

Working Paper

No. 40

**Bank Characteristics, Financial Market
Development and Monetary Policy
Transmission**

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February 2017

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Bank Characteristics, Financial Market Development and Monetary Policy Transmission

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Abstract

The paper examines the effect of bank level characteristics and financial market development on the bank lending channel of monetary policy transmission in India using Arellano–Bond (1991) dynamic panel data model. A sample of 73 Commercial Banks for the period from 2005-2015 is used for the analysis. The results indicate that size, liquidity and capitalization are important bank characteristics which have a significant impact on monetary policy transmission. The study also finds that with the development of financial markets, the bank lending channel of transmission has become weaker.

Keywords: Bank Lending Channel; Bank specific Characteristics; Innovation; Monetary Policy Transmission; India

JEL Classification: E44; E52

I Introduction

The mechanism of monetary policy transmission has always been a subject of great interest to economists. Monetary policy affects the GDP (Gross Domestic Product) and prices through various channels - interest rate channel, credit channel, stock market channel, exchange rate channel etc. There have always been debates on which of these channels prevail in a particular economy. As there is no consensus on the working and relative importance of these channels in the literature and the monetary policy transmission is often referred to as a “Black Box” (Bernanke and Gertler 1995). The policy transmission mechanism is characterized by long, uncertain and variable time lags which further makes it difficult to predict the specific effect of monetary policy actions on the economy and price level. This time lag and uncertainty persist mainly because the policy announcements are not immediately transmitted into the economy. For instance, banks do not change their lending rate immediately after change in policy rate. From January 15, 2015 to April 5, 2016, Reserve Bank of India (RBI) reduced the repo rate by 150 basis points. However, in response to this, Indian

banks have lowered their lending rates by only 60 basis points, (RBI, 2016). Therefore, to design and implement monetary policies, it is imperative to understand both the process of transmission and the factors that strengthen or weaken these channels.

Concerns have been raised about weak transmission mechanism of monetary policy in India and the reason is attributed to the preference of banks to protect profitability in the wake of deteriorating asset quality and higher provisioning (RBI, 2016). Further, for a monetary policy to be successfully implemented, one should have a precise estimation of the speed at which the effects of policy changes proliferate to other parts of the economy and the magnitude of these effects. This requires a systematic understanding of the mechanism through which monetary policy affects economic activity.

Brunner and Meltzer (1963) provide a framework to understand the role of financial intermediaries in the process of monetary policy transmission. A formal model on bank lending channel was created by Bernanke and Blinder (1988) by including the role of banking sector in IS-LM framework. This model was estimated by Bernanke and Blinder (1992) and it was found that the amount of bank loans responds significantly to change in the federal fund rates. However, according to Kashyap and Stein (2000), all the empirical studies of bank lending channel are based on macro-level/aggregate data and they suffer identification problem because of their inability to show whether the changes in credit behaviour after a policy change are induced by bank loan supply or demand. Therefore, the use of bank level data is more important to understand the impact of transmission of monetary policy across banks. Kashyap and Stein (1997) have shown that small banks in US reduce lending more than large banks in case of a restrictive policy. The reason behind small banks being more effective is that they do not have a lot of bargaining power as they depend on central banks and not public deposits. Martinez and Pages (2001) show that less liquid banks have a stronger response to monetary policy change. Similarly, undercapitalized banks tend to be more responsive to change in monetary policy in Europe (Altunbas, *et. al.* 2012).

Most of this work on bank lending channel has been done in the context of developed economies. Pandit, *et. al.* (2006) study the role of bank lending channel on monetary policy transmission in India but the study does not take into account the growing role of financial market development on the bank lending channel. Several other studies have also been conducted by RBI on similar lines. For instance, Khundrakpam and Jain (2012) examine the relative importance of all channels on GDP growth and inflation in India. Mohanty (2012) provided evidence on the interest rate channel of monetary policy transmission. However, most of these studies use VAR and study majorly the interest rate channel of transmission. Most of the earlier studies considered whole banking industry as one giving less attention to the effect of individual characteristics of banks and innovation in financial markets on monetary policy transmission. To the best of our knowledge, not a single study explored for the effect of bank specific characteristics and financial innovation on monetary policy transmission in India. This paper makes an effort to examine whether bank specific characteristics and financial innovation play an important role in the distributional impact of monetary policy in India. The rest of the paper is organized as follows. Section II gives the role of bank specific characteristics and financial innovation on

the policy transmission. Section III discusses various channels of monetary policy transmission. Section IV deals with methodology and data. Results of dynamic panel data are reported in Section V. Section VI concludes the paper.

II Role of Bank Characteristics and Financial Innovation in the Transmission

The Indian financial system has undergone tremendous changes over the last few decades and these changes have important implications on the way monetary policy is transmitted through financial intermediation. Banking sector plays a dominant role in the financial intermediation of the country. As a result, bank lending channel is an important monetary policy channel which explains the effect of change in monetary policy actions on supply of loans. A monetary policy expansion results in increase in credit supply and monetary policy contraction results in a reduced supply of credit. However, not all banks change their lending rate and loan supply at the same time and in the same magnitude. This could be attributed to bank specific characteristics such as size, liquidity and capitalization. Kashyap and Stein (1995) and Kishan and Opiela (2000) argue that since small banks encounter more asymmetric information problems as compared to large banks, they find it more difficult to raise uninsured funds in response to monetary policy tightening, therefore, small banks react more strongly to monetary policy shocks. Similarly, less liquid and poorly capitalized banks react more strongly to a restrictive monetary policy impulse than more liquid and better capitalized banks.

Further, one of the major financial market developments that have taken place over the last few years is financial innovation that results in creation of markets that act as substitutes to banks. Financial innovation has a great influence not only on the type of financial products that are traded but also on the structure of financial markets and the behaviour of economic agents. Since it has now become possible for enterprises to finance themselves through capital market, therefore, they have become less dependent on bank lending (Camelia and Angela 2011). Tufano (2002) classified financial innovation into two types: product and process innovation. Product innovation means introduction of a broad variety of new products which trade in new market settings and thereby reduce the reliance upon banks for traditional credit instruments and evaluation. Process innovation means new ways of distribution of securities or new and innovative payment system technologies. Product innovation, therefore, means growth in equity, derivatives, securitization, hedge funds etc. The introduction of derivative instruments and securitization has been happening for the last three to four decades but these markets have grown in size and become more complex only in recent years.

With the innovation in financial markets, the ease of substitutability between assets and new techniques of obtaining credit has increased over time. This reduces the meaning and usefulness of traditional monetary and credit aggregates as monetary policy indicators. Innovation also reduces the ability of authorities to adopt direct quantitative controls over credit or interest rate ceilings. As the effectiveness of the credit channels reduces, the impact of monetary policy on exchange rates becomes greater as it directly affects the real competitiveness of domestic manufacturing (Levich, *et. al.* 1988). Therefore, financial innovation leads to a strengthened interest and exchange channel but weakens the credit channel. Thus financial innovation poses a serious challenge for the conduct of monetary policy.

III Channels of Monetary Policy Transmission

Over the last few decades, monetary policy has taken the centre stage in discussions to promote sustainable growth and low inflation in the economy. To have a clear understanding on the mechanism through which monetary policy affects the economy, it is essential to know the channels of transmission. According to Mishkin (1996), the transmission of monetary policy affects the macroeconomic variables (GDP and prices) through various channels that can be explained as follows.

Interest Rate Channel: The traditional interest rate channel can be described with the help of the Keynesian IS-LM model. Under the assumption of sticky prices in the short-run, an expansionary monetary policy (fall in policy rate) results in lower nominal interest rates which translate into lower real interest rates that in turn increases aggregate demand. Monetary policy changes influence aggregate demand by altering business investment and durable consumption decisions and these changes are reflected in the long term. This, in turn, alters aggregate output and prices.

Credit Channel: The credit channel is an enhancement mechanism that amplifies and propagates the effect of traditional interest rate (Bernanke and Gertler 1995). Since a certain category of small borrowers might not have access to bond market, therefore while examining the transmission of monetary policy, it is important to understand bank credit. The credit channel has two types: bank lending channel and balance sheet channel. The *bank lending channel* shows the effect of change in monetary policy actions on the supply of loans and the *balance sheet channel* shows the impact of change in monetary policy actions on balance sheet and income statement of borrowers. The effect of bank lending channel on monetary policy transmission has been increasing in importance because of the important role of banks in financial intermediation.

Asset Price Channel: There are two main categories of asset prices besides bonds through which monetary policy can be transmitted – foreign exchange and equity. *Exchange rate channel* involves interest rate effects as when domestic real interest rate falls, domestic deposits become less attractive relative to deposits denominated in foreign currencies. This results in a fall in value of domestic deposits as compared to other currency deposits, i.e., depreciation of domestic currency and as a result domestic goods become cheaper. Therefore, net export rises and hence aggregate output.

The *equity price channel* has two classifications – Tobin's q theory of investment and wealth effects on consumption. Tobin's q is defined as the market value of a firm divided by the replacement cost of capital. An expansionary monetary policy results in higher valuation of equity which can induce household consumption as they perceive value of wealth to be higher. This can have a favourable impact on equity prices which raises the market value of firm as compared to replacement cost of capital. A high value of Tobin's q will encourage firms to undertake investments by issuing equity which will further help in accelerating economic activity.

Stock Market Channel: The stock market channel passes through the stock market instead of the bond market and it emphasizes the importance of defending the stance of inflation targeting by Central banks. Monetary policy affects the real economic

activity. Since inflation levies property tax on stocks and income tax on dividend payments, in this way, monetary policy affects real economic activity through the stock market. Hence, it is evident that inflation taxes stocks more heavily than bonds. The stock market channel therefore suggests that price level is an appropriate target for monetary policy (Chami, *et. al.* 1999).

IV Methodology and Data

The empirical analysis of bank lending channel is divided into two parts. The first model is based on the approach by Kashyap and Stein (1995, 2000) which tests how the reaction of bank loans changes due to the size, liquidity and capitalization of individual banks. This approach has also been used to analyse the existence of bank lending channel in other emerging market economies (Horvath, *et. al.* 2006, Pruteanu-Podpiera 2007, Matousek and Sarantis 2008, Zulkhibri 2012) and euro area (Gambacorta 2003, Koch 2008).

This model is estimated using a panel data of 73 banks for a time period of 10 years. It allows us to study the response of bank loans to change in monetary policy, measured by introducing interaction terms between the policy rate and bank specific characteristics. The model also allows for dynamic estimation and for some variables in first difference is done¹. The model is specified as follows:

$$\Delta \text{Loan}_{it} = \alpha_i + \sum \beta_j \Delta \text{Loan}_{it-j} + \sum \delta_j \Delta \text{PR}_{it-j} + \gamma_0 \text{SIZE}_{it-1} + \lambda_0 \text{LIQUIDITY}_{it-1} + \mu_0 \text{CAPITAL}_{it-1} + \sum \gamma_j \Delta \text{PR}_{t-j} * \text{SIZE}_{it-1} + \sum \lambda_j \Delta \text{PR}_{t-j} * \text{LIQUIDITY}_{it-1} + \sum \mu_j \Delta \text{PR}_{t-j} * \text{CAPITAL}_{it-1} + \sum \phi_j \Delta \text{PRICES}_{t-j} + \sum \phi_j \Delta \text{GDP}_{t-j} + \varepsilon_{it} \quad \dots(1)$$

$$i = 1, 2, 3, \dots, N; t = 1, 2, \dots, T$$

Where Δ is the first difference operator, *Loan* is the logarithm of total loans, *PRICES* is the logarithm of Wholesale Price Index, *GDP* is the logarithm of real GDP, *PR* is the policy rate (call/notice money market), *SIZE*, *LIQUIDITY* and *CAPITAL* are the bank size, liquidity and capitalization, respectively. ε_{it} denotes the error term and α_i denotes bank specific fixed effects² (Pruteanu-Podpiera 2007) (Juurikkala, *et. al.* 2011)

The bank specific characteristics (size, liquidity and capitalization) are selected based on the assumption that the loan supply for a given type of bank is more responsive to monetary policy shocks. *Size* of the banks is measured by the logarithm of total assets. Small banks are forced to reduce lending at the time of monetary tightening because of their inability to raise funds from other sources as they have very little bargaining power. Therefore, when the policy rates are reduced, small banks translate that rate change immediately by changing their lending rates and as bank size increases, the policy rate transmission takes time. Hence, the expected sign of the coefficient of size should be negative. *Liquidity* is measured by the ratio of liquid assets (cash and reserves) to total assets. Banks with less liquid balance sheets are less prepared to

¹ The first difference is taken as banks react to a change in the interest rate by adjusting the new loans.

² Fixed effect specification is chosen over random effect based on Hausman test. The hypothesis that a pooled simple OLS regression does better than fixed effects has been rejected as well.

shield their loan supply in times of unexpected deposit shocks and are therefore more likely to cut down on lending in the time of monetary tightening (Gambacorta 2005), The expected sign of the liquidity coefficient should be negative. *Capitalization* is measured by the ratio of capital and reserve to total assets. Well capitalized banks pay lower risk premium for financing uninsured debt and are better prepared to shield their loan supply from unexpected reserve shocks in case of monetary policy tightening (Olivero, *et. al.* 2010).

The model also incorporates interaction terms of monetary policy with the bank specific characteristics ($\Delta PR * SIZE$, $\Delta PR * LIQUIDITY$, $\Delta PR * CAPITAL$). Depending on the coefficient of the bank specific variables, the interaction term may be positive or negative. The positive coefficient for the interaction term would mean that as the size, liquidity and capitalization increase, the sensitivity of bank lending to monetary policy becomes smaller.

The macroeconomic variables (Price and GDP) are included in the model to control for the demand side effect. Rise in inflation generates uncertainty about future return on investment which discourages firms from undertaking investments and as a result, reduces their loan demand (Cuthbertson 1985). This implies that price should have a negative relation with loan demand.

The bank specific characteristics are normalized with respect to their average such that the sum over all observation is zero. Therefore, the average value of the interaction term is zero which implies that these parameters can be interpreted as overall effect of monetary policy on the loans. Also the bank specific characteristics are the deviations of the values from their cross sectional means for each time period.

The second model adds the financial innovation terms, i.e., the growth in derivatives market, stock market and equity to the model to analyze the impact of financial innovation on bank lending channel. This has the following specification:

$$\Delta Loan_{it} = \alpha_i + \sum \beta_j \Delta Loan_{it-j} + \sum \delta_j \Delta PR_{it-j} + \gamma_0 SIZE_{it-1} + \lambda_0 LIQUIDITY_{it-1} + \mu_0 CAPITAL_{it-1} + \sum \gamma_j \Delta PR_{it-j} * SIZE_{it-1} + \sum \lambda_j \Delta PR_{it-j} * LIQUIDITY_{it-1} + \sum \mu_j \Delta PR_{it-j} * CAPITAL_{it-1} + \sum \phi_j \Delta Prices_{it-j} + \sum \phi_j \Delta GDP_{it-j} + \eta_0 DERIV_{t-1} + \sum \eta_j \Delta PR_{it-j} * DERIV_{t-1} + \phi_0 STOCK_{t-1} + \sum \phi_j \Delta PR_{it-j} * STOCK_{t-1} + \sigma_0 SEC_{t-1} + \sum \sigma_j \Delta PR_{it-j} * SEC_{t-1} + \epsilon_{it} \quad \dots(2)$$

$$i= 1,2,3,\dots,N; t= 1,2,\dots,T$$

Where Δ is the first difference operator, *Loan* is the logarithm of total loans, *PRICES* is the logarithm of Wholesale Price Index, *GDP* is the logarithm of real GDP, *PR* is the policy rate (call/notice money market). Call rate is used as a proxy for policy rate because of two main reasons. Firstly, the change in repo rate is not a continuous process and secondly, for the period after the adoption of Liquidity adjustment facility (LAF), if interest rate is taken as the principal instrument for signaling policy stance, call rate accounts for 21 per cent fluctuation in GDP growth (Khundrakapam and Jain 2012). *DERIV*, *STOCK* and *SEC* are the growth rate in derivatives, stock market and securitization respectively. α_i denotes the individual bank effects and ϵ_{it} denotes the error term.

The growth rate of derivatives, stock market and securitisation are used as measures of financial innovation. Derivatives are used to hedge and transfer specific risks of an underlying security among economic agents. Large scale use of derivative instruments has become a central feature of financial markets globally. However, the greater use of derivatives has an important implication of strengthening the asset price channel but since they allow hedging on long term lending, it weakens the bank lending channel (Vrolijk 1997). Securitisation is the transformation of illiquid financial assets to highly liquid and marketable capital market assets. By doing this, it enables financial institutions to repackage their loans in the form of bonds and make their lending activities less constrained and more attuned to market conditions. Gomez et al (2005) argues that securitization has transformed credit markets and rendered monetary policy less potent. This implies that securitization makes banks less constrained during monetary policy tightening and therefore weakens the bank lending channel.

With development in financial markets, particularly financial innovation, it becomes easy to substitute banks with new techniques of obtaining credit. Therefore, these developments are expected to weaken the transmission channel. However, in an emerging economy like India, these markets have recently started developing; the impact may not be very significant. The interaction term of growth rate in derivatives, stock and equity markets with monetary policy is expected to have a positive sign implying that as the financial markets become more developed, the monetary policy sensitivity to bank lending channel weakens.

In the above specifications, the error term and the dependent variables are correlated due to the presence of lagged dependent variable as an explanatory variable. A standard method to deal with this correlation is to adopt an instrument variable procedure. Therefore, we use the framework of Generalized Method of Moments (GMM) developed by Arellano and Bond (1991) that uses lagged values of explanatory variables in levels as instruments. GMM involves two-step estimation. In the first step, the errors are assumed to be independent and homoscedastic across banks and over time. In the second step, the residuals obtained in the first step are used to construct a consistent estimate of the variance-covariance matrix. However, this method of ‘difference estimator’ leads to aggravate measurement error bias (Griliches and Hausman 1986). Therefore, Arellano and Bover (1995) suggested an alternative method that estimates the regression both in differences and levels. The estimator uses lagged differences of the explanatory variables as instruments. The GMM estimator is considered consistent depending on two assumptions – the error term does not exhibit serial correlation and the instruments included in the model are valid. Arellano and Bond (1991) proposed two diagnostic tests in order to test these assumptions. The first test is the Sargan test which tests the overall validity of the instruments. The second test is a serial auto correlation test to ascertain the absence of serial correlation in the error terms. It tests whether the differenced error term is second order serially correlated or not because given the nature of the model, it is presumed that the error term is first order serially correlated. Under the null hypothesis of absence of second order-serial correlation this test has standard normal distribution (Reddy 2011). A balanced panel of 73 scheduled commercial banks for the years from 2005 to 2015 has been included in the analysis. All the required data for analysis is taken from the Reserve Bank of India.

V Results and Discussion

For the purpose of primary investigation, the summary statistics of selected variables is presented in Table 1. All the values have been converted into 2011-2012 prices. Thus, they are in real values. The mean values show that on an average Indian banks disbursed a loan amount of Rs 1058963 million; have Rs 1774703 million assets; 13 per cent of liquidity; and 14.8 per cent of capital to their assets. Interest rates in call/notice market is around 6.59 per cent. Growth in derivatives market, stock market, and securitization, respectively, on an average, is about 40 per cent, 25 per cent and 21 per cent. Prices rose, on an average, per annum by 4.5 per cent. Standard deviation of variables indicates that there is a slight variation in the data set and it is higher in the case of loan and size of banks, indicating few small and large banks operate along with each other.

Table 1: Summary Statistics

Variable	Description	Mean	Standard Deviation	Minimum	Maximum
Loan (Rs. million)	Loan	1058963	298723	25568	67352132
PR (%)	Policy Rate (Call/Notice Rate)	6.59	1.64	3.29	8.28
SIZE (Rs. million)	Total Assets	1774703	7539653	3000.8	10975928
LIQUIDITY (%)	cash and reserves to total assets	0.1342	0.1349	0.0132	0.8180
CAPITAL (%)	Capital and reserves to Total Assets	0.148	0.1609	0.028	0.98
DERIV (%)	Growth in derivatives	40	35.4	-16	89
STOCK (%)	Growth in stocks	25	16.7	10	65
SEC (%)	Growth in securitization	21	18	-27.6	72
PRICE	Inflation	4.5	1.2	2.5	6.01
GDP (Rs Billion)	Gross Domestic Product	43750	9621	29714	57418

Bank specific characteristics

Table 2 shows the impact of bank specific characteristics on loans resulting from the base model on bank lending channel. It shows that the impact of policy rate on bank lending is negative. This implies that as policy rates are increased, banks reduce their lending. The coefficient for policy rate on lending ranges from -0.0109 to -0.070 which implies that as policy rate increases by one percentage point, the loan supply reduces in a range of 1.09 per cent and seven per cent. The lagged coefficient of loans is significant for all the estimated models which indicate that the past behaviour of loans affects the present loan behaviour. An obvious interpretation of this is that large values of loans (positive or negative) one year stimulate banks to increase the loans in the next year. In the present case, lagged loan variable coefficients take, on an average, a value of below 0.04, which means that loan persistency of banks is low. The failure to reject the null hypotheses of our diagnostic tests, both Sargan and second order serial correlation, support the overall validity of given instrumental variables and no auto correlation in the model, respectively.

The results show that the importance of bank specific characteristics with respect to the bank lending channel. The coefficient of variable SIZE is significant and negative which implies that the loan growth rate is lower for larger banks. The reason is that it is easy for large banks to substitute their source of financing as compared to small banks and therefore they change loan supply by a lesser amount. This result is similar to the one found by Schmitz (2003) for Central and eastern European countries. The

variable LIQUIDITY is negative and highly significant which shows that more liquid banks are less likely to cut down on lending in the event of a monetary tightening (Ashcraft 2006). In case of capitalization, the result shows that the coefficient CAPITAL is significant and positively associated with bank loan.

When policy variable is interacted with the other variables, the respective coefficients are having different signs. The estimated coefficients of interaction terms $\Delta PR * SIZE$ and $\Delta PR * LIQUIDITY$ show a positive sign and are highly significant except $PR * CAPITAL$ which is negative and insignificant. The positive coefficient of the interaction of monetary policy indicator and bank size means that small banks react more strongly to changes in interest rate (Kohler, *et. al.* 2006). The positive coefficient on the interaction term of monetary policy and liquidity means that less liquid banks show a stronger reduction in lending after a monetary policy tightening as compared to more liquid banks (Ehrmann, *et. al.* 2003)

The model incorporates control variables (Price and GDP) which control for the demand side effect. Both price and GDP are significant and GDP has a positive coefficient whereas Price has a negative coefficient. This signifies the inverse relationship between inflation and investments. Rise in inflation urges firms to reduce investments and consequently loan demand falls. The coefficient of GDP growth rate is positive and statistically significant implying that growth rate of bank loans is larger in a growing economy where the demand for loans is rising. These results are in consistent with theory and similar studies by Olivero et al (2010).

Table 2: Estimation Results of Bank Lending Channel with Bank Specific Characteristics

$\Delta Loan_{it}$	SIZE	LIQUIDITY	CAPITAL	ALL
$\Delta Loan_{it-1}$	-0.0507* (0.011)	-0.0264* (0.005)	-0.0340* (0.007)	-0.0406** (0.176)
ΔPR_t	-0.070** (0.003)	-0.050** (0.059)	-0.063** (0.052)	0.0109** (0.015)
<i>Bank specific characteristics</i>				
SIZE	-1.3552** (0.041)			-1.3792* (0.108)
LIQUIDITY		-0.1336* (0.029)		-0.1061* (0.126)
CAPITAL			0.9287** (0.067)	0.1700*** (0.193)
<i>Monetary Policy Impact</i>				
$\Delta PR * SIZE$	0.0013* (0.006)			0.0016** (0.002)
$\Delta PR * LIQUIDITY$		0.0257* (0.026)		0.0431* (0.015)
$\Delta PR * CAPITAL$			-0.0190 (0.003)	-0.0309 (0.028)
<i>Macro-economic variables</i>				
ΔGDP_t	0.3212* (0.021)	0.2000* (0.012)	0.1117* (0.027)	0.3568* (0.040)
$\Delta Prices_t$	3.1887* (0.091)	-0.3481* (0.0286)	-0.4277* (0.025)	3.3579* (0.256)
Sargan test p value	0.89	0.91	0.97	0.95
AR (2)	0.572	0.618	0.505	0.587

Notes: Values reported in parentheses are standard errors and *, ** and *** denote statistical significance at the one per cent, five per cent and 10 per cent levels, respectively. Estimation methodology: GMM first-difference estimator using the robust one-step method suggested by Arellano and Bond (1991).

Financial Innovation

Table 3 shows the impact of financial innovation on loans resulting from the second model on bank lending channel. Similar to the previous model, it shows that the

impact of policy rate on bank lending is negative implying that as policy rates are increased, banks reduce their lending. The coefficient for policy rate on lending ranges from -0.038 to -0.0649 which implies that as policy rate increases by one percentage point, the loan supply reduces in a range of 3.8 per cent and 6.5 per cent. The diagnostic tests reveal that both Sargan and second order serial correlation, support the overall validity of given instrumental variables and no auto correlation in the model, respectively.

The coefficients of bank specific characteristics show similar results as that of the base model. Derivatives and securitization have negative and significant coefficients which implies that as these markets grow, the loan supply by banks reduced indicating the loss in efficiency of bank lending channel. However, stock market coefficient is negative but insignificant. This concludes that monetary policy loses its effectiveness in influencing real variables in the short run because of the partial dilution of credit channel caused by the completion of financial market that derivative instruments imply (Gomez, *et. al.* 2005). The interaction term between monetary policy and derivatives is significant and negative which implies that as the derivative market grows, the impact of monetary policy on loan growth reduces.

Table 3: Estimation Results of Bank Lending Channel with Financial Innovation

ΔLoan_{it}	DERIV	STOCK	SEC	ALL
$\Delta \text{Loan}_{it-1}$	-0.0412** (0.018)	-0.0429** (0.014)	-0.0517* (0.023)	-0.0631** (0.041)
ΔPR_t	-0.0607* (0.116)	-0.0383* (0.009)	-0.0649* (0.012)	-0.0812* (0.138)
<i>Bank specific characteristic</i>				
SIZE	-1.3924* (0.049)	-1.7041* (0.084)	-1.4013** (0.054)	-1.8213* (0.091)
LIQUIDITY	-0.2205* (0.058)	-0.1520** (0.062)	-0.3503* (0.071)	-0.1706** (0.053)
CAPITAL	0.0106*** (0.074)	0.3955* (0.148)	0.6933** (0.214)	0.4925** (0.162)
<i>Financial Innovation</i>				
DERIV	-0.814** (0.69)			-0.571* (0.549)
STOCK		-0.6635(0.57)		-0.438 (0.713)
SEC			-0.7652*	-0.895** (0.641)
<i>Monetary Policy Impact</i>				
$\Delta \text{PR}*\text{SIZE}$	-0.0033*** (0.018)	-0.0055** (0.019)	-0.0485**	-0.0827** (0.052)
$\Delta \text{PR}*\text{LIQUIDITY}$	0.0480* (0.013)	0.0361* (0.118)	0.05143*	0.0791** (0.018)
$\Delta \text{PR}*\text{CAPITAL}$	-0.0511 (0.012)	-0.0831 (0.135)	-0.071 (0.032)	-0.0452 (0.061)
$\Delta \text{PR}*\text{DERIV}$	-0.3214** (0.192)			-0.246* (0.073)
$\Delta \text{PR}*\text{STOCK}$		0.863 (0.09)		0.923 (0.017)
$\Delta \text{PR}*\text{SEC}$			-0.458*** (0.06)	-0.536 (0.091)
<i>Macro economic variables</i>				
ΔGDP_t	0.4189* (0.071)	1.4696* (0.093)	1.3416* (0.072)	0.7314** (0.084)
ΔPrices_t	-2.231* (0.071)	-4.382* (0.216)	-3.372* (0.189)	-2.397* (0.282)
Sargan test p value	0.91	0.81	0.92	0.94
AR(2)	0.618	0.519	0.585	0.671

Notes: Values reported in parentheses are standard errors and *, ** and *** denote statistical significance at the one, five and 10 per cent levels, respectively. Estimation methodology: GMM first-difference estimator using the robust one-step method suggested by Arellano and Bond (1991).

VI Conclusion

This paper uses bank level data to assess the impact of monetary policy on lending behaviour of banks. Both bank's specific characteristics and innovation in financial market have been included in the model to assess the quality of transmission of

monetary policy through bank lending channel in India for a period 2005-2015 under dynamic panel data model framework. The results from base model show that as policy rate increases by 100 basis points the loan supply reduces in a range of 1.09 per cent and seven per cent. When innovation parameters are included in the model, with same increase the loan supply reduces in a range of 3.8 per cent and 6.5 per cent. Size and liquidity of banks negatively affect loan's growth whereas capitalization positively affects. Small banks react more to changes in interest rate and whereas less liquid banks are less responsive to changes in interest rates. Study also finds that developments in financial markets, derivatives and securitization in particular, would reduce the loan supply by banks, and thus experiencing a loss in efficiency of bank lending channel.

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