Implications of bank ownership for the credit channel of monetary policy transmission: Evidence from India

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Abstract:

Using bank-level data from India, we examine the impact of ownership on the reaction of banks to monetary policy, and also test whether the reaction of different types of banks to monetary policy changes is different in easy and tight policy regimes. Our results suggest that there are considerable differences in the reactions of different types of banks to monetary policy initiatives of the central bank, and that the bank lending channel of monetary policy is likely to be much more effective in a tight money period than in an easy money period. We also find differences in impact of monetary policy changes on less risky short term and more risky medium term lending We discuss the policy implications of the findings.

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1. Introduction

The recent financial crisis brought to the fore the debate about the bank lending channel of monetary policy transmission. Traditional macroeconomic models such as the IS-LM representation assume that monetary policy affects the real economic activity by changing interest rates which, in turn, affects the investment demand of the firms. However, this line of argument has increasingly come under scrutiny.[1] To begin with, evidence suggests that investment decisions of firms are affected much more by factors such as cash flows than by the cost of borrowing (Bernanke and Gertler, 1995). Evidence also suggests that banks are not passive intermediaries between the central bank and end users of money such as the firms. For example, in an early discussion of this issue, Bernanke and Blinder (1992) demonstrate that the composition of banks' portfolios change systematically in response to monetary policy initiatives. They conclude that the impact of monetary policy on the investment of firms is not entirely demand driven, and that at least part of it can be explained by the supply side or the bank lending channel. Kashyap and Stein (1993) demonstrate that if a central bank pursues tighter monetary policy, there is a decline in the amount of bank loans to firms and simultaneously a rise in the issuance of commercial paper, and conclude that contractionary monetary policy reduces loan supply.

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[1] There are a number of attempts to theoretically extend the IS-LM framework to a multi-asset framework with imperfect substitutability among the assets. As such, the lending channel view of monetary policy is a special case of these extended frameworks, with money, bonds and loans as three imperfectly substitutable assets (Kashyap and Stein, 1995).

Importantly, research suggests that there might be significant heterogeneity in the reaction of banks to monetary policy initiatives. It may, for example, depend on the extent of competition in the banking sector. Olivero, Li and Jeon (2011) argue that an increase in competition in the banking sector weakens the transmission mechanism of monetary policy through the bank lending channel.

Banks' reaction to monetary policy initiatives also depends on the quality of their balance sheets. Peek and Rosengren (1995) argue that an important determinant of a bank's reaction would be its capital-to-asset ratio. If banks find it difficult (or expensive) to raise capital, for example, they could be reluctant to lend even if there is ample demand for credit in the aftermath of easing of monetary policy. This hypothesis finds support in the empirical literature. Kishan and Opiela (2000) find that small and undercapitalised banks are most affected by monetary policy. Gambacorta (2005) too finds that lending of undercapitalized Italian banks is adversely affected by contractionary monetary policy, even though lending is not correlated with bank size. Further, there is a directional asymmetry in the impact of monetary policy on the lending behaviour of undercapitalised banks (Kishan and Opiela, 2006). In the event of contractionary monetary policy, there is a sharp tightening in loan disbursal by undercapitalised banks, but in the event of an expansionary monetary policy there is no corresponding expansion of credit disbursal.

The reaction of banks to monetary policy also depends on the composition of their assets. The traditional or money view of monetary policy transmission assumes that all asset classes are perfect substitutes of each other. If, therefore, contractionary monetary policy leads to a reduction in deposits, a bank is capable of substituting for this loss of deposits dollar for dollar, using other assets like CDs, such that loan supply is not affected. Stein (1998) argues

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that, contrary to this view, assets included in a bank's balance sheet are not perfect substitutes. For example, since deposits are guaranteed by the FDIC (or its overseas counterpart), while CDs are not, there may be adverse selection in the market for CDs, such that banks do not use these instruments to compensate for loss of deposits dollar for dollar. This results in a decline in loan supply. It follows that banks that have less liquid assets such that they cannot quickly and costlessly compensate for loss of deposits in the event of contractionary monetary policy or, alternatively, those that cannot raise funds quickly to the same end, would react more to monetary policy changes. Kashyap and Stein (2000) find that monetary policy has greater impact on loan supply of banks with low securities-to-assets ratios.

The literature does not, however, empirically examine the impact of bank ownership on the lending channel of monetary policy transmission.[2] This is hardly surprising, given that much of the literature is based on the United States and Western European experiences,[3] where private ownership of banks overwhelmingly dominates. However, as pointed out by La Porta et al. (2000), state-ownership of banks is ubiquitous in much of the world, especially in emerging economies. Indeed, the 2007-09 financial crisis has led to significant state ownership of banking assets even in developed countries such as the United Kingdom, and concerns about the lending activities of the de facto nationalised banks have brought into

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[2] Andries and Billion (2010) develop a theoretical model that demonstrates that state-owned banks are more able to counteract restrictive monetary policy because they have greater capability to raise additional deposits.

[3] See, for example, the following related recent studies focusing on Western European countries: Altunbaş, Fazylov and Molyneux (2002); Huang (2003); Hülsewig, Mayer and Wollmershäuser (2006); De Graeve, De Jonghe and Vennet (2007); and Dovern, Carsten-Patrick and Vilsmeier (2010)

focus the impact of bank ownership on the lending channel in the developed country context as well. In this paper, we address this lacuna in the literature, and examine whether the impact of monetary policy on lending differs across banks with different ownerships.

Studying how bank ownership plays a role in the credit channel of monetary policy transmission is important because public sector banks account for a significant portion of the banking assets and loan portfolio emerging economies, and, at the same time, many of these countries are fiscally constrained such that monetary policy may be the only instrument available to policy makers to induce growth. This indeed is currently the situation in a wide range of developed countries as well. Our analysis provides an empirical basis for this policy debate concerning the relative effectiveness of monetary policy when a significant proportion of the banking sector is under state ownership.[4] This is one of the key contributions of the paper. Further, by isolating the response of foreign-owned banks, it adds to the small but growing literature on the impact of foreign banks on credit growth, especially in emerging economies context.

Our second important contribution is that we separately examine the reaction of different types of banks (i.e., private, state and foreign) in easy and tight monetary policy regimes. As mentioned earlier, reaction of banks to monetary policy changes may be asymmetric: a

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[4] Note, for example, the public policy debate in the United Kingdom, an industrialised economy, where two large banks are currently in public ownership. The easy monetary stance adopted by the Bank of England has not resulted in credit growth to the desired extent, and there is an on-going debate about the role of these nationalised banks in delinking expansionary monetary policy and credit growth, at a time when economic growth is perhaps of greater importance than inflation targeting.

change in interest rates might have very different outcomes, depending on whether these rates are low or high to begin with. If an asymmetry does exist, a greater understanding of the differences in the impact of monetary policy in easy and tight money regimes would be imperative for successful monetary policy interventions. The richness of our contribution is enhanced by the fact that, for each of these monetary policy regimes, we estimate the reaction of the different types of banks based on ownership.

Finally, we examine whether impact of monetary policy differs with respect to different maturities, and hence riskiness, of lending activities. Specifically, we examine the impact of monetary policy on disbursal of (more risky) medium term credit and (less risky) short term credit. We estimate the impact for tight and easy monetary regimes, and also for the different types of banks.

We use bank-level data from India to examine these issues. We focus on India for several reasons. First, India is a fast growing emerging market that embraced the market economy in the early nineties and has since liberalised its economy substantially. Importantly, in the absence of a well developed market for corporate bonds,[5] banks are by far the largest source of credit for Indian companies,[6] and hence bank lending plays an important role in the transmission of monetary policy in India. Second, the Indian banking sector is also marked by the presence of a number of state-owned and private-owned (including foreign) banks, who compete on a level playing field. Third, the state-owned banks themselves have autonomy regarding lending decisions, and many of them have sold shares to private (and even foreign)

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[5] Corporate bonds account for only 3 percent of the Indian bond market.

[6] Domestic credit provided by banking sector increased from 44.1 percent of GDP in 1995 to 64.2 percent of GDP in 2007 (Source: World Bank Development Indicators).

shareholders, thereby opening themselves up to greater scrutiny. Indeed, Indian state-owned banks resemble the de facto nationalised banks of the United Kingdom much more closely than state-owned banks in former transition economies of Central and Eastern Europe (see, e.g., Bonin and Wachtel, 2002). The state maintains an arms-length relationship with the banks in which they have majority (or complete) ownership, such that these banks are autonomous and focussed on profitability.[7] In that respect, the state-owned and privately-owned banks are similar, and hence the presumption of profit focus that underlies the analyses of banks in the stylised literature is applicable to all Indian banks. There are, nevertheless, important differences between state-owned and privately-owned banks in terms of their customer base (Berger et al., 2008), and also in terms of factors that affect their lending (Bhaumik and Piesse, 2008). Therefore, there are likely to be differences in ways in which the state-owned and privately-owned banks react to monetary policy initiatives of India's central bank, the Reserve Bank of India (RBI).

Our results indicate that banks of different ownership types respond very differently to monetary policies in different monetary regimes. During periods of tight monetary policy, state-owned banks, old private banks and foreign banks curtail credit in response to an increase in interest rate. The reaction of foreign banks is particularly sharp. The reactions of the new private banks are not statistically significant. By contrast, during easy money periods, an increase in interest rates by the central bank leads to an increase in the growth of credit disbursed by old private banks, with no significant reactions from other types of banks. Our

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[7] The state-owned banks are somewhat less efficient than their privately owned counterparts (Kumbhakar and Sarkar, 2003). However, evidence suggests that, contrary to the popular wisdom about state-owned companies, ownership does not significantly affect profitability of Indian banks (Sarkar, Sarkar and Bhaumik, 1998; Bhaumik and Dimova, 2004).

study also suggests that monetary policy initiatives have different implications for (less risky) short term lending and (relatively more risky) medium term lending. Monetary tightening in a tight money regime adversely affects both short term and medium term lending, especially by foreign banks. But a similar policy initiative in an easy money regime actually increases short term lending, without having an effect on medium term lending. We argue that to a significant extent the behaviour of the different types of banks in the two different monetary regimes can be explained by their closeness to (and hence the extent of informational asymmetry with respect to) their borrower base.

The rest of the paper is structured as follows: Section 2 provides an overview of the banking system and the operation of monetary policy in India. Section 3 explains the empirical methodology and the model specification, and discusses the data. The results are discussed in Section 4. Finally, Section 5 concludes.

2. Banking sector and monetary policy in India

2.1. Banking sector

Independent India inherited a weak financial system. Commercial banks mobilized household savings through demand and term deposits, and disbursed the credit primarily to large corporations. This lop-sided pattern of credit disbursal, and perhaps a spate of bank failures that reduced the number of banks from 566 in 1951 to 90 in 1968, led the government to nationalize the banks in 1969. The main thrust of nationalization was social banking, with the stated objective of increasing the geographical coverage of the banking system, and extension of credit to the priority sector that comprised largely of agriculture, agro-processing, and

small-scale industries. This phase of banking in India was characterized by administered interest rates, mandatory syndicated lending, and pre-emption of the banks' deposit base by the government in the form of measures like high cash reserve ratio (CRR) and statutory liquidity ratio (SLR). Banks were required to invest a significant proportion of their deposits in bonds issued by the government and "approved" (quasi-government) institutions. At the same time, between 1969 and 1990, the nationalized banks added over 55,000 branches to their network.

While the social agenda of the banking sector, measured in terms of geographical and sectoral coverage, was arguably a success, the Indian banking sector, about 88 percent of whose assets were managed by state-owned banks, was in distress. While the ratio of gross operating profit of the scheduled commercial banks rose from 0.8 percent (of assets) in the seventies to 1.5 percent in the early nineties, the net profit of the banks declined. More importantly, perhaps, financial repression involving state-owned banks was not in harmony with the agenda of real sector reforms that the government of India unleashed in the aftermath of the balance of payments crisis of 1991. The RBI, therefore, initiated reform of the banking sector in 1992, based on the recommendations of Narasimham Committee I.

Between 1992 and 1997, the CRR was reduced from 15 percent to about 10 percent, and the SLR was reduced from 38.5 percent to 25 percent over the same period. The interest rates were gradually liberalized. Prior to 1992, the lending rates structure consisted of six categories based on the size of advances. During the 1992-94 period, the lending rates structure was rationalised to three categories, and in 1994 banks were given the freedom to determine interest rates on all loans exceeding 200,000 Indian rupees (INR). By 1998, banks were free to determine the interest rates for all loans, with the understanding that the lending

rates on loans up to INR 200,000 would not exceed the declared prime lending rates (PLR) of the banks.

Prior to the initiation of reforms, banks were required to refer all loans above a size threshold to the RBI for authorization, and formation of a consortium was mandatory for all loans exceeding INR 50 million. Bank credit was delivered primarily in the form of cash credit for use as working capital, and there were significant restrictions on the ability of banks to deliver term credit for projects. Finally, the RBI implemented selective credit controls on "sensitive" commodities.

In the wake of the reforms, as early as in 1993, the threshold for the mandatory formation of consortiums was raised tenfold from INR 50 million to INR 500 million. Further, banks within consortiums were permitted to frame the rules or contractual agreements governing the consortium lending. In 1996, selective credit controls on all sensitive commodities except sugar were removed. Banks were also allowed much greater flexibility about the proportion of the cash credit component of the loans, the new floor being 25 percent. The following year witnessed further elimination of credit controls: Banks were no longer subjected to the instructions pertaining to Maximum Permissible Bank Finance (MPBF), and were allowed to evolve their own methods for assessing the credit needs of the potential borrowers. Further, banks were no longer required to form consortiums to lend in excess of INR 500 million, and restrictions on their ability to provide term loan for projects were withdrawn. However, prudential regulations required that an individual bank not be over-exposed to any one (or group of) creditor(s).

Finally, in 1998, the RBI initiated the second generation of banking reforms, in keeping with

the recommendations of Narasimham Committee II. The most important recommendation of the Committee was the creation of asset reconstruction companies (ARCs) to simultaneously improve the quality of the balance sheets of the banks and to facilitate recovery of loans. In a separate development, after a prolonged period of legal disputes, debt recovery tribunals (DRTs) began functioning in India, in earnest, by 1999.

To summarize, by 1996, banks operating in India, were, by and large, in a position to take independent decisions on the composition of their asset portfolio, and on the choice of potential borrowers. Furthermore, there is evidence to suggest that these banks, including the state-owned ones, allocate resources in a way that was consistent with optimization of risk-return tradeoffs. There are, however, significant differences across credit market behaviour of banks of different ownership. Berger et al. (2008) find that comparative advantage of Indian banks, with respect to relationship with potential borrowers, vary considerably with ownership. State-owned banks typically have banking relationship with small firms, state-owned firms and rural firms, domestic private banks have comparative advantage with respect to opaque closely held firms, and foreign banks have banking relationship with large, listed and foreign firms. The likelihood of adverse selection, therefore, varies considerably across banks, by ownership type. Bhaumik and Piesse (2008) demonstrate that bank ownership also has an impact on risk aversion among Indian banks, with foreign banks being significantly more risk averse than domestic banks. Finally, state-owned banks retained, in principle, the ability to raise capital without being exposed to market forces. Since the impact of monetary policy on bank lending depends in large measure on the risk of adverse selection the extent of risk aversion of banks, and also on their ability to raise affordable capital, we expect to see considerable differences in the impact of such policy on banks of different ownership.

2.2. Monetary policy

The authority to implement monetary policy in India rests with the RBI. It was established under the Reserve Bank of India Act of 1934, as a private shareholders' bank, and was subsequently nationalised in 1949. Unlike the Bank of England, which was formally granted independence in 1997, the RBI does not have de jure independence from the Government of India. However, with the phasing out of automatic monetisation of fiscal deficit by 1997 by way of ad hoc treasury bills, the central bank was granted de facto independence. There are strict limits on the ways and means advances by the RBI to the government, and the former does not participate in primary market auctions of government securities. While the RBI takes into cognizance the federal government's views about the state of the economy, it de facto sets monetary policy independently.

Originally, the bank rate and open market operations were the RBI's instruments of choice for conducting monetary policy. In the seventies and eighties, with increased accommodation of the federal government's fiscal policies by the central bank, these instruments lost their efficacy, and the CRR became the primary instrument for conducting monetary policy. In 1998, in light of the realisation that in an increasingly complex environment broad money supply in the medium term cannot be the sole intermediate target of monetary policy, the RBI formally adopted a multifactor approach to monetary policy. This resulted in a focus on the use of short term interest rates as the instruments of monetary policy, facilitated by the deregulation of interest rates, which was initiated as early as 1989. The bank rate, therefore, made a comeback in 1997-98, and was complemented by the rates for reverse repo (and, from 2000-01, repo) transactions. The repo and reverse repo rates have emerged as the primary

instruments of monetary policy since the turn of the century. The CRR, which was reduced steadily from 15 percent in the early nineties to 5 percent by 2004, has not completely been abandoned. It is still used in situations that demand significant monetary response, or when other monetary policy options have been exhausted. The use of all monetary policy instruments of the RBI are summarised in Table 1.

[insert Table 1 about here]

It is evident from Table 1 that it is difficult to select any one instrument as the indicator of monetary policy of the RBI. This poses a problem because empirical analysis requires the use of a single monetary policy signal; the US literature on the lending channel of monetary policy focuses on changes in the federal funds rate (Kashyap and Stein, 1995, 2000), while the European literature uses short-term interest rates (Erhmann et al., 2001) or the refinancing rate (Gambacorta, 2005). Fortunately, Indian banks declare their respective prime lending rates (PLR) – the rate at which they are prepared to lend to the most credit-worthy borrowers – that is linked to their cost of funds. The average PLR of the five largest banks is quoted by the RBI. Figure 1 demonstrates that movements of this average PLR closely replicates movements in the bank rate, and, to a somewhat lesser extent, also the repo and reverse repo rates. Hence, we use the average PLR reported by the RBI as the basis for our measure of monetary policy. We are not alone in our use of such constructs as the basis for the measure for monetary policy. In the British context, Huang (2003) use the average of the base rates of selected banks as the indicator of monetary policy, while Hofman and Mizen (2004) eschew the official Bank of England rate in favour of the average of the base rates of four major clearing banks.

[insert Figure 1 about here]

3. Methodological issues

In the traditional IS-LM model, a reduction in money supply is immediately translated into a higher equilibrium interest rate in the money market, and this in turn affects the real sector through a reduction in investment. On a bank's balance sheet, a reduction in deposits on the liability side is matched by a reduction in the bank's holding of bonds and loans on the asset side. If bonds and loans are perfect substitutes, as in the traditional Keynesian framework, there is a proportionate reduction in the bonds and loans portfolios. The impact of monetary policy on the asset composition of the banks (and the firms, the borrowers) is of no interest.

Now, suppose that bonds and loans are imperfect substitutes. For example, at least some of the banks might find it easier to both build up and unwind their loans portfolios than their bonds portfolios. In the presence of such imperfections in capital market access, a contractionary monetary policy is likely to be followed by a much greater reduction in loan supply than in the sale of (or a drop in the demand for) bonds.[8] The literature on the bank

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[8] Alternatively, if bonds are safer than loans, which is often the case in developing countries where the main issuer of bonds are the sovereign governments, a monetary contraction initiated by a central bank might trigger a flight to the less risky asset, with banks downsizing their loans portfolios much more aggressively than their bonds portfolios (Bernanke, Gertler and Gilchrist, 1996; Ashcraft and Campello, 2002). This is the so-called balance sheet channel of monetary transmission that, together with the bank lending channel, comprises the credit channel of monetary policy transmission.

lending channel of monetary policy transmission takes this change in the asset composition of banks into consideration.

As discussed earlier in this paper, there can be considerable cross-sectional variation in the nature of bank's reaction to monetary policy. Banks with strong linkages with their corresponding borrower pools, with resultant amelioration of the informational asymmetry and hence credit risk, might downsize (or reduce the growth of) their loan portfolios less in response to contractionary monetary policy than other banks. Similarly, less capitalised banks and smaller banks that find it more difficult to raise capital might cut back on lending (or reduce lending growth) far more than larger and well-capitalised banks. Since these cross-sectional variations affect only the supply side of the loan market – the banks and not the firms that demand credit – they can be used to circumvent identification problem of empirical modelling the bank lending channel, i.e., distinguishing between the demand and supply side effects of monetary policy on the amount of loans disbursed.

In keeping with the literature, the theoretical basis for which can be found in Ehrman et al. (2003) and Gambacorta and Mistrulli (2004), we model change in loans disbursed by bank i (y_i) as a function of the change in the monetary policy instrument (MP) – the average PLR of the five largest Indian banks in our case. Given the aforementioned cross-sectional heterogeneity in banks' response to monetary policy based on their characteristics, we control for three different bank characteristic in our specification, namely, liquidity (LIQ), capitalisation (CAP) and profitability (PROFIT). This is consistent with the stylised literature

(Gambacorta, 2005; Van den Heuvel, 2007).[9] In light of the evidence that suggests that bank behaviour in India can be affected by whether or not it is subjected to market scrutiny (Bhaumik and Piesse, 2008), we also include in our specification a dummy variable (LISTING) that takes the value 1 if a bank is listed at one of the country's stock exchanges. Finally, in order to further facilitate identification to distinguish between loan demand and loan supply, we include industrial growth (IND) that affects the demand for funds much more than banks' behaviour.[10]

Our base specification, therefore, is as follows:

$$\Delta y_{it} = \alpha + \beta \Delta MP_{it-1} + \gamma_1 \Delta CAP_{i,t-1} + \gamma_2 \Delta LIQ_{i,t-1} + \gamma_3 PROFIT_{i,t-1} + \gamma_4 LISTING_{i,t-1}$$

$$+ \gamma_5 IND_{i,t-1} + \mu_i + \varepsilon_{it} \qquad [1]$$

where t represents time, μ_i is the bank-specific fixed effect and ε_{it} is the i.i.d. error term. In the literature, bank lending models are usually estimated using quarterly data. Since a change in monetary policy in quarter t is likely to affect disbursal in bank loans with at least a one-period lag, Δy_{it} is modelled as a function of monetary policy in the previous four quarters.

[9] According to Van den Heuvel (2007), changes in bank profitability affects bank lending through the "bank capital" channel. According to this view, when bank profits decline, if equity capital is low, and it is costly to issue shares, banks may reduce lending.

[10] In the literature, the controls for loan demand usually are GDP growth rate and the inflation rate, sometimes used together in the specification. However, there is evidence to suggest that in the Indian context bank's behaviour is influenced more by industrial growth than by GDP growth (Bhaumik and Piesse, 2008), and hence our choice. We also experiment with specifications that included the inflation rate, in isolation as well as together with the industrial growth rate. The coefficient of inflation is never significant, and hence we do not report that specification in the paper.

However, in the Indian context, only annual data are available for banks, such that the time unit of analysis is a year, as opposed to a quarter. Therefore, we make the reasonable assumption that a change in monetary policy in a given year will affect loans disbursal with a lag, in the following year.[11] Hence, we model Δy_{it} as a function of $\Delta MP_{i,t-1}$, the lagged change in the monetary policy instrument.

For the empirical analysis, we amend this base specification in three ways. First, since we focus on the differences in the reactions of bank with different ownership to monetary policy, we interact bank ownership dummies with $\Delta MP_{i,t-1}$. Second, we argue that a given change in interest rates cannot have the same impact in a tight and an easy monetary regime; a 50 basis point increase in the interest is likely to have a very different impact on loan disbursal when the initial value of the interest rate is (say) 8 percent, compared to the case when the initial value of the interest rate is (say) 2 percent. Hence, we further interact the $\Delta MP_{i,t-1}$ variable with an indicator of the nature of the monetary regime. In other words, our regression estimates identify the impact of monetary policy on loan disbursal for banks of each ownership type, for both the easy and tight monetary regimes. In order to facilitate this process further, following Huang (2003), we include in the specification interaction between $\Delta MP_{i,t-1}$ and indicators of both these type of regimes: a dummy variable *MCI* that takes the

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[11] This assumption finds support in earlier research on monetary policy transmission in India that uses time series – quarterly data from 1996 through 2007 – data to examine the effects of an unanticipated monetary policy tightening on GDP, prices and overnight call money rate in India (Aleem, 2010). The VAR impulse responses reported in the study suggest that prices, output, and interest rate react significantly to monetary policy shocks and the bulk of the adjustment takes place about within 3 or 4 quarters following the policy tightening.

value 1 in an easy monetary regime, and its inverse *IMCI* that takes the value 1 in a tight

monetary regime. The resultant specification is as follows:

$$\Delta y_{it} = \Sigma_j \alpha_j (IMCI_{t-1} \times \Delta MP_{i,t-1} \times OWN_{jit}) + \Sigma_j \beta_j (MCI_{t-1} \times \Delta MP_{i,t-1} \times OWN_{jit})$$

$$+ \gamma_1 \Delta CAP_{i,t-1} + \gamma_2 \Delta LIQ_{i,t-1} + \gamma_3 PROFIT_{i,t-1} + \gamma_4 LISTING_{i,t-1} + \gamma_5 IND_{i,t-1}$$

$$+ \mu_i + \varepsilon_{it} \qquad\qquad [2]$$

where *OWN* is a dummy variable capturing type of bank ownership and *j* is the index of the

types of bank ownership.

We use panel unit root tests to ascertain that the continuous variables used in our regression

specification are stationary.[12] Our tests suggest that credit growth and industrial growth are

trend stationary while the rest are stationary. We, therefore, add a time trend to the

specifications of both the baseline (equation 1) and augmented (equation 2) models.

Regression estimates from the baseline model, which we do not report in the paper, suggest

that interest rate change and credit growth are inversely related. Estimates from the

augmented model are discussed in the next section, where we also describe our data set.

4. Data and empirical results

4.1. Data and descriptive statistics

The data for the estimation are obtained from a number of sources. Bank balance sheets are

obtained from the Indian Banks' Association. Using these financial statements, we measure

the change in loan disbursal by each bank during each financial year (Δy_{it}). We measure *CAP*

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[12] We thank an anonymous referee for drawing our attention to this aspect of the estimation

process.

as the log of capital and reserves, *LIQ* as the log of liquid assets, and *PROFIT* as the return on assets. The information about year of stock exchange listing of banks is obtained from the Prowess database marketed by the Centre for Monitoring the Indian Economy. The ownership types of the banks[13] – public sector, old domestic private, new domestic private, and foreign – are obtained from the RBI. As mentioned earlier in the paper, the central bank is also the source for our measure of monetary policy. We measure ΔMP_{it} as the change in the aforementioned PLR between the beginning and end of a financial year. Finally, the indicators of easy and tight monetary regime are obtained from the estimates of monetary conditions index of Kannan et al. (2006).

We include in our sample banks with at least two branches. This primarily leads to exclusion of foreign banks that have a solitary branch in India to finance trading activities of their

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[13] The nature of public sector (or state-owned) and foreign banks are easily understood, even though it should be noted that private investors own minority shares in a number of public sector banks. The distinction between the two types of domestic private banks is more complex. The *old* domestic private banks were in operation much before the initiation of the financial reforms in the early 1990s. They were typically closely held, often by members of trading communities. Subsequent to the reforms, a few of these banks floated themselves on stock exchanges and expanded beyond their traditional geographical enclaves. The *new* private banks came into existence after the financial reforms paved the way for market entry for new banks. Many of them have links to large former or existing non-bank financial institutions. These de novo banks by and large have professional management, almost always are stock exchange listed, and have expanded their shares of the deposit and loans markets aggressively. For further details, see Sarkar, Sarkar and Bhaumik (1998) and Bhaumik and Dimova (2004).

respective client multinationals. We also exclude from our sample banks that experienced very large changes to their balance sheets, often on account of acquisition of non-banking assets of other financial organisations, or on account of financial distress. Our final sample consists of 58 banks, and the data covers the 2000-07 period, resulting in over 300 bank year observations. Of these, 24 are public sector banks, 21 are old private sector banks, 3 are new private sector banks and 10 are foreign banks. For our period of analysis, these banks account for over 80 percent of the total credit disbursed by all scheduled commercial banks.

Summary statistics of the variables used in the regression model are reported in Table 2, and the following can be observed: First, interestingly, old private domestic banks are much smaller, on average, than the new private and foreign banks even though they have operated in India much longer than their new competitors. Further, a much smaller percentage of old private banks are listed on the stock exchanges than even *state-owned* banks.[14] This is consistent with the observation, highlighted earlier in the paper, that these old private banks are generally closely held organisations with close links to various business and trading communities. Second, foreign banks are much better capitalised than domestic banks. The ratio of capital and reserves to total assets of foreign banks (9.3 percent) is nearly double that of state-owned banks (5.1 percent), old private banks (5.7 percent) and new private banks (5.4 percent). This could imply either that foreign banks are in a better position to take risk, or that they are more risk averse. Third, the proportion of lending by way of securities such as corporate bonds and debentures is small, and similar across the different types of banks. Bonds and debentures account for 10.1 percent of lending of state-owned banks, 12.3 percent

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[14] The percentage figures reported in Table 2 are period averages, and are not time invariant. However, throughout the sample period, more state-owned banks were stock exchange listed than their old private counterparts.

of lending of old private banks, 13.6 percent of lending of new private banks, and 11.5 percent of lending of foreign banks. Finally, the ratio of small-term lending to medium-term lending of state-owned banks (1.08) and old private banks (1.14), a reasonable proxy for the risk appetite of the banks, is much lower than that of new private banks (1.66) and foreign banks (2.90).

[insert Table 2 about here]

4.2. Results and discussion

4.2.1. Regression results

The regression estimates for the basic model are reported in Table 3. The table should be read as follows: We use two different measures of credit disbursed. In columns (1) − (3), the measure for credit disbursed is "advances" made by banks to borrowers, while in columns (4) − (6) the measure is the sum of advances and "debentures" when the latter includes subscription to both short term securities like commercial paper and longer term securities like coupon bonds. Further, aside from estimating our model for the entire sample (columns 1 and 4), we separately estimate the model for the public sector or state-owned banks (columns 2 and 5) and all non-state sector banks (columns 3 and 6). There are 334 bank-year observations for the entire sample, of which 144 are for the public sector banks and 190 are for our mix of privately-owned banks. Our decision to pool together the different types of domestic and foreign private sector banks is based on the small sample size for new domestic banks and foreign banks.

[insert Table 3 about here]

For each of these samples, and for each measure of credit disbursal, equation (2) is estimated using fixed effects models that control for time-invariant unobserved characteristics of the banks like their relationships with (and the quality of) the borrowers.[15] The regression statistics reported in the last four rows of the table suggest that overall our model specification fits the data reasonably well. The F-statistics for all the columns are significant at the 1 percent level, and the pseudo R-square values for the regression models are in the 0.10-0.26 range. These R-square values indicate that our specification works better for the models that attempt to explain variations in advances alone, as opposed to variations in the sum of advances and subscriptions to debentures by the firms. Importantly, our results are robust across the choice of the measure of credit and the choice of the sample.

Down the rows of Table 3, we first report the impact of monetary policy on the growth rate of credit disbursed by banks of different types of ownership in a tight money regime. These are the regression coefficients α_i in equation (2). Given that an increase in the interest rate in a tight money regime should lead to a decline in credit disbursal, we expect α_i to be negative. We next report the impact of monetary policy in the growth rate of credit disbursed by the different types of banks in an easy monetary regime. These are the regression coefficients β_i in equation (2). In an easy money regime, when the interest rate level is relatively low, credit

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[15] We experiment by extending the specification in equation (2) to a dynamic panel framework, adding a lagged dependent variable to the list of explanatory variables. The coefficient of the lagged dependent variable is insignificant for both the fixed effects estimation and that involving the Arellano-Bond estimator. Hence, we drop the lagged dependent variable from the specification and returned to the specification in equation (2).

disbursal by banks may not be negatively affected by an increase in this interest rate. Indeed, if the monetary tightening in an easy money regime signals an attempt by the central bank to dampen the speed of expansion in a fast growing real economy, there might actually be an increase in borrowing in the near term, in anticipation of further rate rises in the future. Hence, we do not have any ex ante expectations about the signs of the estimated β_i. Finally, we report the coefficient estimates of the control variables.

The regression results suggest that credit disbursal by both public sector banks and private sector banks is adversely affected by a tightening in monetary policy in a tight money regime, i.e., $\alpha_i < 0$ for $i \in$ {public sector, old private sector, foreign}. To begin with, this demonstrates that, contrary to popular wisdom in the ownership literature, and in keeping with the literature on the Indian banking sector (Sarkar, Sarkar and Bhaumik, 1998; Bhaumik and Dimova, 2004), public sector banks operate on the basis of market incentives. The much larger (and negative) response of credit disbursal by the foreign banks to monetary tightening, despite the fact that these banks typically have relationship with multinationals operating in India and blue chip domestic firms (Berger et al., 2008), demonstrates that these banks are quite risk averse when it comes to credit disbursal to emerging market entities. This could be on account of the fact that foreign banks often have disadvantages in obtaining and processing information about firms in overseas markets, especially when information is costly (Stein, 2002). These banks also have a less diversified customer base in the host country and hence are more vulnerable to adverse shocks.

Much more interesting is the fact that an interest rate increase in a tight money regime adversely affects credit disbursal by old private banks as well. These banks have historically had long term relationships with their customers, and hence are less vulnerable to adverse

selection. However, as demonstrated by Berger et al. (2008), most old private banks in India are community based and are concentrated geographically,[16] and hence their customer base is not well diversified. This might explain the behaviour of these banks during tight money regimes. Given the small sample for new private banks, it is difficult to draw general conclusions about these banks.

The coefficient estimates for β_i, which capture the impact of monetary policy on credit disbursal by banks during easy money periods, are entirely consistent with the estimates for α_i. During easy money periods, a monetary policy induced change in the interest rate has a weak impact on credit disbursal by public sector banks (column 4) and none on the disbursal by foreign banks, but there is a noticeable increase in the disbursal of credit by old private banks. (Once again, for the reason mentioned above, we ignore the coefficient estimate for the new private banks.) In other words, if the interest rate is low, monetary tightening does not affect the credit disbursal of banks that are at an informational disadvantage – the public sector and foreign banks – because the interest rate is low to begin with. However, old private banks for whom the problem of informational asymmetry is not acute, lend more, on average,

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[16] For example, as late as 2009, 17 years after liberalisation of branching regulations, while Karur Vyasya Bank has 183 offices in Tamil Nadu and 69 in the neighbouring state of Andhra Pradesh, it has a total of 36 offices in the fairly large and high growth-high income states of Delhi, Gujarat, Haryana, Maharashtra and Punjab (Group 1). The bank has a total of three branches in the large (but lower income) states of Bihar, Chattisgarh, Jharkhand, Rajasthan, Uttar Pradesh and West Bengal (Group 2). Similarly, the Dhanalakshmi Bank has 127 offices in Kerala and 27 in the neighbouring state of Tamil Nadu, but a total of 12 offices in the Group 1 states and a total of 1 office in the Group 2 states.

possibly accommodating greater demand for credit in anticipation of further rate increases in the future.

Of the control variables, capital adequacy has a negative (albeit statistically weak) impact on credit disbursal of state-owned or public sector banks. Liquidity does not affect credit disbursal in any way. This contrasts with the literature on developed countries where capital adequacy is generally positively correlated with bank lending, and where liquidity has an impact on lending as well (Thakor, 1996; Jackson et al., 1999). Growth of credit disbursal is affected by demand for credit, as captured by industrial growth. And lending increases with profitability of private banks, even though profitability of public sector banks does not have any impact on credit. Given that our fixed effects model controls for the (arguably time invariant) quality of the borrowers, this suggests that private banks lend more if they have greater ability to absorb adverse shocks by way of loan defaults.

Next, we distinguish between less risky short term loans, those with maturity less than one year, and medium term loans, those with maturity of 1-3 years. We ignore long term loans because they constitute a very small proportion of the loan portfolio of most Indian banks. Since the results reported in Table 3 are robust to the measure of credit, for this exercise we use advances as our measure of credit. The regression estimates for these models are reported in Table 4. As before, we estimate the model for the sample of all banks and sub-samples of public sector and private sector banks. The F-statistics are significant once again, albeit at the 5 percent level. There is a sharp reduction in the pseudo R-square values. However, as we shall see, the results are quite suggestive.

[insert Table 4 about here]

We find that in a tight money regime a further monetary tightening by the central bank leads to a decline in disbursal of both short term and medium term credit by public sector, old private and foreign banks. The result is especially strong for foreign banks. Further, the decline in credit disbursal by foreign banks is much larger for medium term advances than for short term advances. This is entirely consistent with the fact that medium term loans are more risky. Interestingly, while there is a sharp contraction of short term advances made by state-owned banks and old private banks in the tight money regime, there is no statistically significant impact on medium term advances. A plausible explanation for this is that the pool of borrowers that receive short term credit from these banks is more risky than the pool of borrowers that receive medium term credit.[17] As before, in the easy money regime, a monetary tightening leads to an increase in credit disbursed by old private banks. However, the increase in credit disbursed is restricted to short term loans; there is no impact on medium term loans. Interestingly, the differentiation between short term and medium term advances demonstrates that while the impact of monetary tightening in easy money regimes on overall credit disbursal by public sector banks is weak or insignificant (see Table 3), such tightening has positive impact on disbursal of short term loans.

4.2.2. Discussion

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[17] Data permitting, it would be interesting to discover whether this increase in disbursal of medium term credit is directed towards public sector enterprises with respect to whom public sector banks may have an informational advantage, or whether it is directed to the entire range of borrowers.

Overall, there is support for the view that monetary tightening by the central bank leads to a reduction in credit disbursal by Indian banks, albeit only in tight monetary regimes. Given that public sector banks, old private banks and foreign banks account for nearly 90 percent of the banking assets (and loan portfolio) in India, the bank lending channel of monetary policy transmission in India can be viewed as being fairly active during tight monetary regimes. In easy monetary regimes, however, monetary tightening can have the perverse effect of increasing credit disbursal. However, much of this increase in credit would be in the form of short term loans, thereby limiting its impact on the real sector.

Importantly, there are significant differences in the reaction of banks of different ownership to monetary policy actions of the central bank. Foreign banks are by far the most risk averse. They react to monetary tightening during tight money regimes by sharply reducing credit disbursal, and the decline is much greater for riskier medium term loans than for relatively safe short term loans. This is in sharp contrast to the behaviour of foreign banks in Latin America where they are much less responsive to changes in monetary policy (Arena, Reinhart and Vasquez, 2006). State-owned banks and old private banks also curtail credit during these periods, albeit by a much smaller magnitude, but there is evidence – weaker for state-owned banks than for old private banks – to suggest that they may actually extend more (short-term) credit following monetary policy tightening during easy money regimes. However, the observed similarity of response of the state-owned and old private banks masks the difference in the challenge that they face. State-owned banks have a large banking network throughout the country – a legacy of their social objectives – and hence have a geographically diversified portfolio. The old private banks are much more concentrated geographically and hence their loan portfolios are vulnerable to shocks affecting specific states and regions. But their

community based existence reduces informational asymmetry vis-a-vis the borrowers relative to other types of banks. We discuss the policy implications of this in the concluding section.

One implication of our results is that the new private banks, which protect their customers from the effects of contractionary monetary policy initiatives during tight money regimes, charge their customers higher interest rates in steady state (Berger and Udell, 1992). This is an interesting hypothesis that, unfortunately, cannot be tested without access to loan contract level data from the different types of banks. Each Indian bank declares a prime lending rate, no publicly available archive for which exists, but the actual interest rate charged by the bank can vary significantly in both directions. Borrowers with low credit worthiness can pay significant premium over the prime lending rate, while credit is often offered to blue chip borrowers at sub-prime lending rates.

Thus far, we have discussed the direction of change in advances made by the different types of banks, under different monetary conditions, tight or easy. How economically meaningful, however, is the impact of monetary policy initiatives, wherever statistically significant? Consider the results reported in Table 3. The regression coefficients reported in columns (1) suggests that a 1 percentage point increase in PLR in a tight money regime would reduce advances made by state-owned banks by 16 percent, and advances made by foreign banks by 42 percent.[18] Given the mean advances reported in Table 2, this would indicate a total

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[18] As highlighted by Figure 1, the PLR, our proxy for the policy rate, did not change by more than 1 percentage point during the 2001-2007 estimation period. At the same time, India experienced double digit credit growth annually, sometimes in excess of 20 percent. Our ceteris paribus estimates of banks' reactions to interest rate changes are, therefore, entirely plausible.

reduction in advances by approximately INR 6,244 billion. If instead we take into consideration the coefficients reported in columns (2) and (3), a 1 percentage point increase in PLR in a tight money regime will indicate a reduction in advances by approximately INR 5,500 billion.

This estimated economic impact may have significant policy implications, if firms have exclusive relationships with banks that act as their creditors.[19] The Berger et al. (2008) analysis suggests that this is likely to be the case. It demonstrates that multiple banking relationships are more likely for firms that have banking relationships with foreign banks, that account for a tiny proportion of the Indian credit market. By contrast, firms that have relationships with public sector banks that account for over 70 percent of the credit market are much less likely to have multiple banking relationships, and also less likely to have relationships with different (bank) ownership types. Recall also that old private banks are generally community-based such that, by their very nature, they are likely to account for a very large proportion of banking relationships within their respective communities.

In order to further verify that banks and their customers have an exclusive relationship, we undertake the following exercise. From the widely used *Prowess* data set, we obtain bank relationship data for 2114 firms for whom such data are available for at least three successive years. If the starting year for the data on bank relationship for a firm is t, we check whether the firm retains relations with at least x percent of these banks in the final year of availability of bank relationship data $t+j$, when $j \geq 3$ and $x = \{50, 75, 100\}$. Our data suggests that over the period for which data are available, the majority of the firms have relationships with similar types of banks, e.g., public sector or private sector. Further, 76.7 percent of the firms

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[19] We thank an anonymous referee for drawing our attention to this issue.

retain relationship with at least 50 percent of the banks, 61.5 percent retain relationship with at least 75 percent of the banks, and 57 percent retain relationships with all the banks with which they had relationship in the first year of availability of the data. While this is an imperfect test, and the exact degree of exclusivity is difficult to ascertain, our exercise suggests that bank relationships in India are fairly strong. Indeed, firms included in *Prowess* are larger than the average Indian firm, and many of them are listed on the stock exchanges, enabling them to signal credibly to a wider range of credit providers. The average Indian firm is likely to find it much more difficult to switch creditors, especially to and from the dominant public sector banks where past volume of sanctioned credit is a key current volume of credit (Banerjee et al., 2005), such that the aforementioned figures of 76.7 percent, 61.5 percent and 57.8 percent are significant underestimates of the strength of banking relationships in India.

5. Conclusion

There is a fairly large literature on the bank lending channel of monetary policy. But much of this literature is in the context of the United States, Europe and other developed economies where the banks are heterogeneous but are almost entirely in private sector. The emerging market economies, by contrast, have their fair share of state-owned banks, such that, in these contexts, the implications of ownership for the bank lending channel remains an important, yet largely unexplored, policy consideration. In this paper we address this issue, using bank-level data from India.

Our results suggest that there are considerable differences in the reactions of different types of banks to monetary policy initiatives of the central bank. During periods of tight monetary policy, as captured by the monetary conditions index, state-owned banks, old private banks

and foreign banks curtail credit in response to an increase in interest rate. The reaction of foreign banks is particularly sharp. The reaction of the new private banks is not statistically significant. By contrast, during easy money periods, an increase in interest rates by the central bank leads to an increase in the growth of credit disbursed by old private banks, with no significant reactions from other types of banks. The regression results also indicate that the adverse reaction to a policy initiated increase in interest rate in a tight monetary regime is much greater for medium term borrowing than for short term borrowing.

Our results have two significant implications for the literature on bank lending channel. First, it suggests that the bank lending channel of monetary policy might be much more effective in a tight money period than in an easy money period. In other words, if interest rates are low, then a central bank that desires monetary contraction may have to raise the rate substantially to witness an impact on money supply through the bank lending channel. This has implications for future analyses of the bank lending channel; the condition under which a central bank changes its policy rate should be explicitly taken into account. It has also implications for the implementation of monetary policy strategies during a business cycle period or economic crisis. For example, if the economy is going through a downturn and the authorities try to stimulate the economy towards the recovery zone, then, depending upon the type of money regime the economy is in, the policymakers need to consider making adjustments in policy rates to get the desired effects. Second, the bank lending channel is likely to function much better if the lending relationships pose significant risk for the banks, whether because of arms length relationship with the borrowers that result in greater informational asymmetry, or because of significant geographical concentration of borrowers that increases the systematic risk of the loan portfolios. The implication of the risk of adverse selection for monetary policy transmission is especially interesting. If banks are relatively

small and closely tied to their borrower base, monetary policy initiatives may have limited impact because the likelihood of adverse selection may not increase significantly. This has implications for the post-crisis debate about the size of banks and their relationship with borrowers.

Acknowledgement

References

Aleem, A., 2010. Transmission mechanism of monetary policy in India. Journal of Asian Economics 21, 186-197.

Altunbaş, Y., Fazylov, O., Molyneux, P., 2002. Evidence on the bank lending channel in Europe. Journal of Banking and Finance 26, 2093-2110.

Andries, N., Billon, S., 2010. The effect of bank ownership and deposit insurance on monetary policy transmission. Journal of Banking and Finance 34, 3050-3054.

Arena, M., Reinhart, C., Vasquez, F., 2006. The lending channel in emerging economies: Are foreign banks different? Working paper no. 12340, National Bureau of Economic Research.

Ashcraft, A.B., Campello, M., 2002. Borrowers' financial constraints and the transmission of monetary policy: Evidence from financial conglomerates. Staff Reports 153, Federal Reserve Bank of New York.

Banerjee, A., Cole, S., Duflo, E. (2005). Bank financing in India, In: Tseng, W. and Cowen, D. (Eds), India's and China's Recent Experience with Reform and Growth, Palgrave Macmillan: New York.

Berger, A.N., Klapper, L.F., Peria, M.S. M., Zaidi, R., 2008. Bank ownership type and banking relationships. Journal of Financial Intermediation 17, 37-62.

Berger, A.N., Udell, G.F., 2009. Some evidence on the empirical significance of credit rationing. Journal of Political Economy 100, 1047-1077.

Bernanke, B.S., Blinder, A.S., 1992. The federal funds rate and the channels of monetary transmission. American Economic Review 82, 901-921.

Bernanke, B.S., Gertler, M., 1995. Inside the black box: The credit channel of monetary policy transmission. Journal of Economic Perspectives 9, 27-48.

Bernanke, B.S., Gertler, M., Gilchrist, S., 1996. The financial accelerator and the flight to quality. Review of Economics and Statistics 78, 1-15.

Bhaumik, S.K., Dimova, R., 2004. How important is ownership in a market with level playing field? The Indian banking sector revisited. Journal of Comparative Economics 32, 165-180.

Bhaumik, S.K., Piesse, J., 2008. Does lending behaviour of banks in emerging economies vary by ownership? Evidence from the Indian banking sector. Economic Systems 32, 177-196.

Bonin, J.P., Wachtel, P., 2002. Financial sector development in transition economies: Lessons from the first decade. Discussion paper no. 9/2002, BOFIT.

De Graeve, F., De Jonghe, O., Vennet, R.V., 2007. Competition, transmission and bank pricing policies: Evidence from Belgian loan and deposit markets. Journal of Banking and Finance 31, 259-278.

Dovern, J., Carsten-Patrick, M., Vilsmeier, J., 2010. How resilient is the German banking system to macroeconomic shocks? Journal of Banking and Finance 34, 1839-1848

Erhmann, M., Gambacorta, L., Martinez-Pages, J., Sevestre, P., Worms, A., 2001. Financial system and the role of banks in monetary policy transmission in the Euro area. Working Paper No. 105, European Central Bank.

Gambacorta, L., 2005. Inside the bank lending channel, European Economic Review 49, 1737-1759.

Gambacorta, L., Mistrulli, P.E., 2004. Does bank capital affect lending behavior?, Journal of Financial Intermediation 13(4), 436-457.

Garcia, R., Schaller, H., 2002. Are the effects of monetary policy asymmetric? Economic Inquiry 40, 102-119.

Hofmann, B., Mizen, P., 2004. Interest pass-through and monetary transmission: Evidence from individual financial institutions' retail rates. Economica 71, 99-123.

Huang, Z., 2003. Evidence of bank lending channel in the UK. Journal of Banking and Finance 27, 491-510.

Hülsewig, H.; Mayer, E., Wollmershäuser, T., 2006. Bank loan supply and monetary policy transmission in Germany: An assessment based on matching impulse responses. Journal of Banking and Finance 30, 2893-2910.

Jackson, P. et al., 1999. Capital requirements and bank behaviour: The impact of the Basle accord, Basle Committee on Banking Supervision working paper no. 1, Bank for International Settlements.

Kannan, R., Sanyal, S., Bhoi, B. B., 2006. Monetary conditions index for India. Occasional papers 27, No. 3, Reserve Bank of India.

Kashyap, A.K., Stein, J.C., 1993. Monetary policy and bank lending. Working papers no. 4317, National Bureau of Economic Research.

Kashyap, A.K., Stein, J.C., 1995. The impact of monetary policy on bank balance sheets. Carnegie-Rochester Conference Series on Public Policy 42, 151-195.

Kashyap, A.K., Stein, J.C., 2000. What do a million observations on banks say about the transmission of monetary policy? American Economic Review 90, 407-428.

Kaufmann, S., 2002. Is there an asymmetric effect of monetary policy over time? A Bayesian analysis using Austrian data. Empirical Economics 27, 277-297.

Kishan, R.P., Opiela, T.P., 2000. Bank size, bank capital and bank lending channel. Journal of Money, Credit and Banking 32, 121-141.

Kishan, R.P., Opiela, T.P., 2006. Bank capital and loan asymmetry in the transmission of monetary policy. Journal of Banking and Finance 30, 259-285.

Kumbhakar, S.C., Sarkar, S., 2003. Deregulation, ownership and productivity growth in the banking industry: Evidence from India. Journal of Money, Credit and Banking 35, 403-424.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2002. Government ownership of banks, Journal of Finance 57, 265-301.

Olivero, M.P., Li, Y., Jeon, B.N., 2011. Competition in banking and the lending channel: Evidence from bank level data in Asia and Latin America. Journal of Banking and Finance 35, 560-571.

Peek, J., Rosengren, E., 1995. Bank regulation and the credit crunch. Journal of Banking and Finance 19, 679-692.

Sapienza, P., 2004. The effects of government ownership on bank lending. Journal of Financial Economics 72, 357-384.

Sarkar, J., Sarkar, S. and Bhaumik, S.K., 1998. Does ownership always matter? – Evidence from the Indian banking industry. Journal of Comparative Economics 26, 262-281.

Stein, J.C., 1998. An adverse-selection model of bank asset and liability management with implications for the transmission of monetary policy. RAND Journal of Economics 29, 466-486.

Stein, J.C., 2002. Information production and capital allocation: Decentralized vs. hierarchical firms. Journal of Finance 57, 1891-1921.

Thakor, A.V., 1996. Capital requirements, monetary policy, and aggregate bank lending: Theory and empirical evidence. Journal of Finance 51, 279-324.

Van den Heuvel, S.J., 2002. Does bank capital matter for monetary transmission? Economic Policy Review (Federal Reserve Bank of New York) 8, 258-265.

Table 1. RBI monetary policy operations

Year	Bank rate (%)			CRR (%)			REPO (%)[a]			Reverse REPO (%)[b]		
	1 April	31 March	No. of changes	1 April	31 March	No. of changes	1 April	31 March	No. of changes	1 April	31 March	No. of changes
1996-1997	12	12	0	14	10	7	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
1997-1998	12	10.5	5	10	10.25	5	n.a.	n.a.	n.a.	4.5**	8	5
1998-1999	10.5	8	3	10.25	10.5	3	n.a.	n.a.	n.a.	8	6	5
1999-2000	8	8	0	10.5	9	3	n.a.	n.a.	n.a.	6	10	4
2000-2001	8	7	4	9	8	6	11.5%	9	6	10	6	5
2001-2002	7	6.5	1	8	5.5	3	9	8	5	6	5	6
2002-2003	6.5	6.25	1	5.5	4.75	2	8	7	4	5	4.5	1
2003-2004	6.25	6	1	4.75	4.5	1	6	6	1	4.5	4.75	1
2004-2005	6	6	0	4.5	5	3	6	6	0	4.75	4.75	0
2005-2006	n.a.	n.a.	n.a.	5	5	1	6	6.5	2	4.75	5.5	3
2006-2007	n.a.	n.a.	n.a.	5	5.5	1	6.5	7.75	5	5.5	6	2

Source: RBI Annual Reports

Note: [a] Started in June 2000
       [b] Started on 27 November 1997

Table 2. Summary statistics by bank ownership, 2001-2007

Bank characteristics		State-owned banks	Old private banks	New private banks	Foreign banks
Total assets	Mean	52846.43	5313.31	15310.06	11366.03
	Std. Dev.	75552.61	5057.44	11249.78	12348.29
Capital and reserves	Mean	2712.99	310.97	805.39	1064.45
	Std. Dev.	3822.87	330.54	698.88	1155.07
Liquid assets	Mean	24919.87	2373.86	6598.75	4110.85
	Std. Dev.	37765.82	2281.62	4833.27	4398.47
Advances	Mean	23474.70	2539.87	6760.65	5507.03
	Std. Dev.	32289.41	2612.82	4947.37	6231.61
Advances, debentures and bonds	Mean	26117.14	2903.14	7862.60	6227.34
	Std. Dev.	34877.70	2998.19	5647.44	6825.87
Short-term advances	Mean	8926.75	1083.31	3163.74	3449.37
	Std. Dev.	12004.92	1121.86	1573.01	3473.09
Medium-term advances	Mean	8206.03	935.35	1962.50	1183.47
	Std. Dev.	11223.34	1075.81	1998.47	1815.21
Return on assets	Mean	0.96	0.92	0.17	1.75
	Std. Dev.	0.78	1.61	3.00	1.85
Listing on stock exchanges	Mean	0.65	0.47	0.67	1.00
	Std. Dev.	0.47	0.50	0.48	0

Note: All level variables are in billions of Indian rupees. Liquid assets include cash, balances with RBI and other banks, money at call and short notice, government and other approved securities. Short-term means less than 1 year and medium-term means from 1 year up to 3 years.

Table 3. Impact of monetary policy on credit disbursal

	Dependent variable: log change in advances			Dependent variable: log change in advances and debentures		
	All banks	**State-owned**	**Private sector**	**All banks**	**State-owned**	**Private sector**
	(1)	(2)	(3)	(4)	(5)	(6)
Tight money regime						
Change in interest rate x Public sector banks	- 0.167***	- 0.106**		- 0.135 **	- 0.084 *	
	(0.053)	(0.044)		(0.052)	(0.048)	
Change in interest rate x Old private sector banks	- 0.079		- 0.141 **	- 0.075 *		- 0.124 **
	(0.05)		(0.06)	(0.046)		(0.056)
Change in interest rate x New private sector banks	- 0.103		- 0.168	- 0.145		- 0.197
	(0.184)		(0.196)	(0.147)		(0.162)
Change in interest rate x Foreign banks	- 0.422 ***		- 0.482 ***	- 0.36 ***		- 0.411 ***
	(0.094)		(0.01)	(0.104)		(0.116)
Easy regime						
Change in interest rate x Public sector banks	0.09	0.041		0.166 **	0.163	
	(0.06)	(0.06)		(0.082)	(0.103)	
Change in interest rate x Old private sector banks	0.158 ***		0.193 ***	0.177 ***		0.194 ***
	(0.059)		(0.07)	(0.058)		(0.069)
Change in interest rate x New private sector banks	0.109		0.085	0.063		0.035
	(0.279)		(0.248)	(0.22)		(0.196)
Change in interest rate x Foreign banks	0.06		0.125	0.097		0.133
	(0.137)		(0.131)	(0.143)		(0.133)
Control variables						
Capital	- 0.085	- 0.44 *	0.099	- 0.091	- 0.424 *	0.06
	(0.137)	(0.252)	(0.068)	(0.13)	(0.242)	(0.086)
Liquidity	- 0.071	0.005	- 0.084	- 0.054	0.052	- 0.072
	(0.059)	(0.108)	(0.064)	(0.054)	(0.119)	(0.057)
Return on assets	0.054 **	0.029	0.05 **	0.053 **	0.068	0.048 **
	(0.024)	(0.051)	(0.024)	(0.014)	(0.055)	(0.024)
Industrial growth	0.056 ***	0.033 **	0.08 ***	0.052 ***	0.026 *	0.074 ***
	(0.014)	(0.015)	(0.02)	(0.013)	(0.015)	0.02
Stock exchange listing	0.008	- 0.006	0.038	0.027	0.004	0.047
	(0.023)	(0.029)	(0.041)	(0.025)	(0.024)	(0.049)
Time trend	-0.017*	0.013	- 0.036 ***	- 0.016 *	0.017	- 0.038 ***
	(0.009)	(0.01)	(0.012)	(0.009)	(0.023)	(0.013)
F-statistic	5.6	11.9	2.62	4.11	5.75	8.39
Prob(F-stat>0)	0.00	0.00	0.014	0.00	0.00	0.00
R-squared	0.124	0.268	0.192	0.105	0.205	0.174
No. of observations	334	144	190	334	144	190

Note: The values in parentheses are robust standard errors
***, **, * indicate significance at 1%, 5% and 10% levels, respectively

Table 4. Impact of monetary policy on disbursal of short and medium term credit

	Dependent variable: log change in short term advances			Dependent variable: log change in medium term advances		
	All banks	**State-owned**	**Private sector**	**All banks**	**State-owned**	**Private sector**
	(1)	(2)	(3)	(4)	(5)	(6)
Tight money regime						
Change in interest rate x Public sector banks	- 0.297 ***	- 0.212 *		- 0.264 *	- 0.05	
	(0.107)	(0.108)		(0.149)	(0.124)	
Change in interest rate x Old private sector banks	- 0.226 **		- 0.313 **	- 0.157		- 0.263
	(0.112)		(0.128)	(0.188)		(0.249)
Change in interest rate x New private sector banks	- 0.003		- 0.092	- 0.353		- 0.448
	(0.315)		(0.326)	(0.436)		(0.467)
Change in interest rate x Foreign banks	- 0.498 ***		- 0.595 ***	- 0.98 ***		- 1.054 ***
	(0.141)		(0.168)	(0.333)		(0.326)
Easy regime						
Change in interest rate x Public sector banks	0.205 **	0.251 *		0.35 **	0.099	
	(0.096)	(0.14)		(0.156)	(0.193)	
Change in interest rate x Old private sector banks	0.399 **		0.431 **	0.268		0.40
	(0.164)		(0.175)	(0.335)		(0.367)
Change in interest rate x New private sector banks	- 0.04		- 0.007	0.604		0.594
	(0.28)		(0.31)	(0.522)		(0.473)
Change in interest rate x Foreign banks	- 0.138		- 0.113	0.55		0.715
	(0.442)		(0.5)	(0.735)		(0.787)
Control variables						
Capital	- 0.006	- 0.218	- 0.002	0.305	0.224 **	0.61
	(0.131)	(0.189)	(0.2)	(0.269)	(0.096)	(0.422)
Liquidity	- 0.017	- 0.086	- 0.017	- 0.46 **	- 0.062	- 0.494 *
	(0.074)	(0.204)	(0.075)	(0.23)	(0.228)	(0.264)
Return on assets	0.054 **	0.192	0.042 **	- 0.026	- 0.161	- 0.01
	(0.022)	(0.125)	(0.012)	(0.029)	(0.153)	(0.027)
Industrial growth	0.099 ***	0.029	0.149 ***	0.063	0.036	0.069
	(0.024)	(0.019)	(0.037)	(0.045)	(0.035)	(0.078)
Stock exchange listing	- 0.022	0.037	- 0.217	- 0.004	- 0.306 *	0.606
	(0.119)	(0.052)	(0.253)	(0.254)	(0.166)	(0.419)
Time trend	- 0.069 ***	0.004	- 0.123 ***	0.019	0.009	0.048
	(0.025)	(0.018)	(0.037)	(0.043)	(0.037)	(0.069)
F-statistic	2.87	3.60	3.25	4.2	2.41	4.21
Prob(F-stat>0)	0.00	0.03	0.00	0.00	0.047	0.00
R-square	0.064	0.083	0.066	0.056	0.013	0.039
No. of observations	319	135	184	319	135	184

Note: The values in parentheses are robust standard errors
*** , ** , * indicate significance at 1%, 5% and 10% levels, respectively

Figure 1. Movement of prime lending rate and other policy rates