

Final report

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A district-level analysis

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# Financial intermediation and economic development in the state of Bihar, India: A district-level analysis

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## **Abstract:**

*This paper analyses the relationship between financial intermediation and economic development in the state of Bihar in India. We find that the standard index of depth of financial intermediation measured by credit deposit (CD) ratio is very low in the state (30%) and has little impact on economic development at the aggregate level. However, the analysis of sectoral CD ratios show that credit allocation to agricultural sector influences per capita income across districts but similar allocation to the industry has almost no impact on that sector. This finding is robust to different model specifications including other financial indicators. Interestingly, when we examine the impact of bank branches, they tend to be significant in explaining variation in per capita income across districts, as reflected through its indirect effect via higher realised credit relative to planned credit limit. On the other hand, directed lending towards the priority sectors in the form of Kishan credit card (KCC) has significant impact on economic development in Bihar. Since the loan disbursement under KCC is voluntary, its over utilization suggests rationing of credit in the rural sector while the limited impact on industrial growth points to poorer screening of projects and lack of proper financial intermediation in the state. A firm-level analysis for the state suggests limited impact of different sources of financing, although companies are heavily dependent on bank borrowing as opposed to equity financing.*

## **1. Introduction:**

In recent times, economic activities surged greatly in Bihar and had been manifested in a growth rate of the state that had averaged 11.03 percent between 2003-4 and 2008-9. This achievement is spectacular not only with respect to similar performance of India's economy which grew at the rate of 8.49 percent in the same period but is also striking with respect to her past performance when the state grew about 3.50 per cent during the period between 1999-00 to 2003-4. (Source: Economic Survey of Bihar 2008-09). These achievements after decades of stagnation with negative growth rates at times, certainly sounded very much impressive, but may not be sustainable in the long run for two inter-related reasons. First, these growth rates have not been uniform

across the sectors. For example, while the sectors like the Construction, Communication and Trade, Hotel, Restaurants grew by 35.80, 17.68 and 17.71 percent respectively, the agriculture sector which provides livelihood of the majority of the population grew only by 5.58 per cent. Second, the future development may not carry on smoothly if the state's financial sectors fail to mobilize current resources (savings) into investment in areas that promote growth with equality. The same report indicates while per capita deposit of Bihar has increased significantly in 2008-09 by Rs 1437 while the increase in per capita credit was only Rs. 246.

The purpose of this study is to discuss the overall development of the financial sectors in Bihar in recent years measured by credit-deposit (CD) ratio and their contributions to current economic activity both at the macro (state) and at the district level of Bihar with special attention to directed credit programme such as KCC. In this study, we therefore examine: (1) the pattern of CD ratio across districts in Bihar in the light of high growth performance in recent years; (2) the extent to which the CD ratio and other financial indicators in Bihar influence district-level development and (3) sectoral developments.

This exercise thus helps us understand to what extent the mobilised resources are allocated in the form of loans to the private sector, how do they vary across districts and across banks, and finally what is their impact on both SDP as well as on the district level economic activities. This, in turn, will reflect the concentration of banking activity in different areas in Bihar and underline its effective contribution to state's economic activities.

Our main findings are as follows: The Overall CD ratio shows a remarkable stability across districts and bear almost negligible co-relation with economic activity. On the other hand, impact of CD ratio on the economic growth is at best statistically insignificant both across the state and district levels. However, when we extend our analysis to include the impact of CD ratio on sectoral output, we find its impact positive and significant for agriculture and trade but very negligible for industry and consumption loan. Interestingly, we find that the public provision of working capital

loan to farmers in the form of Kisan Credit card (KCC) has a positive and significant impact on the output of agricultural sector. The implications of these results are widespread rationing of credit as withdrawing funds are voluntary in the KCC scheme and also lack of proper screening and selection of projects in industrial sector indicate the failures of the banking sector.

The rest of the paper is organized as follows: section 2 makes a brief discussion to the existing literature of financial intermediation in the context of other less developed regions and discusses the limitations of replicating such studies in this context. Section 3 presents a statistical picture of the current state of intermediation in the state. Section 4 introduces the empirical framework, section 5 deals with approach, data and descriptive statistics for the ensuing analysis, section 6 discusses the results and section 7 details firm-level analysis followed by conclusion in section 8.

## **2. Literature on Finance and Economic Activities**

A well-functioning financial system plays an important role in the process of economic growth by performing a wide range of activities. They include not only transferring resources from savers to investors but also help an economy attain transformation of maturity of assets. For example, depositors would like to withdraw funds with a short notice but banks can earn higher rate of return from projects with longer term horizons. The financial markets help an economy grow by resolving this maturity mismatch by making an optimal allocation of funds between current withdrawals and investment in long term projects (see Diamond and Dybvig, 1983). In addition, banks also perform valuable service by screening projects, monitoring borrowers and renegotiating the loan contracts in times of financial distress. The value enhancing activities tend to increase sharply when an economy makes transition from an interventionist financial regime to a market- led paradigm of development finance. (see Levine, 1997).

Although there are studies which indicate that financial markets may have contributed significantly to corporate growth in the 1980s and 1990s (Singh, 1997), however, financial markets in India is far from liberalized to a fullest extent. The existence of macroeconomic instability, government and political intervention and inadequate banking supervision (Fry, 1997; Gupta and Lensink, 1996) had made financial sector and granting of credit allocation dictated not always by rational economic calculations but by considerations ranging from regional, sectoral and political considerations.<sup>1</sup>

The evidence on the impact of financial sectors for Indian economy as well as for emerging markets as a whole is mixed. It is true that there exists some relationship between banking expansion as reflected in domestic credit to the private sector (as percent of GDP) and long run growth, and also there is a link between stock market development and growth (Levine and Zervos, 1998). There are also studies that show the link is tenuous when alternative measures of financial development is used for examining impact of financial markets and economic activities. See Arestis et al., 2002, who have used nominal liquid liabilities to GDP and other studies that employed measures of financial sector development, include stock market capitalisation, stock market turnover, the ratio of domestic credit to the private sector to GDP, the ratio of M3 to GDP. These indicators of financial development have been used in the existing studies to examine their impact on investment (see Hermes and Lensink, 1996; Luintel and Khan, 1999) and the link between financial market development and economic activity is ambiguous (Pentecost and Moore, 2006).

Besides, in many emerging economies, 'flight to quality' in the asset allocation of the financial institutions and lack of willingness by the financial institutions, primarily banks, to extend credit to the private sector could arise in part due to fears over default due to risks related to political and other factors, which may have affected

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<sup>1</sup> Financial liberalization and capital market growth have led partly to portfolio substitution from bank deposits to tradeable securities, with limited impact on greater aggregate national or financial savings. However, the spread of banking facilities in a developing economy has positive impact on private savings (Athukorala and Sen, 2004).

development.<sup>2</sup> Blanco (2009) finds that the net effect of financial development on growth is relatively small. Ang (2010), on the other hand, explores how financial development and financial sector reforms influence the evolution of income inequality in India and finds that while financial development helps reduce income inequality, financial liberalization seems to exacerbate it.

The problem of replicating many of these studies in the context of India and for that matter towards any state in India, like Bihar, is problematic for the following sets of reasons. First, credit is also used as a tool for redistribution and programmes like implicit government guarantees and loan waiver schemes towards priority sectors like agriculture implies that such decisions are often based on social welfare cum political criteria. Second, banks in India are often federal and link between credits granted to a particular state may or may not be strongly related to overall deposits in that state. Third, many rural regional banks are also co-operatives that also make the loan decisions based on norms other than profit maximizing which is the standard assumption made in papers that explore the links between financial intermediation and aggregate economic activities.

In other words, there is a two-way interdependence between financial development (measured by volume of credit, deposits, stock market capitalization etc.) and GDP. As the economy grows, financial intermediation becomes more profitable and FIs enter the market and mobilize the resource that in turn aids the process of savings, investment and growth which encourage intermediation activities. However, political considerations, directed-credit programme, co-operative nature of the rural banks, the presence of nationwide Banks etc., make very often loan decisions divorced from the pure economic activities in local or geographical regions and may not have one-to-one

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<sup>2</sup> Credit to the commercial sector not only plays an important role in influencing domestic liquidity, but also it acts as a crucial input in the production process (for a simulation exercise, see Mallick, 2006). If credit gets channelled by the government through the banking sector to the loss-making state enterprises, such as in China and Russia, that kind of financial development reflected in credit-GDP ratio may not indicate the true development of the financial sector.

relationship in both ways, namely credit and GDP<sup>3</sup>. Hence, what follows, we would like to make variables related to credit as explanatory variables and then would like to examine its impact on SDP of Bihar's state as a whole as well as its districts.<sup>4</sup>

The study will thus help assessing the impact of financial intermediation across districts and sectors using recent available data. Kendall (2012) is the only study, which uses district-level data from India to investigate the connection between banking sector development, human capital, and economic growth in Indian districts. But the focus of this paper is to examine the effect of financial intermediation on economic development, which we examine at a more disaggregated level across districts and sectors within a poorest Indian state. Such closer examination of micro data can help avoid many of the omitted variable problems in cross-country studies in this line of literature.

This study therefore aims to analyse and understand the effectiveness of the banking sector in Bihar in disbursing loans to private enterprises using disaggregated district-level data, along with understanding its impact on the overall economic activity at both aggregate and sectoral levels.

### **3. Current state of financial intermediation in Bihar**

There are three types of financial institutions that operate in the formal market for lending and borrowing in Bihar. They are: 1. Commercial Banks which mostly provide finance for both agricultural and Industrial sectors. 2. Co-operative banks and Rural banks which mostly specialize in the transactions in the rural credit markets. Consistent with the current growth rates of SDP, the volume of deposit has risen in almost all types of Banks. For example, in 2008-09 alone, the total deposits have increased by

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<sup>3</sup> Ang (2009) show that significant directed credit programmes favouring certain priority sectors tend to discourage private capital formation in India.

<sup>4</sup> The paper explicitly recognizes these problems in specific contexts. See Banerjee and Duflo (2012) or Burgess and Pande (2005) for use of specific instruments to deal with the problem. However, limitations of data in our study prevent us from using a specific instrument suitable for our analysis.

over Rs 18,000 crore. However, such increases in the volume of deposits are not matched by increments in the disbursement of loan size. In the same year, the overall credit in the state expanded by only INR 3251 crore. For example, Per capita deposit of Bihar has increased significantly in 2008-09 by Rs 1437 while the increase in per capita credit was only Rs. 246, which is 17percent of the per capita deposits. Such a gap between the volume of deposits and lending typically measured by credit-deposit ratio (CD) is an indicator of the development of financial sector and also indicates the overall link between real and financial sectors and thus gives an idea about Bank's involvement in aggregate economic activities.

The CD ratio in Bihar is among the lowest in the country and far behind the national average of 72.6 percent and other states like Tamil Nadu (108.9 percent), Maharashtra (90.8 percent), Rajasthan (80.2 percent), West Bengal (60.8 percent), MP (57.4 percent). The ratio also shows a remarkable diversity in districts, across banks and across sectors. For example, CD ratio in the district of Siwan is 20percent, while in Araria it is above 40percent. The CD ratio of private commercial banks varied from 1 percent to 38 percent. None of these banks had any rural branches as on September 2009 and except for ICICI Bank and Axis Bank, no other bank even had a branch in semi-urban areas.

The institutional credit delivery system for agriculture was started in the country with the setting up of co-operative credit societies in 1904, but the coverage of these societies towards meeting the credit requirement of farmers was limited (Kumar *et al.*, 2011). The process of financial reforms has led to a novel credit intervention from the financial institutions to support farmers. Launching of Kisan Credit Cards (KCC) in 1998-99 was one of the innovative credit delivery mechanisms introduced in the country to promote financial inclusion. We therefore examine the effect of KCC on per capita income across districts. Another major intervention in this regard is the implementation of the agricultural debt waiver and relief scheme in 2008 by



Government of India covering nearly 37 million farmers to mitigate the consequences arising out of growing indebtedness and agrarian crisis.

High NPAs in the case of state-owned commercial banks and cooperatives do suggest that default risk is high, while in case of private banks, there are limited non-performing assets. Loan Waiving together with targeted lending towards priority sectors are probably creating twin effects:

1. Over-lending in some sectors but under-lending in other sectors.
2. Lack of project selection because loans made to sectors receiving waivers tended to be safer even though they might not generate highest surplus.

To sum up, our study is expected to yield insights about the effectiveness of both private intermediation and efficacy of the public programme of directed credit (in the form of KCC) on both macro (SDP) and micro (district level output) level activities in the state.

#### **4. Empirical Framework**

We estimate the above relationships by using fixed effects panel model. The advantage of using panel data is that it contains more degrees of freedom and greater sample variability than cross sectional data, improving the efficiency of estimates.

The panel data model takes the following form:

$$y_{it} = x_{it}\beta + \alpha_i + \delta_t + \varepsilon_{it}$$

where  $y_{it}$  is GDP per capita for district  $i$  in period  $t$ . All control variables mentioned in above section are captured by the vector  $x_{it}$ .  $\alpha_i$  is a district specific effect and  $\delta_t$ , a fixed time effect.  $\varepsilon_{it}$  is a random error term that captures all other variables.

The fixed-effects estimator permits controlling for any unobserved country-specific time-invariant effects. We also follow a two-way random effects log linear regression

model for period 2008-10. Before using the random effects model, we check our model with Hausman specification test of whether there is significant correlation between the unobserved random effects and the regressors. The advantage of this test is whether the error term is uncorrelated with the time series component and the cross-sectional (group) error. We estimated both fixed and random effects models. A Hausman test showed greater support for the fixed effects model, therefore results are reported for the fixed effects estimator. Although the fixed effects estimator is designed to control for unobserved region-specific time-invariant effects in the data, it does so, by conditioning them out and taking deviations from time-averaged sample means. The result of this is the removal of any long run variation in the dependent variable.

Our first model captures the effect of aggregate CD ratio in each district. In addition, we decompose the aggregate CD ratio into sectoral CD ratios, and then we measure the effects of sectoral CD ratios in each district. We plan to estimate the following log-level empirical specification:

$$y_{it} = \alpha_i + \delta_t + \beta_1 CD_{it} + \beta_i x_{it} + \varepsilon_{it}, \quad t = 1, \dots, T \quad (1)$$

$$y_{it} = \alpha_i + \delta_t + \beta_1 CD_{it} + \beta_2 KCC + \beta_3 CGAP_{it} + \beta_4 BBR_{i,2010} + \varepsilon_{it} \quad (2)$$

Where subscripts:  $i$  = districts, and  $t$  = time. Equation (1) is a panel regression, while equation (2) is cross-section regression due to bank branches data being available only for one year. CGAP denotes credit gap (proportion of actual credit in targeted credit limit), and BBR refers to bank branches.  $\delta_t$  refers to time fixed effects which captures business cycle effects and  $\delta_i$  captures unobserved district heterogeneity like local conditions, or environment.  $\varepsilon_{it}$  is the idiosyncratic error term with IID (independently and identically distributed) properties. In equations 1 and 2,  $y_{it}$  is log of GDP per capita in each district,  $x_{it}$  is  $1 \times K$  vector of explanatory variables which includes aggregate CD ratio across districts and CD ratios in sectors such as agriculture, industry, transport operator, professional and other services, personal loans, trade and finance & all other

sectors. The value of KCC is used in log levels,  $\delta_j$  in equation 1 is the unobserved time-invariant district heterogeneity like local conditions, or different policies introduced in different sectors that could affect the development level in each district. The annual credit plan (ACP) is used to capture credit deployment plan which is percentage achieved of credit allocated in priority (agriculture, small scale industries and other priority sector) and non priority sectors.

The notations  $\alpha$  and  $\delta$  respond to district and time respectively. The GDP per capita measures the regional development level, while credit/deposit ratio measures the financial deepening in the district and KCC measures the political preferential policies towards farmers. Credit/Deposit ratio and KCC can be thought of as the supply side of credit.  $\delta_t$  is the time fixed effects which capture business cycle effects and  $\varepsilon_{jt}$  is the idiosyncratic error term with independently and identically distributed properties: *iid*  $(0, \sigma^2)$ .

## 5. Approach, data and descriptive statistics

The assessment of impact of financial intermediation on economic development in Bihar is done following a three pronged approach which complement each other in addressing multiple dimensions of financial intermediation.

### A. Approach 1:

Districts are clustered by economic growth rate, represented by cumulative annual growth rate of GDP per capita (at constant prices) for 2008 to 2011. This is then compared with speed of financial intermediation, represented by cumulative annual growth rate of CD ratio for the same time window. This enables us to assess at an overall level whether rate of growth is because of enhanced credit flow or despite of it.

### B. Approach 2:

Panel regression methods employed to test the relationship between financial intermediation and GDP per capita at district level. We construct sectoral CD

ratios at district level which directly measures proportion of bank deposits in a district that is allocated as loans to different sectors. The sectoral deployment of credit can reveal the demand originating in a particular sector which could also reflect whether a sector is a high-return sector from the bank's point of view or there are state guarantees in place that encourage banks to create loans to that sector. We also look at other indicators of financial intermediation e.g. bank branches and their fund mobilisation and deployment capacity

**C. Approach 3:**

This approach uses firm level data to examine the impact of the alternative sources of financing on various indicators that measure performances of the publicly listed firm located in Bihar. This approach reveals the nature and characteristics of the methods of financing and links to economic activity of the listed firms given in the in Appendix 1. Out of 56 companies, the data on 46 are usable which allow us to analyze whether bank-financing and equity financing are substitutes or compliments.

The data used in this research mostly come from State Level Bankers Committee (SLBC) in Bihar and other sources in India such as RBI, covering all 38 districts. The CD ratios of all Scheduled Commercial Banks as well as the Regional Rural Banks in all the 38 districts come from SLBC. The wide variation in CD ratios across districts- for instance, 19 percent in Siwan to 51 percent in Kishanganj, however, indicates that the high CD ratio of districts, accumulated interests on loan and NPA of many banks prevent any increase in the credit flow in those areas. The data on KCC, ACP, number of bank branches and NPA also come from SLBC, Bihar (several issues). GDP data at district-level for Bihar (over 10 years) are obtained from Indicus Analytics Pvt. Ltd – an economics research firm ([www.indicus.net](http://www.indicus.net)). In addition, aggregate time series data for financial variables across districts for Bihar have been procured from RBI and SLBC in Bihar.

The Kisan Credit Cards (KCC) scheme introduced in 1998-99 shows that the numbers of KCCs issued by Banks in Bihar during the period from 1999 through 2009 and the achievement figures were consistently high during the entire period.

On the other hand, if we look at the role of banking services in Bihar, during 2009-10, 214 new branches were opened, while Bihar's share in the total bank branches in the country have remained at little less than 5 percent during the past few years. With a share of less than 5 percent of the total number of bank branches in India, 1500 RRB branches in Bihar mobilise about INR 1600 cr. annually. But only half of it flows back to the rural economy in the form of credit. The deposits of RRBs constitute nearly 43 percent of the total rural deposits of all scheduled commercial banks in Bihar and 6.0 percent of all rural deposits of the scheduled commercial banks in the country. The total rural deposits of the scheduled commercial banks in Bihar amounted to Rs. 24,000 crore, which is more than most other states in India. But the per capita deposits and credits in the state remain one of the lowest and the population served by a bank office one of the highest in the country, while there has been significant growth in total deposits of banks in Bihar in 2009-10 over the previous year by about Rs 14,000 crore.

An operational indicator from the supply side therefore is the credit-deposit (CD) ratio which measures 'financial deepening' in a country or local region. A low CD ratio would mean that for every unit of currency deposited, less credit flow could imply lower investments (see Table 1). For example, an increase in the total (per capita) deposits in Bihar in 2008-09 (INR 1437) by over INR 18,000 cr. while credit expanded by only INR 3251 cr. (INR 246, i.e., 17 percent). The CD ratio in Bihar is behind the national average of 72.6 percent and other states like Tamil Nadu (108.9 percent), Maharashtra (90.8 percent), Rajasthan (80.2 percent), West Bengal (60.8 percent), Madhya Pradesh (57.4 percent). Bihar shows remarkable stability at the low level which probably indicates failure of mobilization of resources.

[Table 1 about here]

It is obvious from Table 1 that the CD Ratio in Bihar has never exceeded, on an average, a ratio of 33.41 indicating that credit allocation in the economy has only been just over 30 percent of the deposits received during the period. Moreover, it seems that the trend of CD ratio in Bihar has a downward trend. With a maximum of approximately 70 percent in 2004, CD ratio has never reached that level since then. The CD ratio has never exceeded 58 percent during 2006-2010. Patna has always been a district with highest GDP growth which has one of the lowest CD ratios. Kaimur, West Champaran, etc have been the districts with highest CD ratios with middle-range growth rates. The map of Bihar with CD ratios does indicate the regions with five different categories of CD ratios (see Figure 1).

[Figure 1 about here]

The decline in CD ratio could indicate inefficiency in the use of credit which triggers the unwillingness of further credit to be allocated in the economy. Low CD ratios raise serious concerns about the effectiveness of the banking sector as to why banks are not lending as much as they are mobilising in the form of deposits. There is little correlation between per capita income and CD-ratio (see Figure 1), implying that districts with higher CD ratio do not appear to have higher per capita income.<sup>5</sup>

[Figure 2 about here]

If an increase in financial deepening and political preferential policies increased the development level, we would expect the estimated coefficients on credit/deposit ratio and KCC to be positive. However, if credit is not efficiently utilised, its impact on the development level would be less and therefore we may expect the coefficient estimate on credit/deposit ratio and KCC to be either small insignificant or even negative. If the

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<sup>5</sup> Since the CD ratio bears almost no correlation with the economic growth, we also explore percentage realised of credit limit set by the banks in each year.

allocated credit does not have any impact on the development level of the state, then we would expect the coefficient estimate to be insignificant. A correlation matrix of Log GDP per capita and CD Ratio denotes a negative correlation between the two key variables of interest here.

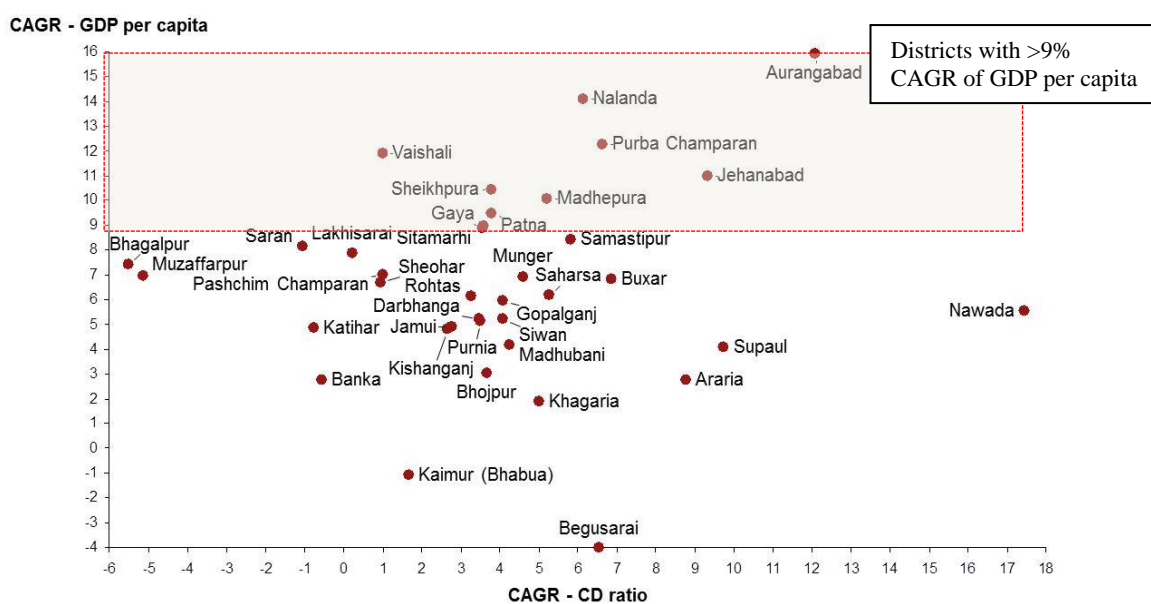
## 6. Results

### **A. Approach 1: Analysis of effect of financial intermediation by district clusters**

10 of Bihar's 37 districts recorded high cumulative annual growth rate ( $\geq 9\%$ ) of GDP per capita.

	CAGR (2008 - 2011)		
	GDP Contribution by district	GDP per capita (constant price)	CD Ratio
Aurangabad	2%	16%	12%
Nalanda	3%	14%	6%
Purba Champaran	5%	12%	7%
Vaishali	4%	12%	1%
Jehanabad	1%	11%	9%
Sheikhpura	0%	10%	4%
Madhepura	2%	10%	5%
Patna	14%	9%	4%
Sitamarhi	3%	9%	4%
Gaya	3%	9%	4%
Samastipur	4%	8%	6%
Saran	3%	8%	-1%
Lakhisarai	1%	8%	0%
Bhagalpur	3%	7%	-6%
Pashchim Champaran	5%	7%	1%
Muzaffarpur	5%	7%	-5%
Munger	2%	7%	5%
Buxar	1%	7%	7%
Sheohar	0%	7%	1%
Saharsa	2%	6%	5%
Rohtas	4%	6%	3%
Gopalganj	3%	6%	4%
Nawada	1%	6%	17%
Siwan	3%	5%	4%
Darbhanga	3%	5%	3%
Purnia	3%	5%	4%
Jamui	1%	5%	3%
Katihar	2%	5%	-1%

Kishanganj	1%	5%	3%
Madhubani	2%	4%	4%
Supaul	2%	4%	10%
Bhojpur	2%	3%	4%
Banka	1%	3%	-1%
Araria	2%	3%	9%
Khagaria	1%	2%	5%
Kaimur (Bhabua)	2%	-1%	2%
Begusarai	5%	-4%	7%



The table distinctively reveal that the fact that while in Bihar, the growth of SDP has taken place along with the development of intermediation but issues of distributive concerns persist. While for these high growth districts there is a significant correlation (>65%) between GDP growth rate and CD ratio growth rate, the causality is less clear for districts with relatively less growth rate (<9% CAGR of GDP per capita). Six of these 10 high growth districts are located in relatively prosperous and agrarian north Bihar. The 4 districts from south Bihar (Aurangabad, Gaya, Jahanabad and Sheikhpura) are part of Magadh division which has the highest MSME activities next to Patna division. While some these districts, which are historically prosperous due to development of Agriculture and located mostly in the Northern part of the state and others located near important divisions did thus relatively better both terms of generation of high output and CD ratio. For the remaining districts, the overall CD ratio is stagnating and



has negative impact on the GDP growth per capita. However whether the stagnation in CD ratio is driven by historical NPA driving down the appetite of the financial intermediaries need to be further assessed. The next section explores some of these themes in detail both at the district and sectoral level and link these findings with proactive Government policies in part of rural areas that displayed higher growth with intermediation.

### **B. Approach 2: Analysis of financial intermediation and its effect by sector**

With a view to trace the impact of financial development from the supply side (as measured by credit-deposit ratios) on per capita income, we use disaggregated data at district level for Bihar. Panel regression methods have been employed to test the relationship between financial intermediation and GDP per capita at district level. At the aggregate level, the relationship between the level of development and CD ratio can be tested with KCC as a control variable where KCC can be thought of as an instrument for political preferential policies towards agricultural farmers.

The heterogeneity in the relationship between GDP per Capita and CD Ratio & KCC can be tested considering time-invariant district-differences along with the time dimensions. **We find that there is negative correlation between per capita income and CD-ratio across all districts on average using data from 2004 onwards (see Table 2).** While CD-ratio is negative and significant for the full sample, KCC does have significant positive impact on per capita income. **Districts with higher KCC tend to have higher per capita income, although there is regional heterogeneity across districts.** As CD ratio has declined significantly from 2004 onwards, we decided to run this regression for a reduced sample period from 2008 onwards and it is seen from Table 2 (column 4) that **the coefficient estimate on CD ratio is now positive but statistically insignificant while KCC has a significant impact.** This suggests that credit allocated within the state directly or indirectly does not seem to have any significant positive impact on the level of development level within the region (see Table 2 and Figure 3).

[Table 2 about here]

[Figure 3 about here]

In finance and growth literature, issues have been raised with regard to dealing with identification issues with aggregate data due to problems of heterogeneity of effects across countries, measurement errors, omitting relevant explanatory variables, and endogeneity all of which tend to bias the estimated effect of the included variables. This is where micro data at district level with sectoral differences can help us identify sectors that are more likely to benefit from access to finance relative to other sectors with lower credit flows. Financial underdevelopment in some sectors can prevent investment in profitable growth opportunities and thereby lower per capita income. Thus we decided to construct sectoral CD ratios. We calculated sectoral CD ratios by deriving total deposits for each district from the CD ratio, given the total credit for each district. Then the ratio of credit allocated to each sector divided by total bank deposits as above gave us the sectoral CD ratios in each sector which directly measures proportion of bank deposits in a district that is allocated as loans to different sectors.

The sectoral deployment of credit can reveal the demand originating in a particular sector which could also reflect whether a sector is a high-return sector from the bank's point of view or there are state guarantees in place that encourage banks to create loans to that sector. Cole (2009) showed that meeting development lending goals had no impact on the real economy. This is another reason why we need to compute sectoral CD ratios. **Our results show that sectoral CD ratio in agriculture did have a positive impact on per capita income, although the aggregate CD ratio had no significant impact over the reduced sample period** (see Table 3 & Figure 4).

**The relationship between sectoral financial development and income is positive and significant only in the case of credit to agriculture and transport infrastructure, but not in other sectors (see Table 3 and Figure 4).** This is probably because the probability of default could be very high in those sectors due to lack of selection and screening of

projects. On the other hand, sectors where credit is flowing could be in part due to government intervention that encourages banks to create loans to this sector.

[Table 3 about here]

[Figure 4 about here]

Besides analysing the credit-output linkage across sectors, we also examine the relationship under annual credit plan across districts focusing on both demand for (actual loans made) and supply of credit (credit limit) respectively by banks. This helps us identify the difference between two broad sectors where credit flow is growing rapidly (more than the targeted credit limit during a year) and the sector which is credit constrained (or sectors/districts facing declining credit flow requiring government intervention). In order to examine this possibility of excess demand or excess supply in priority versus non-priority sectors, we looked at the percentage deviation between actual loans disbursed and the targeted credit limit in priority vs. non-priority sectors and their relative impact on income for period 2008-2010. **We find that when the percentage deviation between actual and targeted credit (a negative deviation or lower than the planned allocation could reflect credit rationing) increases in the priority sector, it has a positive impact on income, while it has no significant impact in the non-priority sector (see Table 4A).**

[Table 4A about here]

Due to significant variation in the percentage deviation between actual loans disbursed and the targeted credit limit in priority vs. non-priority sectors in 2008 compared to 2009-10, in addition to Table 4-A, we do a similar cross-section regression analysis for the period 2009-10. We find that there is a positive and significant relationship in CD ratio across districts [see Table 4-B] whereas in Table 4-A, column 2, 3, no correlation is found in the case of non-priority sectors. However, excluding the KCC from analysis, we find that the percentage deviation between actual and targeted credit is positively correlated in priority sectors.

[Table 4-B about here]

Finally, we look at another financial intermediation indicator to check the robustness of our results with regard to the relationship between CD ratio and GDP per capita at district level, controlling for the interaction of credit gap with district level bank branch expansion. We carry out a district-level cross-section regression including bank branches as another supply-side financial intermediation variable for further robustness of our results. We use total number of branches in a district including different groups of credit institutions (commercial banks, cooperative banks, foreign and private banks).

The CD ratios could be higher in local regions where there is higher number of bank-branches (see Figures 5a-5b). So we include an interaction term between credit gap in (priority vs. non- priority) and bank branches to uncover any non-linearity in the data and show its impact on per capita income. **We find that districts with higher level of bank branches do have positive and significant effect on the development in those districts (Table 5, Model 1).** As shown in Model 1 (Table 5), compared to non-priority sectors, districts with higher bank branches tend to experience lower credit gap (proportion of actual credit out of targeted credit) in priority sectors, which has a positive and significant effect on per capita income. The same is the case for the non-priority sector credit gap when there is bank branch expansion. We then considered regional (Table 5, Model 2) CD ratios which do not seem to have any regional variation, except in districts (category D) with CD ratios between 35-40%. We have classified different regions of Bihar into 5 regional categories on the basis of CD ratios.

[Figures 5a-5b about here]

[Table 5 about here]

### **C. Approach 3: Firm-level analysis**

In this section, we use firm level data to exploit the impact of alternative sources of financing on firm level performance in Bihar, using company level data from Prowess published by CMIE. We extracted 54 companies, which are located in Bihar (see the list of companies in Appendix 1). Data on 46 companies are usable which allow us to find whether bank-financing or equity financing is important for company performance. It appears that most companies resort to bank-financing as shown in Table 6 with a higher proportion of debt share (borrowings as a proportion of total assets) rather than equity financing.

[Table 6 about here]

***Despite the data caveats with regard to missing/unreported values, the key question that we intend to address here is whether the alternative sources of financing have varied impact on firm output in terms of their performance indicators like income, value added, profitability, and share price of the industries located in Bihar. That is, while in the earlier section, we dealt with the agriculture sector and financial resources available in Bihar, here we consider the impact of such financial resources on the industrial sector at company level, although for the state as a whole in the absence of useful district-wise information.*** Specifically, we first carried out the empirical analysis to examine the impact of the level of borrowing and equity financing on the first two performance indicators (namely income and value added), while controlling for firm size, with the remaining two indicators (profitability and share price) being used for robustness checks.

First, we estimate when the dependent variable is output (or gross revenue) and then we turn to using value added - gross-output net of intermediate inputs - as the dependent variable. Both total revenue and value added are used as alternative indicators of performance and the results are presented in Table 7. **We find that borrowing and equity financing have a positive impact on firm output in the benchmark case, but when we control for firm size via total assets, the effect turns insignificant. When we include a squared term for borrowing to capture any non-linearity, the impact is negative confirming that firms with high level of borrowing tend to experience higher debt burden influencing their output negatively.**

But when we replace gross income with value added (see panel B, Table 7), the effect of borrowing (whether level or squared term) turns insignificant, regardless of whether we use the borrowing or equity capital in their log levels or as a proportion of assets. However equity capital tends to have a negative impact on gross revenue or value added, which confirms that companies in Bihar are less dependent on equity capital (as 22% of their total assets on average), while they are heavily dependent on bank borrowing for their performance as reflected through their debt share as a proportion of total assets (see Table 6).

When we consider the impact of borrowing as a proportion of total assets on firm profitability (defined as profits over sales) or share price, the effect is somewhat different. **We find that debt/assets ratio has a negative effect and the squared debt ratio has a positive effect, which is contrary to what one would expect in corporate**

finance literature. The plots however do not show a clear U-shape, implying that with very higher level of debt, the profitability is lower but remains flat (see figure 7). When we turn to share price replacing profitability as a dependent variable, we find that the effect remains the same. The share price is lower with higher debt ratio or with higher equity ratio. As the number of observations gets halved due to missing data, we have not presented these results in a tabular form, but they are available upon request from the authors.

Since both sources of financing have negative impact on performance, we tried to separate the firms with high and low levels of borrowing (by dividing the sample into below- and above-average borrowing). We find that there are only 6 firms (out of 46) who have high debt ratio (above average), and those firms' equity ratio is also above average. From this we can conclude that firms with high debt ratio tend to have high equity ratio which might explain the negative impact of equity on performance. In other words, firms who borrow too much may end up reducing their creditworthiness by increasing the possibility of bankruptcy and bankruptcy costs on their performance in the equity market, overall firm performance and shareholder value. Thus over-borrowing and lack of creditworthiness lead companies to resort to equity financing and thereby jeopardizing the value of equity. However the number of firms on the high side is very small who basically drive the negative impact in the credit market that spills over to the equity (stock) market. Since Bihar has only a very small number of companies with higher level of debt or equity ratio (i.e., skewed at the low

end), it may not be reasonable to generalise the average relationship for the whole of Bihar.

Nevertheless, directed credit policies might have helped these firms to expand their borrowing from the bank, as opposed to going for equity financing which requires more disclosure on the part of the firms. This explains why equity financing has not had a discernible positive effect on company performance. In a panel of 62 countries, Agnello et al. (2012) find that the removal of mandatory credit allocation has a favourable impact on an economy in terms of helping reduce income inequality. Banerjee and Duflo (2012) show that unconstrained firms will primarily use a directed credit programme to borrow more, so as to substitute other sources of financing. This suggests that directed credit is probably contributing to bank loans accounting for a big proportion of company total assets, but as shown in our results they do not seem to translate into better company performance.

[Table 7 about here]

## **8. Conclusions**

To sum up, higher bank branches do imply higher credit allocation relative to the targeted credit, given their combined positive impact on per capita income. But CD ratios do not provide conclusive evidence as to whether better financial intermediation can contribute to higher level of economic activity. Our preliminary analysis of the data show that while Bihar grew at a more rapid pace than that of India but much of the growth and development of the intermediation took place in the prosperous belts of North as well as South and proactive Government programme like KCC helped these



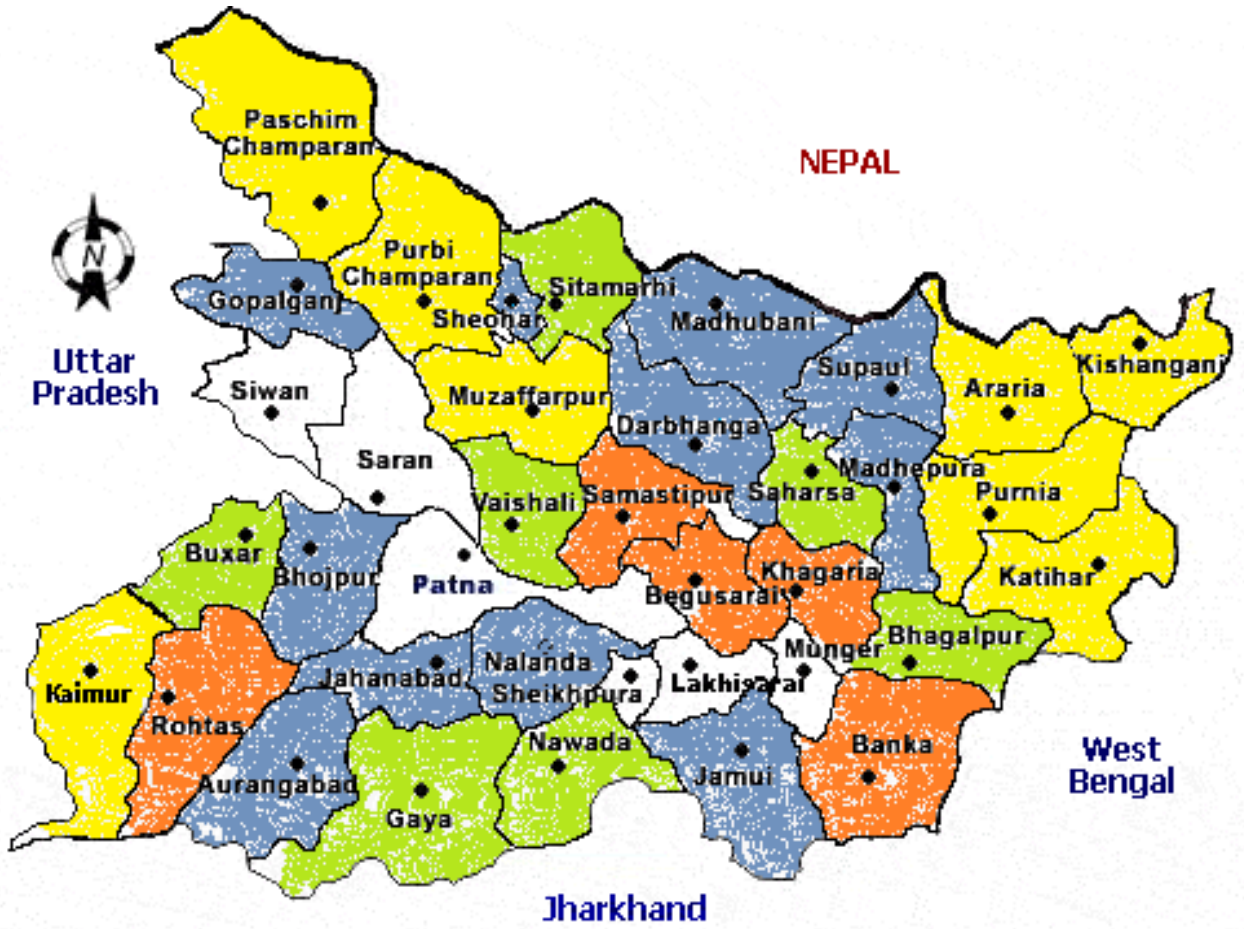
regions to grow both in terms of output and development of financial indices while the rest of the regions are still languishing and underperformed with a poorer indices of intermediation activities. It is however confirmed that while allocation of credit certainly has a positive impact on the priority sector but the opposite holds true for the non priority segments of the economy, including industrial sectors. We also find that similar effects with respect to Government guarantees or regions where there are more bank branches. However, the overall impact of financial intermediation on economic development is limited possibly due to credit market imperfections in the state of Bihar. Companies in Bihar however derive big part of their financing in the form of borrowing, although the impact of borrowing on firm performance remains less significant in our empirical analysis, which requires further research with data on more companies over longer time period and better location information of companies.

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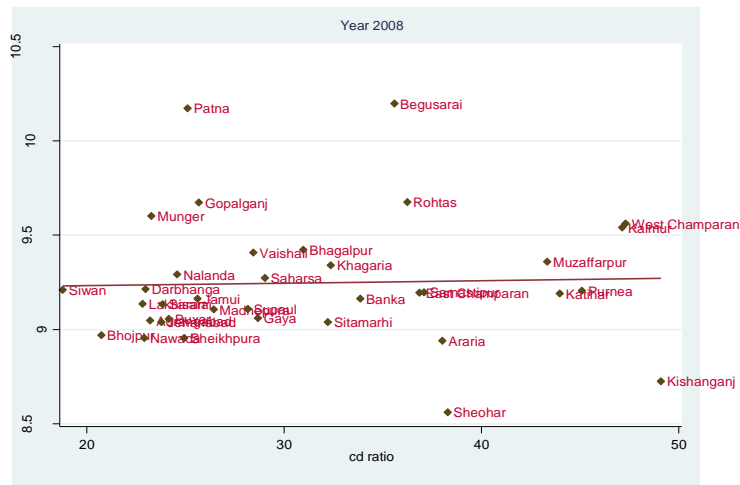
Figure 1: Map of Bihar



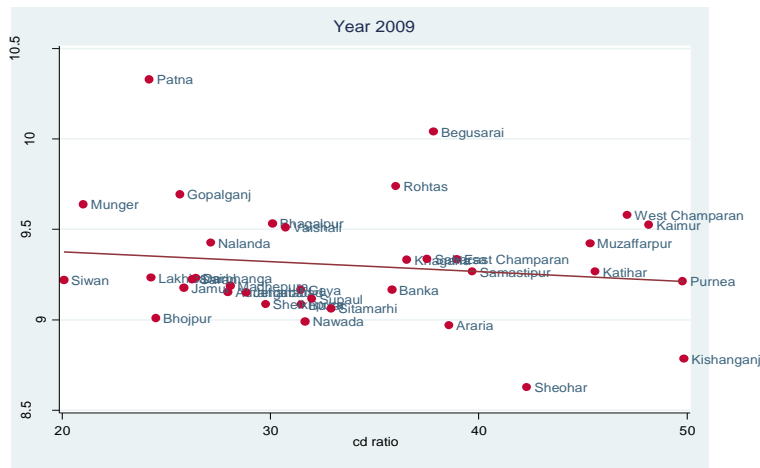
Yellow>40-52%, Orange>35<40%, Green>30<35%, Blue>25<30%, White>19<25%

Source: The Government of Bihar (<http://gov.bih.nic.in/>)

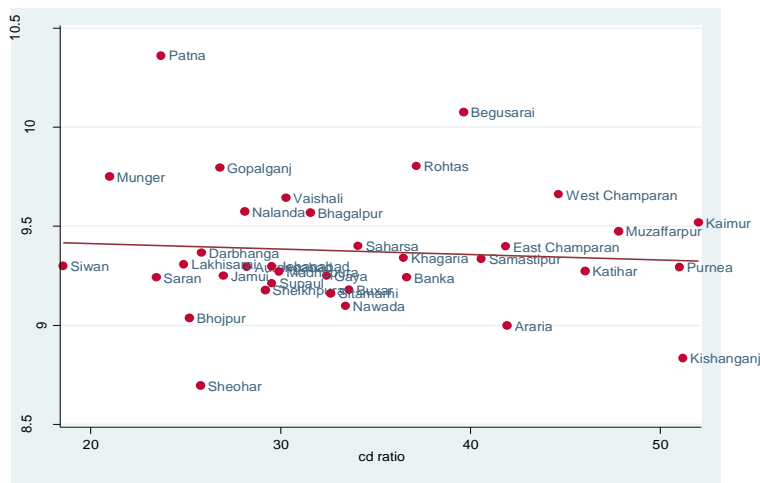
Figure 2: Scatter plot of Credit Deposit ratio versus per capita GDP for 2008-2010.



2008



2009



2010

Figure 3: District-wise estimated relationship between Credit Deposit ratio and GDP per capita (2008-10).

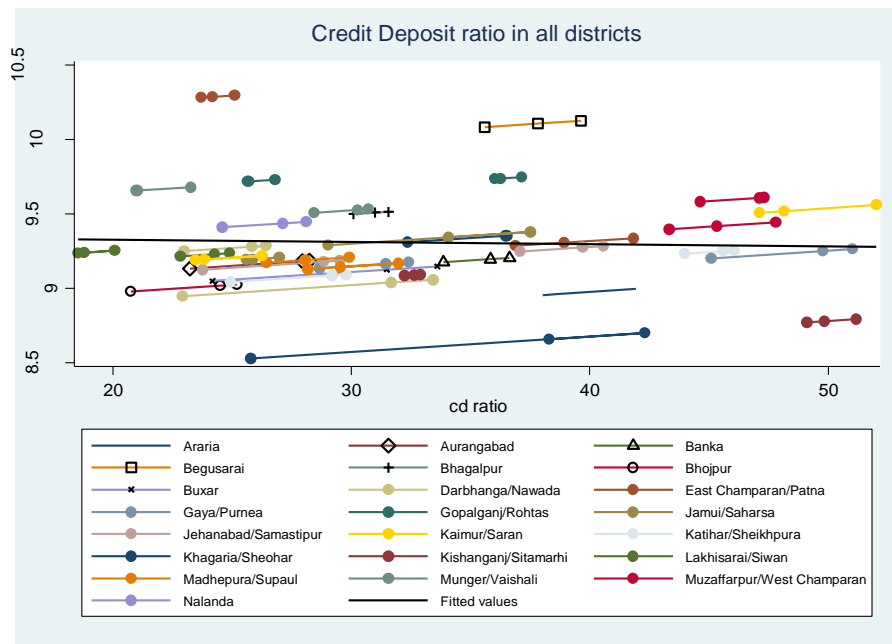
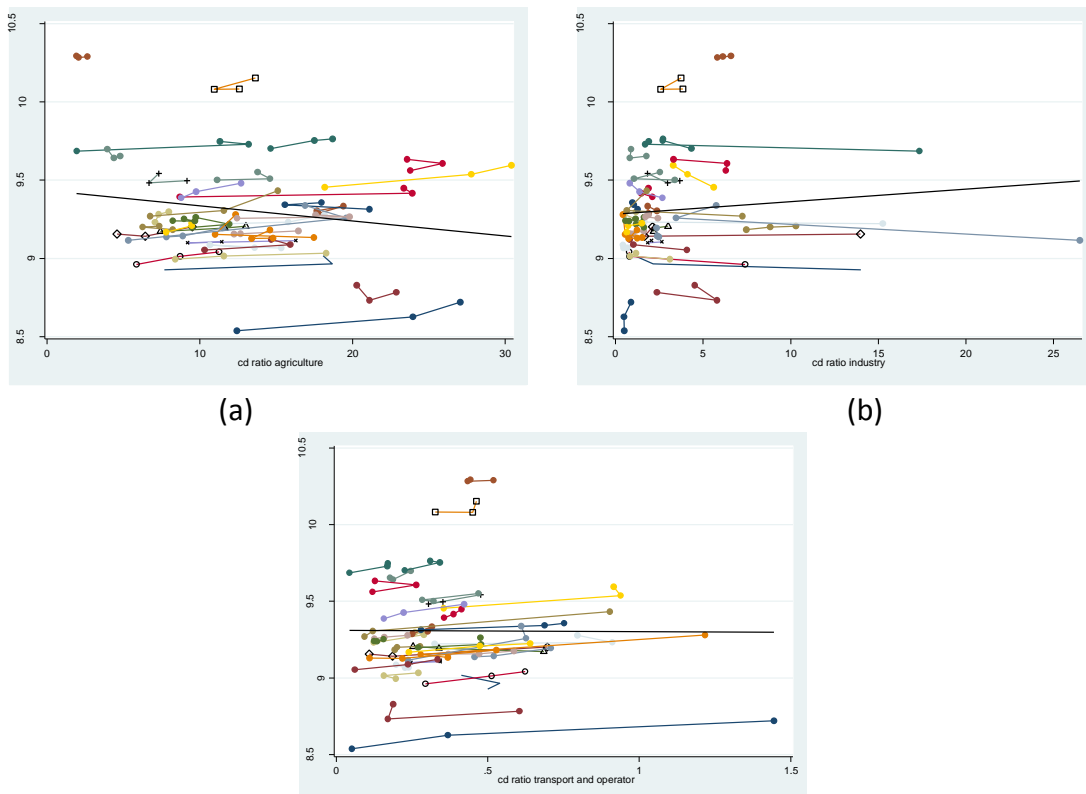
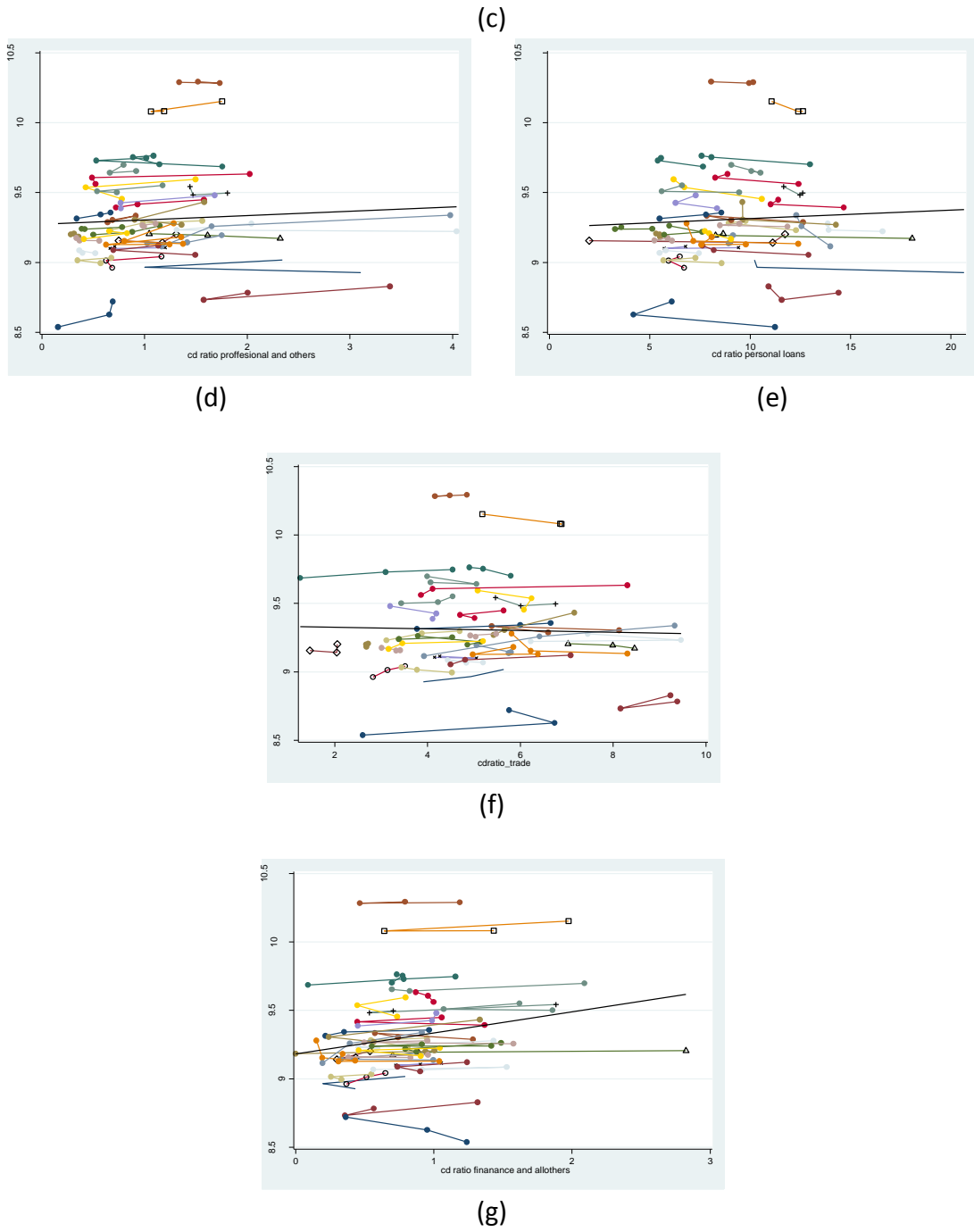


Figure 4: District-wise estimated sectoral Credit Deposit ratio and GDP per capita (2008-10).





Note: (i) All coloured lines represent districts. (ii) a - agriculture, b - industry, c - transport and operators, d - professional and other services, e - personal loans, f - trade, g - finance and others.

Figure 5-A: Credit Gap vs. Bank Branches in (Priority Sectors)

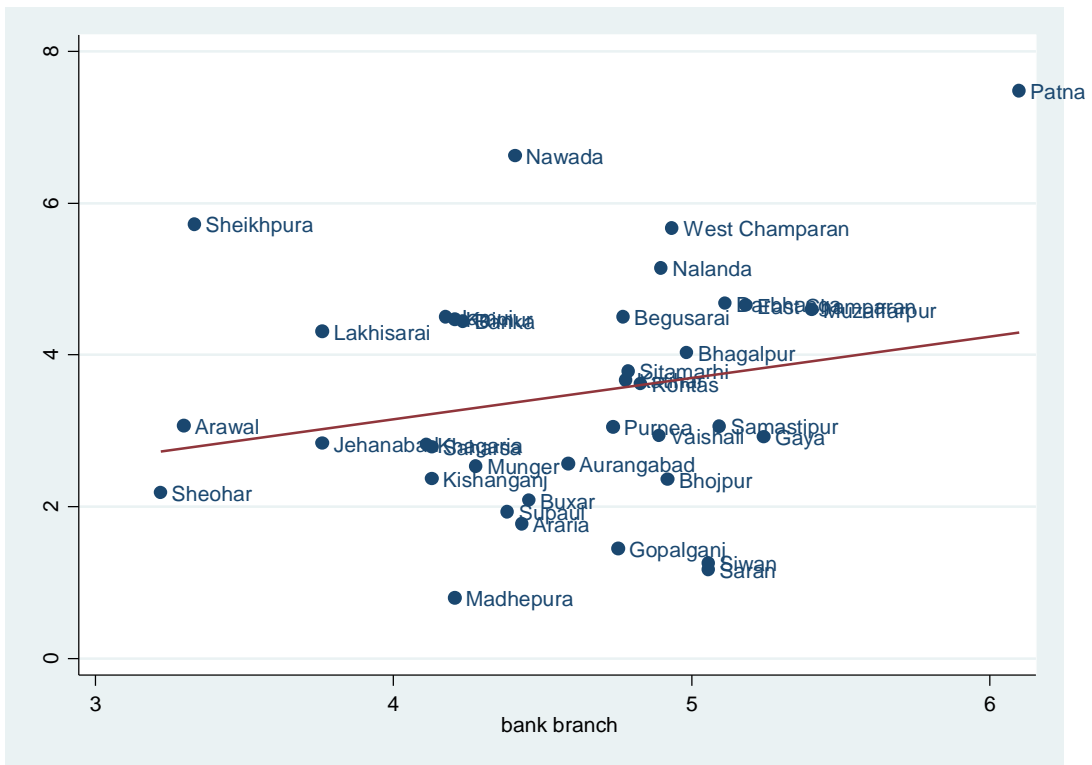


Figure 5 -B: Credit Gap vs. Bank Branches in (non-Priority Sectors)

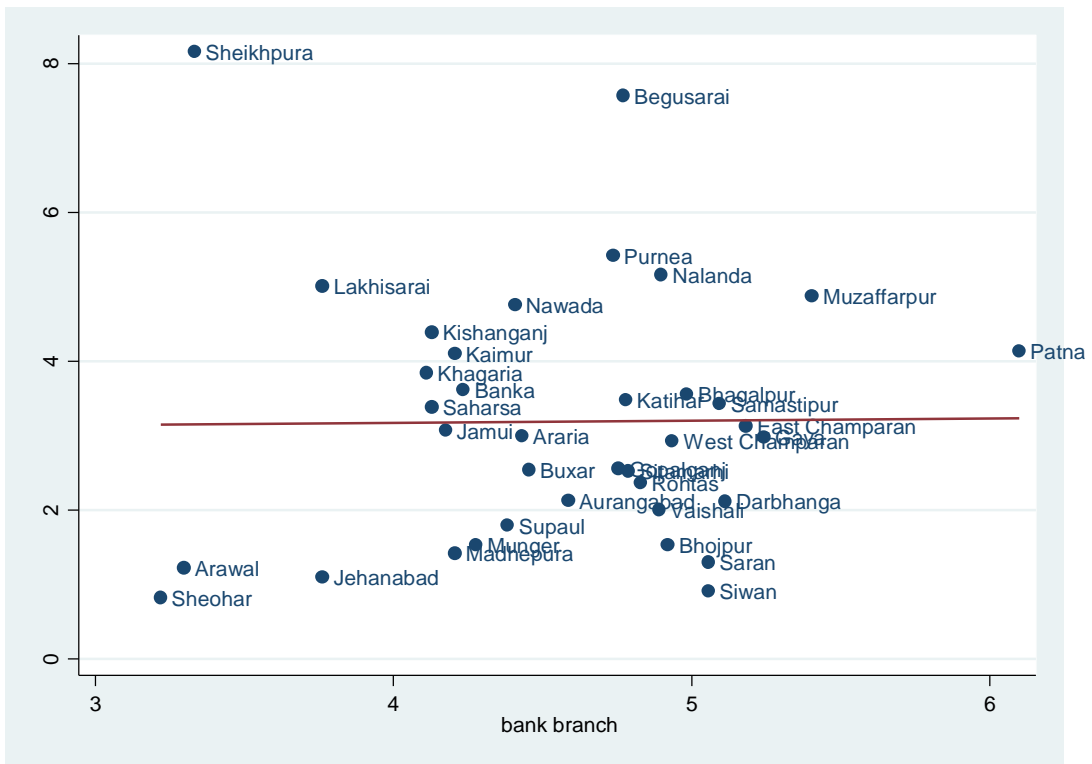


Figure 6-A Credit Gap vs. Credit ratio in (Priority Sectors)



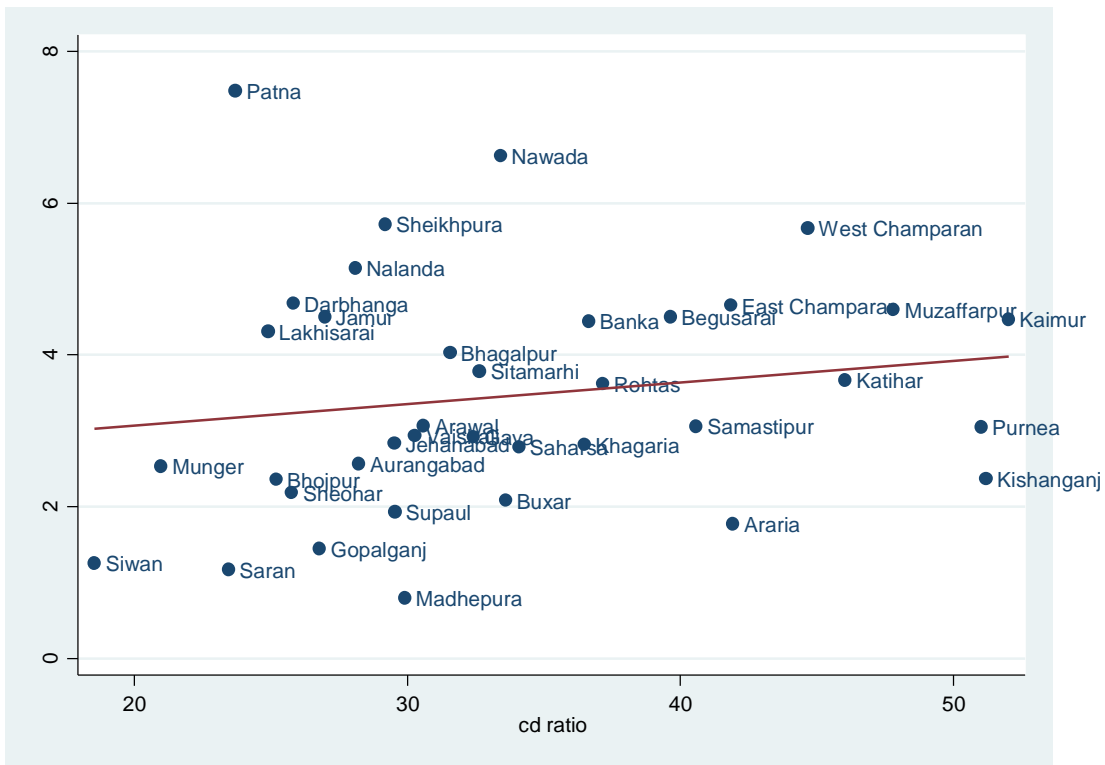


Figure 6-B Credit Gap vs. Credit ratio in (non-Priority Sectors)

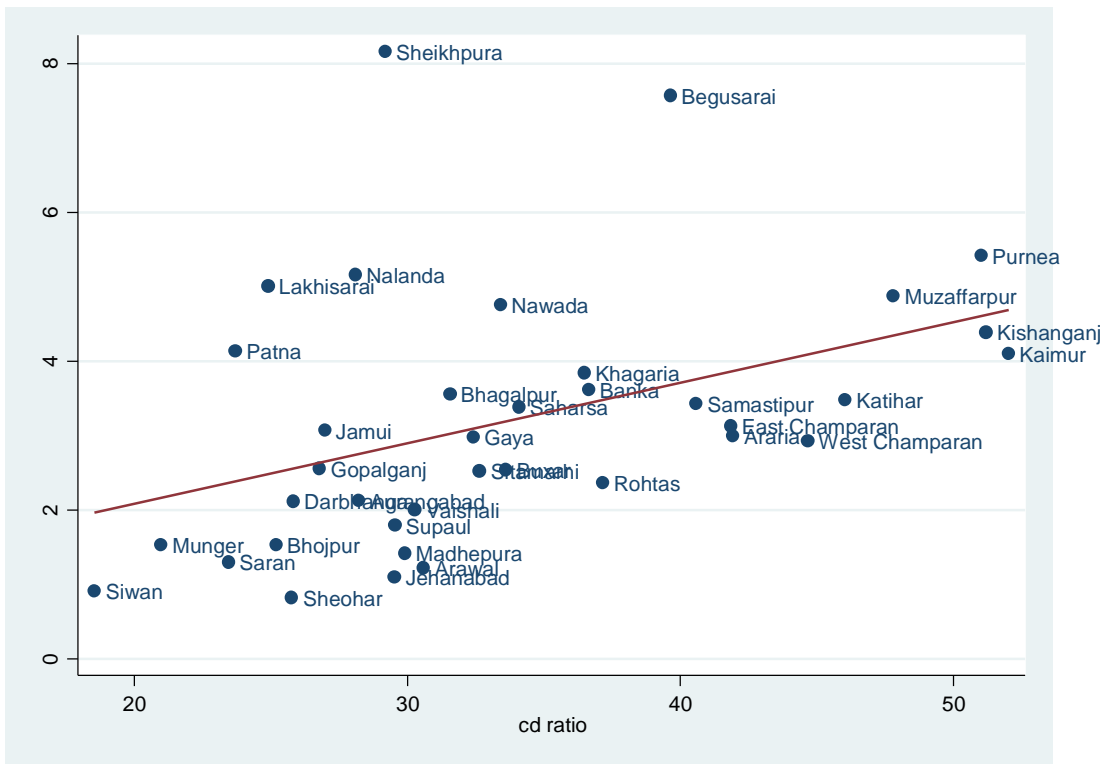


Figure 7: Relation between Corporate borrowing over assets and Profitability

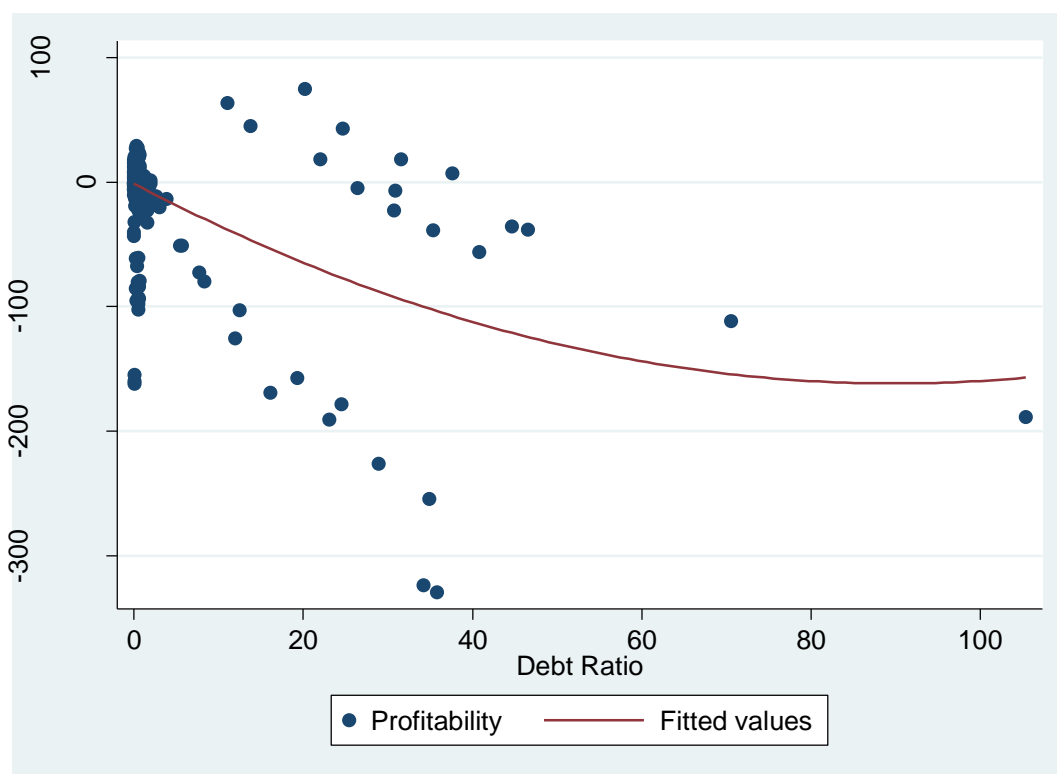


Table: 1 Descriptive Summary for years (2008-10)

	<b>N</b>	<b>Mean</b>	<b>Std. Err.</b>
Log of GDP per capita	108	9.31	0.0315
Credit Deposit ratio	108	32.79	0.8264
Log of Kisan credit card	108	9.84	0.0709
Credit Deposit ratio (agriculture)	108	12.99	0.5797
Credit Deposit ratio (industry)	108	3.13	0.3710
Credit Deposit ratio (transport operators)	108	0.37	0.0233
Credit Deposit ratio (professional and other services)	108	1.10	0.0672
Credit Deposit ratio (personal loans)	108	9.06	0.3071
Credit Deposit ratio (trade)	108	5.05	0.1672
Credit Deposit ratio (finance and all others)	108	0.82	0.0449
Credit gap in priority sectors	108	34.60	3.41
Credit gap in non-priority sectors	108	48.55	5.67

Note: \*NPA is based on 2 years (2009-10) across 41 bank branches.

Table 2: Regression of per capita income on Credit Deposit ratio across districts

	(1) †	(2) †	(3) †	(4) † †
Constant	9.189*** (0.1678)	7.461*** (0.1117)	8.013*** (0.1927)	7.942*** (0.1424)
CD ratio	-0.00816* (0.0032)		-0.00698* (0.0027)	0.00268 0.0018
KCC		0.151*** (0.0114)	0.125*** (0.0137)	0.0956*** (0.0109)
Fixed effect	YES	YES	YES	YES
<b>R<sup>2</sup></b>	0.7909	0.8094	0.8484	0.9821
<b>N</b>	258	258	258	108

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) Unless specified, all specifications include districts and times dummies. (4) KCC is in log form. (5) † for period 2001-10. (6) † † for period 2008-10.

Table 3: Regression of GDP per capita on Credit Deposit ratio of each sector across districts (2008-10)

<b>CD Ratio</b>								
Constant	8.846*** (0.0536)	9.004*** (0.0455)	8.901*** (0.0446)	8.900*** (0.0562)	9.087*** (0.0672)	8.901*** (0.0595)	8.955*** (0.0451)	8.979*** (0.0796)
Agriculture	0.00834*** (0.0023)							
Industry		-0.0059* (0.0025)						-0.0033 0.0028)
Transport operators			0.142*** (0.0371)					0.111** (0.0381)
Professional and other services				0.0326 (0.0165)				0.0380* (0.0161)
Personal loans					-0.0085* (0.0037)			-0.0083* (0.0035)
Trade						0.0143 (0.0083)		-0.00465 (0.0089)
Finance and all others							0.031 (0.0199)	0.0222 (0.0178)
Fixed effect	YES	YES	YES	YES	YES	YES	YES	YES
<b>R<sup>2</sup></b>	0.9684	0.9654	0.9690	0.9645	0.9651	0.9641	0.9638	0.9743
<b>N</b>	108	108	108	108	108	108	108	108

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) Unless specified, all specifications include districts and times dummies.

Table 4 A: District-wise performance under annual credit plan (ACP) for **2008-10**

Constant	8.790*** (0.0899)	8.803*** (0.1050)	8.207*** (0.1680)	7.913*** (0.1750)
KCC	‡	‡	0.0632*** (0.0159)	0.0993*** (0.0170)
CD ratio	0.00570** (0.0020)	0.00466 (0.0024)	0.00443* (0.0019)	0.00248 (0.0020)
CD ratio x Credit gap in priority sectors	-0.0041*** (0.0000)	--	-0.0019** (0.0000)	--
CD ratio x Credit gap in non priority sectors	--	-0.00194*** (0.0000)	--	0.0133 (0.0000)
Fixed effect	YES	YES	YES	YES
<b>R<sup>2</sup></b>	0.97.81	0.9726	0.9826	0.9818
<b>N</b>	108	108	108	108

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) Unless specified, all specifications include districts and times dummies. (4) KCC is in logs. (5) ‡ no interaction (6) -- referenced category.

Table 4 B: District-wise performance under annual credit plan (ACP) for 2009-10

Constant	8.317*** (0.1201)	8.405*** (0.1261)	8.007*** (0.1790)	8.093*** (0.2003)
KCC	‡	‡	0.044* (0.0197)	0.0401 (0.0205)
CD ratio	0.0172*** (0.0029)	0.0155*** (0.0031)	0.0140*** (0.0030)	0.0132*** (0.0032)
CD ratio x Credit gap in priority sectors	0.0033 (0.0047)	--	-0.0033** (0.0045)	--
CD ratio x Credit gap in non priority sectors	--	-0.0039 (0.0032)	--	-0.00217 (0.0033)
Fixed effect	YES	YES	YES	YES
<b>R<sup>2</sup></b>	0.9914	0.9917	0.9926	0.9925
<b>N</b>	72	72	72	72

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) Unless specified, all specifications include districts and times dummies. (4) KCC is in logs. (5) ‡ no interaction (6) -- referenced category.

Table 5: Effect of Bank Branches on per capita income across Sectors and Regions

	Model 1		Model 2	
	A	B	A	B
Constant	8.406*** (0.3952)	8.289*** (0.3756)	7.825*** (0.6531)	7.177*** (1.020)
Log of bank branch	0.198* (0.0858)	0.254** (0.0755)	0.251** (0.0897)	0.251* (0.0897)
CD ratio	-0.0053 (0.0049)	-0.0103 (0.0054)	0.0144 (0.0185)	0.014 (0.0185)
Credit gap in priority sectors x log bank branch	0.0148* (0.0060)	--	0.009 (0.0071)	0.009 (0.0071)
Credit gap in non priority sectors x log bank branch	--	0.0179* (0.0066)	0.005 (0.0084)	0.005 (0.0084)
Category-A			--	0.648 (0.4460)
Category-B			-0.223 (0.1605)	0.424 (0.3580)
Category-C			-0.383 (0.2280)	0.265 (0.2741)
Category-D			-0.146 (0.6481)	0.501* (0.2296)
Category-E			-0.648 (0.4461)	--
<b>R<sup>2</sup></b>	0.4118	0.4333	0.5405	0.5405
<b>N</b>	35	35	35	35

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) -- referenced category.

Category-A : Siwan, Munger, Saran, Patna, Lakhisarai. **(Colour Code on Map-White)**

Category-B : Bhojpur, Sheohar, Darbhanga, Gopalganj, Jamui, Nalanda, Aurangabad, Sheikhpura, Jehanabad, Supaul, Madhepura. **(Colour Code on Map- Blue)**

Category-C : Vaishali, Arawal, Bhagalpur, Gaya, Sitamarhi, Nawada, Buxar, Saharsa **(Colour Code on Map-Green)**

Category-D : Khagaria, Banka, Rohtas, Begusarai. **(Colour Code on Map-Orange)**

Category-E : Samastipur, East Champaran, Araria, West Champaran, Katihar, Muzaffarpur, Purnea, Kishanganj, Kaimur. **(Colour Code on Map-Yellow)**

**Table 6: Descriptive Statistics at Firm level**

	Mean	Std. Dev.	Min	Max
Total income	57735.71	310767.10	0.100	3622316.00
Borrowings	15218.98	55710.46	0.100	527338.70
Equity Capital	3177.57	13767.33	0.500	82455.00
Raw materials	22491.01	122301.20	2.000	1428809.00
Wages	1388.86	4928.77	0.200	51919.70
Total assets	44099.20	184621.40	0.300	1868434.00
Net fixed-assets	13693.83	55794.05	0.200	581874.00
Debt share	1.63	7.11	0.001	105.34
Equity share	0.22	0.39	0.001	3.41

Source: Prowess data, CMIE

**Table 7: Firm-level Empirical Results**

	Panel-A				Panel-B			
<b>Total Income</b>					<b>Total Value added</b>			
Constant	5.947*** (0.3917)	5.293*** (0.4022)	0.788 (0.4108)	-0.0602 (0.4676)	Constant	8.144*** (0.3090)	8.174*** (0.2907)	8.177*** (0.2906)
Borrowing	0.417*** (0.0380)	0.287*** (0.0442)	-0.108* (0.0419)	0.112 (0.0728)	Debt share	-0.0331** (0.0110)	0.0121 (0.0117)	-0.0187 (0.0288)
Equity capital	‡	0.363*** (0.0674)	-0.246*** (0.0640)	-0.212** (0.0640)	Equity share	‡	-2.666*** (0.3225)	-2.499*** (0.3524)
					Debt share squared	‡	‡	0.000284 (0.0002)
Total assets	‡	‡	1.131*** (0.0640)	1.169** (0.0641)				
Borrowing squared			‡	-0.0236** (0.0064)				
<b>R<sup>2</sup></b>	0.8774	0.8833	0.9252	0.927		0.8776	0.8918	0.8921
<b>N</b>	605	605	605	605		566	566	566

Note: (1) \* p<0.05, \*\* p<0.01, \*\*\* p<0.001. (2) Robust standard errors are shown in parenthesis. (3) Unless specified, all specifications include company (4) ‡ no interaction.

**Appendix 1: List of company names**

<b>Company Names</b>	<b>District Names</b>
Alkem Laboratories Ltd.	Araria
Ambuja Electrocastings Ltd.	Arawal
Ambuja Flour Mills Ltd.	Aurangabad
Ambuja Zinc Ltd.	Banka
Balmukund Concast Ltd.	Begusarai
Bata India Ltd.	Bhagalpur
Belsund Sugar & Inds. Ltd.	Bhojpur
Bennett, Coleman & Co. Ltd.	Buxar
Bestavision Electronics Ltd.	Darbhanga
Bharat Wagon & Engg. Co. Ltd.	Gaya
Bihar Mercantile Union Ltd.	Gopalganj
Cawnpore Sugar Works Ltd.	Jamui
Champarun Sugar Co. Ltd.	Jehanabad
Dina Iron & Steel Ltd.	Kaimur
Dumraon Textiles Ltd.	Katihar
Eastern India Powertech Ltd.	Khagaria
Eastern Sugar & Inds. Ltd.	Kishanganj
Ganesh Foundry & Castings Ltd.	Lakhisarai
Gangotri Iron & Steel Co. Ltd.	Madhepura
Graphite India Ltd.	Munger
Graphite India Ltd. [Merged]	Muzaffarpur
Harinagar Sugar Mills Ltd.	Nalanda
Hindustan Fertilizer Corpn. Ltd.	Nawada
I T C Ltd.	West Champaran
Indian Oil Corpn. Ltd.	Patna
Indian Railway Catering & Tourism Corpn. Ltd.	East Champaran
J J Exporters Ltd.	Purnea
J M D Alloys Ltd.	Rohtas
J V L Agro Inds. Ltd.	Saharsa
Kalyanpur Cements Ltd.	Samastipur
Krishi Rasayan Exports Pvt. Ltd.	Saran
Mcdowell & Co. Ltd. [Merged]	Sheikhpura
Motilal Padampat Udyog Ltd.	Sheohar
N T P C Ltd.	Sitamarhi
Nacro Chemicals Ltd.	Siwan
National Jute Mfrs. Corpn. Ltd.	Supaul
National Textile Corpn. (W.B., Ass., Bih. & Ori.) Ltd. [Merged]	Vaishali
New India Retailing & Invst. Ltd.	
Oudh Sugar Mills Ltd.	
Progressive Steels (India) Ltd.	

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Pyrites, Phosphates & Chemicals Ltd.

Rameshwara Jute Mills Ltd.

Riga Sugar Co. Ltd.

S K G Consolidated Ltd.

S R P Industries Ltd.

Saraswati Steel & Alloys Ltd.

Shalimar Pellet Feeds Ltd.

Sree Beharaji Mills Ltd.

Tirupati Sugars Ltd.

United Spirits Ltd.

Upper Ganges Sugar & Inds. Ltd.

Usher Agro Ltd.

Vishnu Sugar Mills Ltd.

Winsome International Ltd.

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