Chapter 7

The Banking System in East Asia and the Transmission of the Global Financial Crisis

Jenny Corbett
Crawford School, Australian National University

Prasanna Gai
Crawford School, Australian National University

Kazukii Onji
Crawford School, Australian National University

March 2010

This chapter should be cited as
Corbett, J., P. Gai and K. Onji (2010), 'The Banking System in East Asia and the Transmission of the Global Financial Crisis', in Findlay, C., F. Parulian and J. Corbett (ed.), *Linkages between Real and Financial Aspects of Economic Integration in East Asia*. ERIA Research Project Report 2009-1, Jakarta: ERIA. pp.196-225.

Chapter 7

The Banking System in East Asia and the Transmission of the Global Financial Crisis

Jenny Corbett
Australia–Japan Research Centre
Crawford School
Australian National University

Prasanna Gai
Crawford School
Australian National University

Kazuki Onji
Crawford School
Australian National University

Abstract

This paper asks whether the impacts of the Global Financial Crisis on 10 East Asian economies were amplified through the banking system in the region. We examine balance sheets of 474 banks in East Asia for evidence on the bank lending channel of financial crisis transmission. We test whether the lending fell faster for banks with (1) a high reliance on money market funding and (2) a high exposure to the Lehman Brothers bankruptcy. We find a statistically significant correlation between loans growth in 2008 with the degree of dependency to the money market but not with the direct exposure to the Lehman Brothers. Interestingly, the importance of the lending channel of the transmission mechanism appears to vary across economies, possibly due to the differences in the nature of the relationship between banks and firms. Korean banks in our sample are relatively heavy on money market finance, and appear to be affected more by the Global Financial Crisis. In contrast, Japanese banks appear to have countered the shock by increasing lending, at least temporarily. Data limitations prevent

us from offering strong conclusions for other economies, but the impacts on ASEAN countries in our sample would have been small except for Singapore. Most banks around the region rely largely on deposits as the chief source of finance so that the effects through the bank lending channel would have been quantitatively modest on average.

***Keywords*:** financial crisis, bank lending channel, Asian banks

***JEL Classifications*:** G01, G21, G18

Introduction

The global financial crisis (GFC) of late 2008 both strained the financial sector and induced a dramatic drop in the export demand for East Asian products. This paper asks whether or not the GFC shock to East Asian economies was amplified through the financial sector in the region.

The global fall in the demand for industrial produce manufactured in East Asia, especially motor vehicles, is the main factor behind the declines in export from Asia. The conventional wisdom also suggests that the financial sector in East Asia withstood the GFC relatively well (Pomerleano, 2009). While the shock to the real sector is the main factor behind the decline in output, the well-established body of study linking financial shocks and loan supplies (e.g. Peek and Rosengren, 1997), leads one to suspect that the output decline in Asia after the Lehman Brothers shock of September 2009 might have been amplified by the transmission of financial sector shock into the real sector even with a relatively healthy financial sector.

In a complementary analysis, Siregar (2010) examines the role played by credits extended through international trade. This is another channel of the financial crisis transmission mechanism, considered by Amiti and Weinstein (2009) in the context of the Japanese financial crisis in the 1990s. We focus instead on the role of loans extended by domestic financial institutions, or the lending channel of financial sector transmission. Our aim is to see whether the lending channel of the GFC transmission amplified the GFC shock in East Asia. In particular, we pay attention to variations in the transmission mechanism across economies in the region. Understanding the regional diversity in the transmission channel of financial crisis is important in identifying the potential policy needs for the banking sector in East Asia.

That it is difficult to identify the lending channel is well known. For instance, as emphasized by Borensztein and Lee (2002) in the context of the Korean financial crisis, it is difficult to separate the decline in demands for loans and the constraint in supplies of available credits. In other words, a decline in bank loans is insufficient evidence for credit crunch, since such pattern is attributable to a decline in demand. To overcome this challenge, Borensztein and Lee (2002) consider an identification strategy developed

through the debate on the transmission mechanism of monetary policy. In theory, a monetary tightening could affect the real economy through either a reduced loan demand or a contraction in supply of loans. Thus, a shock transmitted through the bank lending channel is difficult to quantify in the context of a financial shock arising from a change in monetary policy stance or that arising from a financial crisis Given this similarity, the literature on the monetary transmission mechanism offers useful analytical tools.

We implement two complementary techniques proposed in the monetary transmission mechanism literature: the analysis of the ratio of commercial loans to bank lending, or the "mix" (Kashyap et al., 1993), and the two-step regression procedure (Kashyap and Stein, 2000). The first technique is a macro-level analysis and helps us visualize the overall impacts on the economy. Results from this analysis, however, admit alternative explanations. The second technique is based on bank-level information on lending activities. This micro-level analysis allows us to test whether banks that are expected to be vulnerable to GFC were affected more – thus providing more direct evidence on credit crunch.

The intuition behind the analysis of "mix" is the substitutability of sources of external finance: if the quantity demanded for loans remains constant at a given interest rate but the quantity of bank loans supplied at the respective interest rate fall, firms fill the shortfall by issuing commercial papers (Kashyap et al., 1993). An increased ratio of commercial papers to bank loans is interpreted as evidence consistent with the lending channel. We implemented this analysis on aggregate data for Japan, Korea and Taiwan, and found a pattern consistent with a temporary credit crunch for Korea and Taiwan during the first quarter of 2009. Japanese firms in aggregate issued less commercial papers and increased reliance on bank loans, suggesting that the lending channel was not in operation in Japan, at least until the second quarter of 2009.

In our adaptation of a procedure suggested by Kashyap and Stein (2000), we examined whether the bank lending fell more rapidly in 2007 and 2008 for banks with (1) a high reliance on money market funding and (2) a high exposure to the Lehman Brothers bankruptcy. The data used for this study are an unbalanced panel of 747 banks from China, Hong Kong, Indonesia, Japan, Korea, Malaysia, the Philippines, Singapore,

Thailand and Taiwan at the annual frequency, and up to the financial year that spans the Lehman Brothers shock of September 2008. We find a statistically significant correlation between loan growths in 2008 with the degree of dependency to money market dependence. The direct exposure to the Lehman shock appears to be hedged away on average. The regression analysis on the whole suggests that on average the lending channel amplified the financial sector shock in the region to some degree. The experiences of countries appear heterogeneous: the lending channel was at work for Korea and Malaysia; Japan showed indications contrary to the lending channel.

Our result confirms the intuition that the business model of Asian banks, which rely on deposits as the main source of credits, shielded the bulk of the financial sector shocks from transmitting to the real economy through the lending channel. However, our empirical analysis provides evidence indicating that the GFC shock was amplified through the financial sectors for some countries in East Asia, particularly Korea, but less so in others.

Our examination of the GFC shock thus highlighted heterogeneity in the banking practices around the region, which has a bearing on the integration of the financial sector in East Asia. Korean banks in our sample are more dependent on short-term finance. Japanese banks appear to have countered the shock of the financial crisis by extending loans to firms, at least in the short run. For the integration of the financial sector in East Asia, regulators would need to be aware of differences in the banking sector within the region in developing a regulatory framework. One possibility is to develop a cooperative mechanism that pools risk by targeting vulnerable parts of the region.

This paper is organized as follows. Section 2 presents a macro-level analysis. Section 3 discusses the data and the sample selection procedure. Section 4 presents a micro-level analysis. Section 5 concludes.

2. Macro-level Evidence

2.1. Did Firms Substitute toward Commercial Papers?

This section follows Kashyap et al. (1993) in their analysis of the "mix" variable – the ratio of commercial papers to bank loans. Our aim in this macro-level analysis is to complement the micro-level analysis on individual banks, to be discussed below, by examining the net effects at the economy level. The intuition behind Kashyap et al. (1993) is the substitutability of sources of external finance: if the quantity demanded for loans remains constant at a given interest rate but the quantity of bank loans supplied at the respective interest rate fall, firms fill the shortfall by issuing commercial papers. An increased ratio of commercial papers to bank loans is interpreted as evidence consistent with the lending channel. Kashyap et al. (1993) find statistically significant increases in commercial paper issues relative to bank loans after the tightening of monetary policy. In the current application, an increase in this variable is taken as evidence consistent with the contraction of loan supplies relative to loan demands. Importantly, an increase in the mix variable is consistent with the lending channel, but admits an alternative explanation. As elaborated by Oliner and Rudebusch (1993) and Kashyap and Stein (1995), commercial papers are typically issued by large firms, so the mix can increase when small firms demand fewer credits while large firms maintain credit demand. We think that the analysis of mix provides a good starting point, but caution is needed in interpretation.

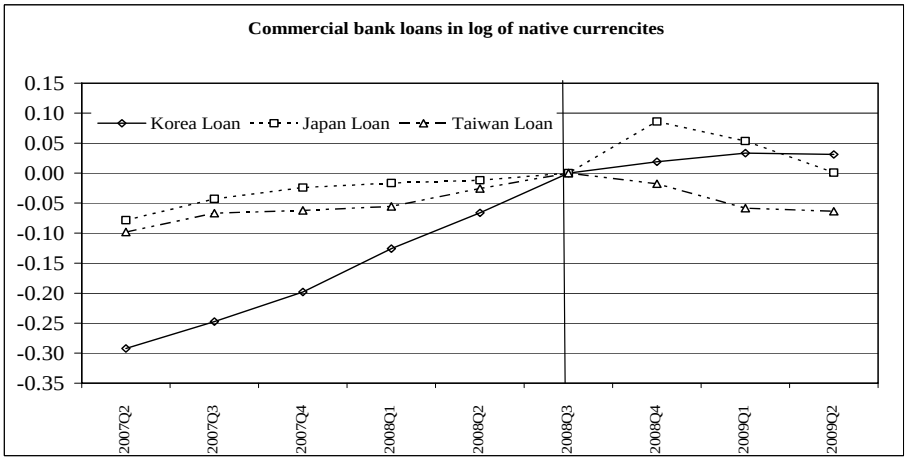
Our analysis focuses on Korea, Japan and Taiwan. Data availability determined this choice. For Korea and Japan, we obtained information on *loans outstanding from private financial institutions* and *commercial papers issued by private non-financial corporations* from the Flow of Funds data in Datastream. The Flow of Funds for other countries did not contain information on commercial papers. Data for Japan and Korea are quarterly and are available up to 2009Q2. Taiwanese data are based on monthly information on *commercial paper issued* and *loans and discounts at all banks*, also from Datastream. The Taiwan data were converted to quarterly data by taking the value from the latest month in respective quarters.

2.2. Results

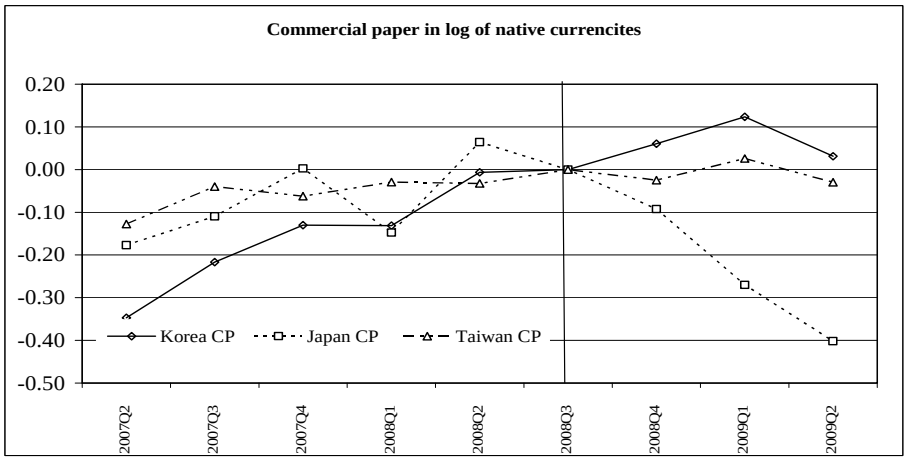
Figure 1 presents the log of bank loans, the log of commercial papers, and the mix for the three economies over 2007Q2–2009Q2. For convenience of visual comparison, the

Figure 1. Changes in Short-term External Finance around the Lehman Brothers Shock

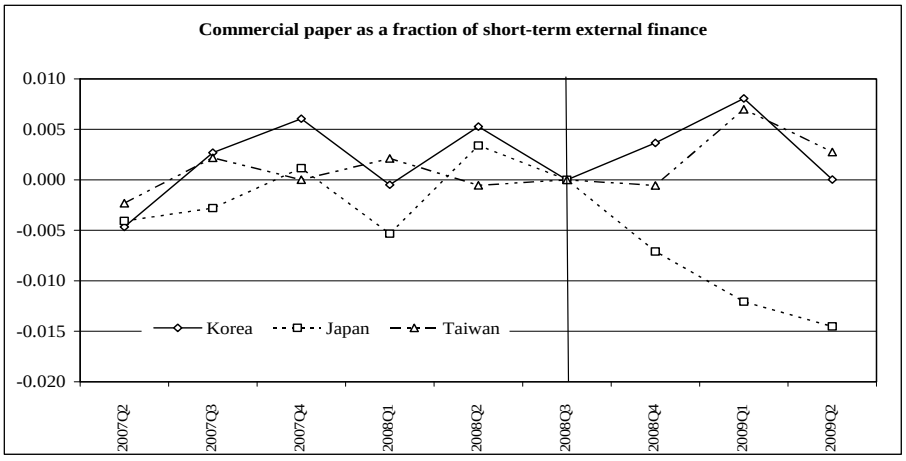
Panel A: Bank loans



Panel B: Commercial papers



Panel C: "Mix"



Source: Author

values in those figures are rescaled by subtracting the 2008Q3 value. For instance, 0.1 point in the top two panels indicates that the value is 10 percentage points higher than the base period. Korean and Taiwanese firms rely more on t commercial papers than Japanese firms; in 2008Q3 the values of commercial papers were 9.5 percent and 8.7 percent of total bank loans, respectively. The share of commercial papers for Japanese firms is 4.0 percent.

The top panel in Figure 1 presents the amount of bank loans in log. Bank loans in Korea increase over the period. The apparent kink at the 2008Q3 shows that the growth rate slows after the Lehman shock.[1] Surprisingly, Japanese bank loans increase sharply in 2008Q4, approximately 10 percentage points, and revert to the base level in 2009Q2. Taiwanese bank loans increase until 2008Q3, and decline thereafter. The middle panel presents the amount of commercial papers in log. The commercial papers increase for Korea, remain roughly the same for Taiwan, but decline sharply for Japan (approximately 40 percent reduction in outstanding commercial papers over 2008Q3 through 2009Q2).

The bottom panel shows the ratio of commercial papers to bank loans. The mix variable for Korea increases initially and reverts to the 2008Q3 level in 2009Q2. Likewise for Taiwan, the mix variable increases in 2009Q1 but reverts. These patterns for Korea and Taiwan suggest that firms temporarily resorted to commercial papers, possibly because of increased difficulty in obtaining bank loans. Notably, the mix variable in Japan falls by 1.5 percentage points over 2008Q3 through 2009Q2. According to the conventional wisdom of Japanese economists, a main bank – the largest lender to a company— extended loans to their main clients in response to the GFC; consequently those firms that did not have a close tie with a main bank were hit more severely. This is despite the decline in the role of main banks, which played a key monitoring role under the Figure 1.

[1] One may argue on the basis of the continuous increase in loans that Korea did not experience a "credit crunch." The question asked in this paper is whether or not the GFC led to a supply-driven contraction in credits. The slowdown in loan growth is consistent with banks reducing the supply of loans. Of course, the slowdown can be explained by the slowdown in loan demand. The point of looking at the mix is to gauge the demand condition by taking the commercial paper issues as a benchmark for the demand condition.

Source: Author "traditional" Japanese economic system, as documented in Hoshi et al. (2009). If anything, this result for Japan indicates the persistence of the main bank system.

In summary, our macro-level examination suggests a diverse experience among Korea, Japan and Taiwan: the bank lending channel might have been at work in Korea and Taiwan.

We turn next to a micro-level analysis of 10 Asian economies since the mix analysis admits alternative explanation and the low coverage of the economies is of interest.

3. Data for Micro-level Analysis

3.1. Individual Bank Data

We extracted the balance sheets and income statements of banks in 10 Asian regions from BankScope. Our data are based on the reporting format in BankScope that standardizes across countries so that variables should in general be comparable. We first selected 946 financial institutions for which unconsolidated financial statements for financial 2008 were available in December 2009. We dropped non-surviving banks because the main point of this exercise is to see the impact of the Lehman shock of September 2008. When we constructed the dataset, the year 2008 was the latest available. We next excluded securities companies since they reportedly extended customer loans but the amounts were usually small.

We then deleted observations that lack data consistency and sufficient information. (1) 16 institutions changed financial year during the sample period. Of those, two banks with three or fewer years of observations after the financial year change were dropped entirely. For 14 other banks, we dropped observations before the change in financial years. (2) Missing observations: we dropped observations that lack essential variables for the analysis (total customer loans, total deposits, and total liabilities). (3) Banks with no information on key variables in 2008 were dropped.

We also accounted for mergers and acquisitions (M&A). To prevent any structural changes from confounding the analysis we dropped observations prior to M&A. BankScope reports bank histories, including mergers, acquisitions or transfer of

divisions, and other significant changes. We tabulated from this bank history section the years of M&A, and if available, the months. To be conservative, for those without information on the month of merger, we assumed that M&A occurred in December. This led to more observations being dropped. Observations with financial years ending before recent M&A were dropped. We also dropped observations in which M&A dates fell within 365 days of the end of the financial year. Finally, we dropped observations with less than four years of data. This sample selection process left us with 747 banks, or about 80 percent of the original sample size.

3.2. Data on the Exposure to the Lehman Brothers Shock

The measure of exposure to Lehman Brothers and its subsidiaries is based on the list of individual Asian financial institutions summarized and reported by Reuters on 25 September 2008.[2] This report lists individual banks and the amount of exposure in millions of US dollars, assembling information from reports by major financial firms and the Lehman's Chapter 11 bankruptcy filing. Table 1 provides a summary by country. In the seven Asian economies included in this report, the total exposure is estimated to be US$6.1 billion. Not all information on individual banks is reported; the sum of individual-level information is US$3.6 billion, or 58.5 percent of the total. In particular, the Bank of Korea estimates its exposure to be US$1.34 billion—the second largest amount in the region following Japan. As the Reuters' report does not include individual information for Korean banks, we drop Korea from the analysis when examining the Lehman exposure. However, we assume that banks in Indonesia and Malaysia – two countries not included in the report – have insignificant exposure given the low exposures in other ASEAN countries. We matched this list with our BankScope sample on the basis of names. The reported exposure is sometimes at the holding company level. In light of the finding by Ashcraft (2006) that a holding company in the US shift capital among its group companies, we presumed those subsidiaries will be exposed indirectly at unspecified amount. Overall, the matching appears reasonable.

[2] http://uk.reuters.com/article/idUKMAN20091320080925 Accessed 5 January 2010.

Table 1. Exposure to the Lehman Brothers Bankruptcy: Asian Financial Institutions

	Reuters sample	Estimated total
Japan	1,721	2,200
Korea	n.a.	1,340
Taiwan	641	1,200
Hong Kong	398	
China	385	
Philippines	242	386
Thailand	101	124
Singapore	93	
Total	3,581	6,126
	(58.5%)	
Japan, Taiwan, Philippines, Thailand	2,705	3,910
	(69.1%)	

Note: Unit is in millions of US dollars. The estimated totals are based on respective agencies for countries: S&P for Japan; the Bank of Korea for Korea (includes the exposure to Merrill Lynch); the regulatory agency for Taiwan; the Philippines *Daily Inquirer*, on their bases of the hearing on the central bank, for the Philippines.

Source: Author's summary from Reuters.

4. Micro-level Evidence

4.1. Empirical Approach

This section considers an application of the identification strategy developed by Kashyap and Stein (2000) in the context of their analysis of the monetary transmission mechanisms, paying particular attention to necessary modifications.

Kashyap and Stein (2000) identify the credit channel of the monetary transmission mechanism by examining whether illiquid banks reduce loans when monetary policy tightens, all else being equal. To do so they take advantage of a large dataset that contains nearly a million bank-level observations from the quarterly call report of US banks. Their two-step regression procedure takes advantage of this large sample. In the first step, a difference in log of loan is regressed on four lags of itself, a measure of

liquidity, and geographical region dummies for each point in time. This cross-section regression estimates the correlation between liquidity and loan growth, accounting for region-specific time effects. If a credit channel existed, illiquid banks should exhibit low loan growth compared to their peers, holding all else constant. The second step takes the coefficient on liquidity from the first step as a dependent variable. In this time-series regression, the coefficient on liquidity is regressed on the measure of changes in monetary policy (and its lags), GDP growth rates (and its lags), and a linear time trend. If monetary policy affects illiquid banks, there should be a stronger relationship between liquidity and loan growth (i.e. a larger coefficient on liquidity) when the monetary policy is tight. Put differently, the liquidity should matter only when the monetary policy is tight, and the two-step procedure tests whether this is the case.

Instead of this two-step procedure, we apply its one-step variant considered by Kashyap and Stein (2000) for a sensitivity analysis. Both procedures are equivalent under certain assumptions on the functional form.. A loan growth regression includes an interaction of the liquidity measure and the monetary policy measure, in addition to other explanatory variables. Here, the coefficient on the interaction term is the key variable of interest. If the one-step model accurately captures the data generation process, in theory two procedures should produce the same coefficient estimates. If this is the case, the one-step procedure should provide a more powerful test by virtue of the stronger assumptions. The key advantage of the two-step procedure over the one-step procedure is the weaker degree of parameterization: The one-step procedure imposes a tighter functional form assumption on the data whereas the two-step procedure allows for more flexibility, or lets the data speak more freely. The two-step procedure, however, is data intensive: the second step is estimated using 20 years of quarterly data in Kashyap and Stein (2000). Given that our data contains at most 17 years of annual data, the one-step procedure seems more sensible for the dataset at hand. We take comfort in the fact that the one- and two-step procedures in Kashyap and Stein (2000) produce similar results. The variant of this one-step procedure is common in the literature (Gambacorta, 2005; Gambacorta and Mistrulli, 2004).

Furthermore, we modify the Kashyap–Stein one-step procedure by considering an alternative source of variation to identify a lending channel. In this, the balance sheet

strength is measured by the ratio of securities plus federal funds sold to total assets. In response to the shock to the monetary contraction, the bank with a strong balance sheet "should be better able to buffer their lending activity against shocks in the availability of external finance, by drawing on their stock of liquid asset" (Kashyap and Stein, 2000: 410–12). In the context of the GFC, we think that the dependence on the money market is the primary channel through which the bank balance sheet is affected. As often noted, the fund in interbank markets dried up, as shown by the shooting up of OIS-LIBOR spreads (e.g. Cecchetti, 2009). As a consequence, those banks that rely more on raising funds from the market for short-term debt securities would have faced difficulties raising the necessary funds to extend loans. Pomerleano (2009) observes that Asia continued to depend on deposits as the primary source of finance, with the exception of Korea. The importance of this channel thus may be limited given the business model of Asian banks in general, but this is an empirical question. In the following empirical analysis, we examine whether the money market dependence had any effects in 2008.

4.2. Summary Statistics

Table 2 shows the summary statistics by bank types; figures are in current US dollars. The cooperative banks, nearly all of which are from Japan, are the most highly represented. The second largest group is the commercial banks. Others total just 24 banks, or 3.2 percent of the total number of banks. The last three columns of the table report, respectively, the change in total loans over 2007–2008, the measure of money market dependence, and the fraction of banks that were exposed directly to the Lehman Brothers bankruptcy. Notably, investment banks reduced lending on average by 5.4 percentage points, and had a high money market dependence as well as a high exposure to the Lehman shock.

Table 2. Summary Statistics by Bank Types

Types	Number of Banks	All years (in USD millions) Total Loan	Total Deposit	Total Liabilities	2008 Loan growth	Money market dependence	Lehman Brothers Exposure (fraction)
Commercial Banks	301	15,684	20,086	24,093	0.204	0.062	0.060
		(37,962)	(52,809)	(66,464)	(0.318)	(0.115)	
		3,376	3,376	3,376	300	301	301
Cooperative Bank	422	2,510	4,271	5,312	0.291	0.007	0.002
		(11,540)	(23,482)	(32,636)	(0.147)	(0.030)	
		4,322	4,322	4,322	422	422	422
Investment Banks	11	8,923	5,045	14,704	-0.054	0.153	0.182
		(21,839)	(9,034)	(34,370)	(0.546)	(0.302)	
		95	95	95	11	11	11
Islamic Banks	5	1,428	2,671	2,767	0.345	0.001	0.000
		(782)	(1,552)	(1,612)	(0.769)	(0.001)	
		33	33	33	5	5	5
Savings Bank	8	2,271	13,286	24,028	0.102	0.001	0.125
		(3,521)	(32,564)	(44,966)	(0.102)	(0.002)	
		55	55	55	8	8	8
Total	747	8,225	11,111	13,590	0.249	0.031	0.029
		(27,171)	(39,573)	(50,893)	(0.252)	(0.090)	
		7881	7881	7881	746	747	747

Source: Author.

Table 3 presents the summary by economies, excluding cooperative banks. Japan is represented the most in this sample (111 banks). As noted elsewhere in studies that draw data from BankScope, this reflects the oversampling of banks from advanced economies. Banks in the sample are limited to larger banks for other economies.

Table 3. Summary Statistics by Economies

Regions	Number of Banks	All years (in USD millions) Total Loan	Total Deposit	Total Liabilities	2008 Loan growth	Money market dependence	Lehman Brothers Exposure (fraction)
CHINA	43	22,981	36,802	40,889	0.314	0.107	0.070
		(62,012)	(105,830)	(115,446)	(0.342)	(0.177)	
		364	364	364	43	43	43
HONG KONG	14	6,062	11,469	13,018	0.027	0.023	0.143
		(8,737)	(17,119)	(20,054)	(0.200)	(0.031)	
		56	56	56	14	14	14
INDONESIA	41	1,104	1,868	2,176	0.157	0.035	0.000
		(2,231)	(4,309)	(4,971)	(0.239)	(0.063)	
		416	416	416	41	41	41
JAPAN	111	21,255	26,122	31,991	0.295	0.047	0.045
		(43,006)	(53,870)	(75,006)	(0.066)	(0.079)	
		1611	1611	1611	111	111	111
KOREA	13	23,473	17,943	32,284	-0.169	0.271	NA
		(36,845)	(27,946)	(45,535)	(0.040)	(0.168)	
		152	152	152	13	13	13
MALAYSIA	30	2,816	4,159	4,596	0.022	0.035	0.000
		(6,040)	(8,026)	(8,957)	(0.481)	(0.097)	
		302	302	302	29	30	30
PHILIPPINES	18	1,051	1,829	2,075	0.247	0.008	0.167
		(1,347)	(2,407)	(2,713)	(0.828)	(0.012)	
		72	72	72	18	18	18
SINGAPORE	9	9,484	13,878	16,485	0.101	0.139	0.111
		(16,261)	(25,617)	(29,603)	(0.264)	(0.312)	
		38	38	38	9	9	9
TAIWAN	27	11,745	16,418	20,136	0.105	0.057	0.222
		(12,528)	(19,986)	(25,294)	(0.229)	(0.110)	
		337	337	337	27	27	27
THAILAND	19	8,304	9,642	10,588	0.186	0.061	0.053
		(8,719)	(9,863)	(10,619)	(0.425)	(0.128)	
		211	211	211	19	19	19
Total	325	15,164	19,418	23,643	0.195	0.062	0.065
		(37,221)	(51,699)	(65,258)	(0.337)	(0.125)	
		3559	3559	3559	324	325	325

Source: Author.

Table 4 lists banks with a positive Lehman exposure from our sample of banks and is ordered by the amount of exposure relative to total assets in 2008. The exposure on average is 0.49 percent of assets, indicating that the banks in general are diversified. Aozora Bank of Japan is exposed the most in terms of the absolute amount. The Reuters' report notes, however, that Aozora's net exposure could be less than US$25 million due to hedging and collateral. Inevitably, the true extent of exposure is difficult to assess, but this is the best available data we were able to obtain.

Table 4. The List of Banks Exposed to the Lehman Brothers Bankruptcy

ID	Bank Name	Country	Exposure (mil USD)	Ratio to Asset
853	RCBC Savings Bank Inc	PHILIPPINES	40	0.0407
77	Citibank (Hong Kong) Limited	HONG KONG	275	0.0211
858	Bank of Nova Scotia Asia Ltd (The)	SINGAPORE	93	0.0143
837	Bank of Commerce	PHILIPPINES	15	0.0074
168	Aozora Bank	JAPAN	463	0.0069
483	Mizuho Trust & Banking Co., Ltd	JAPAN	382	0.0055
848	Metropolitan Bank & Trust Company	PHILIPPINES	71	0.0054
875	Bank of Kaohsiung	TAIWAN	18	0.0031
889	EnTie Commercial Bank	TAIWAN	24	0.0027
924	Bangkok Bank Public Company Limited	THAILAND	101	0.0021
633	Shinsei Bank Limited	JAPAN	231	0.0020
893	Hua Nan Commercial Bank	TAIWAN	93	0.0017
70	Bank of East Asia Ltd	HONG KONG	54	0.0014
218	Chuo Mitsui Trust & Banking Co Ltd (The)	JAPAN	144	0.0009
879	Cathay United Bank Co Ltd	TAIWAN	33	0.0008
24	China Merchants Bank Co Ltd	CHINA	70	0.0003
628	Shinkin Central Bank	JAPAN	93	0.0003
45	Industrial Bank Co Ltd	CHINA	34	0.0002
913	Taiwan Business Bank	TAIWAN	7	0.0002
656	Sumitomo Mitsui Banking Corporation	JAPAN	177	0.0002
4	Bank of China Limited	CHINA	129	0.0001
898	Mega International Commercial Bank Co Ltd	TAIWAN	n.a.	n.a.
			121	0.0056

Source: Author.

4.3. Estimation Model

The goal of this section is to see if the banks that depend highly on money market funding reduced loans at the time of the GFC. We consider as our base-line specification the following adaptation of the one-step version of Kashyap and Stein (2000).

$$\Delta \ln L_{it} = \pi \Delta \ln L_{it-1} + g(M_{it};\Phi) + \sum_{t=2007}^{2008} \left[\rho_t D_t + g(M_{it};\Psi_t) D_t\right] + \sum_{j=2}^{10} \theta_j R_j + \sum_{t=1995}^{2006} \rho_t D_t + \sum_{k=1}^{5} \omega_k S_k + u_{it} \quad (1)$$

L_{it} is total loans of bank i at time t. Ideally, we would like to distinguish between commercial loans and residential loans but the breakdown is not reported in BankScope's Global Standardized Presentation. Changes in loans are regressed on past changes, as in Kashyap and Stein (2000). We include one lag, rather than four lags as in previous applications with quarterly data, since our data is annual. M_{it} is the measure of money market dependence, defined as the ratio of total deposits to money market funding. Money market funding is defined as *total liabilities* less *other liabilities* less *total loan loss reserve* less *total other funding*. Under BankScope's Global Standardized Presentation of the balance sheet, the latter term is identical to the *total money market funding*. We did not use *total money market funding* directly since we could not distinguish between missing observations and 0.

The distribution of M_{it} is heavily skewed toward 0, reflecting that most Asian banks rely on deposits for their main source of funding. To capture any non-linear relationship between a loan growth and a money market dependence, the model includes $g(.)$, a non-linear function of M_{it}. Φ is a vector of parameters of $g(.)$. We tried several specifications:

$$g(.) = \begin{cases} \beta_1 M_{it} \\ \alpha_1 K_{F(M_{it}|t)\geq 0.75} \\ \beta_1 M'_{it} + \beta_2 M'^2_{it} \\ \alpha_1 K_{F(M_{it}|t)\geq 0.75} + \alpha_2 K_{0.75>F(M_{it}|t)\, and\, M_{it}>0} \end{cases} \quad (2)$$

The first specification is a simple linear function of M_{it}. The second is a dummy specification. $F(.)$ represents a cumulative distribution function of M_{it}, conditional on year t. K is a dummy for M_{it} being in the top 25 percentile of the distribution of M_{it} at a given point in time, t. The set of banks that belongs to K=1 can change across years. As many of the banks in the bottom 75th percentile are close to zero, the latter term allows us to capture the average loan growth for banks at the higher end of the distribution. The third is a quadratic specification. Since M_{it} is less than one, we defined $M'_{it}=M_{it}+1$. The fourth is a 'step function,' augmenting the second specification by adding a dummy for non-zero M_{it} being in the bottom 75th percentile of the distribution.[3] The key difference between the second and fourth specifications is that the base sample is taken to be banks with zero money market dependence in the fourth specification, whereas the base is banks in the bottom 75th percentile in the second specification.

D_{2008} is a dummy variable for year 2008. Banks around the region adopt different timing of the financial years: many end on 31 December, while all Japanese banks and some Malaysian and Philippines banks end on 31 March. In the latest financial year available, most banks have one quarter after September 2008 while those in Japan, Malaysia and the Philippines have two quarters. With our annual data, the difference in fiscal year poses some inconvenience in interpretation. We define "year" to be a calendar year in which a financial year began.

$g(.)D_{2007}$ and $g(.)D_{2008}$ are the interaction terms of main interest. If the GFC affected money market dependent banks more, we would expect to observe a slower loan growth, or a contraction, for banks with higher money market dependence. A vector of parameters, Ψ, is designed to capture this effect. The Lehman shock occurred in September 2008, so any of those impacts are captured on the coefficient on $g(.)D_{2008}$. We have included the interaction term with year 2007 since the sub-prime mortgage crisis in the US began in 2007.

Our empirical model allows for heterogeneity in average growth rates by country and by bank types. R_j is the economic region dummies for 10 economies: 1. China, 2. Hong Kong, 3. Indonesia, 4. Japan, 5. Korea, 6. Malaysia, 7. The Philippines, 8. Singapore, 9.

[3] In addition, we implemented a spline function that included the top 25th percentile dummy and M_{it} but the result was hard to interpret due to collinearity.

Thailand and 10. Taiwan. China is the omitted category. D_t is year dummies. S_k is a dummy for bank types: 1. Commercial Banks, 2. Corporative Banks, 3. Investment Banks, 4. Islamic Banks, 5. Saving Banks. Commercial Banks is the omitted category. u_{it} is a heteroskedastic and idiosyncratic error term assumed to be serially uncorrelated.

OLS estimates produce unbiased estimates under the assumption that u_{it} is a white noise. To be consistent with Kashyap and Stein (2000), who report OLS estimates, we take OLS estimates as our baseline. One way in which OLS estimates become biased is if the true data generation process is such that u_{it} has a time-invariant component (i.e. $u_{it} = \mu_i + \nu_{it}$). Such a component may represent a bank-specific trend in loan growth over the sample period. In the presence of a fixed effect, the lagged dependent variable is mechanically correlated with u_{it}, leading to inconsistent estimates for short time series, as is well known in the dynamic panel regression literature (Baltagi, 2001). The time series dimension of data used by Kashyap and Stein (2000) is about 80 periods, so this dynamic panel bias is not of concern in their application. The time dimension in our unbalanced panel ranges from four to 16 periods. A simulation by Judson and Owen (1999) shows a substantial bias with 30 periods, so one may be concerned about the potential bias arising from the presence of some fixed components. To check robustness of the baseline OLS estimates, we implement the Difference GMM (Arellano and Bond, 1991) and the System GMM (Blundell and Bond, 1998). These estimation techniques are a widely applied solution to address the dynamic panel bias. In a setting close to ours, Gambacorta (2005) builds on Kashyap and Stein (2000) but estimates the Difference GMM.

4.4. Results: Combined Sample

Table 5 presents the estimation results. The lag of the dependent variable is highly significant across all specifications. The first column shows estimates for the linear specification (the raw value of money market dependence interacted with the dummy for year 2008 and 2007). The coefficient on the interaction term with 2008 has a negative coefficient, significant at the 1 percent level. The magnitude implies that, compared to banks with no money market funding, loans from a bank at the top 95 percent of M_{it} (=0.13 in 2008) grew 6 percentage points slower. A rough approximation

of the average impacts is that at most 3 percent of lending was reduced through the lending channel of the GFC transmission.[4] The coefficient on the interaction term with 2007 is low and not statistically significant. The second column shows the dummy variable specification. As with the linear specification, the estimate indicates a strong association between the high money market dependence and low loan growth in 2008 but not in 2007. The coefficient is negative and is significant at the 1 percent level. The magnitude of the coefficient on the interaction term with year 2008 indicates that the loans from the banks in the top 25th percentile of money market dependence grew on average 10.8 percentage points less than did the other category. The results from the third and fourth columns are qualitatively similar. The interaction term with the quadratic term for 2008 has a significantly positive coefficient (1.66), but the magnitude is much lower than that on the linear term (–4.68). These two terms are negative for all relevant ranges of $M'_{it} \in [1,2]$. The fourth column shows the "step function" specification. The interaction terms with dummies for medium dependence are not significant, and the results are similar to the simple dummy specification. Overall, the baseline analysis shows a negative association between loan growth and the degree of money market dependence in 2008.

To gauge the differences in the GFC impacts through the lending channel across the East Asian economies, Figure 2 presents the estimated impact of the GFC through money market funding. Specifically, the height in this bar chart represents negative impacts and is computed as the product of the coefficient estimate from column 1 in Table 5 (–0.463) and the average money market dependence in 2008 reported in Table 3. Higher values indicate greater impacts of the GFC through the lending channel. The estimate implies that Korea was affected the most, followed by Singapore and China, while the Philippines, Hong Kong and Indonesia were little affected. Pomerleano (2009) observes that Korea is unique in having a guaranteed loan for small- and medium-sized enterprises by the middle of 2009, and this relatively aggressive policy stance in Korea seems to support the result. Taking the estimates at face value, the importance of the lending channel appears to be heterogeneous across economies.

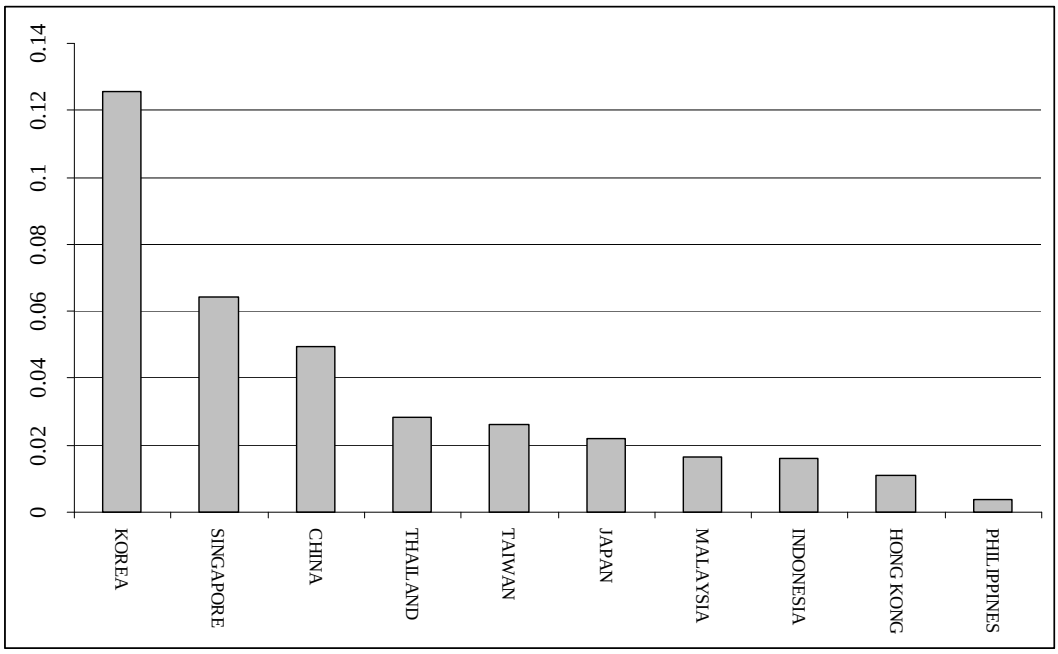
[4] This is based on the product of the coefficient (–0.463) and the average dependence in 2008 (0.065).

Table 5. OLS Estimates: All Sample

	(1) Raw	(2) Dummy	(3) Quadratic	(4) Step	(5) Exposure1	(6) Exposure2	(7) Exposure3
lagged dependent var.	0.186**	0.186**	0.185**	0.185**	0.185**	0.185**	0.186**
	(0.039)	(0.039)	(0.039)	(0.039)	(0.040)	(0.040)	(0.040)
MMDEP	0.117*		0.104+			0.087	
	(0.059)		(0.059)			(0.080)	
MMDEP × YEAR 2007	-0.005		-0.170			0.134	
	(0.094)		(0.815)			(0.138)	
MMDEP × YEAR 2008	-0.463**		-4.675**			-0.209	
	(0.163)		(1.008)			(0.173)	
HIGHDEP		0.017**		0.022**			0.014*
		(0.006)		(0.008)			(0.006)
HIGHDEP × YEAR 2007		0.001		-0.000			0.010
		(0.016)		(0.018)			(0.018)
HIGHDEP × YEAR 2008		-0.108**		-0.107**			-0.082**
		(0.025)		(0.027)			(0.026)
MIDDEP				0.008			
				(0.006)			
MIDDEP × YEAR 2007				-0.003			
				(0.012)			
MIDDEP × YEAR 2008				0.000			
				(0.017)			
MMDEP_SEQ × YEAR 2007			0.068				
			(0.307)				
MMDEP_SEQ × YEAR 2008			1.659**				
			(0.398)				
POSITIVE EXPOSURE					-0.017	-0.021	-0.023
					(0.017)	(0.018)	(0.017)
POS EXPO × YEAR 2007					0.001	-0.016	-0.005
					(0.034)	(0.036)	(0.037)
POS EXPO × YEAR 2008					-0.054+	-0.035	-0.017
					(0.030)	(0.035)	(0.037)
Hong Kong	-0.247**	-0.244**	-0.247**	-0.244**	-0.251**	-0.245**	-0.247**
	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)	(0.055)
Indonesia	-0.082**	-0.082**	-0.083**	-0.081**	-0.091**	-0.083**	-0.085**
	(0.026)	(0.027)	(0.026)	(0.027)	(0.027)	(0.027)	(0.027)
Japan	-0.164**	-0.167**	-0.165**	-0.168**	-0.170**	-0.164**	-0.168**
	(0.020)	(0.021)	(0.020)	(0.021)	(0.022)	(0.021)	(0.022)
Korea	-0.140**	-0.124**	-0.132**	-0.124**			
	(0.031)	(0.026)	(0.030)	(0.026)			
Malaysia	-0.182**	-0.182**	-0.183**	-0.179**	-0.192**	-0.184**	-0.186**
	(0.032)	(0.034)	(0.032)	(0.034)	(0.034)	(0.033)	(0.034)
Philippines	-0.113*	-0.114+	-0.118*	-0.114+	-0.116*	-0.108+	-0.115+
	(0.058)	(0.059)	(0.058)	(0.059)	(0.058)	(0.058)	(0.059)
Singapore	-0.028	-0.030	-0.058	-0.029	-0.048	-0.044	-0.038
	(0.087)	(0.083)	(0.086)	(0.083)	(0.086)	(0.087)	(0.084)
Thailand	-0.093**	-0.095**	-0.094**	-0.093**	-0.101**	-0.093**	-0.096**
	(0.030)	(0.031)	(0.030)	(0.031)	(0.031)	(0.030)	(0.031)
Taiwan	-0.135**	-0.136**	-0.136**	-0.136**	-0.134**	-0.131**	-0.133**
	(0.022)	(0.022)	(0.021)	(0.022)	(0.022)	(0.021)	(0.022)
Cooperative Bank	-0.013**	-0.013**	-0.016**	-0.010+	-0.014**	-0.012**	-0.013**
	(0.004)	(0.005)	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
Investment Banks	-0.104+	-0.104+	-0.111+	-0.103+	-0.097	-0.102	-0.098
	(0.062)	(0.060)	(0.062)	(0.061)	(0.063)	(0.064)	(0.062)
Islamic Banks	0.058	0.056	0.054	0.057	0.061	0.060	0.057
	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)	(0.065)
Savings Bank	-0.018	-0.011	-0.020	-0.010	-0.010	-0.015	-0.011
	(0.033)	(0.032)	(0.033)	(0.032)	(0.032)	(0.033)	(0.032)
Constant	0.237**	0.238**	0.134*	0.234**	0.251**	0.247**	0.250**
	(0.025)	(0.025)	(0.062)	(0.027)	(0.028)	(0.027)	(0.028)
Year dummies	YES	YES	YES	YES	YES	YES	YES
Observations	6341	6341	6341	6341	6218	6218	6218
R-squared	0.35	0.35	0.36	0.35	0.36	0.36	0.36

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Year dummies are included but are not shown

Figure 2. Heterogeneity in the Impacts through the Lending Channel



Source: Author.

4.4. Results: Country-by-Country Analysis

Thus far, the key coefficient estimates are based on the average of 10 economies. This approach allows us to utilize the variation in the money market dependence created by banks operating in different business environments. We have repeated the analysis for the subsample of banks from each economy. The advantages of focusing on an economy-by-economy analysis are twofold. First, the sample of banks is relatively homogenous within each economy. Unlike in the previous exercise, we will be asking whether or not a bank with more money market dependence reduced lending relative to its peers within an economy. Second, time-economy specific shocks are better accounted for by including time dummies.[5] To the extent that banks within one

[5] We have tried to account for economy-specific time effects by including the interaction term between country and time in the baseline regression in the previous section. With this control, the negative relationship between money market dependence and loan growth is no longer statistically significant. One interpretation of this result is that the observed association was caused by unobserved country–time specificity. Caution is required in interpretation, given the symptom of multicollinearity – a large number of variables have variance–inflation factors of more than 10. Further, to the extent that the exogenous cross-country differences in business practices led to the cross-country variations in money market dependence, the country–time effects absorb the genuine relationship between the two. The difficulty

economy share similar characteristics and are subject to similar shocks, this approach allows for a cleaner identification of the lending channel by keeping the sample relatively homogeneous. However, an economy-based regression entails basing it on a within-economy variation in money market dependence in identifying lending channels. The power of the test is likely to be low given the smaller variation in money market dependence within a single economy. Moreover, due to the partitioning, subsamples are quite small for some economies, particularly for Hong Kong, the Philippines and Singapore. Results for those economies are prone to influential observations. Thus, estimation results in this exercise should be viewed with caution, especially for those economies with small sample sizes.

We estimated a parsimonious version of Equation (1) given the small sample size. Specifically, instead of year dummies for all years, we lump all years except 2008 into one base. As in Table 1, we estimate specifications with an intercept change in 2008 and a slope change in 2008. In addition, K is redefined as a dummy for M_{it} being in the top 34^{th} percentile of the distribution of M_{it} at a given point in time t for a given country. Other specifications could not be implemented for some economies owing to small sample size so they are not shown. Finally, we split the Japanese sample into cooperative banks and all other banks since the sample size is relatively large.

Table 6 presents the summary of the main coefficients. Estimates are generally imprecise, as expected from smaller sample sizes and from a lower within-country variation in money market dependence. Notable exceptions are Hong Kong and Singapore and the Japanese banks that have positive and significant coefficients. For those countries, on average, banks with higher money market dependence increased loans faster than other less-dependent banks in the respective countries. This is contrary to the prediction that the money market constrained bank lending for those countries at the early stage of the GFC. This result suggests that banks in relatively advanced financial sectors did not experience any constraint on the lending channel. The result for Hong Kong and Singapore, however, should be viewed with caution given the small sample size.

---

distinguishing between alternative explanations precludes us from drawing a strong conclusion but it seems fair to suggest that the overall pattern indicates the transmission mechanism at work.

Malaysia and the Philippines have negative coefficients on all specifications that are sometimes significant at the 10 percent level. While the Philippines subsample is too small to draw reliable inference, the results show that Malaysian banks with higher money market dependence grew more slowly than their peers within their economy. While the overall importance of the lending channel was low in Malaysia, shown by the earlier analysis, this result suggests that the GFC constrained credit to some extent in Malaysia. Interestingly, as noted above many Malaysian and Philippines' banks have their financial year ending in March. It is possible that the longer coverage of the post-September 2008 operation in the sample might have made it easier to identify effects for those economies. The estimates for Korea, which has the highest average dependency ratio within our sample, are not significant, but this is likely to be due to the low within-economy variation and to the small sample size (13 banks).

Table 6. OLS Estimates: Country-by-Country

	CHINA	HONGKONG	INDONESIA	JPNCOOP	JPNBANKS	KOREA	MALAYSIA	PHILIPPINES	SINGAPORE	THAILAND	TAIWAN
INTERCEPT	0.003	0.370*	-0.026	-0.006	0.020*	-0.064	-0.347	-0.284+	0.278+	0.096	0.036
	(0.008)	(0.136)	(0.099)	(0.009)	(0.010)	(0.048)	(0.301)	(0.149)	(0.152)	(0.105)	(0.055)
R-squared	0.05	0.31	0.15	0.34	0.39	0.21	0.11	0.42	0.66	0.15	0.20
SLOPE	0.154	5.808*	-1.515	0.129	0.215+	0.004	-6.538+	-4.672	0.516**	-0.253	-0.173
	(0.384)	(2.310)	(1.727)	(0.140)	(0.111)	(0.116)	(3.851)	(8.637)	(0.106)	(0.370)	(0.208)
R-squared	0.08	0.30	0.15	0.34	0.39	0.21	0.11	0.47	0.65	0.15	0.20
Observations	280	28	316	3456	1366	123	243	36	20	169	281

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%.

Source: Author.

4.5. Did Lehman-exposed Banks Reduce Lending More?

As a preliminary examination to see whether direct exposure to the Lehman Brothers' bankruptcy shock affected lending, Table 7 compares the means of loan growth over 2007–2008 for those banks with any exposure to the Lehman shock and those without. The sample excludes Korea since we do not have bank-level information on exposure for Korean banks. On average, the total amount of loans in US dollars increased by 25.8 and 19.3 percent, respectively, for those with and without exposure. The difference in mean is significant at the 10 percent level. Thus, a simple comparison suggests the negative impact of direct exposure to the Lehman shock.

Table 7. Loan Growth (2007–2008) by the Lehman Exposure

	Positive Exposure	No Exposure	Difference
Loan Growth	0.190	0.259	0.069
	(0.156)	(0.250)	[0.058]
No. of Obs.	22	711	

Note: Standard deviations in parentheses. P-value for a two-tailed *t*-test with unequal variance in bracket. The sample is from 2008 and excludes Korea.

Source: Author.

We have tried incorporating a dummy variable for positive exposure in the baseline model. Columns 5 through 7 in Table 5 present the results. Column 5 shows the result from a model that does not include the money market dependence variable. The coefficient on the interaction term between the exposure dummy and the 2008 dummy is –0.054 and is significant at the 10 percent level. The coefficient on the interaction term with the 2007 dummy is 0.001 and is not significant. The correlation is no longer significant when the raw value of money market dependence or its binary transformation is included (Columns 6, 7). This is not surprising given the high correlation between positive exposure and money market dependence. Conditional on money market dependence being in the top 25th percentile of the sample, 7.5 percent had positive Lehman exposure whereas those below the top 25th percentile had only 1.25 percent positive exposure. However, we did not find any strong indication of a collinearity problem, suggesting that direct exposure to the Lehman shock alone is not important in explaining the lending behavior of banks. One possible explanation is that there was a measurement error in the Lehman exposure that attenuated the estimated effects. However, the results suggest that banks were sufficiently hedged against the Lehman shock.

4.6. Robustness Check

As the analysis so far has presumed no individual-specific trends in loan growth, OLS was a sensible estimation method given the assumption. To check the sensitivity of the estimates to this assumption, we have implemented the Difference GMM (Arellano and Bond, 1991) and the System GMM (Blundell and Bond, 1998). Table 8 presents the

results for the baseline specification. The first two columns show the results from the Difference GMM estimates, the last two columns show the results from the System GMM estimates. The specification tests indicate no second-order autocorrelation in the error term.

Table 8. Robustness Check: Difference and System GMM

	(1) Difference	(2) Difference	(3) System	(4) System
L. First Difference of LN(Loan)	0.194**	0.188**	0.219**	0.214**
	(0.045)	(0.044)	(0.043)	(0.012)
MMDEP	-0.142		-0.002	
	(0.225)		(0.231)	
MMDEP × YEAR 2007	-0.279		-0.284	
	(0.172)		(0.193)	
MMDEP × YEAR 2008	-0.866**		-0.896**	
	(0.208)		(0.227)	
HIGHDEP		0.014		0.025*
		(0.014)		(0.011)
HIGHDEP × YEAR 2007		-0.039+		-0.035+
		(0.022)		(0.018)
HIGHDEP × YEAR 2008		-0.174**		-0.175**
		(0.032)		(0.020)
Constant	0.148**	0.142**	0.151**	0.146
	(0.036)	(0.036)	(0.031)	(0.127)
Observations	5587	5587	6341	6341
Number of id	745	745	745	745
m_2	0.196	0.170	0.235	0.212

Note: Robust standard errors in parentheses. + significant at 10%; * significant at 5%; ** significant at 1%. Time dummies, country dummies, and bank type dummies are included but are not shown.

Source: Author.

The estimates from both estimation methods are qualitatively similar to those from the OLS baseline. In particular, the interaction terms with the 2008 dummy are negative and significant, indicating that the result is not sensitive to the assumption of no individual specific trend. There are some differences from the benchmark. Interestingly, the interaction terms with the 2007 dummy are significant for the dummy variable specification. The interaction of the raw value with the 2007 dummy is still not significant, indicating the sensitivity of the estimate to the model specification. Given

this sensitivity, it remains difficult to conclude the effect of the financial crisis transmitted to East Asia through the lending channel in 2007.

5. Conclusion

This paper applied two techniques developed in discussions of monetary transmission mechanisms to study the impacts of the GFC on the supply of bank loans in East Asia. Following Kashyap et al. (1993), we first examined aggregate data on the ratio of commercial papers to bank loans for Korea, Japan and Taiwan. We then applied the two-step regression procedure considered by Kashyap and Stein (2000), with suitable modifications to fit the available data, on 10 East Asian economies. The results from these two complementary techniques suggested that Korea would have experienced a temporary credit crunch as a result of the GFC. In contrast, Japanese banks appeared to have countered the GFC shock by increasing lending, suggesting that the main bank system is still alive. Data limitations prevent us from offering strong conclusions for other economies, but the impacts on ASEAN countries in our sample would have been small except for Singapore. Malaysia exhibited some indication of a credit crunch but its extent is estimated to be much smaller than in Korea. Taiwan also exhibited symptoms of a credit crunch in our analysis of macro variables, but this result was not corroborated in the analysis of bank-level data. Banks from mainland China were predicted to be affected, but their actual performance, in terms of the amount of loans extended, was robust, suggesting some other factor was in operation in China. A rough estimate is that at most 3 percent of lending was reduced through the lending channel of the GFC transmission, but the substitution of other sources of funding would have reduced the impacts of reduced bank lending. Overall, our exercise indicated that the GFC was transmitted through the lending channel to East Asian economies, but the effects were heterogeneous within the region.

These results have bearings on the financial integration in the region. Our finding suggests that a financial shock that originated in the US had heterogeneous impacts on East Asian economies. Closer integration of the financial sector of a region could mean that a shock to one country is likely to transmit across national borders. The shock, for instance, could be transmitted through the presence of foreign banks (Peek and

Rosengren, 1997) or could come about from a convergence in the models of bank and corporate financing. Since closer financial integration of East Asia could increase the risk of exposure to external shocks as a result of easier transmission within the region, it seems worthwhile to develop a framework for containing contagion from a weak link in the system. Such a framework could take the form of cross-border supports by injecting liquidity into economies that are hardest hit by an external shock. While regulators must watch for moral hazard, a risk-sharing framework seems a desirable accessory to closer financial integration. This would be a counterpart to the proposals for greater risk sharing in consumption that emerges from the paper by Corbett and Maulana in this volume.

Future Research

Finally, we view this paper as an early attempt to understand the transmission of the current financial crisis to East Asia and further work is necessary before making stronger conclusions.

- First, to better understand the impacts beyond the short-term impacts, the sample needs to be extended to cover a greater post-crisis period.
- Second, the data may be extended to make more precise inference: quarterly data would enable researchers to pinpoint the timing of changes; impacts on businesses are better analyzed with information on narrower categories of loans; and to limit any issues arising from the sample selection, more coverage of smaller lending institutions beyond that covered by BankScope is necessary. Comprehensive regulatory data on banks around the region would be a significant contribution to research.
- Third, we were not able to conduct an analysis of mix variables for ASEAN due to data limitations and it would be of interest to see the behavior of this variable.
- Fourth, our sample is restricted to banks that are operating in 2008, and does not include banks that were closed or absorbed. This restriction prevented us from comparing the impacts of current the GFC with the Asian financial crisis of 1998, but such a comparison would be of great interests.

References

Amiti, Mary, and David E. Weinstein (2009). "Exports and Financial Shocks." *NBER Working Paper* No. 15556. Cambridge, MA: NBER.

Arellano, Manuel, and Stephen Bond (1991). "Some Tests of Specification for Panel Data: Monte Carlo Evidence and Application to Employment Equations." *Review of Economic Studies* 58: 277–97.

Ashcraft, Adam (2006). "New Evidence on the Lending Channel." *Journal of Money, Credit and Banking* 38, no. 3: 751–75.

Baltagi, Badi H. (2001). *Econometric Analysis of Panel Data*. England: John Wiley & Sons.

Blundell, Richard, and Stephen Bond (1998). "Initial Conditions and Moment Restrictions in Dynamic Panel Data Models." *Journal of Econometrics* 87: 115–43.

Borensztein, Eduardo, and Jong-Wha Lee (2002). "Financial Crisis and Credit Crunch in Korea: Evidence from Firm-level Data." *Journal of Monetary Economics* 49, no. 4: 853–75.

Cecchetti, Stephen G. (2009). "Crisis and Responses: The Federal Reserve in the Early Stages of the Financial Crisis." *Journal of Economic Perspectives* 23, no. 1: 51–75.

Gambacorta, Leonardo (2005). "Inside the Bank Lending Channel." *European Economic Review* 49, no. 7: 1737–59.

Gambacorta, Leonardo, and Paolo Emilio Mistrulli (2004). "Does Bank Capital Affect Lending Behavior?" *Journal of Financial Intermediation* 13, no. 4: 436–57.

Hoshi, Takeo, Satoshi Koibuchi, and Ulrike Schaede (2009). "Changes in Main Bank Rescues during the Lost Decade: An Analysis of Corporate Restructuring in Japan 1981–2007." Paper presented at the NBER Japan Project Meeting June 30–July 1, 2009.

Judson, Ruth A., and Ann L. Owen (1999). "Estimating Dynamic Panel Data Models: A Guide for Macroeconomists." *Economics Letters* 65, no. 1: 9–15.

Kashyap, Anil K., and Jeremy C. Stein (1995). “The Impact of Monetary Policy on Bank Balance Sheets.” *Carnegie–Rochester Conference Series on Public Policy* 42: 151–95.

Kashyap, Anil K., and Jeremy C. Stein (2000). “What Do a Million Observations on Banks Say about the Transmission of Monetary Policy?” *American Economic Review* 90, no. 3: 407–28.

Kashyap, Anil K, Jeremy C Stein, and David W Wilcox (1993). “Monetary Policy and Credit Conditions: Evidence from the Composition of External Finance.” *American Economic Review* 83, no. 1: 78.

Oliner, Stephen D., and Glenn D. Rudebusch (1993). “Is There a Bank Credit Channel for Monetary Policy?” *Finance and Economics Discussion Series, Federal Reserve Board*, 93–8.

Peek, Joe, and Eric S Rosengren (1997). “The International Transmission of Financial Shocks: The Case of Japan.” *American Economic Review* 87, no. 4: 495–505.

Pomerleano, Michael (2009). “What Is the Impact of the Global Financial Crisis on the Banking System in East Asia?” *ADBI Working Paper Series*, 146.

Siregar, Reza (2010). “Trade Financing and Export Performance in Asia. Experiences of Indonesia, Korea and Thailand.” Chapter 7 of this volume.