the data on variables of interest by writing the dictionary files to extract from the raw data files which are coded in text formats. I use the schedules of the annual surveys to prepare the dictionary files. The ASI data before 2000 was collected for all those enterprises which had more than 200 employees. From 2000 onward the data was collected from all the enterprises which had more than 100 employees. To avoid adjustment of the data, I take my sample from 2000 onward. there were few new states which were created in the year 2001 by carving out from big states viz. Jharkhand from erstwhile Bihar, Uttarakhand from erstwhile Uttar Pradesh and Chhattisgarh from erstwhile Madhya Pradesh I assign the location of establishments to the last observed state, which correctly places establishments despite state splits, as long as the establishment is surveyed after 2001.

India classifies manufacturing establishments with its National Industrial Classification (NIC), which is similar to the other countries. The NICs were revised on several occasions, i.e., in 1987, 1998, 2004, and 2008. I convert all NICs to NIC-1987 scheme using the concordance tables provided by the Ministry of Statistics and Programme Implementation (MOSPI).

I deflate all the amounts which were in nominal terms to constant 2004-05 Rupees. Gross sales is deflated by 3-digit commodity price deflators by using the Wholesale Price Index

numbers by groups and subgroups (annual average). This data is published by the Office of Economic Adviser.

# Appendix D

## State-wise Credit Availability and Misallocation

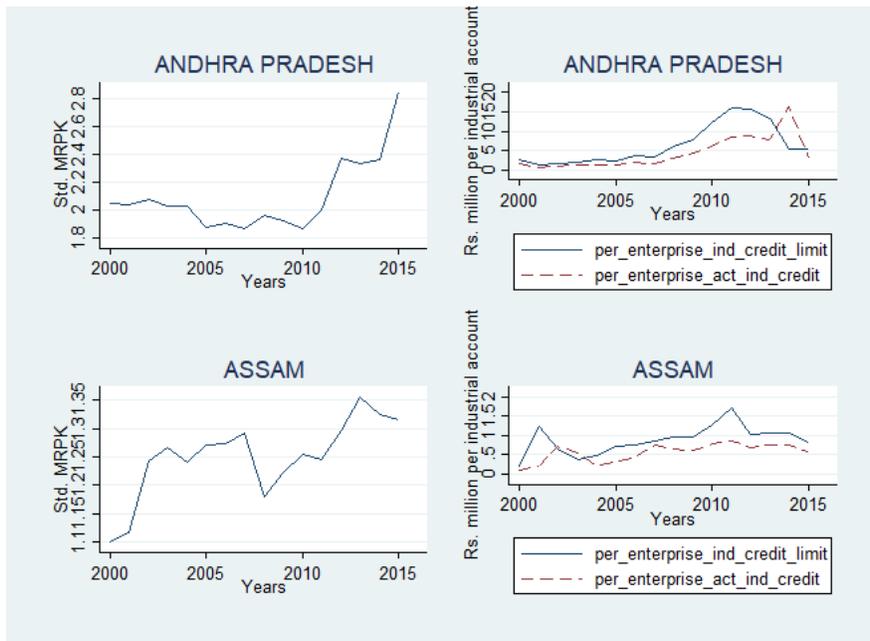
States	Mean			
	Std. MRPK	Std. Dev	min	max
ANDHRA PRADESH	2.093	0.261	1.868	2.840
ASSAM	1.250	0.069	1.100	1.355
BIHAR	1.590	0.063	1.490	1.702
CHHATTISGARH	1.588	0.110	1.351	1.743
DADRA AND NAGAR	1.606	0.149	1.341	1.819
DELHI	1.401	0.049	1.293	1.470
GOA DAMAN AND DI	1.522	0.134	1.296	1.722
GUJARAT	1.530	0.086	1.419	1.751
HARYANA	1.420	0.136	1.282	1.824
HIMACHAL PRADESH	1.544	0.081	1.351	1.674
JHARKHAND	1.682	0.067	1.566	1.826
KARNATAKA	1.684	0.166	1.496	2.041
KERALA	2.102	0.421	1.524	2.944
MADHYA PRADESH	1.819	0.104	1.649	2.106
MAHARASHTRA	1.618	0.062	1.534	1.727
ORISSA	1.718	0.081	1.570	1.905
PUNJAB	1.550	0.096	1.428	1.762
RAJASTHAN	1.656	0.114	1.440	1.887
TAMIL NADU	1.653	0.064	1.567	1.760
UTTAR PRADESH	1.585	0.046	1.504	1.678
UTTARANCHAL	1.602	0.281	1.387	2.613
WEST BENGAL	1.659	0.074	1.519	1.773

Table D.1 State-wise Std. Log MRPK: Summary Table

## State-wise Credit Availability and Misallocation

Log Per Enterprise Industrial				
States	Credit Limit	Std. Dev	min	max
ANDHRA PRADESH	1.513	0.853	0.092	2.768
ASSAM	-0.225	0.527	-1.637	0.539
BIHAR	-1.012	1.241	-3.019	0.467
CHHATTISGARH	0.968	1.106	-0.822	2.377
DADRA AND NAGAR	2.380	0.551	1.722	3.301
DELHI	2.839	1.056	1.470	4.281
GOA DAMAN AND DI	1.323	0.752	-0.235	2.465
GUJARAT	1.894	0.819	0.177	2.844
HARYANA	1.506	0.923	-0.280	2.564
HIMACHAL PRADESH	0.839	0.910	-1.278	1.641
JHARKHAND	0.495	0.941	-0.952	1.643
KARNATAKA	1.495	0.943	-0.509	2.616
KERALA	0.036	0.876	-1.458	1.154
MADHYA PRADESH	0.618	1.095	-1.007	2.158
MAHARASHTRA	2.443	0.963	0.876	3.710
ORISSA	0.034	1.190	-2.028	1.679
PUNJAB	1.194	0.983	-0.771	2.475
RAJASTHAN	0.866	1.103	-1.067	2.157
TAMIL NADU	1.359	0.825	-0.154	2.361
UTTAR PRADESH	0.357	1.098	-1.507	1.694
UTTARANCHAL	0.664	1.008	-1.380	1.908
WEST BENGAL	0.728	1.301	-1.263	2.402

**Table D.2** State-wise Log Per-Enterprise Industrial Credit Limit: Summary Table

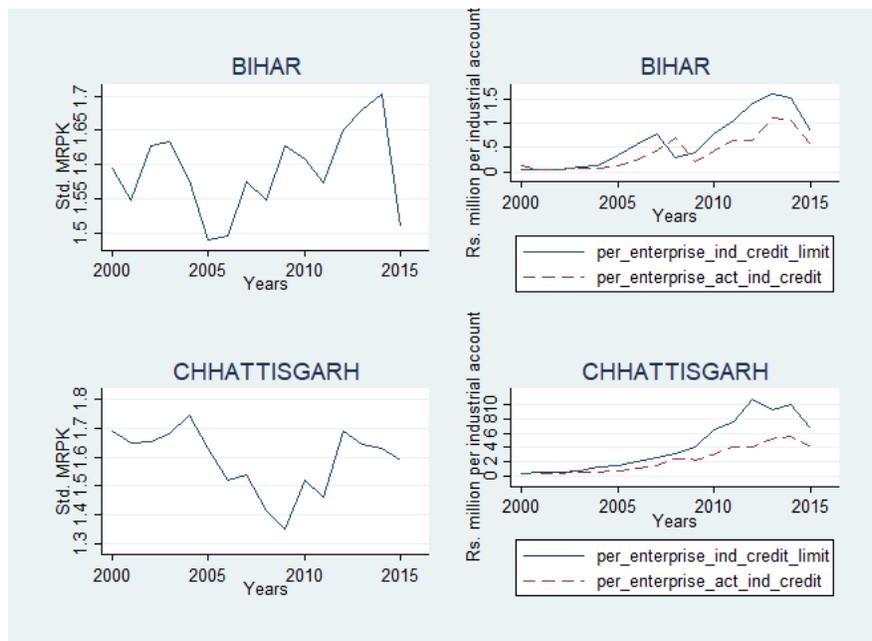


**Figure D.1** a. Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Log Actual Industrial			
	Credit per Enterprise	Std. Dev	min	max
ANDHRA PRADESH	1.032	0.939	-0.381	2.796
ASSAM	-0.699	0.597	-2.197	-0.137
BIHAR	-1.394	1.138	-3.257	0.102
CHHATTISGARH	0.521	0.953	-0.896	1.708
DADRA AND NAGAR	2.014	0.599	1.049	2.916
DELHI	2.236	0.997	0.922	3.773
GOA DAMAN AND DI	1.032	0.728	-0.399	1.889
GUJARAT	1.356	0.794	-0.133	2.309
HARYANA	0.937	0.884	-0.786	2.077
HIMACHAL PRADESH	0.418	0.968	-1.799	1.352
JHARKHAND	0.094	0.867	-1.196	1.196
KARNATAKA	0.850	0.850	-0.981	1.790
KERALA	-0.571	0.908	-2.294	0.547
MADHYA PRADESH	0.076	0.925	-1.180	1.212
MAHARASHTRA	1.841	0.895	0.479	3.030
ORISSA	-0.475	1.210	-2.406	1.180
PUNJAB	0.678	0.940	-1.099	1.982
RAJASTHAN	0.417	1.119	-1.388	1.701
TAMIL NADU	0.806	0.774	-0.545	1.789
UTTAR PRADESH	-0.123	1.040	-1.774	1.085
UTTARANCHAL	0.183	0.813	-1.236	1.222
WEST BENGAL	0.142	1.233	-1.623	1.908

**Table D.3** State-wise Log Actual Industrial Credit per Enterprise: Summary Table

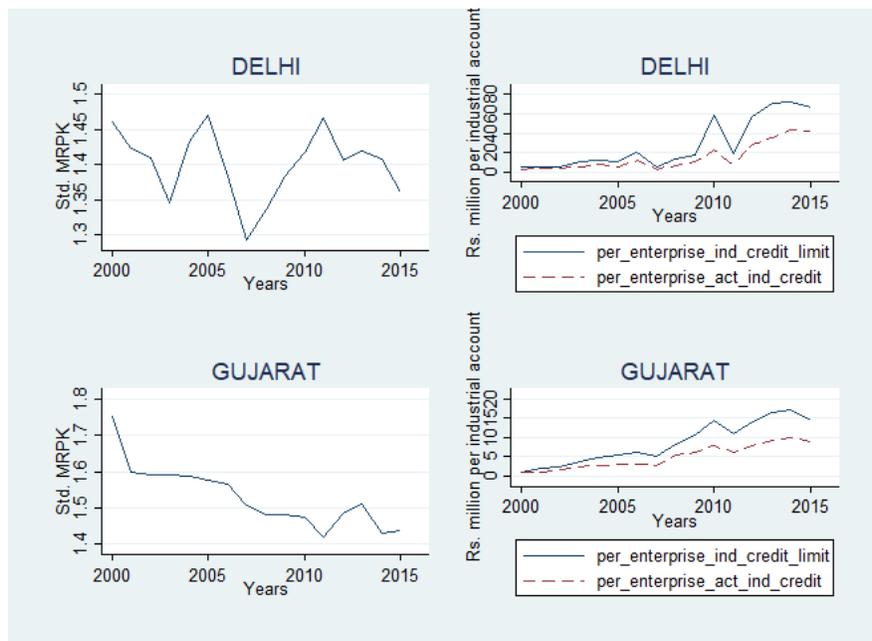


**Figure D.2** b. Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Log Credit			
	to State GDP	Std. Dev	min	max
ANDHRA PRADESH	4.406	0.670	3.431	5.342
ASSAM	2.925	0.649	1.922	3.703
BIHAR	2.983	0.469	2.231	3.757
CHHATTISGARH	3.283	0.701	2.154	4.328
DADRA AND NAGAR	.	.	.	.
DELHI	5.216	0.539	4.316	5.919
GOA DAMAN AND DI	3.415	0.297	2.942	3.786
GUJARAT	3.566	0.502	2.989	4.312
HARYANA	3.460	0.707	2.433	4.412
HIMACHAL PRADESH	3.175	0.581	2.210	3.858
JHARKHAND	3.081	0.483	2.350	3.749
KARNATAKA	4.146	0.593	3.160	4.872
KERALA	3.813	0.526	3.011	4.553
MADHYA PRADESH	3.483	0.498	2.710	4.191
MAHARASHTRA	4.730	0.526	3.817	5.366
ORISSA	3.405	0.624	2.364	4.208
PUNJAB	3.959	0.600	3.010	4.776
RAJASTHAN	3.518	0.648	2.519	4.367
TAMIL NADU	4.234	0.505	3.387	4.905
UTTAR PRADESH	3.341	0.597	2.461	4.215
UTTARANCHAL	3.199	0.403	2.483	3.771
WEST BENGAL	3.730	0.580	2.887	4.485

**Table D.4** State-wise Log Credit to State GDP: Summary Table

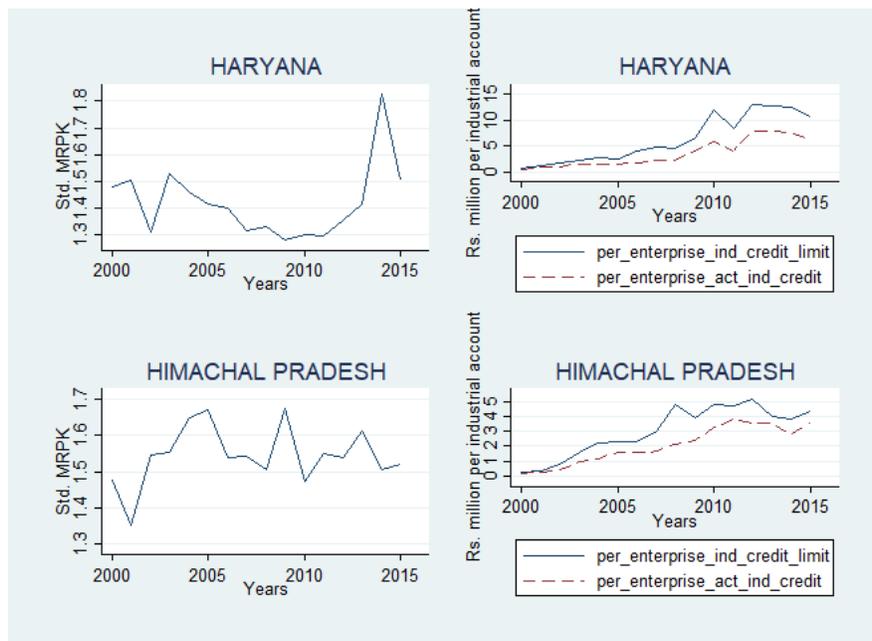


**Figure D.3** c. Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Log Per Capita			
	Power Availability	Std. Dev	min	max
ANDHRA PRADESH	6.802	0.176	6.488	7.039
ASSAM	5.212	0.216	4.901	5.581
BIHAR	4.776	0.308	4.357	5.429
CHHATTISGARH	6.474	0.201	6.190	6.899
DADRA AND NAGAR	9.566	0.233	9.024	9.907
DELHI	7.401	0.063	7.322	7.520
GOA DAMAN AND DI	7.693	0.212	7.373	8.164
GUJARAT	7.162	0.173	6.942	7.447
HARYANA	7.230	0.221	6.880	7.534
HIMACHAL PRADESH	6.945	0.246	6.468	7.167
JHARKHAND	5.224	0.186	4.881	5.435
KARNATAKA	6.712	0.153	6.457	6.905
KERALA	6.285	0.180	5.976	6.543
MADHYA PRADESH	6.414	0.151	6.212	6.756
MAHARASHTRA	6.934	0.120	6.735	7.137
ORISSA	6.272	0.168	5.932	6.452
PUNJAB	7.359	0.111	7.129	7.492
RAJASTHAN	6.572	0.212	6.240	6.887
TAMIL NADU	6.973	0.164	6.636	7.200
UTTAR PRADESH	5.852	0.196	5.522	6.144
UTTARANCHAL	6.806	0.286	6.266	7.133
WEST BENGAL	5.988	0.200	5.650	6.247

**Table D.5** State-wise Log Per Capita Power Availability: Summary Table

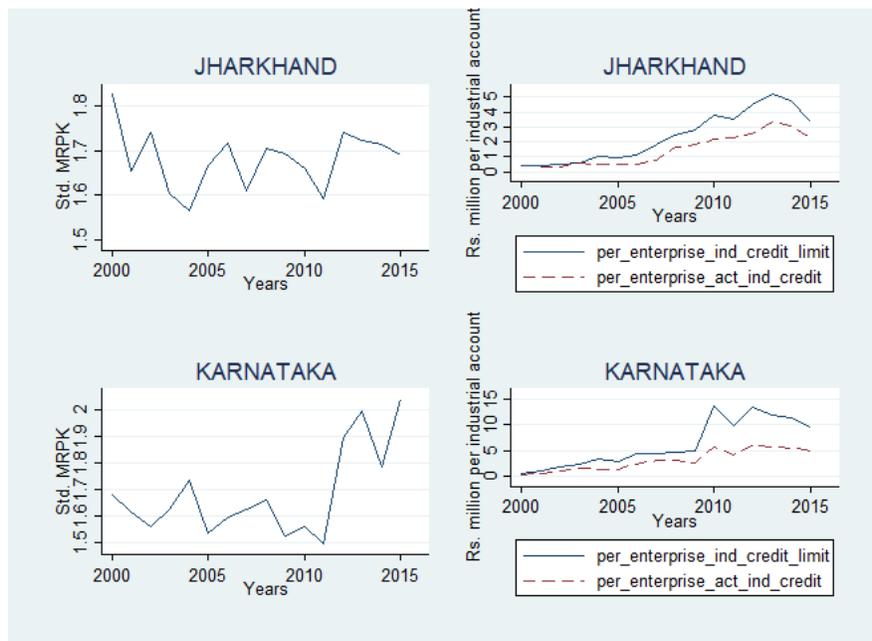


**Figure D.4** d.Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Log Road			
	Density	Std. Dev	min	max
ANDHRA PRADESH	-0.095	0.239	-0.435	0.227
ASSAM	1.114	0.199	0.715	1.426
BIHAR	0.321	0.319	-0.243	0.801
CHHATTISGARH	-0.502	0.119	-0.626	-0.326
DADRA AND NAGAR	0.377	0.147	0.130	0.566
DELHI	3.015	0.034	2.989	3.074
GOA DAMAN AND DI	1.090	0.112	1.013	1.374
GUJARAT	-0.236	0.084	-0.318	-0.074
HARYANA	-0.233	0.192	-0.439	0.046
HIMACHAL PRADESH	-0.340	0.301	-0.865	-0.001
JHARKHAND	-1.293	0.422	-1.946	-0.624
KARNATAKA	0.301	0.175	0.040	0.518
KERALA	1.564	0.134	1.279	1.713
MADHYA PRADESH	-0.467	0.200	-0.632	-0.065
MAHARASHTRA	0.119	0.400	-0.334	0.682
ORISSA	0.423	0.116	0.314	0.600
PUNJAB	0.266	0.385	-0.230	0.738
RAJASTHAN	-0.575	0.231	-0.893	-0.320
TAMIL NADU	0.423	0.155	0.253	0.697
UTTAR PRADESH	0.302	0.217	0.014	0.593
UTTARANCHAL	-0.136	0.214	-0.432	0.163
WEST BENGAL	0.916	0.445	-0.003	1.268

**Table D.6** State-wise Log Road Density: Summary Table

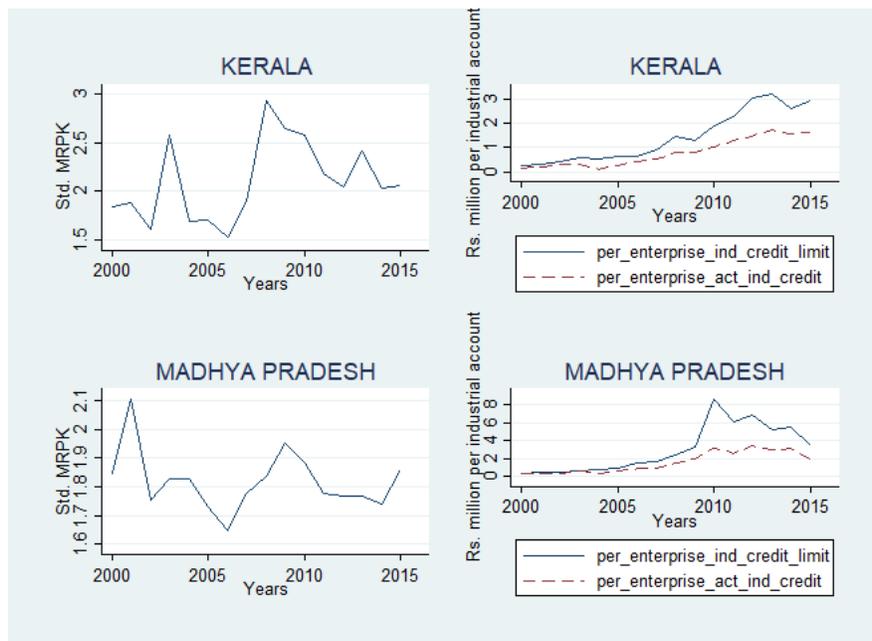


**Figure D.5 e.** Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Infant			
	Mortality	Std. Dev	min	max
ANDHRA PRADESH	51.500	9.709	37	66
ASSAM	62.188	8.360	47	75
BIHAR	53.375	8.382	42	62
CHHATTISGARH	58.000	11.883	41	79
DADRA AND NAGAR	40.000	11.518	21	58
DELHI	29.500	5.550	18	37
GOA DAMAN AND DI	13.500	4.179	9	23
GUJARAT	48.500	9.557	33	62
HARYANA	52.375	10.125	36	67
HIMACHAL PRADESH	44.375	8.793	28	60
JHARKHAND	46.375	9.905	32	70
KARNATAKA	43.438	10.172	28	58
KERALA	12.313	1.250	10	15
MADHYA PRADESH	69.438	12.691	50	87
MAHARASHTRA	33.125	8.640	21	48
ORISSA	68.875	15.253	46	95
PUNJAB	38.938	10.136	23	52
RAJASTHAN	62.000	12.296	43	79
TAMIL NADU	32.688	10.904	19	51
UTTAR PRADESH	65.688	12.175	46	83
UTTARANCHAL	40.438	5.573	32	50
WEST BENGAL	37.500	7.950	26	51

**Table D.7** State-wise Infant Mortality: Summary Table

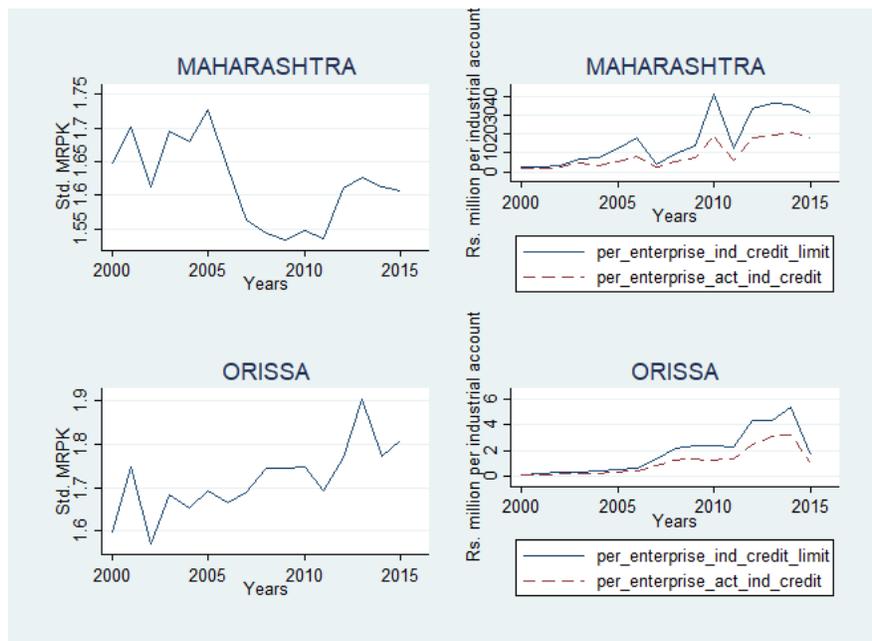


**Figure D.6 f.** Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Shelved to			
	Outstanding Projects	Std. Dev	min	max
ANDHRA PRADESH	2.393	1.518	0.200	4.658
ASSAM	1.944	3.097	0.000	12.857
BIHAR	1.207	1.139	0.000	3.828
CHHATTISGARH	2.706	2.286	0.000	8.228
DADRA AND NAGAR	3.011	4.167	0.000	13.043
DELHI	1.533	1.476	0.000	5.405
GOA DAMAN AND DI	2.350	2.398	0.000	6.936
GUJARAT	2.406	1.369	0.459	4.490
HARYANA	1.696	1.514	0.000	5.219
HIMACHAL PRADESH	1.255	0.996	0.000	2.909
JHARKHAND	1.915	1.896	0.000	4.943
KARNATAKA	1.765	0.935	0.198	3.584
KERALA	1.536	0.859	0.000	3.462
MADHYA PRADESH	1.520	1.242	0.000	4.104
MAHARASHTRA	1.565	1.037	0.257	3.337
ORISSA	2.391	1.398	0.000	4.878
PUNJAB	1.774	1.706	0.000	4.965
RAJASTHAN	1.946	1.186	0.000	4.149
TAMIL NADU	1.728	0.847	0.403	3.151
UTTAR PRADESH	1.407	0.874	0.000	2.775
UTTARANCHAL	1.913	1.901	0.000	6.569
WEST BENGAL	2.370	1.597	0.358	6.803

**Table D.8** State-wise Shelved to Outstanding Projects: Summary Table

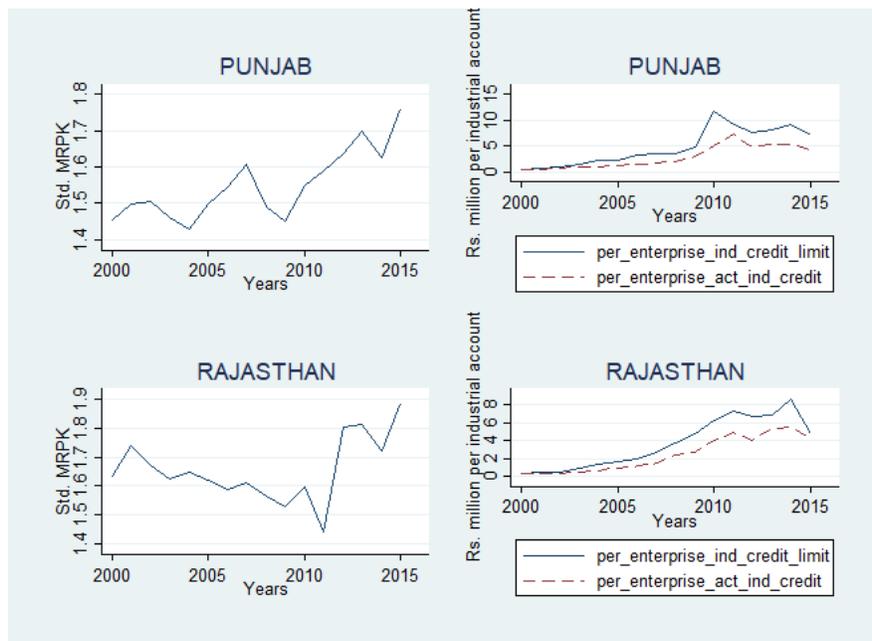


**Figure D.7 g.** Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

States	Per Factory			
	Number of Pending Cases	Std. Dev	min	max
ANDHRA PRADESH	6.101	0.468	5.321	7.122
ASSAM	2.176	0.528	1.389	2.931
BIHAR	2.818	0.228	2.480	3.227
CHHATTISGARH	2.428	0.113	2.208	2.611
DADRA AND NAGAR	2.653	0.992	1.814	4.859
DELHI	10.459	2.379	7.914	16.742
GOA DAMAN AND DI	14.169	3.222	8.549	19.386
GUJARAT	13.203	1.859	10.429	15.498
HARYANA	9.703	0.519	9.054	10.576
HIMACHAL PRADESH	11.492	1.068	10.244	14.059
JHARKHAND	1.875	0.156	1.643	2.087
KARNATAKA	10.643	0.687	9.184	11.576
KERALA	10.889	2.452	6.814	13.500
MADHYA PRADESH	3.659	0.571	3.090	4.947
MAHARASHTRA	9.258	1.593	3.762	10.476
ORISSA	4.994	0.736	3.680	6.287
PUNJAB	9.965	0.934	8.620	11.363
RAJASTHAN	5.830	0.820	4.743	7.079
TAMIL NADU	9.406	1.473	6.797	12.022
UTTAR PRADESH	7.203	0.385	6.458	7.850
UTTARANCHAL	3.349	0.345	2.935	3.911
WEST BENGAL	6.216	0.304	5.697	6.843

**Table D.9** State-wise Per Factory Number of Pending Cases: Summary Table



**Figure D.8** h. Misallocation and Credit Availability

## State-wise Credit Availability and Misallocation

	(9)	(10)	(11)	(12)
	cvmrpk	cvmrpk	cvmrpk	cvmrpk
per enterprise ind credit limit	0.0319*			
	(1.94)			
per ent credit limit*psb share	-0.0004*			
	(-1.90)			
manuf cl to manufsdp		0.003*		
		(2.28)		
manuf cl to manufsdp*psb share		-0.00003*		
		(-2.27)		
per enterprise act ind credit			0.0342*	
			(2.48)	
per ent act credit*psb share			-0.0003*	
			(-2.39)	
ln credi nsdp ratio				0.188*
				(1.74)
ln credi nsdp ratio*psb share				-0.0009
				(-1.07)
Elec def perc	0.00745*	0.00888*	0.0073*	0.00698
	(1.74)	(1.92)	(1.74)	(1.63)
road density	-0.0748	-0.0425	-0.0926*	-0.0880*
	(-1.51)	(-0.79)	(-1.79)	(-1.79)
share stalled	-0.00301	-0.00199	-0.00309	-0.00427
	(-0.51)	(-0.34)	(-0.53)	(-0.75)
PC Pending cases	0.0203	0.0230*	0.0231*	0.0156
	(1.53)	(1.68)	(1.69)	(1.23)
Infant Mort	0.0141***	0.0131***	0.0136***	0.00987*
	(5.06)	(4.27)	(4.95)	(2.24)
Constant	1.613***	1.532***	1.567***	0.946
	(7.84)	(6.45)	(7.93)	(1.67)
Observations	234	204	234	234
Adjusted R-squared	0.452	0.442	0.454	0.456
Observations	221	204	221	221
Adjusted R-squared	0.498	0.479	0.498	0.499

t statistics in parentheses

**Table D.10** Regression: Results using MRPK dispersion

## State-wise Credit Availability and Misallocation

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	(13)	(14)	(15)	(16)
	theil mrpk	theil mrpk	theil mrpk	theil mrpk
per enterprise ind credit limit	0.0178*			
	(1.77)			
per ent credit limit*psb share	-0.0002*			
	(-1.69)			
manuf cl to manufsdp		0.004		
		(1.06)		
manuf cl to manufsdp*psb share		-0.00004		
		(-1.04)		
per enterprise act ind credit			0.0234	
			(1.02)	
per ent act credit*psb share			-0.000255	
			(-0.87)	
ln credi nsdp ratio				0.0886*
				(2.13)
ln credi nsdp ratio*psb share				-0.0007*
				(-2.51)
Elec def perc	0.00224	0.00244	0.00220	0.00190
	(1.54)	(1.61)	(1.56)	(1.30)
road density	-0.0403*	-0.0258	-0.0494*	-0.0419*
	(-2.21)	(-1.28)	(-2.52)	(-2.17)
share stalled	-0.000168	0.000896	-0.000215	-0.000731
	(-0.08)	(0.45)	(-0.11)	(-0.37)
PC Pending cases	0.00284	0.00415	0.00411	0.000256
	(0.63)	(0.89)	(0.88)	(0.06)
Infant Mort	0.00385***	0.00339**	0.00359***	0.00264
	(3.88)	(3.11)	(3.80)	(1.72)
Constant	0.793***	0.744***	0.770***	0.592**
	(9.86)	(7.87)	(10.54)	(2.93)
Observations	234	204	234	234
Adjusted R-squared	0.432	0.449	0.437	0.441

**Table D.11** Regression: Results using MRPK Dispersion

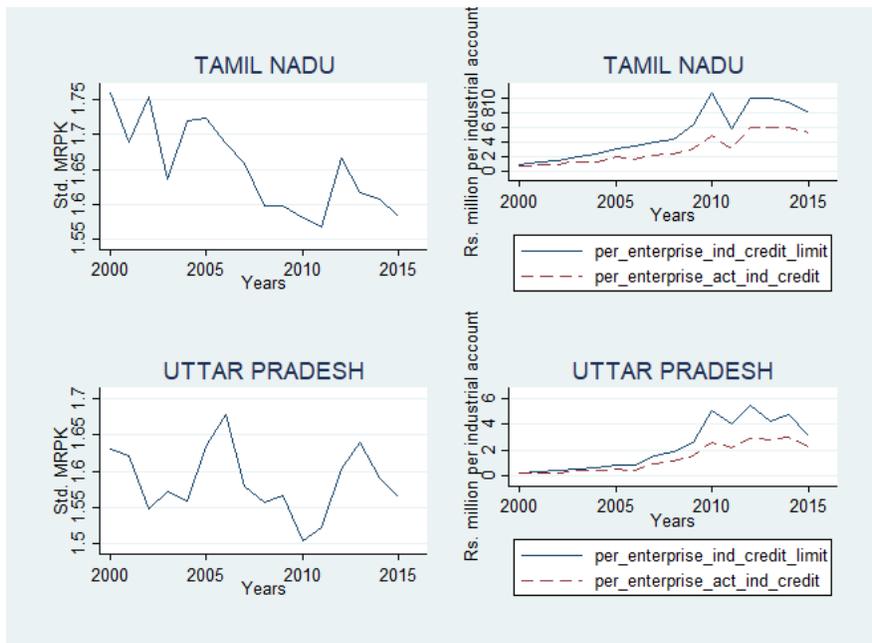


Figure D.9 i. Misallocation and Credit Availability

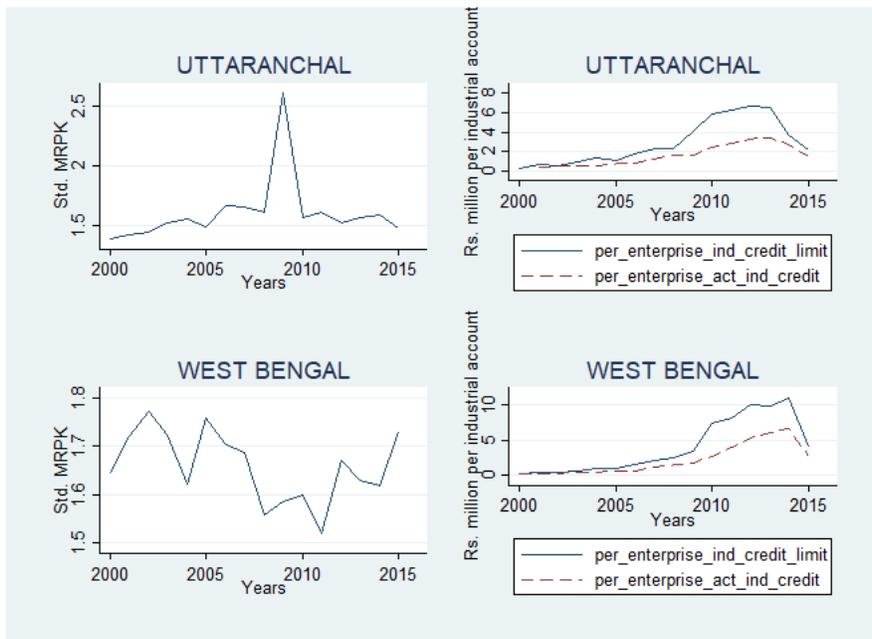


Figure D.10 j. Misallocation and Credit Availability

	[1]	[2]	[3]
Log Industrial Credit Limit per Enterprise	0.002*		
	(1.69)		
Log Credit to State GDP		0.102	
		(0.84)	
Log Actual Industrial Credit per Enterprise			0.002*
			(1.91)
Log Per Capita Power Availability	-0.022	-0.102	-0.024
	(-0.24)	(-0.93)	(-0.26)
Log Railway Density	-4.247*	-3.317	-4.135*
	(-1.75)	(-0.43)	(-1.67)
Shelved to Outstanding Projects	0.001	0.003	0.001
	(0.10)	(0.30)	(0.09)
Per Factory Number of Pending Cases	-0.011	-0.010	-0.011
	(-0.98)	(-0.88)	(-0.95)
Infant Mortality	-0.004*	-0.007	-0.004
	(-1.68)	(-1.32)	(-1.59)
Constant	2.318**	2.334**	2.298**
	(3.05)	(2.86)	(3.00)
Observations	248	248	248
Adjusted R-squared	0.608	0.611	0.608

**Table D.12** State-wise Panel Regression: Results

# Appendix E

## Business Reforms and Productivity

### E.1 Bordering Districts of Adjoining States in India

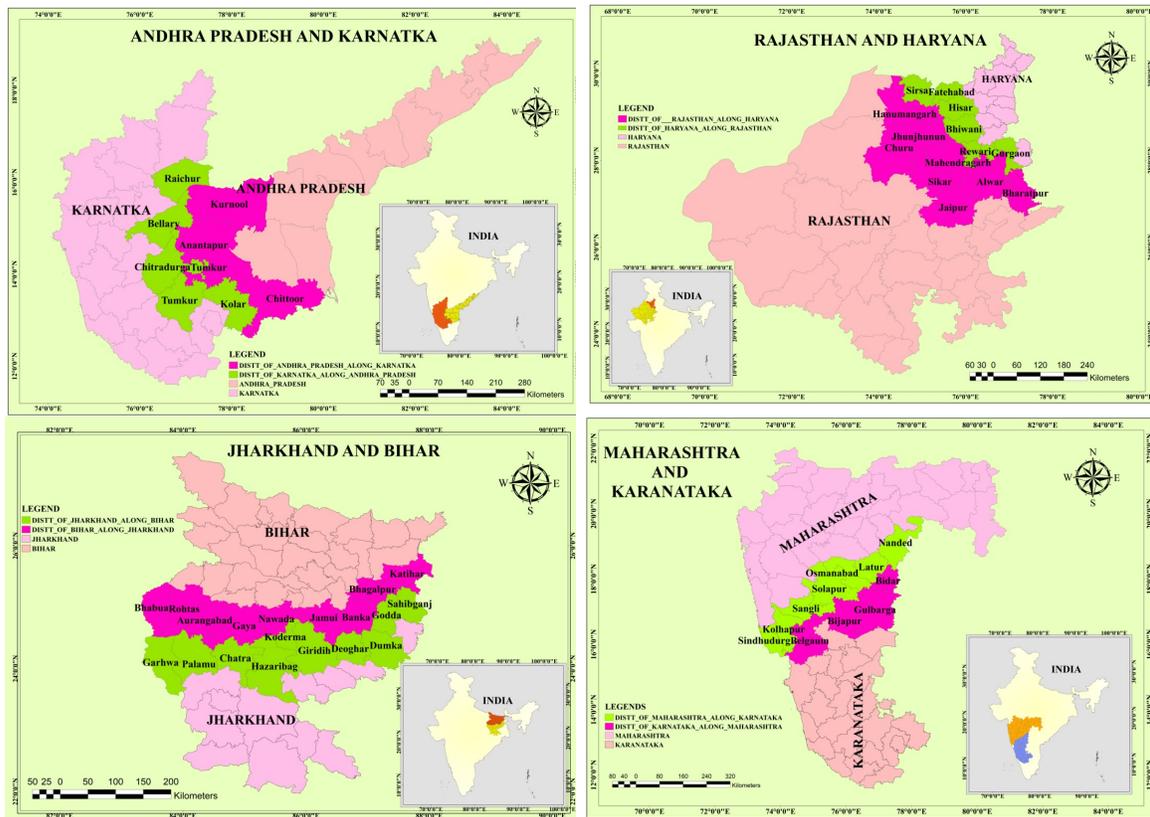


Figure E.1 Bordering Districts Map

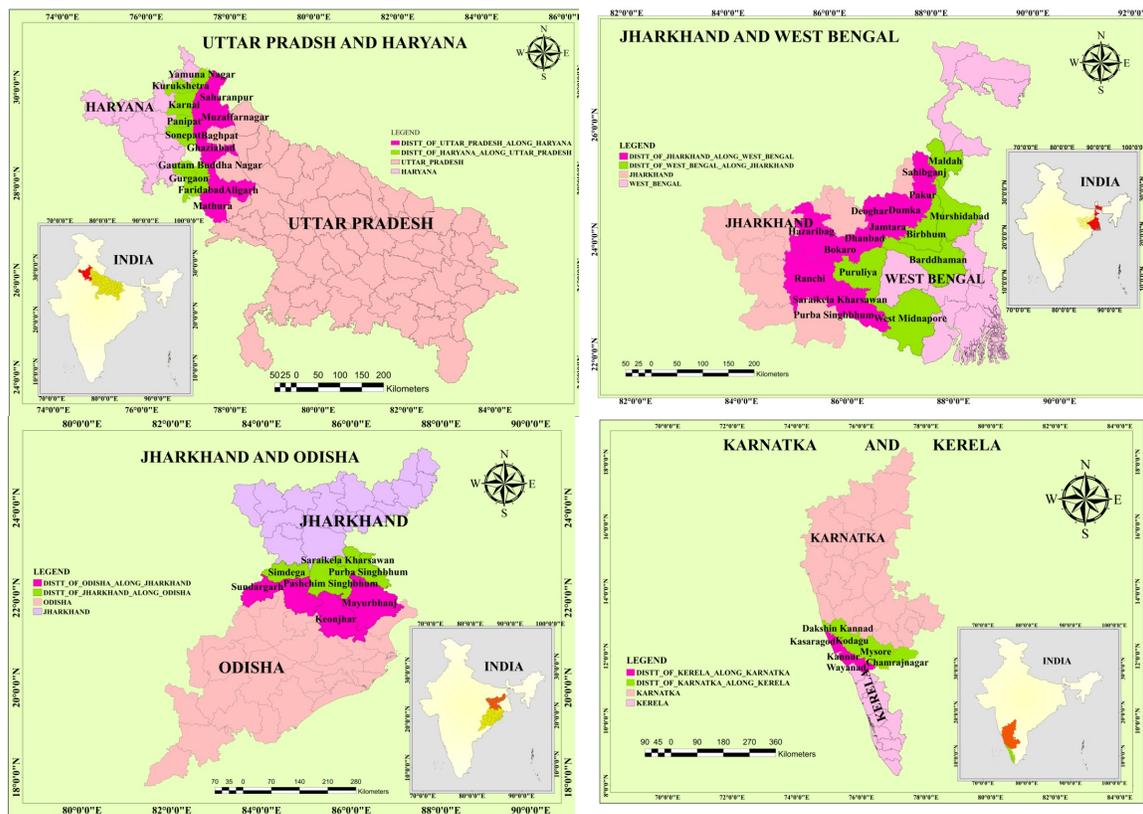


Figure E.2 Bordering Districts Map

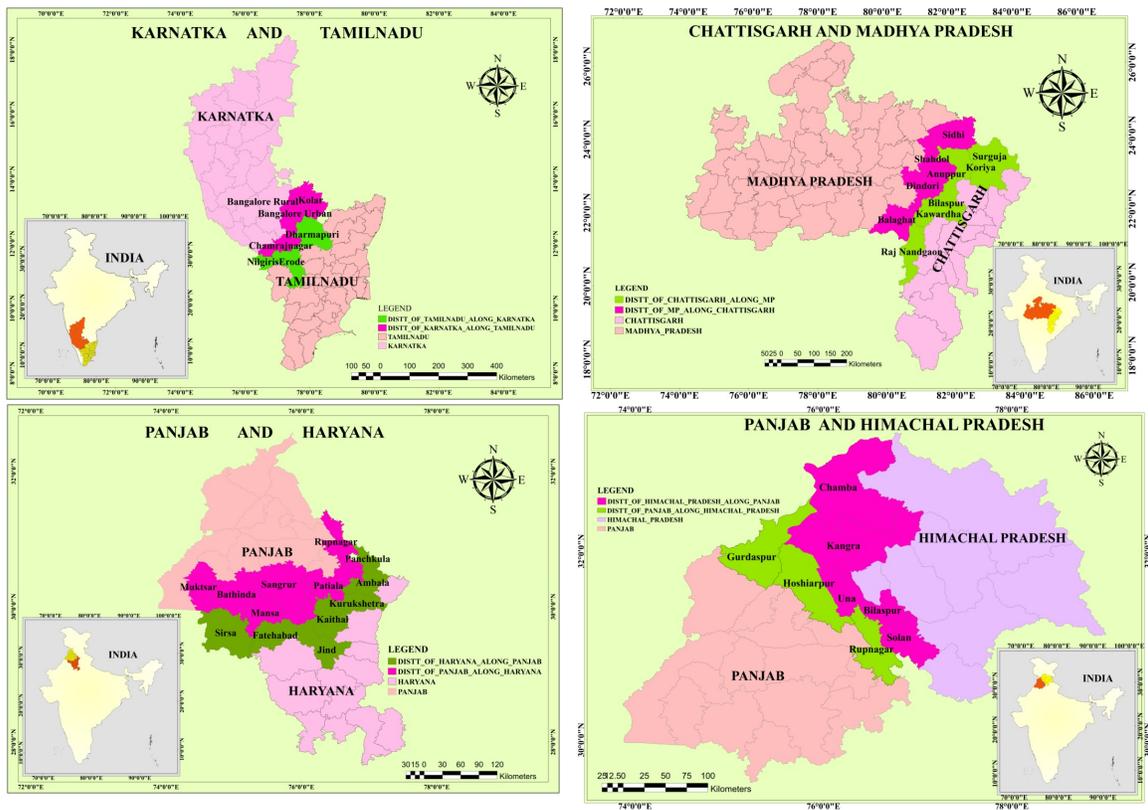


Figure E.3 Bordering Districts Map

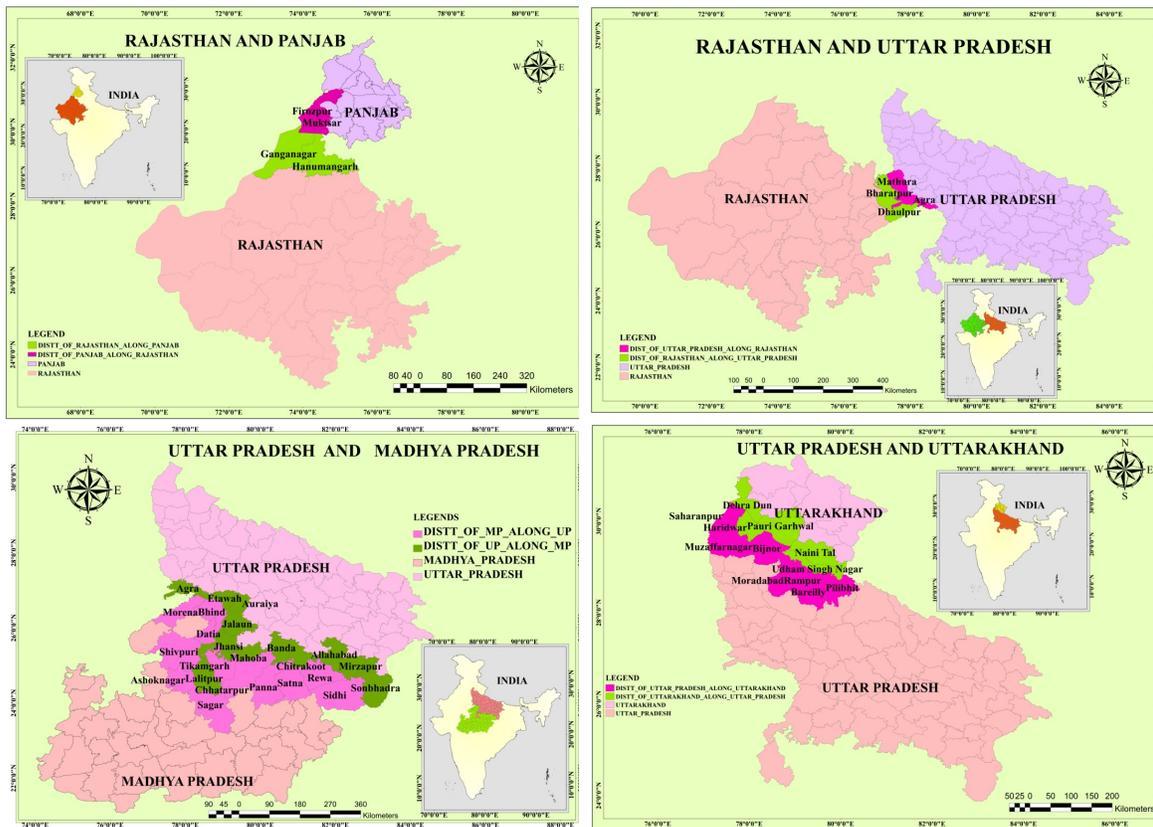


Figure E.4 Bordering Districts Map

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