Foreign Bank Claims on Taiwan During the Recent Global Financial Crisis

1. Introduction

1.1 Motivation

During the recent global financial turmoil that started in the summer of 2007 and deteriorated further in 2008, liquidity squeeze spilled over from the US to other advanced countries and then to emerging and developing economies, and economic growth halted and reversed in most countries. The bank credit in almost all countries dropped sharply, including cross-border bank lending, during the recent global financial crisis. There exists the debate if multinational banks acted as a stabilizing force in local economies or contributed to the transmission of liquidity shocks and home conditions into affiliate markets.

Taiwan's liquidity risk has been relatively low, as the banking system of Taiwan has benefited from ample liquidity. However, the growth in loans extended by local banks in Taiwan has slowed down since the second half of 2008 and turned negative in the period from March to November of 2009. Loans extended by foreign bank affiliates, in particular, declined significantly.

This research would like to clarify the stabilizing role of foreign banks during the recent global financial crisis, with a special focus on foreign bank claims on Taiwan, which have two separate channels: direct cross-border claims, and local lending of affiliates in Taiwan. The foreign bank claims are generally affected by the pull and push factors. The pull factors include those associated with domestic economy and the push factors are associated with the balance sheet of the bank and the country of origin. Therefore, the research would also like to know what factors will affect the change of foreign bank claims on Taiwan, and what factors have key influences on foreign bank affiliates' lending behavior in Taiwan.

This research uses two empirical models to examine the link between host and home factors and foreign bank lending, and try to find out the policy implications of foreign bank claims for Taiwan's banking system.

1.2 The Scope Covered in the Research

The foreign bank claims in this research refer to foreign banks' cross-border claims by their headquarters to a firm abroad, and local lending through a local network of branches and subsidiaries. The cross-border claims in this paper are sourced from the data sets in consolidated banking statistics of Bank for International Settlements (BIS). The lending of foreign bank affiliates in Taiwan is based on the financial statistics of the Central Bank of the Republic of China (Taiwan) (CBC).

Foreign bank affiliates in Taiwan include local branches, subsidiaries and offshore banking units (OBUs) of foreign banks. Domestic banks discussed in this paper include their OBUs for comparison purpose.

According to the BIS consolidated banking statistics, cross-border claims cover reporting banks' on-balance sheet financial claims on Taiwan vis-à-vis all sectors in all currencies. As for local lending by foreign bank affiliates in Taiwan, it also covers all sectors in all currencies. Both are net of inter-office accounts.

In Section 2, we will first introduce the development of foreign bank affiliates in Taiwan, and review their local lending and cross-border claims pre- and during the global financial crisis. Section 3 is a review of related literature with a particular focus on Taiwan. In order to find out the link between pull or push factors and foreign bank claims, this research will employ two empirical models. Section 4 will explain the research methodology and Section 5 presents the empirical results. Policy implications and the conclusion are elaborated in Section 6 and 7.

2. Analysis of Foreign Banks' Involvement Before and During the Global Financial Crisis

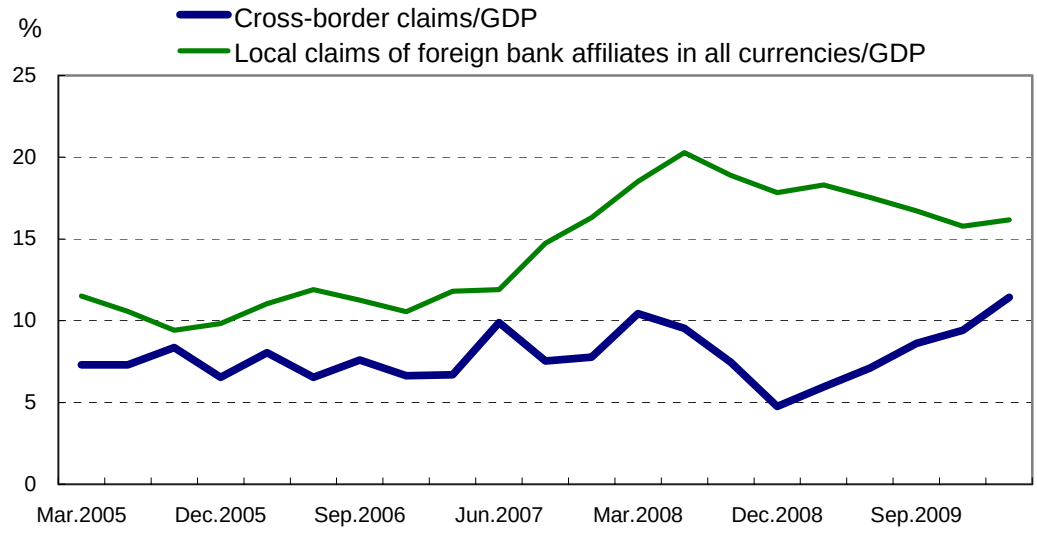
2.1 Foreign Bank Claims on Taiwan

According to BIS consolidated banking statistics, foreign banks' cross-border claims on Taiwan as a share of annual Taiwan GDP ranged from 6.5% to 10.4% before 2008 Q1. However, it had decreased sharply to 4.8% at the end of 2008 Q4 amid the global financial crisis. Benefited from the global economic stimulus packages, it increased gradually to 11.4% at the end of 2010 Q1.

On the other hand, local claims of foreign bank[1] affiliates on Taiwan as a share of annual GDP increased from 10.6% at the end of 2006 to 16.3% at the end of 2007, because Citibank and Standard Chartered Bank set up their subsidiaries by acquiring domestic banks. During the period of global financial crisis, the ratio of foreign bank affiliates' local claims to annual GDP declined slowly from 20.3%, a record-high level at the end of 2008 Q2, to 15.8% at the end of 2009 Q3 (Chart 1).

In general, local claims by foreign bank affiliates are more than foreign banks' cross-border claims on Taiwan. Compared to offshore foreign banks, foreign bank affiliates in Taiwan play a more important role in financial intermediation and more actively involve in Taiwan's economic activities.

Chart 1. Ratios of Foreign Bank Claims on Taiwan to GDP



Source : BIS Consolidated Statistics, Table 9C.

2.2 The Development of Foreign Bank Affiliates in Taiwan

2.2.1 The Number and Total Assets

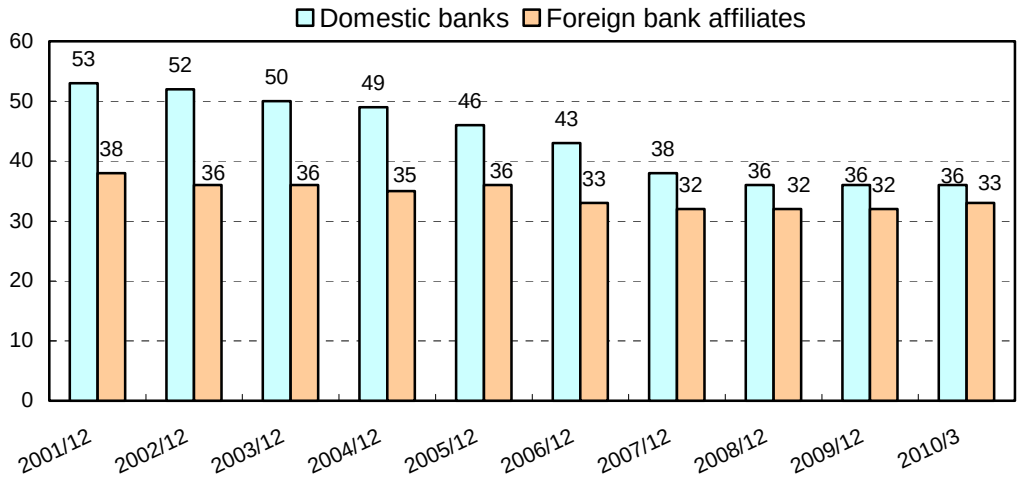
At the end of March 2010, there were 33 foreign bank affiliates in Taiwan: 31 local branches and 2 subsidiaries, including 311 branch offices and offshore banking units (OBUs). Ten years ago, there were 38 foreign bank branches with 103 branch offices and OBUs in Taiwan. Though the number of foreign bank affiliates was comparable

[1] BIS reporting banks.

to domestic banks, the number of local branch offices and OBUs of foreign banks was much less than domestic banks (Chart 2).

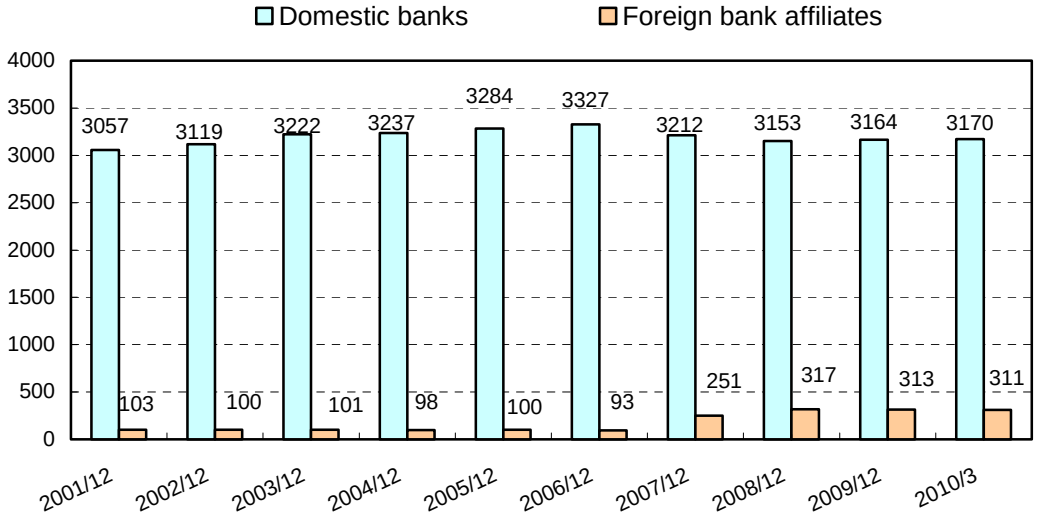
Chart 2

The Number of Banks in Taiwan by Type of Ownership



Note: The figure represents the number of head offices of banks with branches in Taiwan.

The Number of Branch Offices of Banks in Taiwan by Type of Ownership



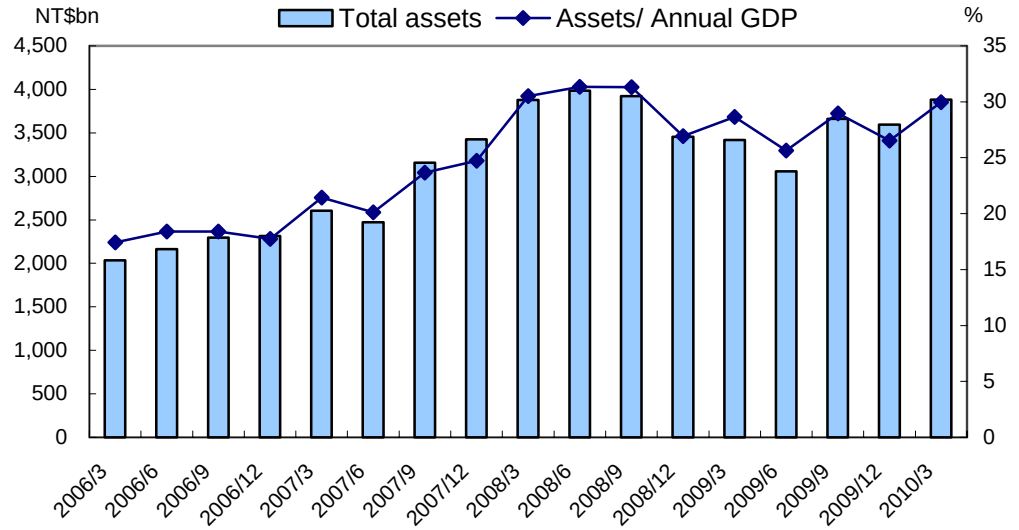
Note: The figure represents the number of branches and offshore banking units set up in Taiwan, excluding overseas subsidiaries.

Sources: 1. *Financial Statistics Monthly,* CBC.

2. Department of Financial Inspection, CBC.

The total assets of foreign bank affiliates amounted to NT$2,316 billion at the end of December 2006, accounting for 17.75% of GDP, but increased by 48% in 2007 because Citibank and Standard Chartered Bank set up their subsidiaries by acquiring domestic banks. After gradual reduction of claims caused by the global financial crisis

from 2008 Q4 to 2009 Q2, the total assets of foreign bank affiliates began to increase in the second half of 2009 and reached NT$3,881 billion at the end of March 2010, equivalent to 30% of GDP (Chart 3). The asset increase was mainly supported by a surge in securities investments due to the recovery of global financial markets.



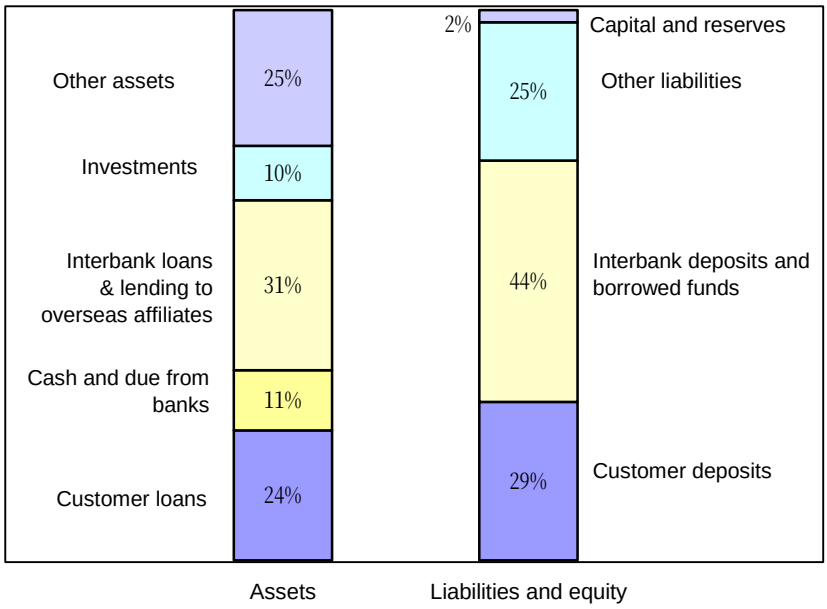
Source: Department of Financial Inspection, CBC.

The major business of foreign bank affiliates in Taiwan is related to foreign exchange and financial derivatives. For the traditional commercial bank operation, foreign bank affiliates accounted for only 3.0% of total deposits accepted and 6.1% of total loans extended by Taiwan's financial institutions in March 2010.

2.2.2 Sources and Uses of Funds

The funds of foreign bank affiliates raised from interbank deposits and borrowing accounted for 44% of total funds raised at the end of March 2010, while 29% of funds came from customer deposits. As for the uses of funds, interbank lending to overseas affiliates accounted for the biggest share at 31%, followed by customer loans at 24%, while 10% of funds invested in domestic and foreign securities and 11% remained in cash and due from banks (Chart 4).

Chart 4. Sources and Uses of Funds of Foreign Bank Affiliates in



Source: Department of Financial Inspection, CBC.

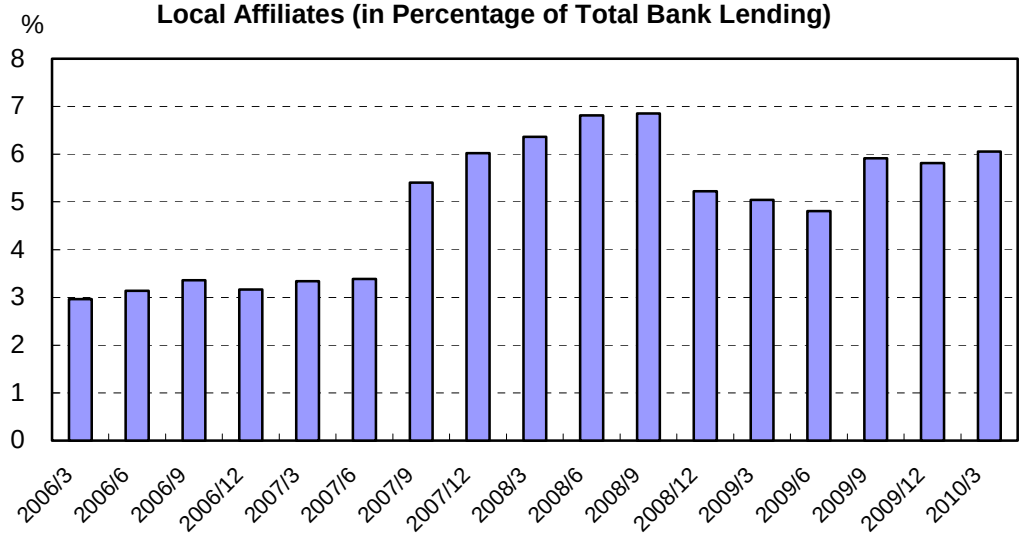
Note: End-March 2010 figures.

2.3 Loan Extension by Foreign Bank Affiliates in Taiwan

2.3.1 Loan Market Share

Compared to domestic banks, the loan share of foreign bank affiliates has been quite low. The loans extended by foreign bank affiliates accounted for around 3.2% of total banking loans in Taiwan before June 2007. After Citibank and Standard Chartered Bank merged with their respective choices of domestic banks in the second half of 2007, the loan share of foreign bank affiliates climbed to 6.85% in September 2008. However, it was still much lower than that of domestic banks. This share declined to around 5% between 2008 Q4 and 2009 Q2, mainly due to the effect of global financial crisis. At the end of March 2010, the share rose to 6.1% (Chart 5).

Chart 5. Share of Foreign Bank Lending Extended Through Their Local Affiliates (in Percentage of Total Bank Lending)



Sources :1. *Financial Statistics Monthly,* CBC.

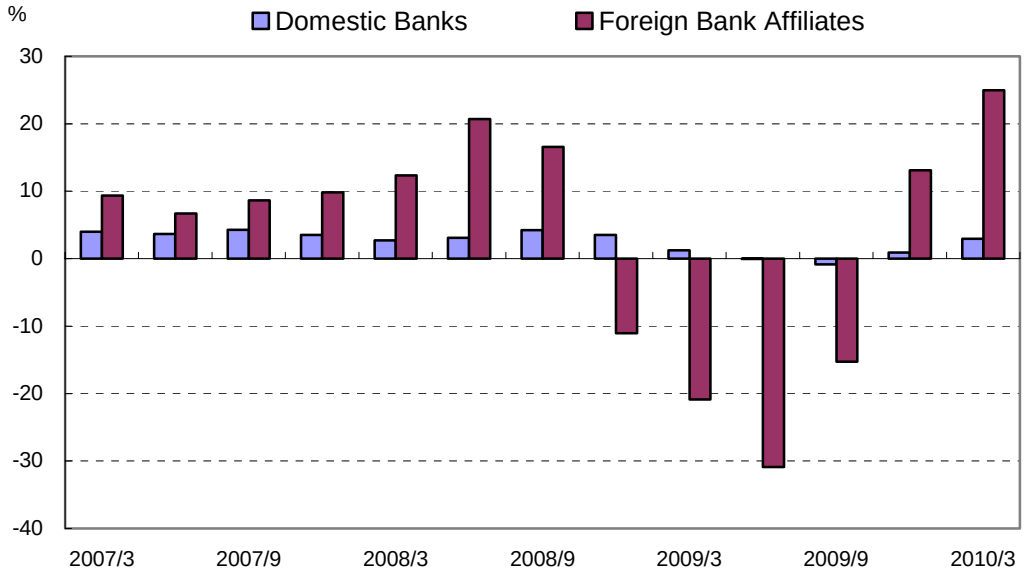
2. Department of Financial Inspection, CBC.

Note: In the second half of 2007, Standard Chartered Bank (Taiwan) Ltd. and Citibank Taiwan Ltd. were set up after merging with domestic banks.

2.3.2 Loan Growth

Affected by shrinking financial transactions and economic activities amid the global financial crisis, growth of banking loans in Taiwan slowed down in the second half of 2008 and turned negative in the first three quarters of 2009. The loans extended by foreign bank affiliates decreased more deeply than domestic banks. The annual growth rate of foreign bank affiliates' lending declined dramatically from 16.57% of September 2008 to -11.05% at the end of 2008, and dropped further to -30.88% in June 2009. In contrast, the annual growth rates of domestic banks' lending were -0.03% and -0.83% in Q2 and Q3 of 2009, respectively (Chart 6). However, the growth rate of foreign bank affiliates' lending rebounded to 13.11% by the end of 2009 and rose to 24.99% in March 2010, much higher than the 2.95% of domestic banks at the same time.

Chart 6. Annual Growth Rates of Lending Extended by Banks in Taiwan



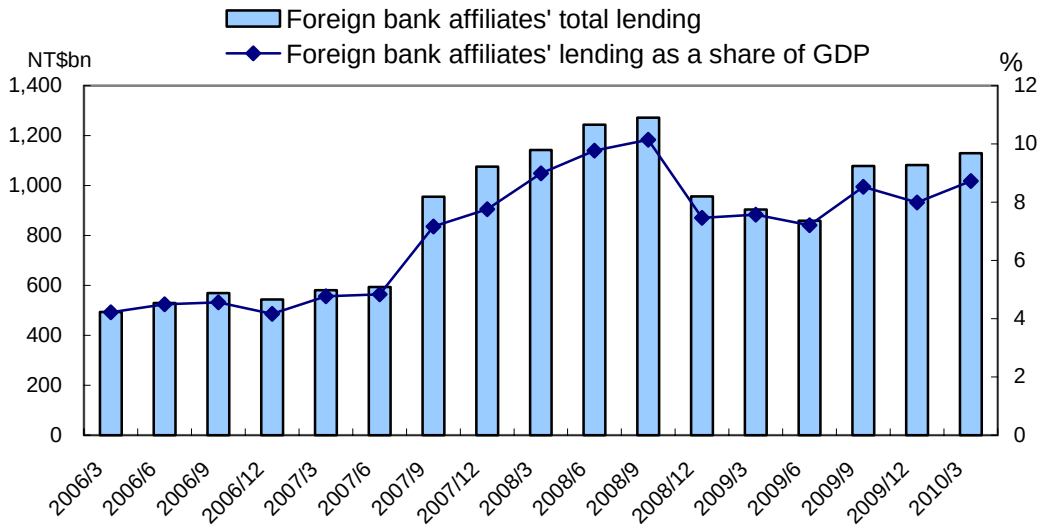
Source: Department of Financial Inspection, CBC.

Note: In the second half of 2007, Standard Chartered Bank (Taiwan) Ltd. and Citibank Taiwan Ltd. were set up after merging with domestic banks.

2.3.3 Comparison with Domestic Banks

Though the global financial crisis resulted in a minor credit crunch in Taiwan, the total lending provided by domestic banks remained more stable than foreign bank affiliates. The foreign bank affiliates' lending decreased by NT$315.7 billion, or 24.8%, in 2008 Q4 (Chart 7), while the domestic banks' lending increased in 2008 Q4 and then decreased by a mere 1.95% in 2009 Q1 (Chart 8). On the other hand, the lending of foreign bank affiliates as a share of annual GDP decreased from 10.15% of Q3 to 7.46% of Q4 in 2008, and declined further to 7.20% in 2009 Q2 (Chart 7). However, the lending of domestic banks as a share of annual GDP rose from 135.42% of 2008 Q4 to 142.50% in Q1 and Q2 of 2009 (Chart 8). That means domestic banks played a predominant role in extending credit during the period of Taiwan's economic recession.

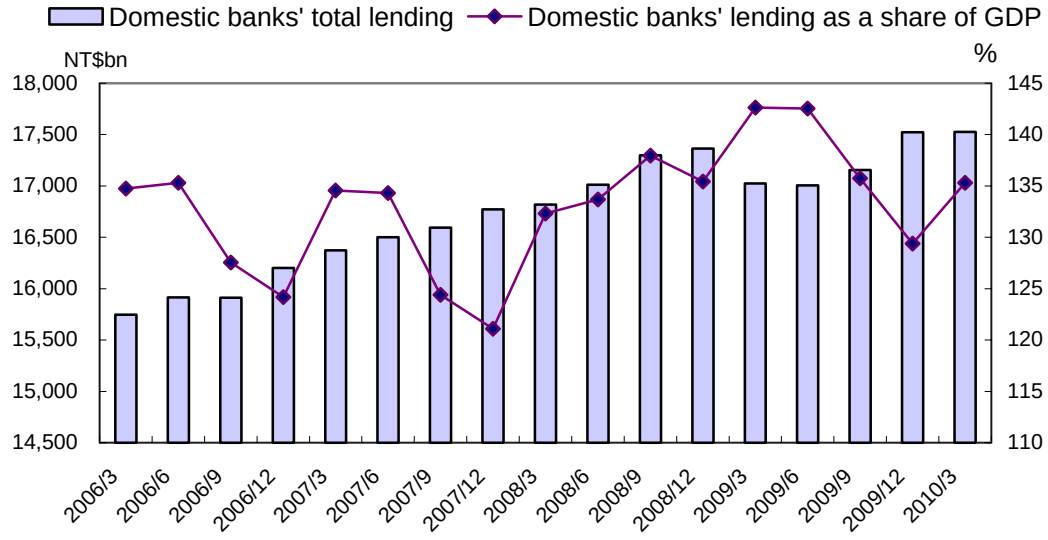
Chart 7. Total Lending of Foreign Bank Affiliates



Source: Department of Financial Inspection, CBC.

Note: In the second half of 2007, Standard Chartered Bank (Taiwan) Ltd. and Citibank Taiwan Ltd. were set up after merging with domestic banks.

Chart 8. Total Lending of Domestic Banks



Source: Department of Financial Inspection, CBC.

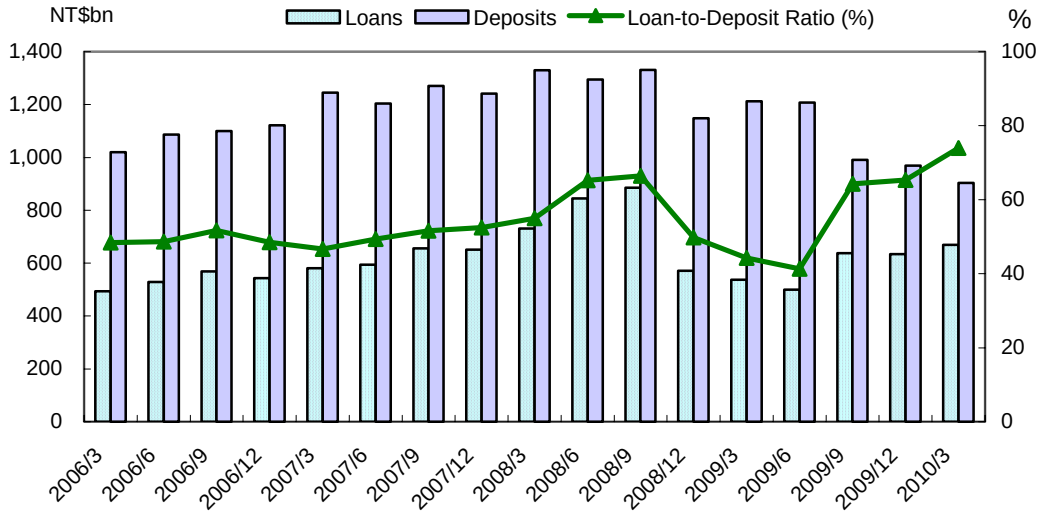
Note: 1. Domestic banks include local branches and offshore banking units in Taiwan.

2. In the second half of 2007, Standard Chartered Bank (Taiwan) Ltd. and Citibank Taiwan Ltd. were set up after merging with domestic banks.

2.3.4 Loan-to-Deposit Ratio from 2008 Q4 to 2009 Q2

After Lehman Brothers filed for bankruptcy protection on 15th September 2008, the impact of the financial crisis enlarged. Taiwan branches of foreign banks didn't suffer much from portfolio investment losses as their parent banks did, but their operating revenues and deposits decreased significantly due to outflow of foreign capital. The deposits received by foreign bank affiliates decreased considerably as their clients moved their funds to domestic banks or overseas. The loan-to-deposit ratio of foreign bank affiliates, however, had declined to below 50% since 2008 Q4 and reached 41.33% in 2009 Q2. This indicated the loans extended by foreign bank affiliates decreased even more dramatically in the period from 2008 Q4 to 2009 Q2. The deposits continuously decreased in the second half of 2009, and posted a -25.41% annual growth rate in March 2010. But lending returned to positive growth in December 2009, with the growth rate climbing to 24.68% in March 2010. As a result, the loan-to-deposit ratio of foreign bank affiliates rose to 73.99% in March 2010 (Chart 9).

Chart 9. Loan-to-Deposit Ratio in Foreign Bank Affiliates

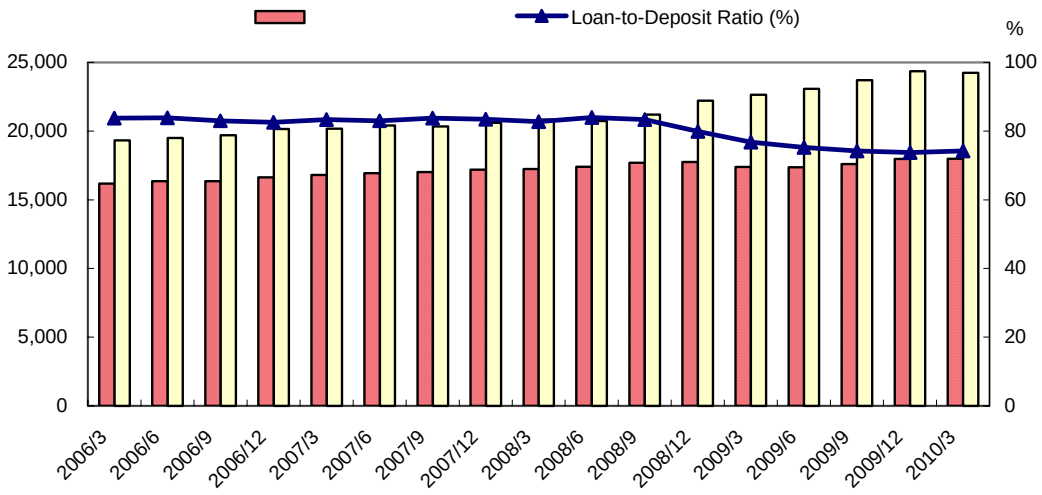


Source: Department of Financial Inspection, CBC.

Note: Foreign banks in Taiwan include local branches, subsidiaries and offshore banking units in Taiwan.

The deposits in domestic banks had risen markedly since the second half of 2008 and grew by 7.79% and 9.61% year on year as of December of 2008 and 2009,

respectively, owing to a large amount of overseas funds flowing back into bank deposits. In contrast, the annual growth rate of loans dropped from 3.85% of September 2008 to 1.25% of December 2009. As a result, the average loan-to-deposit ratio of domestic banks decreased from 79.90% of 2008 Q4 to 73.81% at the end of 2009. As capital inflow slowed down in 2010 Q1, the deposit-to-loan ratio of domestic banks rose to 74.19% (Chart 10).



Source: Department of Financial Inspection, CBC.

Note: Banks in Taiwan include local branches, subsidiaries and offshore banking units in Taiwan.

In summary, domestic banks played a predominant role in Taiwan's bank lending. Though the market share of foreign banks' local lending in Taiwan has been less than 7%, foreign bank claims on Taiwan, accounting for 22.5% of GDP in average between 2005 Q1 and 2010 Q1, have significant influence on Taiwan's economy.

In order to understand the influence of global foreign banks on Taiwan during the recent financial crisis, the implications of related variables, such as push and pull factors, should be analyzed empirically.

3. Literature Review

3.1 Arguments about Foreign Banks' Role for Credit in Host Countries

Multinational banks played a significant role in the transmission of the 2007-2009 crisis to emerging market economies. The relationship between liquidity shocks on

banking systems of major developed countries and those of emerging markets has been examined by economists. The more common observation is that global banks enhance the international transmission of shocks through their activities, contributing to more integrated global business cycle (Goldberg, 2009). However, there exists the debate if global banks in domestic economies acted as a stabilized force.

De Haas and Lelyveld (2009) findings provided evidence for the hypothesis that multinational banks actively manage the credit growth of their subsidiaries due to the existence of internal capital markets, stating that foreign bank subsidiaries do not need to rein in their supply of credit during a financial crisis as domestic banks would need to do. More specifically, they found that, in line with substitution effects, subsidiaries expand their lending faster if economic growth in their home country decreases.

The statement that globalization of banking is a stabilizing force may seem odd during 2007-2009 global financial crisis. Cetorelli and Goldberg (2008) measured capital flows to emerging market regions and found they exhibited dramatic declines during the recent crisis. In the same period, there was a decline in internal lending from parent and other overseas affiliates to the foreign bank affiliates within emerging markets. Both types of contractions were associated with reduced lending within emerging markets. Therefore, Cetorelli and Goldberg (2009) examined the liquidity shocks which isolated credit supply from demand across Europe, Asia, and Latin America, and indicated that credit supply in emerging markets was affected through contraction in direct, cross-border lending by foreign banks, in local lending by foreign banks' affiliates in emerging markets, and in credit supply by domestic banks as well, as a result of the funding shock to their balance sheet induced by the decline in interbank or cross-border lending.

3.2 Taiwan's Literature

The research papers in Taiwan about bank credit in recent global financial crisis concerned more about the implications of structured financial products, the impacts of the financial crisis on real economy and banking system, and relevant central banking policy responses. However, few reports discussed the role of foreign bank affiliates during the recent financial crisis in Taiwan.

Chang, Shen and Chang (2010) utilized the matching methods[2] developed by Rubin (1973) and Rosenbaum and Rubin (1983、1985a,b), based on the data of bank equity and financial performance of six Asian emerging economies (including Taiwan, China, Korea, Malaysia, Singapore and Thailand) from 2007 to 2008, to analyze the performances of foreign banks and domestic banks. The empirical results in that paper show that the performance of most foreign banks went worse than that of domestic banks in those Asian economies. When shocks originate from home countries or regions of foreign banks, these foreign banks will become the shock transmission channel to host countries.

Chen, Wang, Lu and Tsai (2010) summarized the conditions of loans extended by the four[3] types of banks in Taiwan during the period from January 2008 to August 2009, in which the development of credit extension by Taiwan branches of foreign banks was comprehensively reviewed. During the period of global financial crisis, the lending behavior of Taiwan branches of foreign banks was mainly affected by the risk concern resulted from economic recession, other than their own financial conditions. In view of financial conditions, Taiwan branches of foreign banks didn't suffer much from portfolio investment losses as their parent banks did in 2008, but their operating revenues and deposits decreased significantly due to the outflow of foreign capital. Their attitudes for extending credit turned to be more conservative and the loans extended by local branches of foreign banks kept decreasing from September 2008 to July 2009, mainly due to the higher credit risks of enterprises. Their consumer loans declined slower than loans to enterprises because Taiwan's real estate market recovered from 2009 Q2.

The impacts of the global financial crisis on Taiwan economy, and the related policy responses could be important factors for the lending of foreign banks in Taiwan during the crisis, as summarized in Box1 and Box 2.

[2] This paper used matching method to establish the sample of domestic banks. Using matched sample to reduce selection bias, the characteristics of domestic banks were found to be similar to foreign banks.

[3] Including (1) public-owned domestic banks, (2) large private domestic banks, (3) local branches of foreign banks and (4) small private domestic banks.

Box 1. Taiwan Economy Affected By the Global Financial Crisis

In the second half of 2008, worsening international financial conditions and a declining world economy severely affected Taiwan's export momentum and the production of its manufacturing sector. Domestic enterprises responded with large-scale layoffs or requiring employees to take unpaid leave. As a result, the domestic unemployment rate increased dramatically, which in turn had a negative impact on private consumption. Private investment also shrank rapidly against the backdrop of a precipitous drop in corporate profitability and the uncertain economic outlook (Financial Stability Report May 2009, CBC). Taiwan's economic growth registered -0.80% in 2008Q3, and further deteriorated to -9.06% in 2009Q1, causing annual economic growth to decline materially to 0.73% in 2008 from the previous year's 5.98%, and continued to drop to -1.91% in 2009.

Demand for funds remained soft and banks' loans and investments growth declined in the first half of 2009, but trended upwards in the fourth quarter of the year (Annual Report 2009, CBC). Credit risk in corporate loans slightly decreased, but credit risk concentration was still high. Liquidity risk of domestic banks remained low as the banking system benefited from ample liquidity (Financial Stability Report 2010, CBC).

Affected by the slump in the global stock markets and the economic downturn in Taiwan, together with a massive sell-off from foreign investors, the Taiwan Stock Exchange Weighted Index (TAIEX) of the Taiwan Stock Exchange market dropped from a high of 9,295 in mid-May to 4,090 in late November 2008. Trading value and turnover ratio decreased dramatically in the second half of 2008. However, the TAIEX index stopped falling in early 2009 and gradually climbed to 8,100 in January 2010. The main reasons behind this rebound were the net buying of foreign investors, inflows of residents' portfolio investments from abroad and the emerging effects of a warming cross-Strait relationship (Financial Stability Report May 2009, CBC).

Box 2. Taiwan's Policy Measures to Cope with the Global Financial Crisis

The financial and monetary policies responses for the financial crisis would affect the attitude of banks' credit. In order to alleviate the impacts of the financial crisis, Taiwan's government launched the Economic Stimulus Package in September 2008 and implemented a succession of monetary policies, financial stability measures and fiscal policies so as to increase domestic demand, stabilize the financial system and maintain the momentum of economic growth (Financial Stability Report May 2009, CBC).

To increase domestic demand and provide sufficient injection of liquidity into the market, the CBC adopted an easy monetary stance. The CBC lowered the discount rate by 2.375 percentage points in seven cuts from September 2008 to March 2009 to help to reduce individual and corporate funding costs, encourage private consumption and investment, and stimulate domestic economic growth. With a

view to increase the momentum of bank lending, the CBC also lowered the required reserve ratios and expanded the scope of Repo facility operations to provide financial institutions with sufficient liquidity.

As for stabilizing financial markets, improving market confidence, as well as assisting individual and corporate funding, the government also implemented a number of measures to stabilize the financial system, such as adopting an interim blanket deposit guarantee[4]. This measure effectively stabilized the market and restored the confidence of depositors.

Another important policy to assist corporations to weather the economic downturn and to tackle their business difficulties was coordinating corporate financing support (Financial Stability Report May 2009, CBC). The government organized a Special Task Force on Facilitating Enterprises to Obtain Operational Funds to help small and medium enterprises (SMEs) and large corporations to get financing support. The Bankers Association of the ROC released two self-disciplined mechanisms allowing corporations that faced financial difficulties but still operate normally and pay loan interest as scheduled to extend loans by six months. Moreover, The government provided sufficient funds for loans to large corporations under the Directions for the Provision of Special Loans and Credit Guarantees to Non-SMEs, and introduced several measures to assist individuals to get loans from banks and to reduce the interest burden.

4. Research Methodology

As the trend toward greater international financial integration persists, banks' lending behavior has become responsive to external economic factors or their internal financial conditions. In order to verify whether foreign banks, during the recent global crisis, transmitted shocks from their home countries (where banks' headquarters are located) to Taiwan, we will examine the link between foreign banks' cross-border lending to Taiwan and their exposures in the recent financial crisis in view of countries' economic factors.

Furthermore, we would like to examine whether the internal capital market or funding conditions of multinational banks performed supportive functions in extending credit, and the change of loan-to-deposit ratio of foreign bank affiliates reflected individual financial characteristics during the recent crisis.

[4] The government announced that it would guarantee all deposits in insured financial institutions by their full amount until the end of 2010. Additional deposits to be guaranteed included foreign currency-denominated deposits, inter-bank deposits and lending, and financial bonds issued before or on June 23, 2005.

Therefore, this section mainly presents the determinants of foreign bank lending by two panel data empirical strategies, first being the pooled panel data treatment, which is a modification of Martinez-Peria et al. (2005), to analyze macroeconomic data, and second, pooled panel treatment similar to Navaretti et al. (2010) to analyze microeconomic data.

4.1 Model I: Using Aggregated Panel Data

Martinez-Peria et al. (2005) estimated reduced-form model that used a comprehensive data set on foreign bank claims to the private sector in Latin America for the period 1985-2000 to study how foreign bank claims are affected by both push and pull factors, also considering the role of exposure to host countries and the potential influence of movements in foreign claims to other countries. According to the empirical model of Martinez-Peria et al. (2005), this project modified the interaction term "Host Factor ╳ Exposure" as "GFC_Dummy╳Exposure". We tried to use the modified model to examine the relationship between the changes in foreign bank claims on Taiwan and the exposure of foreign bank claims on Taiwan during the global financial crisis. At the same time, we also checked the impact of economic factors of home countries and Taiwan on the changes in foreign bank claims on Taiwan.

4.1.1 The Model Specification and Data

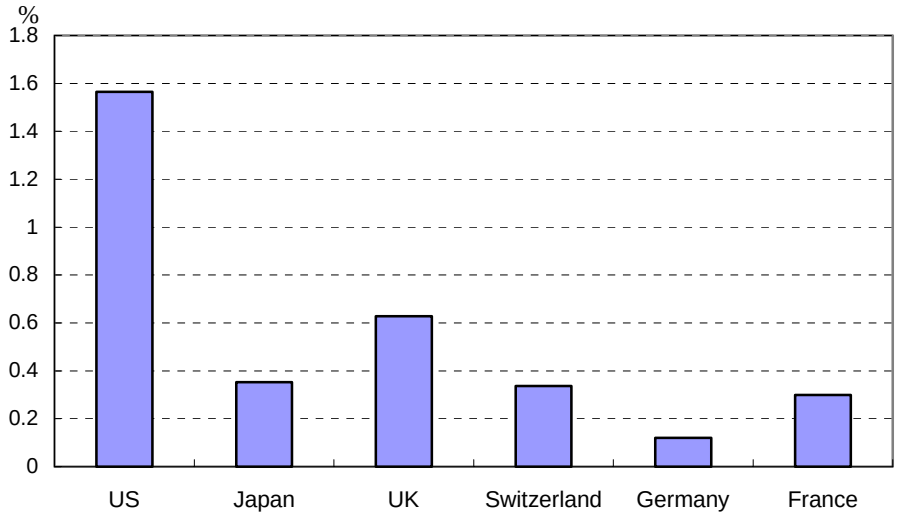
We modified the model of Martinez-Peria et al. (2005) and set up the following regression equation by taking account of the recent global financial crisis, where j = 1 to 4 identifying Japan, the United States, the United Kingdom, and Switzerland. These four countries are the main creditor countries for Taiwan, in which their foreign bank claims on Taiwan over their own total foreign claims are also greater than those on other countries. Chart 11 shows exposure of foreign claims on Taiwan over total foreign claims. t = 1 to 42, referring to the time period considered.

$$D(LOG(Claims))_{j,t} = \alpha_0 + \sum_j \alpha_1 Push\_Factor_{j,t} \times Dummy\_Country_j +$$

$$\alpha_2 Pull\_Factors_t + \alpha_3 GFC\_Dummy_t + \alpha_4 GFC\_Dummy_t \times Exposure_{j,t} + \varepsilon_{j,t} \qquad (1)$$

Chart 11. Exposure of Foreign Claims on Taiwan over Total Foreign Claims

Average of 2000 Q1~2010 Q2



Source : BIS Consolidated Statistics, Table 9B.

Because of the time series limitation of the foreign claims data provided by the BIS on its website, individual country data set runs from 2000 Q1 to 2010 Q2, consisting of 42 quarterly observations. Therefore, we form a panel data set that includes the above-mentioned four countries, making the number of statistical data in our Model I empirical data set a total of 168.

The data set contains the following variables:

(1) $D(LOG(Claims))_{j,t}$: the first difference of the logarithm of foreign claims by foreign bank (j) in Taiwan basing on time *t* compared to time *t-4*.

(2) $Push\_Factor_{j,t}$: control variables that mainly capture macroeconomic conditions in the country of the foreign bank (j), e.g., real GDP growth and real interest rate;

(3) $Dummy\_Country_j$: a dummy variable that takes the value of one if foreign claims come from country(*j*) where j=1 to 4 identifying Japan (*JAPAN*), the United States (*US*), the United Kingdom (*UK*), and Switzerland (*SWISS*), respectively;

(3) $Pull\_Factors_t$: control variables that capture macroeconomic conditions in Taiwan such as real GDP growth and real interest rate;

(4) GFC_Dummy_t: a dummy variable that takes the value of one in 2007, 2008 and

2009;

(5) $Exposure_{j,t}$: the ratio of foreign country/ bank(*j*) claims on Taiwan over the total claims extended by foreign country/ bank(*j*).

(6) $\varepsilon_{j,t}$: error term.

In the regression equation, the test of the effect of the global financial crisis is based on the sign and significance of the α_4 coefficient. Indeed, controlling for other factors, if higher exposure is translated into more stable financing, we expect this interaction term between the GFC dummy and exposure to be positive and significant. It means that the country which has more claims on Taiwan relative to its total claims tend to withdraw less from Taiwan than from other countries.

4.1.2 Push Factors

Regarding push factors, we would like to check α_1 to see the impact of real GDP growth and real interest rate of home countries on the changes of their respective claims on Taiwan.

Home country economic conditions could have a positive or a negative impact on foreign bank lending to host country (Martinez-Peria et al., 2005), because adverse economic conditions and a lack of profit opportunities at home country could encourage multinational banks to extend credit abroad, and a recession at home country could lead to deterioration in the capital of foreign banks and overall retrenchment in claims held at home and abroad. Consequently, we remain agnostic concerning the impact of real GDP growth for home country on the change in claims on a host country.

Moreover, lowering real interest rates in home countries tend to signal periods of easy financial conditions. This might increase banks' willingness to extend riskier but higher interest rate loans to host countries. Therefore, we expect home real interest rate to have a negative impact on the change in claims on a host country.

4.1.3 Pull Factors

With respect to the α_2 coefficient, we mainly considered real GDP growth and real

interest rates in Taiwan as independent variables.

We assume the movement of real interest rate in host country will affect capital flow. That is, an increase in real interest rate in host country will attract more capital inflow and increase foreign bank claims, while a decrease in real interest rate in host country will give rise to a decrease in foreign bank claims. Consequently, we expect real interest rate of Taiwan would have a positive impact on the change in foreign banks claim on Taiwan.

For the relationship between real GDP growth in host country and the change of foreign bank claims, foreign banks will respond to real GDP growth in host country and increase or decrease claims over the cycle. Therefore, we expect real GDP growth of Taiwan to have a positive impact on the change of foreign bank claims.

Table 1 provides the definition and sources of each variable.

Table 1. Definition and Sources of the Model I Variables

Variables	Descriptions	Sources
D(LOG(Claims))	1. D(LOG(Claims)) means $LOG(Claims)_t - LOG(Claims)_{t-4}$. 2. Claims are referred to foreign claims on Taiwan for individual country, including Japan, the United States, the United Kingdom, and Switzerland. 3. *D(LOG(Claims(-1)))* represents the first order of *D(LOG(Claims))* autocorrelation.	Bank for International Settlements
Push Factors		
D(LOG(GDP))	1. D(LOG(GDP)) means $LOG(GPD)_t - LOG(GDP)_{t-4}$. 2. LOG(GDP) represents logarithm of GDP. 3. GDP is the real GDP denominated in US dollar and based on 2005 figures.	International Financial Statistics, IMF
DREALRATE	1. DREALRATE means $REALRATE_t - REALRATE_{t-1}$. 2. REALRATE represents real interest rate of home country, which is lending rate minus CPI inflation.	International Financial Statistics, IMF
Dummy_Country	1. Dummy variable takes the value of one if foreign claims come from country(*j*) where j=1 to 4 identifying Japan (*JAPAN*), the United States (*US*), the United Kingdom (*UK*), and Switzerland (*SWISS*), respectively.	
Pull Factors		
D(LOG(GDP_TW))	1. D(LOG(GDP_TW)) means $LOG(GDP\_TW)_t - LOG(GDP\_TW)_{t-4}$. 2. GDP_TW is real GDP denominated in US dollar and based on 2005 for Taiwan.	Directorate-General of Budget, Accounting and Statistics, Executive Yuan, R.O.C.（Taiwan）
DREALRATE_TW	1. *DREALRATE_TW* means $REALRATE\_TW_t - REALRATE\_TW_{t-1}$ for Taiwan. 2. REALRATE_TW represents real interest rate of Taiwan, which is lending rate minus CPI inflation.	IFS, Central Bank of the Republic of China (Taiwan) (CBC)
GFC_Dummy	Dummy variable taking the value of one in 2007, 2008 and 2009	
D(EXPOSURE)	1. *D(EXPOSURE)* is the first difference of *EXPOSURE*. 2. *EXPOSURE* is the ratio of home country's foreign claims on Taiwan over the total claims extended by their banks.	Bank for International Settlements

4.2 Model II: Using Micro-panel Data

4.2.1 The Model Specification and Data

Navaretti et al. (2010) used a panel model to verify if the bank specific ratio of loans to deposits has changed significantly during the crisis, and in particular if these changes have been different for foreign affiliates operating in different areas. Our research modified the model specification of that used in Navaretti et al. (2010) by

adding more bank specific characteristics as variables, such as return on equity (ROE), growth of bank assets, ratio of interbank borrowings to total assets, and ratio of equity to assets, to examine the impacts of bank specific characteristics on the bank specific ratio of loans to deposits around the time of the global financial crisis. This model

$$\left(\frac{CLENDING}{CDEPOSITS}\right)_{i,j,t} = \beta_0 + \sum \beta_k DUMMY\_CRISIS \times DUMMY\_COUNTRY_{i,j,t} + \sum \beta_l DUMMY\_COUNTRY_{i,j,t} + \sum \beta_m BANK\_Specific\_Char_{i,j,t-1} + \varepsilon_{i,j,t} \quad (2)$$

Basically, Model II uses dummies to capture systemic differences among panel observations results in what is known as a fixed-effects model, a way of dealing with pooled data. In the fixed effect method the constant is treated as country-specific. This means that the model allows for different constants for each country. Since Model II uses panel data, data set runs from 2000 Q1 to 2010 Q2, including 1,148 quarterly observations comprising 35 foreign bank affiliates in Taiwan.

The data set contains the following variables:

(1) $\left(\frac{CLENDING}{CDEPOSITS}\right)_{i,j,t}$: the ratio of customer loans and deposits of foreign affiliate *i* of country *j* in Taiwan at time *t*;

(2) $DUMMY\_CRISIS$: a dummy variable taking the value of one in 2007, 2008 and 2009;

(3) $DUMMY\_COUNTRY_{i,j,t}$: a dummy variable that take the value of one if bank *i* of country *j* in Taiwan at time *t* is a foreign bank subsidiary / branch of a holding company located in the foreign country; where *j*=1 to 6 identifies the United States, the United Kingdom, Switzerland, Japan, Hong Kong and France.

(4) $BANK\_Specific\_Char_{i,j,t-1}$: characteristics of bank *i* of country *j* in Taiwan, such as growth of bank assets, ROE, etc., at time *t-1*.

(5) $\varepsilon_{i,j,t}$: error term.

In the panel regression equation, the test of the effect of the global financial crisis on the internal capital market of foreign banks is based on the sign and significance of each of the β_k coefficients. A positive and significant value would imply that foreign

banks with access to the internal capital market reduced their loan-to-deposit ratio less than the control group of banks, and therefore had a stabilizing effect on the shock caused by the global financial crisis. Obviously, a negative coefficient implies the opposite.

4.2.2 Variables for Bank Specific Characteristics

In reference to factors of bank specific characteristics related to credit extension, first, we consider the measure of profitability, such as the ratio of return on equity (*ROE*). When β_m shows positive and significant, it may imply that banks with more profit would extend more credit. On the other hand, when β_m shows negative and significant, it means that unprofitable banks would take more credit risks to get more profits. Therefore, this variable is indeterminate.

Secondly, we include a measure of liquidity from the interbank capital market (the share of interbank borrowings over total assets, *INTERBANK_ASSETS*), because access to the interbank capital market provides the complementary source of capital for customer loans.

Thirdly, we also consider solvency (total equity to total assets, *EQUITY_ASSET*) as a measure of the bank's risk aversion. A bank with a high level of capital could be relatively risk-aversive and may extend credit more conservatively during the financial crisis. Moreover, bank subsidiaries with low capitalization may be especially prone to moral hazard and rapidly expand (risky) lending (see Black and Strahan, 2002). The effect implied a negative relationship between bank capital and loan growth. On the contrary, high capital ratios could simply represent that liabilities constraints are less serious, so that banks have ample room to expand their lending. Therefore, the sign of these variables is thus indeterminate as well.

Finally, we would also like to examine the implication of bank's assets growth (*DLOG(ASSET)*) for loans. We expect that bank's assets growth would stimulate lending or its assets decline would incur bank's conservative behavior of lending, thereby having a positive impact on bank lending.

Table 2 provides the definition and sources of each variable.

Table 2. Definition and Sources of Model II Variables

Variables	Descriptions	Sources
LOG(CLENDING_CDEPOSITS)$_{i,j,t}$	The logarithm of customer loans over customer deposits of bank (*i*) in Taiwan coming from country (j) at time *t*.	Department of Financial Inspection, CBC
DUMMY_CRISIS	A dummy variable taking the value of one in 2007, 2008 and 2009.	
DUMMY_COUNTRY$_{i,j,t}$	Dummy variables that take the value of one if bank (*i*) in Taiwan at time *t* is a foreign bank subsidiary / branch of a holding company located in the foreign country (*j*) in parentheses. These foreign countries include the United States (US), the United Kingdom (UK), Switzerland (SWISS), Japan (JAP), Hong Kong (HK), and France (FRA).	
BANK_Specific_Char		
ROE(-1)	Ratio of Return on Equity at time *t-1*.	Department of Financial Inspection, CBC
DLOG(ASSETS(-1))	1. DLOG(ASSETS(-1)) means LOG(ASSETS(-1))$_t$－LOG(ASSETS(-1))$_{t-1.}$ 2. LOG(ASSETS(-1)) is the logarithm of individual bank assets at times *t-1*.	Department of Financial Inspection, CBC
LOG(INTERBANK_ASSETS)	1. LOG(INTERBANK_ASSETS) is the logarithm of the ratio of interbank borrowings over total assets. 2. It is a measure of interbank liquidity, meaning that easier access to the interbank capital market provides the complementary source of capital for customer loans.	Department of Financial Inspection, CBC
LOG(EQUITY_ASSETS(-1))	1. LOG(EQUITY_ASSETS(-1)) is the logarithm of bank (*i*) equity to total assets at time *t-1*. 2. It measures bank's risk aversion and the capital constraints of the bank.	Department of Financial Inspection, CBC

5. Empirical Results

5.1 Model I

5.1.1 Panel Unit Root Test

When we use pooled panel estimation method, we have to make sure that all the variables in Model I are stationary by panel unit root test. Basically, we employ Levin-Lin-Chu Test (LLC test) for the panel unit root test. Table 3 shows the results of the panel unit root test, using data from 2000 Q1 to 2010 Q2. All the variable in Model I are I(1) level stationary. Consequently, we took the first difference for these I(1) variables in the empirical panel estimation.

Table 3 Panel Unit Root Test Result of Model I

Variables	Levin-Lin-Chu Test (LLC test)	
	Level	First difference
LOG(Claims)	0.65	**-13.79** ***
LOG(GDP_TW)	1.06	**-2.93** ***
REALRATE_TW	-0.04	**-9.34** ***
LOG(GDP)	-0.19	**-1.44** *
REALRATE	-0.06	**-2.54** ***
EXPOSURE	1.04	**-12.23** ***

Note 1. There is only an exogenous regressor (i.e. constant term) in LLC test equation.
2. Automatic selection of lag length is based on SIC for LLC test.
3. *,**, and *** indicate the 10%, 5%, and 1% level of statistical significance.

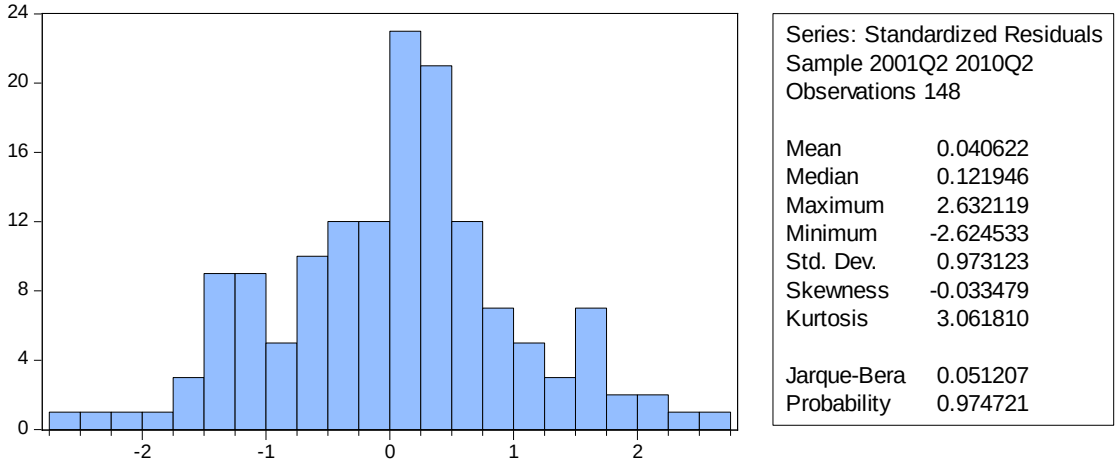
5.1.2 Estimation for Model I

Since the number of cross sections is less than the number of coefficients, a random effects model could not be estimated. Moreover, these four countries' foreign claims on Taiwan have correlation simultaneously. Furthermore, the close relationship with Taiwan is country-specific, and would give rise to unequal variances of individual country's claims on Taiwan.

In addition, according to the above-mentioned situation, when in the presence of cross-section heteroskedasticity and contemporaneous correlation for the pooled panel estimation, we not only had to address the problem of heteroscedasticity by imposing a White's cross-section heteroskedastic structure on the error term in the panel model, but also used the cross-section SUR (Seemingly Unrelated Regressions) model allowing for contemporaneous correlation between cross-sections. We try to estimate a feasible GLS (Generalized Least Square) with cross-section SUR specification correcting for both cross-section heteroskedasticity and contemporaneous correlation. Under the GLS with cross-section SUR specification, the research has made sure that the residuals for Model I converged to normal distribution successfully. Therefore, the

specification for Model I should be appropriate. Figure 1 shows all the statistics for Model I. The results showed Skewness and Kurtosis are near zero and three, respectively. As to normality test, Jarque-Bera value is quite low, that is, null hypothesis of normality is accepted at high level of confidence.

Figure 1. All the Statistics for the Model I



5.1.3 Analysis of the Determination of Foreign Bank Claims on Taiwan

The GLS with cross-section SUR model, after correction for serial correlation and adjustment for heteroskedasticity, is summarized in Table 4. A high Adjusted R-squared value of 0.658 indicates that the SUR model represents a good fit to the data, supported by a significant F-statistic of 22.717.

Table 4. The Determination of the Percentage Change of Foreign Bank Claims on Taiwan

Variables	Coefficient	t-Statistic
Constant	0.011	0.63
Host country variables		
D(LOG(GDP_TW))	1.164	5.16 ***
D(REALRATE_TW)	0.003	0.08
DUMMY_GFC	0.014	0.56
DUMMY_GFC×D(EXPOSURE)	0.863	3.85 ***
Home country variables		
D(LOG(GDP(-1)))×US	-1.998	-1.93 *
D(LOG(GDP(-1)))×JAPAN	1.095	2.23 **
D(LOG(GDP(-1)))×UK	1.042	1.31
D(LOG(GDP(-1)))×SWISS	-2.933	-1.23
D(REALRATE)×US	-0.135	-1.58
D(REALRATE)×JAPAN	0.046	0.44
D(REALRATE)×UK	-0.174	-2.42 **
D(REALRATE)×SWISS	-0.249	-0.70
D(LOG(CLAIMS(-1)))	0.588	11.87 ***
Number of Panel observations	148	
Adj. R^2	0.658	
Durbin h Stat.	-1.517	
F Statistic	22.717	
Pro(F Statistic)	0.000	

Note: *, **, *** indicate the 10%, 5%, and 1% level of statistical significance (two-tailed).

The findings of the empirical results in Model I are summarized as the following:

(1) For the four individual country's claims on Taiwan, the coefficient of *GFC_DUMMY*×*D(EXPOSURE)* is positive and significant. That is, the link between the change of the exposures and their foreign bank claims on Taiwan during the recent financial crisis is significant with a positive coefficient. The results apparently point to stable financing for these four countries' banks claims on Taiwan in the global financial crisis.

(2) For the relationship between the movement in the real GDP growth of Taiwan and the change of foreign bank claims, the coefficient of *D(LOG(GDP_TW))* is positive and significant. As we expected, the finding showed that foreign claims

would be pro-cyclical in accordance with host country growth. The findings are consistent with that of Martinez-Peria et al. (2005).

(3) For the change of real GDP growth in home country, the research found that banks from Switzerland and the United States reduced claims in response to increased profit opportunities at home country (that is, in response to higher home growth) but only the coefficient of the movement of real GDP growth for the U.S. is significant with a negative sign. On the other hand, it is statistically significant with a positive coefficient between the movement of real GDP growth for Japan and the change of foreign bank claims on Taiwan. It means that an increase in real GDP growth of Japan will positively affect Japanese banks to extend credit in Taiwan.

(4) For the change of real interest rate for home country, the change in the home real interest rate has the expected negative impact on the change of foreign bank claims on Taiwan. This variable is statistically significant for the United Kingdom at the relative level of confidence.

5.2 Model II

5.2.1 Panel Unit Root Test

Using pooled panel estimation method for Model II, we also have to make sure that all variables in Model II are stationary by panel unit root test. We would make use of Levin-Lin-Chu Test (LLC test) for the panel unit root test. Table 5 shows the results of the panel unit root test, using data from 2000 Q1 to 2010 Q2. The research also found that all variables in Model II are I(0) level stationary. Consequently, we do not take the first difference for these I(0) variables in pooled panel estimation.

Table 5. Panel Unit Root Test Result of Model II

Variables	Levin-Lin-Chu Test (LLC test)
	Level
LOG(CLENDING_CDEPOSITS)	**-3.56*** **
ROE(-1)	**-27.65*** **
LOG(INTERBANK_ASSETS)	**-8.65*** **
LOG(EQUITY_ASSETS(-1))	**-3.73*** **
D(LOG(ASSETS(-1)))	**-0.86*** **

Note: 1. There is only an exogenous regressor (i.e. constant term) in LLC test equation.
2. Automatic selection of lag length is based on SIC for LLC test.
3. *,**, and *** indicate the 10%, 5%, and 1% level of statistical significance.

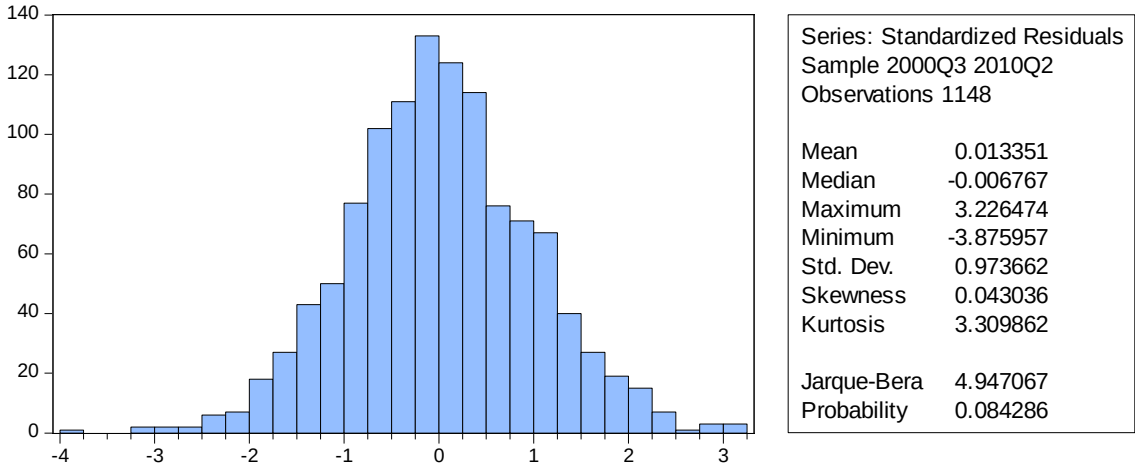
5.2.2 Estimation for Model II

Indeed, the research had intended to use a fixed-effects model in Model II to capture systemic differences among panel observations results. However, the research had to consider what the statistical value for Model II represented, such as a low D-W value and a high JB value, after making use of a fixed-effects panel model. In consequence, we have to consider how to increase estimation efficiency.

In addition, foreign banks in Taiwan face the same competition environment and have some characteristics in common. On the other hand, foreign banks may have specific business and management strategies to affect their overseas affiliates' lending behavior. Therefore, as in Model I, cross-section heteroskedasticity and contemporaneous correlation existed in Model II as well. In view of the above-mentioned situation in Model II, we also have to tackle the cross-section heteroskedasticity and the contemporaneous correlation in order to increase estimation efficiency. As in the presence of heteroskedasticity and correlation for the pooled panel estimation of Model I, the research also tried to estimate a feasible GLS (Generalized Least Square) specification correcting for both cross-section heteroskedasticity and contemporaneous correlation in Model II. Under the GLS with cross-section SUR specification, the research has made sure that the residuals for Model II converged to normal distribution successfully as well. Therefore, the

specification for Model II should be acceptable, although not having been satisfied. Figure 2 shows all the statistics for Model II. The results showed that Skewness and Kurtosis are also near zero and three, respectively. With respect to normality for the residuals of Model II, although null hypothesis of normality is accepted at the relative low level of confidence, the level of confidence is 0.08 at least more than 0.05.

Figure 2 All the Statistics for Model II



5.2.3 Analysis of the Determination of Foreign Bank Lending on Taiwan

For Model II, the GLS with cross-section SUR model, after correction for contemporaneous correlation and adjustment for heteroskedasticity, is summarized in Table 6. Also, a high Adjusted R-squared value of 0.839 indicates that the SUR model represents a good fit to the data for Model II, supported by a significant F-statistic of 373.695. Furthermore, independent variables are almost significant statistically as well.

Table 6. The Determination of Foreign Banks Lending in Taiwan

Variables	Coefficient	t-Statistic	
Constant	3.702	**142.69**	***
DUMMY_CRISIS×DUMMY_FRA	0.353	**4.99**	***
DUMMY_CRISIS×DUMMY_HK	0.353	**12.29**	***
DUMMY_CRISIS×DUMMY_JAP	0.262	**14.34**	***
DUMMY_CRISIS×DUMMY_SWISS	0.948	**19.32**	***
DUMMY_CRISIS×DUMMY_UK	0.048	0.33	
DUMMY_CRISIS×DUMMY_US	0.103	**2.23**	**
DUMMY_FRA	0.341	**9.05**	***
DUMMY_HK	-0.489	**-23.26**	***
DUMMY_JAP	-0.455	**-26.27**	***
DUMMY_SWISS	-1.362	**-35.08**	***
DUMMY_UK	0.083	**1.77**	*
DUMMY_US	-0.639	**-20.12**	***
ROE(-1)	-0.002	**-19.31**	***
LOG(INTERBANK_ASSETS)	0.330	**51.74**	***
LOG(EQUITY_ASSETS(-1))	0.299	**30.08**	***
D(LOG(ASSETS(-1)))	0.143	**8.43**	***
Number of Panel observations	1148		
Adj. R^2	0.839		
D-W Stat.	1.606		
F Statistic	373.695		
Pro(F Statistic)	0.000		

Note: *, **, *** indicate the 10%, 5%, and 1% level of statistical significance (two-tailed).

Examining the sign and significance of each β_k in Model II, we found that the coefficients of *DUMMY_CRISIS*×*DUMMY_COUNTRY* for almost all the six countries except UK are positive and statistically significant at the relative level of confidence as we expected. They revealed that almost all foreign bank subsidiaries presented stabilizing effects for Taiwan on the shock caused by the global financial crisis between 2007 and 2009. This finding is consistent with that of Navaretti et al. (2010).

In addition, concerning the significance of the bank financial characteristics, the

coefficient of *ROE(-1)* is significant and negative. That is, unprofitable banks would take more credit risks to get more profits. Moreover, the coefficient of *LOG(INTERBANK_ASSETS)* is significant. That is, access to the interbank capital market provides foreign banks the complementary capital for customer loans.

As to the solvency, the coefficient of *LOG(EQUITY_ASSETS(-1))* is also significant and positive. The finding revealed that high capital ratios could represent that liabilities constraints are less serious, so that banks have ample room to expand their lending. Furthermore, with respect to growth of bank assets, the coefficient of *D(LOG(ASSETS(-1)))* is statistically significant and positive. The result of the research showed that bank's assets growth would stimulate lending or its assets decline would incur bank's conservative behavior of lending, thereby having a positive impact on bank lending.

5.3 Summary of the Empirical Results

According to the above empirical results, we obtained several findings as follows:

(1) **The empirical results indicate foreign banks in Taiwan could present a stabilizing effect during the financial crisis**

The results in Model I point to stable financing during the global financial crisis for foreign bank claims on Taiwan. Furthermore, the results of Model II show that almost all the foreign banks in Taiwan from different groups of countries except UK had a stabilizing effect on their local lending during the global financial crisis.

However, this could also be explained by the fact that since foreign bank affiliates' major working capitals are funded from the local market, they could not inject funds into their parent companies.

(2) **The effect of Taiwan's economic growth on foreign bank claims is highly significant and positive**

Model I examines the impact of macroeconomic factors on foreign bank claims. The result of the research showed that a change in real GDP growth of Taiwan had an significantly positive effect on the movement of foreign bank claims over the cycle, which shows foreign bank claims are pro-cyclical. Furthermore, the

movement in the real interest rate of Taiwan positively affected the change of foreign bank claims on Taiwan but was insignificant statistically. It implies foreign bank claims are mainly affected by real GDP growth rather than real interest rates of Taiwan.

(3) **The effect of push factors on foreign bank claims is less significant**

According to the empirical results of Model I, the relationship between economic factors of home country and the change of foreign bank claims is insignificant, although there are some variables with statistical significance. It means that economic factors of home country did not play a vital role for foreign bank claims on Taiwan, so foreign banks' role in transmitting shocks into Taiwan through claims seems insignificant.

(4) **Individual bank characteristics would have an important influence on foreign bank affiliates' lending in Taiwan**

From the panel empirical results of Model II, the research also finds that individual bank characteristics of foreign bank affiliates in Taiwan could affect significantly their lending behavior. The research took into consideration several factors such as return on equity, funding from interbank, solvency, and bank's assets growth. The findings revealed that those bank characteristics have a statistically significant relationship with foreign banks' lending in Taiwan.

6. Policy Implications

While the research uses macro and micro data to test the determinants of host country lending by multinational bank subsidiaries, we have not estimated the same regressions for domestically owned banks as a benchmark group. So, simply based on Model I and Model II, it is difficult to find the linkage between financial and monetary policies and the foreign bank lending. However, this research could still have some policy implications.

6.1 Prevention from Country Concentration of Foreign Banks

The findings from Model II tell us foreign bank affiliates' financial characteristics, which are more or less affected by parent company's financial situation, have

significant impacts on their lending. For example, in June 2008, the assets of Taiwan branches of Citibank and HSBC dropped down suddenly because they remitted large amounts of earnings to inject into parent company's liquidity. In order to prevent shock transmission by foreign bank affiliates from their parent companies during the financial crisis, host governments should keenly supervise the concentration of foreign banks from specific countries or regions.

6.2 Supervision for Liquidity and Funding Conditions of Foreign Bank Affiliates

The empirical results from Model II tell us that the decline of capital would decrease foreign bank affiliates' loan extensions. Moreover, the interbank call loan market provides complementary funding for foreign bank affiliates in Taiwan to extend credit. So, the Central Bank or authorities of financial inspection still need to prudently supervise banks' liquidity and funding conditions. For example, they could require foreign bank branches to finance most of capital from stable sources and maintain specific capital adequacy ratios, especially in times of a financial crisis. The Central Bank may provide the bank suffering liquidity problems with sufficient funds through accommodation and open market operation to prevent sudden and sharp decreases of their loans.

6.3 The Importance of Monitoring Foreign Banks' Influence on Taiwan

Although total assets of foreign banks in Taiwan are currently much less than domestic banks, as they are equivalent to 30% of Taiwan GDP and the size of foreign banks assets continues to grow, the financial activities and influence of foreign banks on Taiwan's financial system should still be closely monitored.

7. Conclusion

As the trend toward greater international financial integration persists, the debate on the behavior of foreign banks is likely to continue. In this paper, we have made use of macro and micro data to examine the determinants of foreign bank lending, especially during the recent global financial crisis.

As our empirical findings indicate that foreign bank claims, which are pro-cyclical in line with Taiwan GDP growth, seem affected mainly by the local demand, but are

little affected by the real interest rate of Taiwan or economic factors of home countries. So our empirical results from Model I that multinational banks did not pull out much of their claims on Taiwan at times of crises may be because Taiwan's economy was not hit as hard as developed countries.

In addition, the empirical results of Model II show that foreign bank affiliates' lending in Taiwan is affected by individual bank-specific characteristics, and almost all foreign bank affiliates in Taiwan present a stabilizing effect in their lending during the crisis. This could be because their major funding sources come from Taiwan's interbank call loans, which remained ample during the crisis, and they have less capability to inject funds into their parent companies. Moreover, since foreign bank affiliates' market share of lending in Taiwan is less than that of domestic banks, we could not simply conclude that foreign bank affiliates present a stabilizing force for Taiwan.

However, the decline of capital would decrease foreign bank affiliates' loan extensions in Taiwan. So, the Central Bank or authorities of financial inspection still need to prudently supervise banks' liquidity and funding conditions, and the Central Bank may provide banks with temporary liquidity problems sufficient funds to avoid credit crunch.

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