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## **Monetary policy, bank size and bank lending: Evidence from Australia**

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# Monetary Policy, Bank size and Bank lending: Evidence from Australia

Luke Liu<sup>①</sup>

**Abstract:** The transmission of monetary policy may hold the key to explaining the effects of policy on the economy. The objective of the study is to assess the importance of the bank lending channel in the transmission of monetary policy in Australia. In this paper, we found that the effectiveness of monetary policy varies with the size of the bank as well as the type of the loan. For different asset size and different kinds of loans, the effect of monetary policy is different. Thus, policy has distributional effects on bank loans that depend on asset size and industry in the economy.

Key words: Monetary policy, Bank lending, Bank size

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# Monetary Policy, Bank size and Bank lending: Evidence from Australia

## 1 Introduction

The transmission mechanism of monetary policy is the key to explaining the effects of policy on the economy. There are several transmission channels (e.g. the interest rate, bank lending, balance sheet, and exchange rate channels) that have been identified in the literature (Kashyap and Stein (1995); Kakes and Sturm (2002); Chang and Jansen(2005); Dungey and Renée (2010)). The functioning of these channels is influenced by the economic, legal and financial structure in a specific country. Thus, differences in the structure of the financial markets across countries would imply differences in the transmission mechanisms. Therefore, a good understanding of the major transmission channels for a particular economy is essential to design a tailored monetary policy. There has been a renewed interest among researchers and practitioners in analysing the role of banks as the monetary transmission mechanism.

Australia presents a very interesting case for this topic for two reasons. First, comparing to the large range of research about the US market and Europe market, there has been relatively less researches on Australian market. Second, the monetary mechanism in Australia is very interesting. Monetary policy decisions involve setting the interest rate on overnight loans in the money market. The interest rate target is maintained for a specific duration using open market operations. The monetary policy mechanism is different with many other countries. Taking American for example, in practice, the Federal Reserve uses open market operations to influence short term interest rates, which is the primary tool of monetary policy.

Empirical studies on the relationship between monetary policy and loan growth have been dominated by cross-country studies until recently due to the lack of data(Altunbas et al.(2002); Berger, (2003);Ashcraft(2006); Wang(2010)). Studies on the US market found lending channel has been significantly operative and different sizes of banks have different sensitive to the monetary policy(Kishan and Opiela (2000); Matousek and Sarantis(2009)). Under the background of Australian monetary mechanism and bank industry structure, will these results still hold in Australia where the banking industry is significantly from that of the US? In particular, we are interested in finding out answers for the following questions using Australian bank balance sheet data:

1. Whether smaller banks are more sensitive to monetary policy?
2. Whether different types of loans respond differently to change of monetary policy?
3. Whether contractionary policy is more effective?

This paper is organised as follows. Section 2 reviews related literature, which is followed by data and research methodology. Section 4 presents the econometric results, and the paper concludes with summary of major findings and policy implications.

## 2 Literature Review

In practice, it is difficult to identify whether monetary policy directly affects loan supply or loan demand. Several studies have searched for empirical evidence of the bank lending channel by employing aggregate data. An influential work by Bernanke and Blinder (1992) uses a vector auto regression (VAR) model to show that a contractionary monetary policy induces a reduction of bank loans and economic activities. Many researchers have applied this methodology on different countries (e.g. Suzuki, 2001; Ramlogan, 2004; Ashcraft, 2006; Dungey and Fry, 2010). The findings using this approach are inconsistent in terms of the role of the bank lending channel. For example, Kakes and Sturm (2002) analyse the impact of monetary shocks on bank lending in Germany, and find that the response of bank lending after a monetary contraction is very different across banking sectors. The smallest banks decline most, whereas big banks are able to shield their loans portfolio against monetary shocks. Overall, their results provide support for the existence of a bank lending channel. Ramlogan (2004) shows that the credit and exchange rate channels are more important than the interest rate channel in the Caribbean countries. Buigut (2010) tests the lending channel using a vector error correction model in a frame work that allows the identification of the shifts of demand and supply schedules in the bank loan market. Their findings suggest the dominance of the bank lending channel in Kenya. Available studies on asymmetries in the monetary transmission mechanism are invariably based on macro-economic evidence: such evidence is abundant but often contradictory. This paper takes a different perspective by using micro-economic data. We use the information contained in the balance sheets of individual banks to study the sensitivity of banks in Australia to monetary policy.

Attempts to identify loan supply shifts and the bank lending channel have concentrated on separating banks (or groups of banks) by their ability to supply loans independent of loan demand shocks. Kashyap and Stein (1995) separate banks according to asset size. They find that bank loan growth in the smallest asset category (below the ninety-fifth percentile) is most responsive to monetary policy. Although they find support for the bank lending channel, they surmise that this test may not be stringent enough to separate loan supply effects from demand shocks. Kashyap and Stein (1997a) separate banks by asset size and liquidity and find that the smallest most illiquid banks are most responsive to policy. A summary of additional evidence from various loan markets and various countries can be found in Kashyap and Stein (1997b). Many of the predictions that have been proposed for the U.S. are deemed unlikely to apply in Europe. Testing these hypotheses, Ehrmann et al.(2001) find that monetary policy does alter bank loan supply, with the effects most dependent on the liquidity of individual banks. Unlike US, the size of a bank does generally not explain its lending reaction. Altunbas et al.(2002) classify banks according to asset size and capital strength to see if these factors have a significant impact on the lending channel. Using a panel data, they find that across the Economic and Monetary Union (EMU) systems, undercapitalised banks (of any size) tend to respond more to change in policy. Using similar method, Matousek and Sarantis(2009) argue that bank size and liquidity

seem to play the most significant role in distinguishing banks' reactions to changes in monetary policy. Our paper extends the above literature by specifying asset size along with some control variables, to show further evidence of the existence of the bank lending channel in Australia.

Comparing to the vast literature on relationship of bank lending and monetary policy in US and European countries, there has been relatively less research in Australia in this area. Following the approach of Kashyap, Stein and Wilcox (1993), Suzuki (2001) developed a similar VAR model utilising Australian data between 1985 and 2000. He found that an unanticipated hike of the cash rate was followed by a contraction of bank loans. These findings are certainly not inconsistent with the hypothesis that monetary policy primarily operates through the lending channel. Dungey and Renée (2010) incorporates fiscal and monetary policy shocks into a SVAR (Structural Vector Auto Regression) model of the Australian economy and finds that contractionary monetary policy shocks result in reduced government revenue, as well as reduced debt to GDP ratios. However, it remains unclear whether sensitivity to monetary policy varies with bank size and loan types. In this study, we use data from banks' balance sheet to investigate how banks of different size react to the monetary policy and how monetary policy impact on different types of loan.

### **3 Econometric Method and Data**

As shown by Bernanke and Blinder (1992), macroeconomic time series are not helpful in identifying a lending channel that is actually the sub-channel of a credit channel. Aggregate data do not allow us to distinguish between supply and demand factors that affect the banks' lending activities. Micro-data on banks, on the other hand, may effectively capture the distributional effects of monetary policy through a lending channel.

Suppose that as a result of a monetary tightening, a bank finds that its deposits have been reduced by one percent. How will the bank respond? Basically, it can cut back on the number of loans it lends out or it can sell some of its securities holdings or liquid assets. So the liquidity and change of deposit and holdings of securities affect the change of bank lending. So we include liquidity, change of deposit and holdings of securities to the econometrical equation as control variables. But existing research shows that the liquidity, change of deposit and holdings of securities can be influenced by the unobserved individual-level random effect which should be considered as the endogenous variable. To exclude the impact of the unobserved individual random effect, we choose Hausman–Taylor estimator for error-components model<sup>①</sup> as our econometrical method which is cross-section data and to control for individual-specific unobservable effects. In addition to the above balance-sheet items, we use a proxy for changes in monetary policy and a proxy for overall economic

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<sup>①</sup> The model fit panel-data random-effects models in which some of the covariates are correlated with the unobserved individual-level random effect. The estimators, originally proposed by Hausman and Taylor (1981) and by Amemiya and MaCurdy (1986), are based on instrumental variables.

conditions. We use cash rate as an indicator of monetary policy and confidence index as an indicator as a surrogate for overall economic health.

The empirical model is given in the following equation:

$$\Delta \ln(\text{loans})_{i,t} = \alpha \Delta \ln(\text{loan})_{i,t-1} + \beta_0 \Delta \text{rate}_t + \beta_1 \Delta \text{rate}_{t-1} + \beta_2 \Delta \text{rate}_{t-3} + \chi \Delta \ln(\text{Deposit})_{i,t} + \gamma \Delta \text{Confidence} + \delta \Delta \ln(\text{Securities})_{i,t} + \varepsilon \Delta \text{liquidity}_{i,t} + \phi \text{Domestic}_i + \partial_i + u_{it}$$

(1)

With  $i=1, \dots, N$ , and  $t=1, \dots, T$  where  $i$  refers to a bank, and  $t$  refers to a month. We divided the bank loans into five categories which include loans to nonfinancial corporations, loans to financial corporations, loans to government, loans to household and intra-group loans and advances. The change of loans is regressed on one lagged values of itself, “ $\Delta \text{rate}$ ” is the change of cash rate, we used the change of cash rate 1 and 3 month before to allow us observe when the policy start to take effect. It is possible to include lagged value of 2 and 4 month, but this may potentially lead to multicollinearity problem, and does not improve the model fit significantly, so we only use 1 and 3 month lagged value, change of logarithm of total deposits, change in liquidity and change in value of securities. Liquidity of a bank is measured as the ratio of the liquidity asset to the total asset and we also add the domestic dummy variable.

$\partial_i$  is the individual-specific effects and  $u_{it}$  is the residuals.

The cash rate and confidence data is collected from the website of Reserve Bank of Australia. Data on the balance sheet items of commercial banks (for example, various types of loans, securities, deposit) were sourced from APRA’s website and the websites of the banks. The data are monthly from March 2004 to December 2010 for 61 commercial banks in Australia (15 Australian banks and 46 foreign banks, the list of all banks included in the sample can be found in Appendix). The 61 commercial banks account for 99.1% of the assets of the banking sector in Australia (RBA 2010). We divided the 61 banks into three groups according to their asset value in December 2010.5 large banks with resident assets value more than 100 billion falls in group 1, Group 2 contains 16 banks with resident assets value between 10000 and 100 billion, group 3 includes 40 banks with resident assets value below 10000 million. The statistics of the variables used is summarised in Table 1.

Table 1: Descriptive statistics of the bank balance-sheet data (2004:3-2010:12)

(million AUD\$)

|                       |         | Mean     | SD       | Minimum | Maximum  | Obs  |
|-----------------------|---------|----------|----------|---------|----------|------|
| Total resident assets | Group 1 | 269429.2 | 118617.8 | 66125.1 | 536016.8 | 400  |
|                       | Group 2 | 26582.97 | 16766.04 | 221.6   | 75694.5  | 1182 |
|                       | Group 3 | 3636.763 | 3794.307 | 1.4     | 21085.3  | 2842 |
| Gross loans           | Group 1 | 184828.9 | 78567    | 50044   | 371483.4 | 400  |
|                       | Group 2 | 14207.58 | 13962.89 | 15      | 64362.57 | 1182 |
|                       | Group 3 | 1895.314 | 2164.274 | .6      | 15371.2  | 2842 |

|                                     |         |          |          |          |          |      |
|-------------------------------------|---------|----------|----------|----------|----------|------|
| Loans to non-financial corporations | Group 1 | 46441.16 | 23563.35 | 6484.249 | 95467.3  | 400  |
|                                     | Group 2 | 4696.836 | 5684.891 | 8.2      | 25352.7  | 1182 |
|                                     | Group 3 | 1430.448 | 1919.86  | .3       | 11023.5  | 2842 |
| Loans to financial corporations     | Group 1 | 6194.855 | 4615.22  | 30.16661 | 15791.3  | 400  |
|                                     | Group 2 | 493.7118 | 743.6454 | 0        | 6569.67  | 1182 |
|                                     | Group 3 | 236.1093 | 561.1282 | 0        | 7829     | 2842 |
| Loans to household                  | Group 1 | 130465.6 | 55113.71 | 42723.7  | 296232.8 | 400  |
|                                     | Group 2 | 8662.194 | 9905.678 | 0        | 41154.04 | 1181 |
|                                     | Group 3 | 151.1437 | 638.0358 | 0        | 6123.3   | 2842 |
| Loans to government                 | Group 1 | 1182.6   | 2370.193 | 3.45944  | 11979.   | 400  |
|                                     | Group 2 | 14.95812 | 44.30413 | 0        | 419.3    | 1182 |
|                                     | Group 3 | .0225383 | .7385304 | 0        | 34.4     | 2842 |
| Loans to intra-group                | Group 1 | 7552.177 | 6550.556 | 1635.98  | 34950.51 | 400  |
|                                     | Group 2 | 3862.741 | 6667.171 | 0        | 40562.96 | 1182 |
|                                     | Group 3 | 386.9315 | 1396.48  | 0        | 10660.2  | 2842 |

Note: A resident is an individual, business or other organisation domiciled in Australia. Australian branches and Australian subsidiaries of foreign business are regarded as residents.

Source: Reserve Bank of Australia and Australian Prudential Regulation Authority

## 4 Results

The results are presented in five sections. The first shows the impact of monetary policy on gross loan. The following section presents evidence about the effect of monetary policy on five different types of loan: nonfinancial loan, financial loan, government loan, intra-group loan and household loan.

### 4.1 The impact of monetary policy on the change of gross loan

Figure 1 shows the shares of gross loan in Australian banking sector. The large banks take most share of the market. The small and media banks take up less than 10% of the market share.

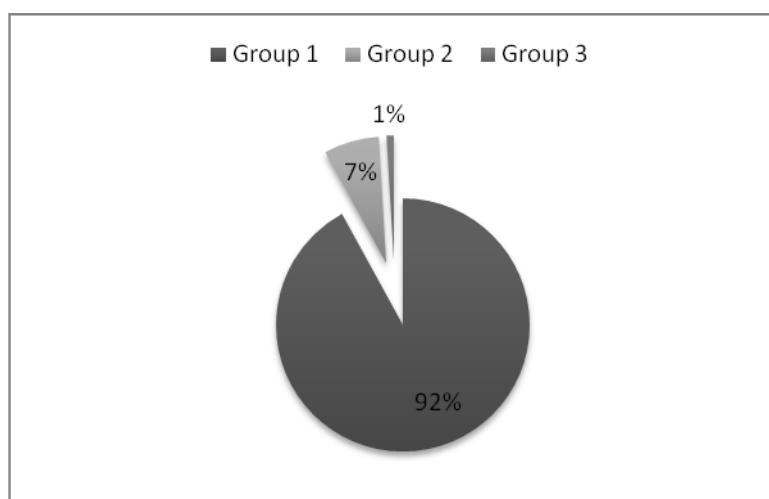


Figure 1: Gross loan shares in Australian banking sector

Tables 2 provide econometric results of the model using gross loans as dependent variable. From table 2, we can see clearly that the effect of monetary policy on gross loans is most significant for banks in group 2 and 3, or small and medium-sized banks. There is one notably striking result. The sums of the coefficients associated with changes in the cash rate are negative, statistically significant, and larger in absolute value for the banks with assets less than \$100000 million. In addition, banks in group 1 are less responsive than the medium and small size groups. The finding is consistent with the research in US (Kashyap and Stein (1995), Berger et al. (1998)). A possible explanation is that smaller banks have few sources of funding, and have limited access of cheap funding, so a change in official cash rate will have a more significant impact on their funding by increasing their cost of funding as compared with the larger banks. A contractionary monetary policy does not necessarily lead to more funding for smaller banks via high deposits due to their limited capacity to attract deposit. Consequently, their loan supply will be more responsive to monetary policy than that of larger banks. The scope of the lagged one period effect is larger within the three groups as indicated by the coefficients. And the results also show that cash rates lagged for one month have negative impact on change of gross loan.

Table 2: The effect of monetary policy on the change of gross loan

| $\Delta \ln(\text{Gross loan})$ | Group 1                | Group 2                 | Group 3                 |
|---------------------------------|------------------------|-------------------------|-------------------------|
| TV exogenous                    |                        |                         |                         |
| $\Delta \text{Cash rate}$       | .1326253<br>(0.180)    | .1320999**<br>(0.018)   | .1412393***<br>(0.000)  |
| L1.                             | -.2320546**<br>(0.050) | -.2320075***<br>(0.001) | -.2398461***<br>(0.000) |
| L3.                             | .0210143<br>(0.842)    | .0176682<br>(0.769)     | .0274472<br>(0.477)     |
| $\Delta \text{Confidence}$      | .0057412*<br>(0.098)   | .0059369***<br>(0.003)  | .005918***<br>(0.000)   |



| TV endogenous                       |                        |                        |                        |
|-------------------------------------|------------------------|------------------------|------------------------|
| $\Delta \ln(\text{Total deposits})$ | .2126814***<br>(0.001) | .202142***<br>(0.000)  | .2191146***<br>(0.000) |
| $\Delta \text{Liquidity}$           | .2089094<br>(0.575)    | .1991415<br>(0.349)    | .2103143<br>(0.138)    |
| $\Delta \ln(\text{Securities})$     | .2030038***<br>(0.000) | .2014548***<br>(0.000) | .2258066***<br>(0.000) |
| TI exogenous                        |                        |                        |                        |
| Nationality                         | -.0001035<br>(0.998)   | -.0085087<br>(0.722)   | -.0045696<br>(0.853)   |
| No. of obs                          | 385                    | 1134                   | 2272                   |
| Wald Test                           | 67.86***<br>(0.000)    | 199.06***<br>(0.000)   | 531.82***<br>(0.000)   |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% confidence level. \*\* = Significant at 5% confidence level. \*\*\* = Significant at 1% confidence level.

Both the change of deposit and securities has significant influence on the change of gross loan within the three groups while the change of liquidity doesn't have significant influence on the change of gross loan. The confidence seems to be more important for small and media banks.

#### 4.2 The effect of monetary policy on the change of nonfinancial loan

Figure 2 shows the shares of nonfinancial loan in Australian banking sector. Similar like the gross loan, the large banks take most share of the market. But the small and media banks also take up more than 10% of the market share.

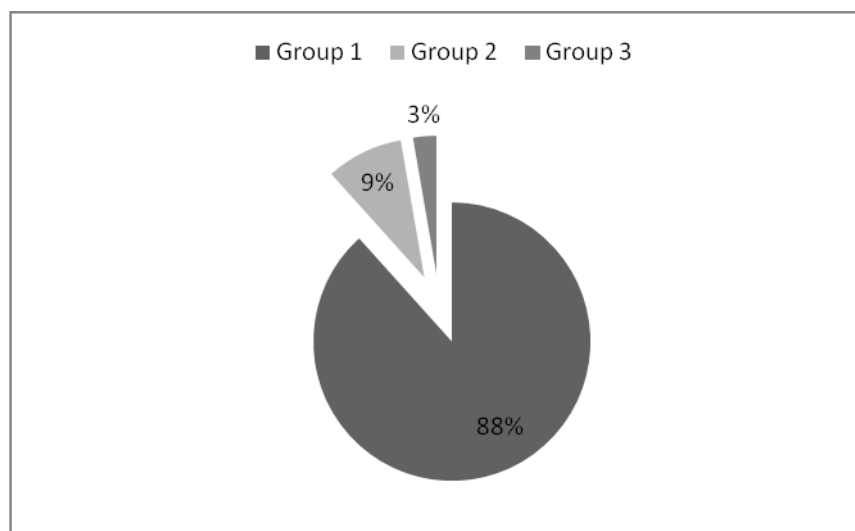


Figure 2: Non-financial loan shares in Australian banking sector

Tables 3 provide estimates of the effect of cash rate change on nonfinancial corporate loan. All groups are significantly sensitive to the change of cash rate in current month as well as three month before. The results of nonfinancial loans share different pattern from the gross loan results as the change of cash rate in current month has a positive effect on loan growth for the gross loan. The scope of the current and lagged three period effects is larger within the three groups as indicated by the coefficients.

Table 3: The effect of monetary policy on the change of nonfinancial loan

| $\Delta\text{Ln}(\text{Non-financial loan})$ | Group 1                | Group 2                | Group 3                 |
|--|------------------------|------------------------|-------------------------|
| TV exogenous                                 |                        |                        |                         |
| $\Delta\text{Cash rate}$                     | -.185068**<br>(0.043)  | -.1885477**<br>(0.000) | -.1769455***<br>(0.000) |
| L1.  | -.0153639<br>(0.888)   | .0009321<br>(0.988)    | -.0162217<br>(0.686)    |
| L3.  | -.1712364*<br>(0.079)  | -.1719267**<br>(0.002) | -.1705182***<br>(0.000) |
| $\Delta\text{Confidence}$                    | .0118983***<br>(0.000) | .0122596***<br>(0.000) | .0120309***<br>(0.000)  |
| TV endogenous                                |                        |                        |                         |
| $\Delta\text{Ln}(\text{Total deposits})$     | .0640309<br>(0.292)    | .080041***<br>(0.021)  | .0623335***<br>(0.006)  |
| $\Delta\text{Liquidity}$                     | -.0837326<br>(0.808)   | -.1037231<br>(0.599)   | -.0828052<br>(0.529)    |
| $\Delta\text{Ln}(\text{Securities})$         | .281488***<br>(0.000)  | .2769269***<br>(0.000) | .2933415***<br>(0.000)  |
| TI exogenous                                 |                        |                        |                         |
| Nationality                                  | -.003394<br>(0.931)    | -.0044687<br>(0.840)   | -.0040756<br>(0.859)    |
| No. of obs                                   | 385                    | 1134                   | 2272                    |
| Wald Test                                    | 124.81***<br>(0.000)   | 368.24***<br>(0.000)   | 968.54***<br>(0.000)    |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% level. \*\* = Significant at 5% level. \*\*\* = Significant at 1% confidence level.

The change of nonfinancial loan in group 2 and group 3 is significantly sensitive to the change of total deposits. Both the change of deposit and securities has significant influence on the change of gross loan within the group 2 and group 3 while the change of liquidity doesn't have significant influence. The confidence seems to have

significant influence on the change of gross loan within the three groups.

### 4.3 The effect of monetary policy on the change of financial loan

Figure 3 shows the shares of financial loan in Australian banking sector. The large banks take most share of the market. The small and media banks take up 10% of the market share.

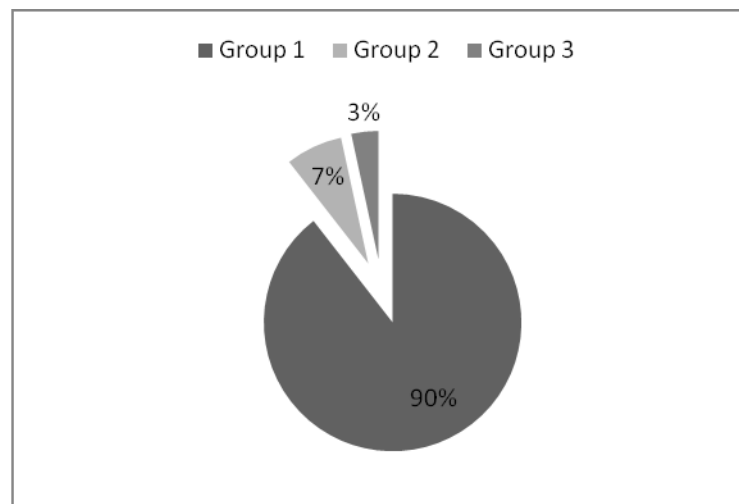


Figure 4: Financial loan shares in Australian banking sector

Tables 3 provide estimates of the effect of policy on change of financial loan. We observed different sensitivities to the change of cash rate across the groups. Group 2 and group 3 are highly sensitive to the change of cash rate in both current value and lagged value, while such sensitivity is not found in group 1. The one period lagged cash rate change has negative effect on financial loan growth while the current period and lagged three period cash rate change have positive effect.

Table 4: The effect of monetary policy on the change of financial loan

| $\Delta \ln(\text{Financial loan})$ | Group 1              | Group 2                  | Group 3                  |
|-------------------------------------|----------------------|--------------------------|--------------------------|
| TV exogenous                        |                      |                          |                          |
| $\Delta \text{Cash rate}$           | .3328578<br>(0.122)  | .3295236 ***<br>(0.007)  | .3460091 ***<br>(0.000)  |
| L1.                                 | -.5703139<br>(0.026) | -.5758824 ***<br>(0.000) | -.5784877 ***<br>(0.000) |
| L3.                                 | .221212<br>(0.96)    | .2378541 **<br>(0.073)   | .222943 ***<br>(0.007)   |
| $\Delta \text{Confidence}$          | .0067025<br>(0.374)  | .0066106<br>(0.130)      | .0057959 **<br>(0.040)   |
| TV endogenous                       |                      |                          |                          |
| $\Delta \ln(\text{Total deposits})$ | .1882708<br>(0.187)  | .1812147 **<br>(0.028)   | .1823482 ***<br>(0.001)  |

|                         |                        |                        |                        |
|-------------------------|------------------------|------------------------|------------------------|
| $\Delta$ Liquidity      | 1.830437 **<br>(0.024) | 1.84819***<br>(0.000)  | 1.801847***<br>(0.000) |
| $\Delta$ Ln(Securities) | .1510513**<br>(0.021)  | .1492991***<br>(0.000) | .1503628***<br>(0.000) |
| TI exogenous            |                        |                        |                        |
| Nationality             | .0001091<br>(0.999)    | .0017764<br>(0.973)    | -.0038054<br>(0.943)   |
| No. of obs              | 385                    | 1134                   | 2272                   |
| Wald Test               | 16.48 **<br>(0.0360)   | 48.63***<br>(0.000)    | 121.97***<br>(0.000)   |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% confidence level. \*\* = Significant at 5% confidence level. \*\*\* = Significant at 1% confidence level.

Change of securities, on the other hand, has consistently significant impact of the change of financial loans across three groups, which implies a strong link between security and financial loans. The liquidity also has significant effect on the financial loan growth within the three groups. Change of deposits may be more important for group 2 and group 3.

#### 4.5 The effect of monetary policy on the change of household loan

Figure 4 shows the shares of household loan in Australian banking sector. The large banks take most share of the market. The small bank only takes up about 0.2% and the media banks take up 5.8% of the market share.

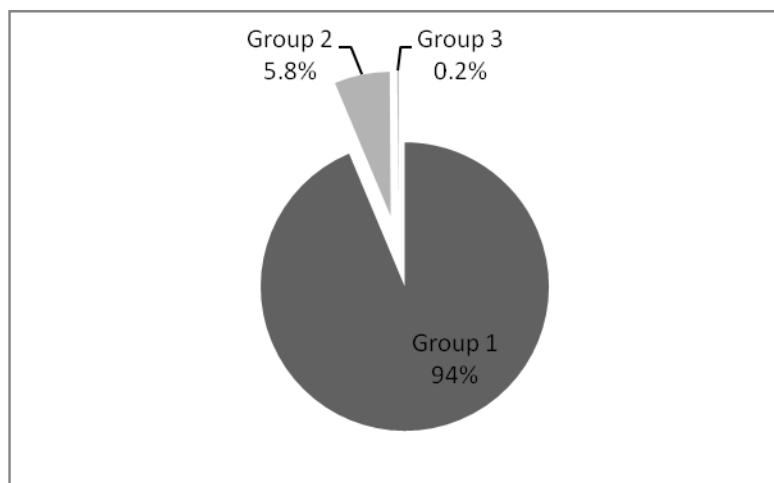


Figure 5: Household loan shares in Australian banking sector

Tables 4 provide estimates of the effect of policy on change of household loan. Household loans across all three groups are insensitive to the current change of cash rate. Since household loan is often collateralized and long maturity, it can't be

adjusted more readily relative to other types of loan. Thus, household loan is less responsive to monetary policy than other types of loans which is different from common sense. The one period lagged cash rate change has negative effect on financial loan growth while the lagged three period cash rate change have positive effect.

Table 5: The effect of monetary policy on the change of household loan

| $\Delta\text{Ln}(\text{Household loan})$ | Group 1                | Group 2                | Group 3                 |
|--|------------------------|------------------------|-------------------------|
| TV exogenous                             |                        |                        |                         |
| $\Delta\text{Cash rate}$                 | -1.1006575<br>(0.650)  | -.0817947<br>(0.481)   | -.0932167<br>(0.258)    |
| L1.                                      | -.2878169<br>(0.278)   | -.2284416<br>(0.101)   | -.2758241***<br>(0.005) |
| L3.                                      | .4510989*<br>(0.057)   | .3720929***<br>(0.003) | .4612669***<br>(0.000)  |
| $\Delta\text{Confidence}$                | .0030403<br>(0.696)    | .0026412<br>(0.522)    | .0034277<br>(0.254)     |
| TV endogenous                            |                        |                        |                         |
| $\Delta\text{Ln}(\text{Total deposits})$ | .8827474***<br>(0.000) | .7242075***<br>(0.000) | .9244411***<br>(0.000)  |
| $\Delta\text{Liquidity}$                 | .175362<br>(0.834)     | .165428<br>(0.708)     | .2231911<br>(0.491)     |
| $\Delta\text{Ln}(\text{Securities})$     | -.0402598<br>(0.550)   | -.0301845<br>(0.403)   | -.0449075*<br>(0.076)   |
| TI exogenous                             |                        |                        |                         |
| Nationality                              | .0072881<br>(0.939)    | -.0419768<br>(0.399)   | -.0044369<br>(0.937)    |
| No. of obs                               | 385                    | 1134                   | 2272                    |
| Wald Test                                | 46.05***<br>(0.0120)   | 111.29***<br>(0.000)   | 346.10***<br>(0.000)    |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% confidence level. \*\* = Significant at 5% confidence level. \*\*\* = Significant at 1% confidence level.

And an interesting issue should note here is that the change of securities has negative effect on the change of household loan. The effect of the change in deposits and securities has very significant explanatory power in all cases. The liquidity rate has no significant effect on household loan for the three groups.

#### 4.4 The effect of monetary policy on the change of government loan and intra-group loan

Figure 5 shows the shares of government and intra-group loan in Australian banking sector. The large banks take most share of the market for the government loan. The small bank only takes up about 0.02% and the media banks take up 0.98% of the market share. For the intra-group loan, the large banks take a share of 64% and the media banks take a share of 0.98%. Relative to their asset size, the intra-group loan seems “larger” for group 2 and group 3 which shows that the intra-group loan is more important to the small and media banks.

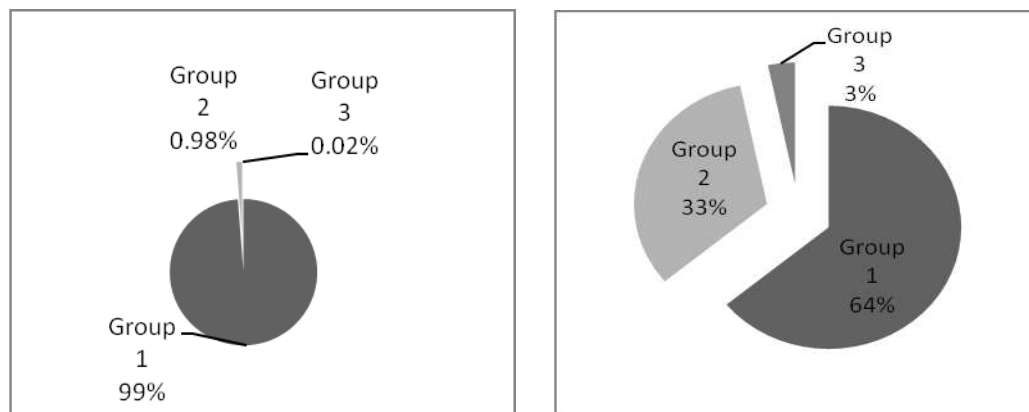


Figure 5: Government loan and intra-group loan shares in Australian banking sector

Tables 6 provide estimates of the effect of policy on change of government loan. The effect of the cash rate on the group 1 is not sensitive. We can observe a significant effect on group 3 but the impact is weak as indicated by small coefficients. Generally speaking, government loans share a "benefit" (one component of a subsidy) and they are made at "below market" interest rates. However, the monetary policy is implemented by the central bank and should be market based to control the whole economy. Our results shows that the government lending is not sensitive to the market based monetary rate for the large banks.

The confidence seems more important for group 2 and group 3. Unlike other kinds of loan, the liquidity has the significantly effect on the change of government loan. The change of the deposits has significant negative effect on the growth of government loan within the three groups.

Table 6: The effect of monetary policy on the change of Government loan

| $\Delta \ln(\text{Government loan})$ | Group 1             | Group 2                | Group 3                 |
|--------------------------------------|---------------------|------------------------|-------------------------|
| TV exogenous                         |                     |                        |                         |
| $\Delta \text{Cash rate}$            | .0330169<br>(0.531) | .0326211<br>(0.285)    | .0346448*<br>(0.093)    |
| L1.                                  | -.086053<br>(0.172) | -.0835685**<br>(0.022) | -.0933477***<br>(0.000) |

|                             |                         |                         |                         |
|-----------------------------|-------------------------|-------------------------|-------------------------|
| L3.                         | -.0517623<br>(0.357)    | -.0429927<br>(0.191)    | -.049594***<br>(0.024)  |
| $\Delta$ Confidence         | .001769<br>(0.338)      | .0020297*<br>(0.061)    | .0023289***<br>(0.002)  |
| TV endogenous               |                         |                         |                         |
| $\Delta$ Ln(Total deposits) | -.1235304***<br>(0.000) | -.1086009***<br>(0.000) | -.1273584***<br>(0.000) |
| $\Delta$ Liquidity          | .2414917***<br>(0.224)  | .2660619***<br>(0.022)  | .3099602***<br>(0.000)  |
| $\Delta$ Ln(Securities)     | .0021544<br>(0.893)     | .0004288<br>(0.964)     | .0020581<br>(0.745)     |
| TI exogenous                |                         |                         |                         |
| Nationality                 | .0051246<br>(0.23)      | .0093967<br>(0.472)     | .0062112<br>(0.659)     |
| No. of obs                  | 385                     | 1134                    | 2272                    |
| Wald Test                   | 19.60***<br>(0.0120)    | 48.15***<br>(0.000)     | 137.80***<br>(0.000)    |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% confidence level. \*\* = Significant at 5% confidence level. \*\*\* = Significant at 1% confidence level.

Tables 7 provide estimates of the effect of policy on change of intra-group loan. Similar with the government loan, the effects of the cash rate on the group 1 is not sensitive. We only can observe significant effect on the growth of intra-group loan in group 3 and the impact is weak. Facing monetary policy change, some banks especially large banks can implement well-structured intra-group lending utilising excess cash balances within the group or by extending intra-group guarantees. Such alternate structures throw up newer monetary policy challenges that need to be properly addressed in light of increasing sophistication of the regulation method.

Table 7: The effect of monetary policy on the change of intra-group loan

| $\Delta$ Ln(Intra-group loan) | Group 1              | Group 2                | Group 3                 |
|-------------------------------|----------------------|------------------------|-------------------------|
| TV exogenous                  |                      |                        |                         |
| $\Delta$ Cash rate            | .0840316<br>(0.405)  | .0845311<br>(0.132)    | .0865724**<br>(0.023)   |
| L1.                           | .0061226<br>(0.960)  | .0118461<br>(0.860)    | -.0071046<br>(0.876)    |
| L3.                           | -.1500607<br>(0.163) | -.1272457**<br>(0.035) | -.1417768***<br>(0.000) |
| $\Delta$ Confidence           | .004108<br>(0.246)   | .0048333**<br>(0.015)  | .0048743***<br>(0.000)  |

| TV endogenous                       |                         |                         |                         |
|-------------------------------------|-------------------------|-------------------------|-------------------------|
| $\Delta \ln(\text{Total deposits})$ | -2.639747***<br>(0.000) | -.225146***<br>(0.000)  | -.2751279***<br>(0.000) |
| $\Delta \text{Liquidity}$           | -1.045906***<br>(0.000) | -1.025066***<br>(0.000) | -1.033774***<br>(0.000) |
| $\Delta \ln(\text{Securities})$     | -1.343265***<br>(0.000) | -.1378571***<br>(0.000) | -.1316015***<br>(0.000) |
| TI exogenous                        |                         |                         |                         |
| Nationality                         | -.005263<br>(0.903)     | .0102569<br>(0.669)     | .0008866<br>(0.973)     |
| No. of obs                          | 385                     | 1134                    | 2272                    |
| Wald Test                           | 52.65***<br>(0.0000)    | 151.67***<br>(0.000)    | 362.66***<br>(0.000)    |

Note: 1. TV refers to time varying; TI refers to time invariant.

2. P-Values in Parentheses

\* = Significant at 10% confidence level. \*\* = Significant at 5% confidence level. \*\*\* = Significant at 1% confidence level.

The changes of deposit, securities and liquidity have significant negative effect on the growth of the intra-group loan which is totally different from other types of loans.

#### 4.5 The contractionary effect of monetary policy

This part provides estimates of the contractionary effect of policy on different types of loans. For the problem of multi-collinearity, we remove the current period effect of cash rate change in the model. In general, lending channel is an effective transmission mechanism of monetary policy. All the types of loan are significantly sensitive to the contractionary policy. Both the one lagged period and three period cash rate change have negative effects on loan growth. The scope of the impact is different between different types of loan. For the nonfinancial loan, the scope of the impact is larger than the other types of loan. A one percentage point increase in the lagged one period monetary policy rate leads to more than 1.1 percent decline in the log of change of nonfinancial loan while one percentage point increase in the monetary policy rate leads to less than 0.5 percent decline in the log of change of household loan.



$\Delta$ Cash rate>0

|                             | Gross loan              | Non-financial loan      | Financial loan          | Household loan          | Government loan         | Intra-group loan        |
|-----------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|-------------------------|
| $\Delta$ Cash rate          |                         |                         |                         |                         |                         |                         |
| L1.                         | -1.301463***<br>(0.000) | -1.132996***<br>(0.000) | -.9632873***<br>(0.001) | -.1228664***<br>(0.000) | -.1060478***<br>(0.000) | -1.037662***<br>(0.000) |
| L3.                         | -1.539959***<br>(0.000) | -2.076279***<br>(0.000) | 3.53035<br>(0.512)      | -.0627532***<br>(0.000) | -.0600187***<br>(0.000) | -.5473752***<br>(0.000) |
| $\Delta$ Confidence         | .0121635***<br>(0.000)  | .0068861***<br>(0.000)  | .0450123***<br>(0.000)  | .0018181***<br>(0.000)  | .0021186***<br>(0.000)  | .0254334***<br>(0.000)  |
| $\Delta$ Ln(Total deposits) | -.1211497**<br>(0.015)  | -.0303632<br>(0.514)    | -1.421162***<br>(0.000) | -.0117843**<br>(0.013)  | -.0293342***<br>(0.000) | .1403724***<br>(0.089)  |
| $\Delta$ Liquidity rate     | -2.657872***<br>(0.000) | -3.408447***<br>(0.000) | 2.21163*<br>(0.059)     | .0480198***<br>(0.002)  | -.0288224***<br>(0.000) | .6287878**<br>(0.022)   |
| $\Delta$ Ln(Securities)     | .5022572***<br>(0.000)  | .6746423***<br>(0.000)  | .2309256***<br>(0.000)  | -.0063806<br>(0.000)    | -.0080263***<br>(0.000) | -.3248476***<br>(0.000) |
| Nationality                 | .0000672<br>(0.816)     | -.0032833<br>(0.854)    | .0047947<br>(0.755)     | .0009984<br>(0.584)     | -.000863<br>(0.201)     | .0124213<br>(0.695)     |
| No. of obs                  | 807                     | 807                     | 807                     | 807                     | 807                     | 807                     |
| Wald Test                   | 4803.18***<br>(0.000)   | 9162.63***<br>(0.000)   | 622.49***<br>(0.000)    | 244.70***<br>(0.000)    | 1493.08***<br>(0.000)   | 427.68***<br>(0.000)    |

## 5 Conclusion

The importance of each of the various transmission channels is uniquely related to the economic, legal and financial structure prevailing in the specific country. Thus country studies are important and help understand the effects of monetary policy. This paper uses micro-data from individual bank balance sheet to study monetary policy on bank lending in Australia. Studies using total loans for the aggregate banking system have generally shown a positive and insignificant effect of monetary policy on loan growth (Becketti and Morris 1992, Bernanke and Blinder 1992). This study confirms the above findings by micro-data from individual bank balance sheet.

This paper segregates banks into three asset sizes and subdivides each size group into five kinds of loan. This study supports that of Kashyap and Stein (1997a) that the bank lending channel plays a significant role in monetary policy transmission. Thus, policy has distributional effects on bank loans that depend on asset size and industry in the economy.

For different asset size and different kinds of loans, the effect of monetary policy is different. Our results suggest that coordination of regulatory and stabilization policies that consider both the bank size and loan industry may offer better monetary control of bank loan growth or decline and the effect on the real economic activity.

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