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Bank Lending Behavior and a Credit Channel in Monetary Transmission: Evidence from Taiwan

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This paper studies the role that bank loans have played in Taiwan's monetary transmission using data on bank loan components in Taiwan. We estimate VAR models consisting of a set of core macroeconomic variables and various bank loan components, and examine the impulse responses of these loan components to a monetary tightening and a real aggregate demand downturn. We find that business loans and secured loans increase while consumer loans and unsecured loans decline after a monetary tightening. In contrast, we find that the above response patterns of bank loans are generally absent during a real aggregate demand downturn. Our findings suggest that bankers' decisions concerning loan portfolios have contributed to the observed changes in loan components after a monetary tightening, confirming the role of a "credit channel" in Taiwan's monetary transmission.

Keywords: monetary transmission, credit channel, bank loan portfolio
JEL classification: E51, E52

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1 Introduction

The monetary transmission mechanism through the so-called "credit channel" has recently been the focus of a large empirical literature. Many studies in the literature employ impulse response functions of an estimated vector autoregressive (VAR) model to investigate the dynamic effects of unanticipated monetary policy changes on "credit channel variables" and real macroeconomic activities. One puzzling finding from the literature is that monetary shocks often exert no significant effect on aggregate credit or total bank loan, e.g., Kakes (2000). However, as addressed by Den Haan, Summer, and Yamashiro (2007), if the micro components of total bank loan have different laws of motion, then the impulse response function of total bank loan may hide useful information about the role that the micro loan components have played in the monetary transmission mechanism. By examining U.S. bank loans data, Den Haan, Summer, and Yamashiro (2007) found drastically different response patterns of various loan components to monetary shocks, highlighting both the importance and the special characteristics of a credit channel. The different response patterns of bank loan components to monetary shocks have also been found in other countries, e.g., Dale and Haldane (1995) for the U.K., Küppers (2001) for Germany, Garretsen and Swank (2003) for the Netherlands, Den Haan, Summer, and Yamashiro (2009) for Canada, and Papadamou and Siriopoulos (2012) for Sweden.

In the current paper, we employ Taiwan's bank loan data to examine the response of different loan components to monetary shocks. The purpose here is two-fold. First, we shall search for evidence that bankers' decision on loan supplies has contributed to the observed changes in bank loan components after a monetary tightening in Taiwan. That is, we explore for evidence of a credit channel in Taiwan's monetary transmission. Second, we shall explore special attributes of Taiwan's bank lending behavior after a monetary tightening. This is of particular importance for the conduct of monetary policy in Taiwan, especially for evaluating the impact of monetary policy on different loan customers and different sectors of the economy. To explore how bank loan components react to monetary shocks in Taiwan, we estimate VAR models consisting of a set of core macroeconomic variables and various bank loan components. We then compare the response pattern of these loan components after a monetary tightening, i.e., a positive shock to "overnight interbank call-loan rate" (overnight loan rate hereafter), with

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that during a "real aggregate demand downturn" to search for evidence of a credit channel in Taiwan's monetary transmission.

Although the empirical strategy of the current paper draws largely from Den Haan, Summer, and Yamashiro (2007), it has the following innovative features. First, in the paper we compare the response pattern of various bank loan components after a monetary tightening, or so called a "monetary downturn", with that during a "real aggregate demand downturn" rather than the "non-monetary downturn" in Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009). As will be discussed in the section 2 below, a "real aggregate demand downturn" is generated by a series of adverse aggregate demand shocks while the "non-monetary downturn" in Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009) is generated by a series of adverse real output shocks, with both downturns generated in a way that they produce the same dynamic output path as that from a monetary downturn. We shall show that our empirical strategy here should shed better light on the role bankers' loan supply decision plays in the monetary transmission. Another innovative feature of the current study is that we study not only the behavior of bank loans categorized according to the type of borrowers as that in Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009), but also the behavior of bank loans categorized according to the "secured/unsecured" and the "maturity" features of loans. As the data for secured-unsecured loans and loans with different maturities in Taiwan are readily available, the study of such data will provide us with more insight on various attributes of bank loan behavior in the monetary transmission. Furthermore, the empirical results should provide valuable information for evaluating the impact of monetary policy on loan customers with different collateral conditions and different maturities of loans.

The empirical results of the current study show that business and secured loans increase while consumer and unsecured loans decrease during a monetary tightening. In contrast, we find that the above response patterns of bank loans are generally absent during a real aggregate demand downturn. The special characteristics of bank loan behavior after a monetary tightening confirm the role of a credit channel in Taiwan's monetary transmission. The results also provide important information on the effect of Taiwan's monetary policy: household consumers, especially those without collateral, bear the major brunt of monetary tightening in Taiwan.

The remainder of this paper is organized as the following. In section 2,

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we describe the data employed in the current study and discuss our empirical method. In section 3, we discuss the empirical findings and check the robustness of our results. In section 4, we provide concluding remarks.

2 Data and Empirical Strategy

In the current study, we use impulse response analysis of estimated VAR models to explore the special features of the response patterns of various bank loan components to a monetary tightening and a real aggregate demand downturn. Our VAR model incorporates two types of variables: the macroeconomic variables and the variables representing bank loan components. For the macroeconomic variables, we incorporate industrial production index, inventory investment for manufacturing sector, consumer price index, and overnight loan rate. For bank loan components in our benchmark model, we incorporate four main loan components categorized according to the type of borrowers and the usage of loans: "loans and discounts for business investment", "loans and discounts for business current operations", "housing loans", and "consumer loans". The definition and the items included in each loan variable are listed in the appendix. All bank loan data contain the loans at all commercial banks in Taiwan, including domestic commercial banks, banks for medium-scale enterprises, and local branches of foreign banks. The data are all from AREMOS database and the sample period is from January 1997 to May 2011 with a sample length of 173 months.

In Figure 1 we plot the share of each bank loan component in total bank loans over the sample period. It is clear from the figure that loans and discounts for business current operations and housing loans are two major items of bank loans, each exceeding 35% on average over the sample period. The loan component with the lowest share is consumer loans, with an average share of around 10% over the sample period.

For the benchmark VAR model specification, we have done the following transformation of data series. First, all bank loan components are transformed into real terms by using consumer price index as the deflator. Second, all variables in the model except overnight loan rate are transformed into natural logarithms and then seasonally adjusted using the X12 procedure. As far as the time series properties of these data series are concerned, we have checked the unit root property of each series (variable) in the model and have found that the unit root null cannot be rejected at the five percent

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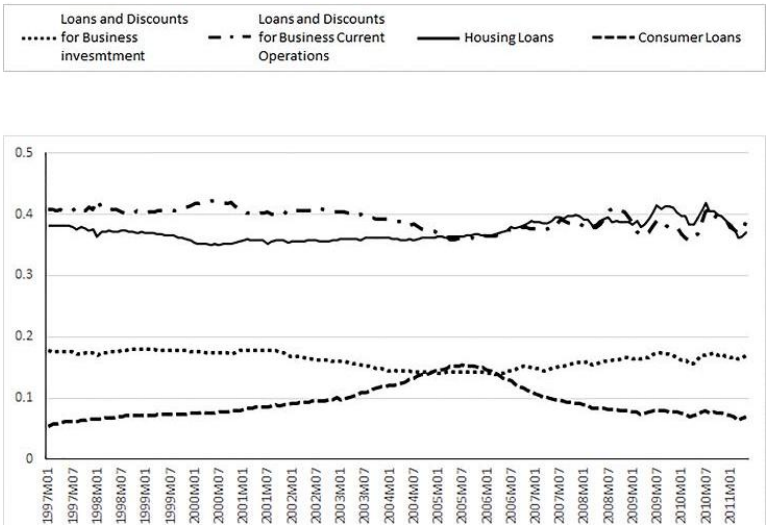


Figure 1: Share of loan components based on the type of borrowers and the usage of loans. (Period: January 1997 to May 2011)

level for all variables. However, we elect to estimate the VAR in levels instead of in first-differences (or error-correction terms) because of the findings in Gospodinov, Herrera, and Pesavento (2013) that the impulse response estimators obtained from the levels specification tend to be most robust when the magnitude of the roots is not known. According to Gospodinov, Herrera, and Pesavento (2013), the pre-test specification works well only when the restrictions imposed by the model are satisfied. However, the performance of estimates deteriorate fast even for small deviations from the exact unit root for one or more model variables. In addition, Doan (2004) has also argued against using differenced series because it may result in a loss of information due to the possibility of over-differencing. We thus estimate the VAR model in level as many previous studies in the literature have done, e.g., Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009).

To identify the monetary shock, we follow Bernanke and Blinder (1992) and Bernanke and Mihov (1998) by assuming that the overnight loan rate (the federal funds rate in the U.S.) is the relevant monetary instrument and that a positive innovation in the overnight loan rate represents a monetary tightening. We also follow Christiano, Eichenbaum, and Evans (1999) by

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assuming that contemporaneous values of all macroeconomic variables and loan components are not included in the policy maker's information set, i.e. the overnight loan rate precedes all other variables contemporaneously. Moreover, we assume that bank loan components precede all macro variables. The above-mentioned Cholesky recursive structure is our benchmark identification scheme.

One innovative feature of our empirical strategy is to compare the effect of a monetary tightening with that of an "aggregate demand downturn" instead of the "nonmonetary downturn" in Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009). The "non-monetary downturn" in Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009) stands for an economic downturn induced by a series of adverse real output shocks which produce the same dynamic response of output as that from a monetary tightening. However, as a "non-monetary downturn" may stem from either adverse real aggregate demand shocks or adverse aggregate supply shocks, there exists ambiguity as to the behavior of interest rate during the downturn. According to the IS-LM/AD-AS macroeconomic framework, adverse real aggregate demand shocks will result in a declining interest rate while adverse supply shocks will induce a rising interest rate. This ambiguity in interest rate behavior during a "non-monetary downturn" complicates the job of teasing out the special role played by bank loans in a credit channel of monetary transmission. This is because the increase in interest rate after a monetary tightening is essential for the working of a credit channel in monetary transmission. According to the credit channel literature, e.g., Bemanke and Gertler (1989), the rise in interest rate from a monetary tightening affects investment not only through conventional channel as stipulated by the IS-LM/AD-AS model, but also through its effect on agency costs due to the asymmetric information between borrowers and lenders. According to the theory, an increase in interest rate raises the total amount that the borrowers must pay the lenders, inducing a higher debt default risk. In addition, an increase in interest rate will cause a decline in the value of collaterals and firms' net worth. As a result, the credit condition of borrowers gets worse and it becomes harder for borrowers to obtain loans.

Given that a real aggregate demand downturn is generated from adverse real aggregate demand shocks, there is no ambiguity in the direction of change in interest rate during the downturn. Moreover, as a monetary downturn and a real aggregate demand downturn result in opposite interest

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rate paths and hence exert very different effects on agency costs, comparing the effect of a monetary downturn with that of a real aggregate demand downturn should better highlight how agency costs affect bankers' lending decision and its role in the monetary transmission. In the current study, we use positive inventory shocks to generate real aggregate demand downturn. The practice is based on the fact that an unexpected buildup in inventory signals a decline in aggregate demand, c.f. Kashyap and Stein (1994) and Bernanke and Gertler (1995). Accordingly, a real aggregate demand downturn is generated by a sequence of inventory shocks such that output follows the exact same path as it does during a monetary downturn. Since by construction a monetary downturn and a real aggregate demand downturn produce the same path of aggregate output, they should exert identical output effect on agency costs. Therefore, the different effects of a monetary downturn and a real aggregate demand downturn on agency costs should purely stem from the different interest rate paths under these two types of downturn. Accordingly, by examining how the loan components react differently to a monetary downturn and a real aggregate demand downturn, we should be able to better detect how agency costs affect banks' lending decision and its role in the monetary transmission. In our empirical study, we shall compare the impulse response functions of macro and loan component variables generated from a monetary shock (i.e., a monetary tightening) with those from an aggregate demand downturn to tease out evidence of a credit channel in monetary transmission.

3 Empirical Results and Robustness Check

In this section, we first report and discuss the empirical results derived from estimated VAR models, with our focus on comparing the impulse response functions of various macro and bank loan variables during a monetary downturn and a aggregate demand downturn. We then conduct robustness checks of our major empirical findings.

3.1 Empirical Results

We estimate the benchmark VAR model with a lag order of twelve, which is determined according to Bayesian information criterion (BIC). The estimated benchmark model is then used to construct impulse response functions of various macro and loan component variables. Beside the point es-

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timates of impulse response functions, we also employ the bootstrapping Monte Carlo procedure of Runkle (1987) and Efron and Tibshirani (1993) with 1000 replications to construct their 90 percent and 95 percent confidence intervals. In all of the following figures plotting the estimated impulse response functions, we use a solid (empty) square to denote that the estimate is different from zero at the five percent (ten percent) significance level. In Figure 2, we plot the impulse responses of various macro variables to a monetary tightening and a real aggregate demand downturn. Figure 2(A) shows the dynamic paths of overnight loan rate after a monetary tightening and during a real aggregate demand downturn. We observe here that the response of overnight loan rate to its own shock (by one standard deviation, roughly 25 basis points) tends to persist for a bit more than one year, revealing the persistent nature of a monetary tightening. In contrast, the figure also shows that the overnight loan rate declines persistently during a real aggregate demand downturn, confirming the prediction of a standard IS-LM/AD-AS model. In Figure 2(B), we plot the dynamic path of industrial production index during a real aggregate demand downturn, which, by construction, emulates the output path following a monetary tightening. The dynamic path here confirms that a monetary tightening does induce an economic downturn. Figure 2(C) shows how the consumer price index responses to a monetary tightening and a real aggregate demand downturn. Here, we find that the consumer price is rather sticky, exhibiting no strong and statistically significant response to either a monetary tightening or a real aggregate demand downturn. In sum, the overall results depicted in Figure 2 generally confirm the prediction of a standard IS-LM/AD-AS model.

In Figure 3, we plot the dynamic paths of various loan components during a monetary downturn and a real aggregate demand downturn. We observe here that the impulse responses of loan components to a monetary tightening are rather varied, as indicated by the solid curves in Figure 3. In particular, as Figure 3(A) shows, loans and discounts for business investment experience a sustained increase after a monetary tightening. Voreover, according to figure 3(B), loans and discounts for business current operations also rise after a monetary tightening, and then quickly fall back to zero. In contrast, as Figure 3(C) shows, consumer loans experience sustained and large decline soon after a monetary tightening. In addition, as figure 3(D) shows, even though housing loans appear to change little immediately after a monetary tightening, they start declining around one year after the tightening. The contrasting response patterns in business loans and consumer

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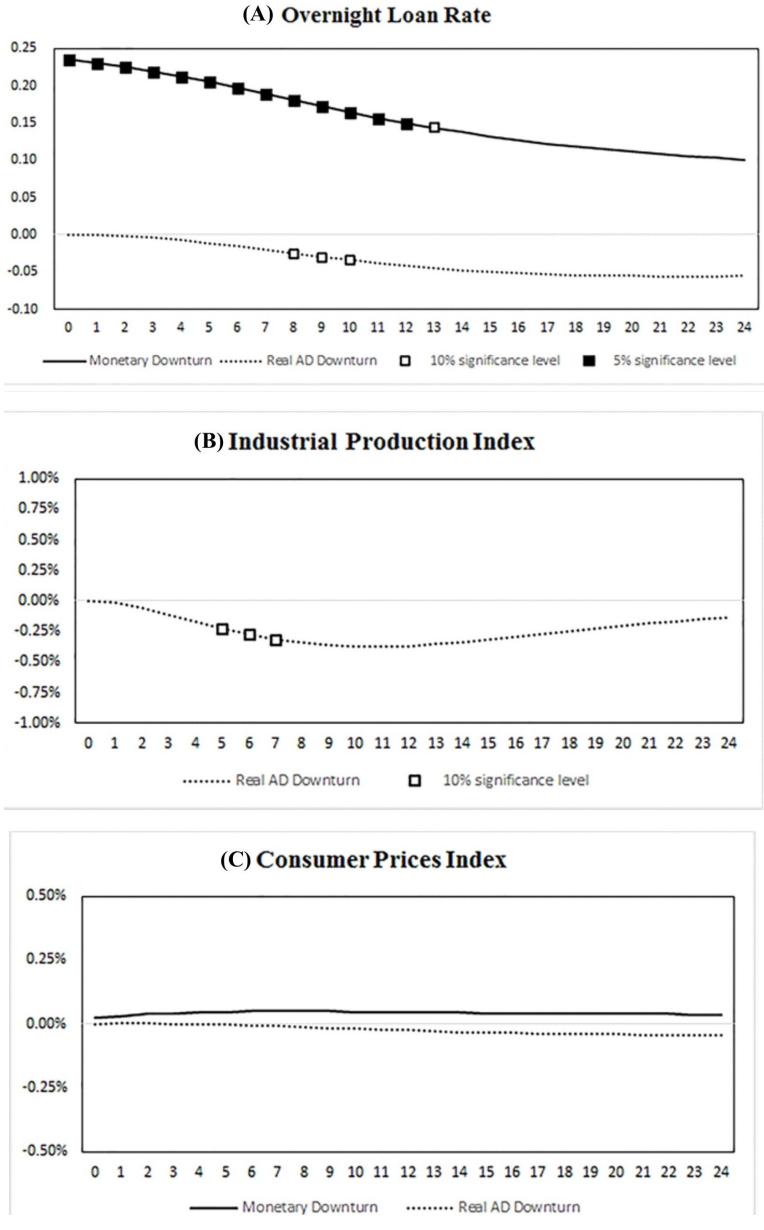


Figure 2: Impulse Responses of Macroeconomic Variables to a Monetary Downturn and a Real Aggregate Demand Downturn

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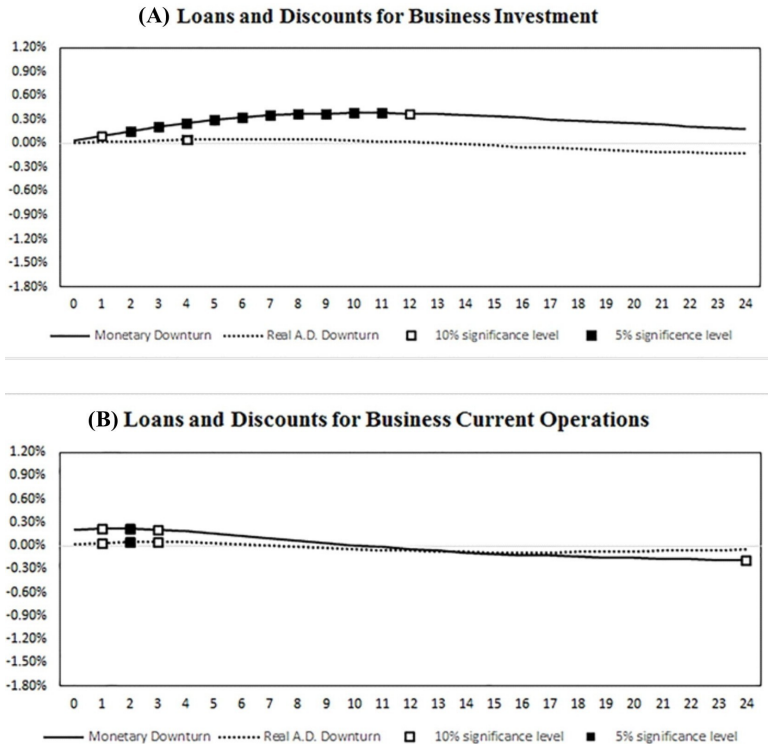


Figure 3: Impulse Responses of Various Loan Components to a Monetary Downturn and a Real Aggregate Demand Downturn

loans here are similar to those found in the U.K., the U.S. and Canada, c.f., Dale and Haldane (1995), Gertler and Gilchrist (1993) and Gertler and Gilchrist (1994), Den Haan, Summer, and Yamashiro (2007), Den Haan, Summer, and Yamashiro (2009), and Den Haan, Summer, and Yamashiro (2011). The response of housing loans to a monetary tightening here is also similar to what has been found in Sweden, e.g., Papadamou and Siriopoulos (2012).

Figure 3 also reveals that the dynamic paths of loan components during a real aggregate demand downturn are very different from those during a monetary downturn. In particular, business loans and housing loans appear to change little during a real aggregate demand downturn. Moreover, consumer loans, though rising during a real aggregate demand downturn,

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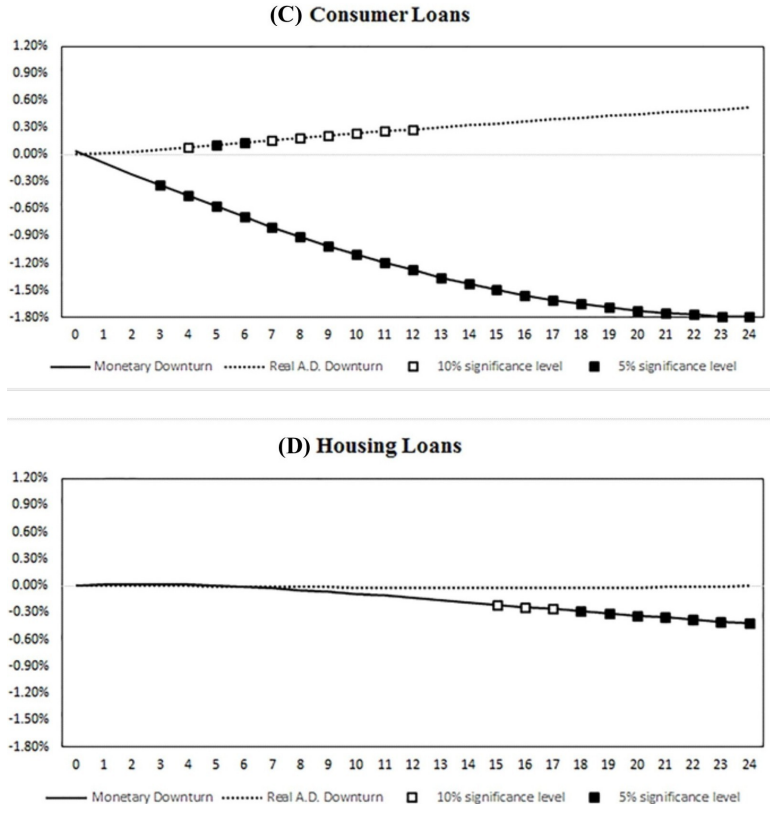


Figure 3: Impulse Responses of Various Loan Components to a Monetary Downturn and a Real Aggregate Demand Downturn

change with a much smaller magnitude than during a monetary downturn and the change is mostly statistically insignificant at the five percent level.

To argue that the above special response patterns of bank loan components to a monetary tightening when compared with those in an aggregate demand downturn provide clear evidence for the presence of a credit channel in monetary transmission, we have to establish that: (1) the response patterns are not consistent with what the conventional interest-rate channel of monetary transmission predicts, and (2) the response patterns reflect mainly the result of bankers' decision on loan supply rather than bank customers' decision on loan demand.[1]

[1] For detailed discussions on the conventional interest-rate channel and the credit channel

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We begin by exploring whether the first statement above holds true. Note that the conventional interest-rate channel of monetary transmission is the standard transmission channel stipulated in the textbook IS-LM/AD-AS framework. Under the framework, all non-monetary assets are lumped together as a single interest-bearing asset: bond, and it is assumed that bank loans, which are perfect substitutes for bonds, play no special role in the monetary transmission, c.f. Bernanke and Blinder (1988). Accordingly, the transmission channel in the IS-LM/AD-AS framework is that by raising interest rate, a monetary tightening induces a decline in desired investment and consumption along with a general decline in borrowing. Therefore, one should observe a general decline in various bank loans after a monetary tightening provided that only the conventional interest-rate channel is at work. However, we find that not all bank loans decline after a monetary tightening. This phenomenon contradicts what the IS-LM/AD-AS model predicts, signifying that an alternative channel, in parallel with the conventional channel, is also at work.

We now turn to exploring whether the second statement above also holds true. Let's begin with the assumption that all changes in bank loans after a monetary tightening reflect only changes in loan demands. However, given that business loans do not increase during a real aggregate demand downturn, the increase in business loans following a monetary tightening is unlikely to result from the reduction of real activity. Accordingly, the increase in interest rate after a monetary tightening should be the major reason for the increase in business loans. An increase in interest rate may lead to an increase in business loan demand if the higher burden of interest payments can only be met by increased borrowing. But the same argument can also be applied to consumer loans: higher burden of interest payments on consumer loans is likely to lead to an increase in consumer loan demand. This is even more so because consumers generally have much less access to alternative financing options than firms do. Accordingly, it becomes logically incoherent to rely solely on "changes in loan demands" as the explanation for the co-existence of rising business loans and declining consumer loans during a monetary downturn. Therefore, it can be inferred that bankers' decision on loan supplies has played an important role in the observed changes in loan components during a monetary downturn. This concludes our argument

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of monetary transmission mechanism, please see Mishkin (1995) and Bernanke and Gertler (1995).

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for the presence of a credit channel in Taiwan's monetary transmission.

There are several reasons why bankers may want to adjust their loan supplies during a monetary downturn. One reason is that agency costs for different type of loans change unevenly during the downturn. To explain the observed shift of bank assets from consumer loans to business loans, the agency costs related to consumer loans must rise far more than those related to business loans. One possible cause here is that the increase in interest rate during a monetary downturn worsens consumers' balance sheets more than firms' balance sheets. This may hold true if interest payments are a larger fraction of spending for consumers than for firms, or if the decrease in property prices induced by a monetary tightening is more harmful for the credit worthiness of consumers than firms, c.f., Den Haan, Summer, and Yamashiro (2007).

The worsening of borrowers' balance sheets in general also tends to induce a shift of bank assets from unsecured loans to secured loans. This "flight to safety" can result from a decrease in property prices and, consequently, the borrowers' net worth, c.f., Bemanke, Gertler, and Gilchrist (1996). Another possible reason for banks to adjust their loan portfolio after a monetary tightening is to hedge against the ill effect of rising interest rate on the matching of maturities of banks' assets and liabilities, c.f., Den Haan, Summer, and Yamashiro (2007). In an environment of rising interest rates, the expected maturities of long-term loans tend to increase because borrowers are less likely to prepay the loans through refinancing. With the lengthening of the expected maturities of bank loans, a shift from long-term loans to short-term loans, that is, a "flight to liquidity", ensures a better matching in the maturities of banks' assets and liabilities.

To explore whether the above-mentioned phenomena of "flight to safety" and "flight to liquidity" exist during a monetary downturn, we estimate a VAR model incorporating the macroeconomic variables adopted in our benchmark model as well as the loan components based on the "secured/unsecured" and the "maturity" features of bank loans: "short-term secured loans", "short-term unsecured loans", "medium & long-term secured loans", and "medium & long-term unsecured loans". The items included in each loan variable here are listed in the appendix. Again, the bank loan data employed here are all from AREMOS and the sample period is from January 1997 to May 2011.

In Figure 4 we plot how the share of each of the above loan components changes over time. We observe here that the share of medium & long-term

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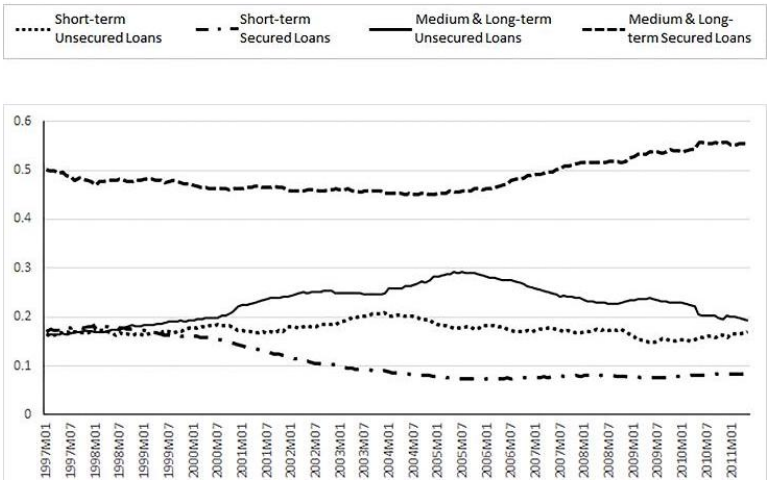


Figure 4: Share of secured/unsecured and short-term/medium & long-term loans (Period: January 1997 to May 2011)

secured loans in total bank loans has hovered around 45% to 55% over the sample period. Medium & long-term unsecured loans also have a substantial share in total bank loans, exceeding 20% for most of the sample period. The share of short-term unsecured loans has been a bit less than 20% for most of the sample period. Short-term secured loans, in contrast, take the least share in recent decade, only 8% for most time.

As in the benchmark VAR model, the loan components in the current VAR model are all in real terms, which are obtained by dividing nominal bank loans by consumer price index. Moreover, all variables except overnight loan rate are in logarithms and are seasonally adjusted. The lag order of the VAR model is twelve, which is determined according to Bayesian information criterion (BIC). To identify the monetary shock, we use the same identification scheme as our benchmark model. We also generate a real aggregate demand downturn by simulating a sequence of inventory shocks such that industrial production index follows the same path as it does during a monetary downturn.

In Figure 5, we plot the impulse responses of the loan components to a monetary tightening and during a real aggregate demand downturn. As the figure shows, the responses of secured and unsecured loans to a monetary tightening are very different: short-term secured loans rise while short-term

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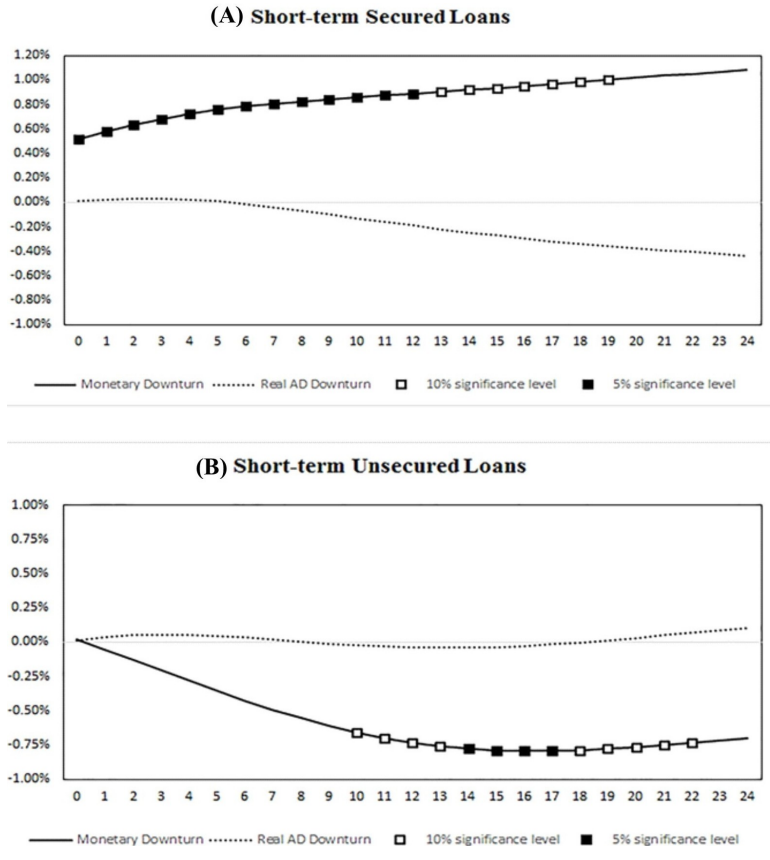


Figure 5: Impulse Responses of Secured and Unsecured Loans to a Monetary Downturn and a Real Aggregate Demand Downturn

unsecured loans decline substantially during a monetary downturn. The responses of medium & long-term loans also follow a similar pattern: secured loans rise while unsecured loans fall after a monetary tightening, although the responses here are not statistically significant at the five percent level. In contrast, the changes in secured and unsecured loans during a real aggregate demand downturn are with a much smaller magnitude than those in a monetary downturn and are generally not statistically significant at the five percent level. The overall results here confirm the "flight to safety" feature of banks' loan portfolio during a monetary downturn.

In contrast to the obvious "flight to safety" feature of bankers' lending

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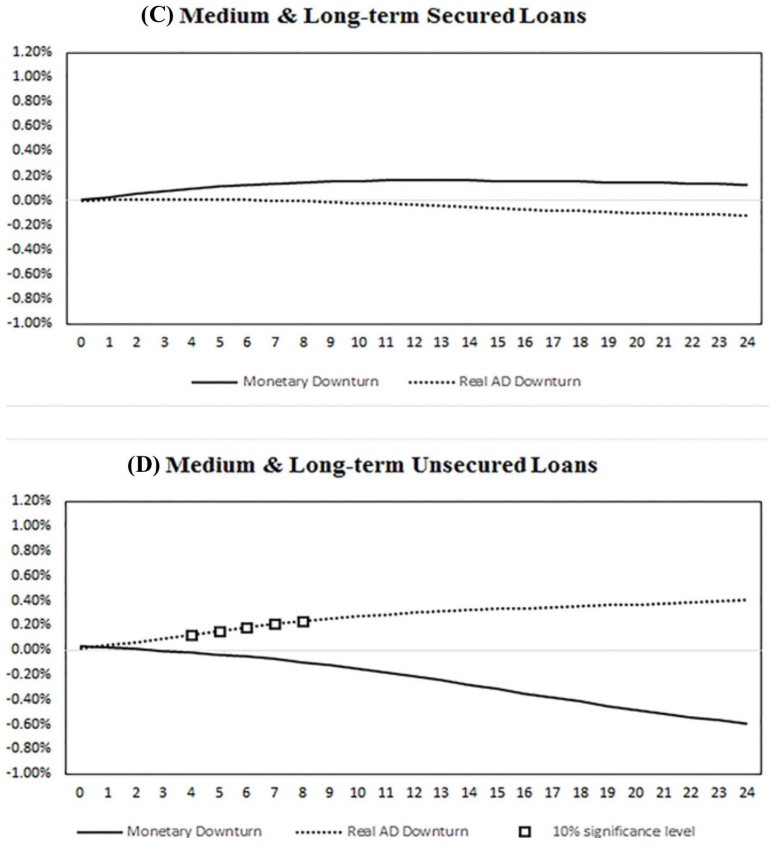


Figure 5: Impulse Responses of Secured and Unsecured Loans to a Monetary Downturn and a Real Aggregate Demand Downturn

decision during a monetary downturn, Figure 5 reveals little evidence of "flight to liquidity" in bank loans. In particular, the increase in short-term secured loans during a monetary downturn is more than offset by the decline in short-term unsecured loans.[2] Moreover, the decrease in medium & long-

[2]For example, according to Figure 5(A) and Figure 5(B), respectively, one year after a monetary tightening, the short-term secured loans increase by around 0.8% while the short-term unsecured loans decrease by around 0.6% when compared with their original levels. With the recent share of short-term secured loans in total bank loans around one half of that of short-term unsecured loans (around 8% vs. 16%, as shown in Figure 4), the increase in short-term secured loans is more than offset by the decrease in short-term unsecured loans.

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term unsecured loans during a monetary downturn is more or less offset by the increase in medium & long-term secured loans, although the changes here are not statistically significant at the five percent level.[3]

In sum, the overall findings in this subsection point toward that bankers' decision on loan portfolio has contributed to the observed changes in loan components after a monetary tightening, confirming the role of a "credit channel" in Taiwan's monetary transmission.

3.2 Robustness Check

As a final step, we check the robustness of the empirical results obtained from the previous subsection. We first examine whether our results are robust to the identification scheme adopted in the benchmark VAR model. As mentioned earlier, to identify the monetary shock, we assume that contemporaneous values of all macroeconomic variables and loan components are not included in the policy maker's information set, i.e. overnight loan rate precedes all other variables contemporaneously. Moreover, we assume that bank loan components precede all macro variables. This recursive structure is our benchmark identification scheme. To check the robustness of our results, we explore alternative identification schemes: all the contemporaneous values of macroeconomic variables and loan component variables are in the policy maker's information set; as well as, only the contemporaneous values of macroeconomic variables are in the policy maker's information set. We find that the results are generally qualitatively similar to those from our benchmark model. We also examine whether our results are robust to the data employed. To do this, we employ an alternative set of bank loan data that contains only loans at all domestic commercial banks in Taiwan. While excluding the loans from local branches of foreign banks, the data here serve as a good representative of domestic bank loans since its share in total bank loans exceeds 90% during most of the sample period. Because the Central Bank of China (Taiwan) stopped publishing the data after March 2007, the sample period here is from July 1992 to March 2007 with a sample length of 177 months. We estimate the VAR model consisting of the core macroeconomic variables and the loan component variables as those in our

[3]The conclusion here is based on the calculation similar to that for the short-term loans. Note that even though the rate of increase in medium & long-term secured loans is much smaller than the rate of decline in medium & long-term unsecured loans, the share of the former in total bank loans is around three times of the latter (as shown in Figure 4).

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benchmark model. We use the same empirical strategy as that applied to the benchmark model, including the comparison of impulse response functions generated from a monetary downturn and those generated from a real aggregate demand downturn. We find that the overall results here are qualitatively similar to those achieved from our benchmark model.[4] Finally, it is also worth mentioning that in a parallel research of Huang (2014), we estimate VAR models comprising nominal monetary aggregate (M2), real exchange rate (between the US and Taiwan), industrial production index and various bank loan components. We identify monetary shocks by invoking the long-run neutrality of money and imposing the implied restrictions on the coefficients of moving average representation of the VAR model via the method of Blanchard and Quah (1989). From impulse response analysis, we find response patterns of bank loans to a monetary tightening similar to those found in the current study. In particular, we find that banks tend to reallocate their loan portfolios with more weight given to business loans while less weight to consumer loans after a monetary tightening

4 Conclusions

This paper studies the role that bank loan supplies have played in the monetary transmission using data on Taiwan's bank loan components. We estimate VAR models consisting of a set of core macroeconomic variables and various micro loan components and examine the impulse responses of these loan components to a monetary tightening and a real aggregate demand downturn. We find that business loans and secured loans increase while consumer loans and unsecured loans decrease after a monetary tightening. In contrast, these special response patterns are absent during a real aggregate demand downturn. Moreover, we find that "changes in loan demands" cannot serve as a logically coherent explanation for the co-existence of rising business loans and declining consumer loans during a monetary downturn. The results point toward that bankers' decision on loan portfolio has contributed to the observed changes in bank loan components, confirming the role of a credit channel in Taiwan's monetary transmission. The results also provide important information on the effect of Taiwan's monetary policy: household consumers, especially those without collateral, bear the major brunt of monetary tightening in Taiwan.

[4]The figures of the impulse response functions are available upon request.

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Among the various results obtained in the current study, the finding of the reallocating of bank assets from consumer loans to business loans after a monetary tightening is of particular interest. The phenomenon has also been documented in previous studies for other countries, c.f., Gertler and Gilchrist (1993) and Gertler and Gilchrist (1994), Dale and Haldane (1995), Den Haan, Summer, and Yamashiro (2007) and Den Haan, Summer, and Yamashiro (2009), and yet there has been no in-depth study on the root causes of it. There are quite a few possible candidates: uneven interest burden between households and firms, uneven effect of a decrease in property prices on the credit worthiness of households and firms, just to name a few. An in-depth study of the issue requires data related to households' and firms' balance sheets and the prices of various collaterals. Since the collection of the relevant data requires major effort, we leave it for future research.

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Appendix

The Loan Variables in the Benchmark VAR Model

Variable name	Loan items included (AREMOS path & name)
Loans and discounts for business investment	Loans and discounts for private & government enterprises: For real estates (FSM.bnk/T.18C/LDALB@PG@R.m) For movable properties (FSM.bnk/T.18C/LDALB@PG@M.m) For business investment (FSM.bnk/T.18C/LDALB@PG@B.m)
Loans and discounts for business current operations	Loans and discounts for private & government enterprises: For current operations (FSM.bnk/T.18C/LDALB@PG@C.m)
Housing loans	Consumer loans: House-purchasing loans (FSM.bnk/T.19/CLOAN@HPUR.m) House-repairing loans (FSM.bnk/T.19/CLOAN@HREP.m)
Consumer loans	Consumer loans: Car loans (FSM.bnk/T.19/CLOAN@CAR.m) Employees' welfare loans (FSM.bnk/T.19/CLOAN@EMP.m) Other consumer loans (FSM.bnk/T.19/CLOAN@OTH.m) Revolving credit for credit card (FSM.bnk/T.19/CLOAN@REV.m)

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The Loan Variables in the Alternative VAR Model

Variable name	Loan items included (AREMOS path & name)
Short-term unsecured loans	Short-term loans & overdrafts: Unsecured (FSM.bnk/T.18A/LDALB@ST@UN.m)
Short-term secured loans	Short-term loans & overdrafts: Secured (FSM.bnk/T.18A/LDALB@ST@SEC.m)
Medium & long-term unsecured loans	Medium & long-term loans: Unsecured (FSM.bnk/T.18A/LDALB@M&LT@UN.m)
Medium & long-term secured loans	Medium & long-term loans: Secured (FSM.bnk/T.18A/LDALB@M&LT@SEC.m)

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銀行放款行為與貨幣傳導信用管道: 台灣的實證證據

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本研究利用台灣商業銀行分類放款資料實證探討銀行放款在貨幣傳導機制中扮演的角色。在研究中, 我們估計涵蓋台灣核心總體經濟變數與各類放款變數的向量自我迴歸模型, 並利用模型估計的結果比較緊縮貨幣政策衝擊與實質總合需求負面衝擊下各類放款變數的衝擊反應函數。我們發現緊縮貨幣衝擊後, 銀行放款組合產生重要改變; 特別是, 企業放款與擔保放款增加, 而消費性放款與無擔保放款減少。然而, 我們亦發現在實質總合需求負面衝擊下, 上述放款組合的變動特色並未出現。我們的實證結果支持銀行對各類放款「供給」的改變造成了上述緊縮貨幣後放款組合的改變, 以及「信用管道」在台灣貨幣傳導機制中扮演的角色。

關鍵詞: 貨幣傳導, 信用管道, 銀行放款組合
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