Chapter 16

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Chapter 16

Banking Structures and the Transmission of Shocks to the Real Sector

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International financial linkages—particularly disruption in the money markets—are thought to have propagated the sub-prime crisis from the United States to the rest of the world. We examine empirically the role of the money market in transmitting the Global Financial Crisis (GFC) to the East Asian economies. We take a comparative perspective by comparing Asian credit institutions with those from the European Union and Anglo-Saxon countries. We also consider the role of the money market in the transmission mechanism during the Asian Financial Crisis (AFC) of 1998. The base sample is an unbalanced panel of 7,119 credit institutions observed over 1995–2009. The findings suggest that the financial sector's dependence on wholesale funds is a more important source of vulnerability in Asian economies than in other developed economies. One policy message is that the supervisory authorities in the region therefore should keep a watchful eye on wholesale-dependent banks when financial shocks occur outside the region.

Keywords: credit crunch, financial contagion, non-core liabilities

JEL Classifications: G01, G21, G14

1. Introduction

The transmission mechanism of the sub-prime crisis from the United States to the rest of the world has spurred lively academic debates. Clearly, trade linkages with the United States played a role in transmitting the shock, but Levchenko et al. (2009) have shown that the reduction in trade volume is not sufficient in explaining the rapid slowdown in overall economic activity. This indicates that factors other than the real-sector shock must have been important in the transmission mechanism. Brunnermeier (2009) and Shin (2009), among others, point to the importance of international financial linkages, particularly the disruption in money markets. The mechanism, as articulated by Raddatz (2009), goes as follows: financial institutions worldwide have increasingly relied on wholesale funding to supplement demand deposits as a source of funds (Adrian and Shin, 2009); the short-term wholesale funds collapsed during the Global Financial Crisis (GFC), forcing banks to shrink their balance sheets by cutting back on lending.

Recent empirical studies support this *money-market transmission hypothesis*. Raddatz (2009) shows that the stock price of banks with larger dependence on wholesale funding fell faster at the time of the Lehman shock of September 2008. Corbett et al. (2010) complement this result on impacts on financial variables by presenting evidence of the *lending channel*: the GFC affected banks that were dependent on the money market more than banks that relied on customer deposits for funding.

Our paper aims to examine further the money-market transmission hypothesis in Asia. The previous study by Corbett et al. (2010) examined the relevance of the

money-market transmission hypothesis using a sample of East Asian credit institutions, emphasizing intra-regional diversities. Our current analysis differs in that we compare Asian credit institutions with those from other regions using data from the European Union and Anglo-Saxon countries. Furthermore, we examine whether a similar mechanism was at work during the Asian Financial Crisis (AFC) of 1998. In a study that compared the GFC with the Great Depression of the 1930s, Almunia et al. (2010) offer an insightful analysis on the effectiveness of macroeconomic policies. A comparison of banks' behavior during the AFC and the GFC would likewise be of interest. Conventional wisdom suggests that Asian banks typically follow the traditional mode of banking practice and that the impact of the GFC was limited due to the limitation in exposure to toxic assets (Pomerleano, 2009). We ask whether the reliance on retail deposits enabled Asian banks to withstand the current crisis compared with their peers in other countries.

For this project, we obtained the individual balance sheets of credit institutions from the Bankscope database for 1995–2009. The sample base for Asian credit institutions consists of 807 credit institutions from 10 Association of South-East Asian Nations (ASEAN) countries, plus China, Hong Kong, India, Japan, Korea and Taiwan. The European sample includes 1,325 credit institutions from 16 EU countries, including Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain and Sweden. Our "Anglo-Saxon" sample includes 786 credit institutions from Australia, Canada, New Zealand, the United Kingdom and the United States. The base sample thus contains 7,119 credit institutions. This sample coverage is much broader than those in the previous studies on the money-market transmission hypothesis.

In this project report, we first explore this large panel data set of credit institutions to document stylized facts about the behavior of credit institutions. Our emphasis is on cross-region comparison to highlight specificities within Asia. We then replicated Raddatz's (2010) analysis of cross-section analysis with our sample to look for evidence of the transmission through the money-market channel. Here, the levels of loans at a period after the onset of a crisis are regressed on a measure of wholesale dependence, the level of loans before the crisis, and control variables. Since our interest is in understanding the cross-country transmission of shocks, the sample to examine the GFC excludes the United States. The analysis of the AFC considers Thailand, Korea and Indonesia as epicenters (Corbett and Vine, 1999) and thus excludes them.

In summary, our sample exhibits a robust bank liability growth over the sample period before the crisis, especially after 2005. The level of liabilities remained roughly constant after 2007. While deposits are the major component of bank liabilities, there is an increasing reliance on non-core liabilities for the EU and Anglo-Saxon countries. The wholesale dependence thus has risen markedly. Asian financial institutions tended not to increase their reliance on non-core liabilities compared with the other regions. Alongside the growth in bank liabilities, aggregate loans for all regions increased rapidly after the turn of the century until 2007; the total amount of loans in US dollars more than doubled from 2001 to 2007. After the onset of the GFC, loans declined sharply for the EU and Anglo-Saxon countries, but continued to grow in Asia due to continued growth in some of the Asian countries such as China and India. A simple plot of the loan growth to wholesale dependence indicates a negative correlation during the crisis periods and no correlation during other periods. The negative correlation is stronger during the GFC than during the AFC.

The regression analysis confirmed the validity of the money-market transmission hypothesis for the GFC. A model that allows for heterogeneous effects across regions showed a curious pattern: among high wholesale-dependent credit institutions, the GFC had a strong effect in Asia but not in other regions, despite Asia's lower overall wholesale dependence and continued growth in credit provision. This pattern suggests that the large drop in credit for the EU and Anglo-Saxon countries (which excludes the United States for being the GFC epicenter) might have been largely driven by the decline in investment demand by firms in those regions. The stronger effects for Asia suggest flight-to-quality effects: for a given level of wholesale dependence, the impacts of the wholesale market collapse were larger for Asian credit institutions because of higher average country risks in the Asian region that exacerbated the ability of credit institutions in the region to attract funds. This result for Asia is consistent with the finding in Corbett et al. (2010) that shows a statistically significant link between wholesale dependence and loan growth, especially for Korea.

During the AFC, this transmission channel—on average for all regions—was not important. This discrepancy with the result from the GFC suggests that the regional nature of the AFC left credit institutions in the EU and Anglo-Saxon countries unscarred. Indeed, a model that allows for heterogeneous effects across regions showed the AFC had a strong effect in Asia but not in other regions. That is, credit institutions in Asia (excluding those from Thailand, Korea and Indonesia) with high wholesale dependence reduced loans more rapidly during the AFC.

A further investigation should be conducted to ascertain the finding on heterogeneous impacts. To draw a policy implication, the finding suggests that the financial sector's dependence on wholesale funds is a more important source of

vulnerability in Asian economies than in other developed economies. Therefore the supervisory authorities in the region should keep a watchful eye on wholesale-dependent banks when financial shocks occur outside the region.

The rest of this project report is organized as follows. We first describe the construction of the data set and report the results of preliminary examination. We then describe an empirical approach and report the results. The final section concludes.

2. Data

We initially obtained bank-level data for 9,163 existing as well as discontinued credit institutions from Asia, Europe and Anglo-Saxon countries from Bureau Van Dijk's Bankscope. We included discontinued credit institutions in the sample because our analysis requires estimating the impacts of the AFC, and an estimation based on a survivor sample would likely be biased due to the sample selection process. The sample coverage is determined by the coverage in Bankscope and our access rights, so it is not all the credit institutions from those regions.[1]

The coverage of credit institutions in Bankscope has undergone some changes. As a result, the number of credit institutions occasionally exhibits large discontinuous rises. For example, the increase in the number of Asian credit institutions in 1998 is due entirely to an expanded coverage of Japanese cooperative banks in Bankscope. Another discontinuity is found for the European Union—especially for Italy and Spain—in 2005. To maintain consistency in the sample, we dropped all Japanese

[1] Our initial sample of US financial institutions includes 1,012 banks.

cooperatives. We also dropped credit institutions that Bankscope started covering after 2005 for all regions. This deletion left 7,119 credit institutions in the base sample. Table 1 shows the number of operating credit institutions in the sample. An "operating bank" is defined as a bank with non-missing information on operating profits. On average, 57 percent of credit institutions are in operation each year out of all samples of credit institutions.

Table 1. The Number of Operating Credit Institutions in the Sample by Region

YEAR	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	Av.	Coverage
ASIA	558	584	565	556	551	550	538	540	566	612	565	596	609	582	511	566	48%
ANGLO	853	862	847	803	872	824	812	780	747	719	678	687	665	638	590	758	53%
EU ex UK	2,760	2,875	2,928	3,072	3,014	2,875	2,839	2,693	2,569	2,547	2,497	2,559	2,599	2,513	2,248	2,706	60%
TOTAL	4,171	4,321	4,340	4,431	4,437	4,249	4,189	4,013	3,882	3,878	3,740	3,842	3,873	3,733	3,349	4,030	57%

Source: The original source is Bureau Van Dijk's Bankscope.

Note: Authors' tabulation of operating credit institutions in the base sample. An "operating bank" is defined as a bank with non-missing information on operating profits. "Coverage" refers to the ratio of an average number of credit institutions in operation each year to a number of credit institutions in the base sample. "Asia" includes 16 Asian countries and economies. "Anglo" includes five Anglo-Saxon countries. "EU ex UK" includes 16 EU countries.

Table 2 tabulates the number of credit institutions in the base sample by country and by type. The sample of Asian credit institutions includes 1,177 institutions from 16 economies including 10 ASEAN countries plus China, Hong Kong, India, Japan, Korea and Taiwan. The sample of Anglo-Saxon credit institutions includes 1,440 institutions from Australia, Canada, New Zealand, the United Kingdom and the United States. The sample of European credit institutions includes 4,502 institutions from 16 EU nations including Austria, Belgium, Cyprus, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain and Sweden. Commercial banks are represented the most (N = 2,918), followed by cooperative banks (N = 1,868) and then by savings banks (N = 1,332).

Table 2. The Base Sample of Credit Institutions by Country/Economy and Specialization

Country Name	Commercial Banks	Cooperative Banks	Investment Banks	Islamic Banks	Other Non Banking Credit Institution	Real Estate & Mortgage Banks	Savings Banks	Specialized Govt. Credit Institutions	Total
ASIA									
BRUNEI DARUSSALAM	2	0	0	2	0	0	0	0	4
CAMBODIA	10	0	0	0	0	0	0	0	10
CHINA-PEOPLE'S REP.	128	3	6	0	1	0	1	2	141
HONG KONG	49	0	41	0	2	0	0	0	92
INDIA	78	8	17	0	0	2	0	8	113
INDONESIA	107	0	4	1	0	0	0	0	112
JAPAN	179	0	58	0	3	0	1	6	247
KOREA REP. OF	32	2	43	0	2	0	2	3	84
LAOS	5	0	0	0	0	0	0	0	5
MALAYSIA	53	1	24	12	1	0	0	5	96
MYANMAR UNION OF	4	0	0	0	0	0	0	0	4
PHILIPPINES	28	0	1	0	1	0	3	2	35
SINGAPORE	26	0	31	1	2	1	1	0	62
TAIWAN	47	1	24	0	1	0	1	2	76
THAILAND	22	0	28	0	1	0	1	4	56
VIETNAM	37	0	1	0	0	0	0	2	40
SUBTOTAL	**807**	**15**	**278**	**16**	**14**	**3**	**10**	**34**	**1,177**
ANGLO-SAXON									
AUSTRALIA	38	1	18	0	3	10	0	4	74
CANADA	18	4	7	0	1	1	1	0	32
NEW ZEALAND	11	0	2	0	1	2	0	0	16
UNITED KINGDOM	181	0	57	4	8	59	7	1	317
USA	538	6	60	0	0	12	370	15	1,001
SUBTOTAL	**786**	**11**	**144**	**4**	**13**	**84**	**378**	**20**	**1,440**
EU ex UK									
AUSTRIA	96	113	5	0	3	15	95	3	330
BELGIUM	78	13	5	0	1	3	20	3	123
CYPRUS	23	2	2	0	0	0	1	0	28
DENMARK	67	7	2	0	2	10	56	2	146
FINLAND	11	0	0	0	0	3	2	4	20
FRANCE	289	123	15	0	27	27	43	16	540
GERMANY	272	1,407	12	0	9	74	609	35	2,418
GREECE	19	1	3	0	0	1	1	1	26
IRELAND	34	0	5	0	0	9	1	0	49
ITALY	107	156	9	0	13	1	22	12	320
LUXEMBOURG	148	2	3	0	1	0	1	0	155
MALTA	13	0	1	0	0	0	1	1	16
NETHERLANDS	57	1	1	0	1	7	3	2	72
PORTUGAL	27	2	6	0	3	1	2	1	42
SPAIN	55	14	2	0	2	2	10	4	89
SWEDEN	29	1	5	0	1	10	77	5	128
SUBTOTAL	**1,325**	**1,842**	**76**	**0**	**63**	**163**	**944**	**89**	**4,502**
TOTAL	**2,918**	**1,868**	**498**	**20**	**90**	**250**	**1,332**	**143**	**7,119**

Source: Authors' computation of the base sample drawn from Bankscope.

Since we examine growth in loans at the individual bank level, one concern is that mergers and acquisitions (M&As) compromise the consistency of a panel unit. We account for M&As as follows: we first tabulated the information on M&As in the "bank history" section contained in Bankscope, and then split a unit if M&As are recorded.

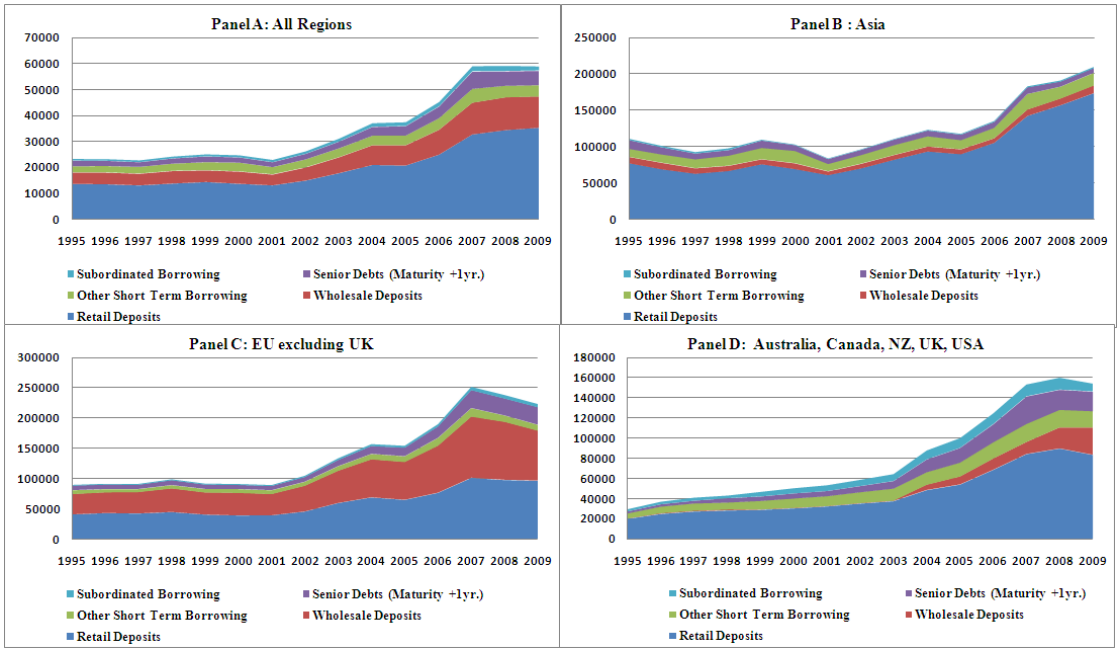
That is, we treat a surviving bank as two different panel units before and after a merger. A non-surviving bank in the data ceases to exist after a merger. The data with this treatment of M&As led to 10,704 units.

We obtained unconsolidated financial statements in the universal banking format, so that balance-sheet items are comparable across countries. The data are in current US dollars.

3. Preliminary Examinations

Panel A in Figure 1 shows the changes in the composition of bank liabilities, aggregated over the base sample, from 1995 to 2009. The unit in Panel A is in trillions of US dollars. Overall, bank liabilities grew over the sample period—especially rapidly after 2005, but remained roughly constant after 2007. Deposits from customers and credit institutions are the major component of bank liabilities. Raddatz (2010) defines the dependency ratio as 1 minus the ratio of deposits to total liabilities, and documents an increase in dependency since 2003. Our sample—which includes US credit institutions, unlike Raddatz (2010)—also exhibits an increasing reliance on non-core liabilities (other short-term borrowings, senior debt maturing after one year, and subordinated borrowing), but this rise in non-core liabilities is not as stark as in his sample.

Figure 1. The Composition of Bank Liabilities from 1995 to 2009



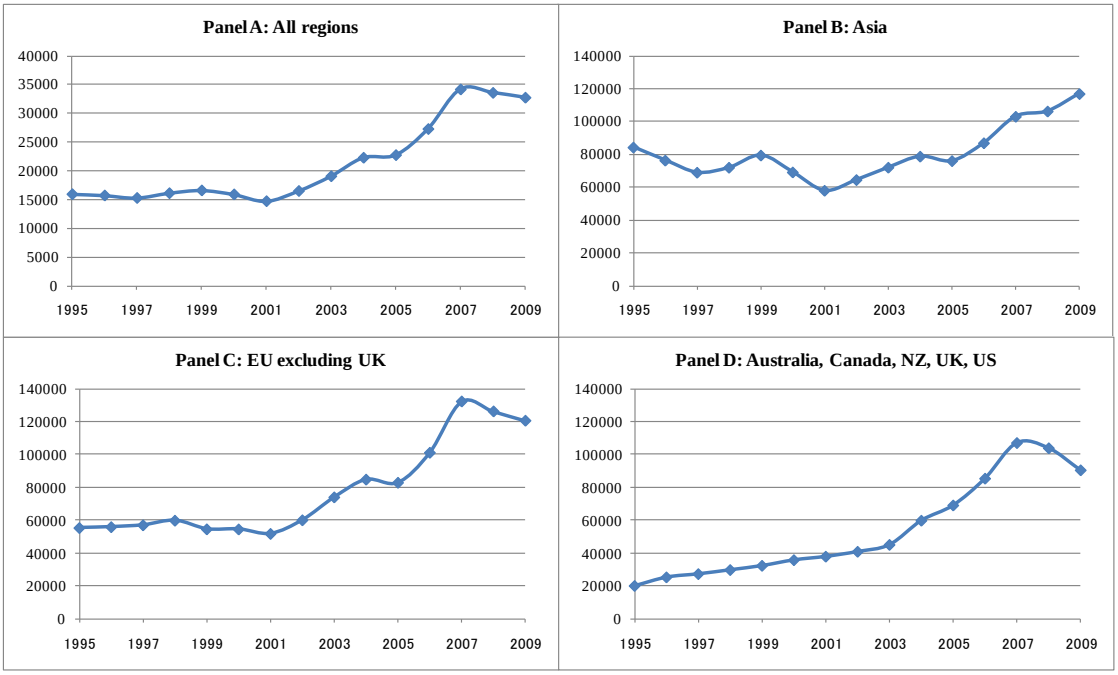
Note: All financial figures are aggregated over credit institutions in the base sample. The unit in Panel A is in trillions of US dollars. The unit in Panels B, C and D is in 100 billions of US dollars.

Panels B, C and D show the composition of liabilities over the three regions (Asia, European Union and Anglo-Saxon). The unit is in 100 billions of US dollars. After 2007, overall liabilities increased in Asia, moderately fell in the Anglo-Saxon countries, and fell fastest in the European Union. Of all regions, the Anglo-Saxon countries have the highest composition of non-core liabilities followed by the European Union and Asia. Comparing the non-core liabilities in the European Union with Asia, the European Union tends to rely on senior debt with maturity of more than one year, whereas Asia tends to rely on other short-term borrowings, including the money market.

Figure 2 describes the overall behavior of the amount of aggregated bank loans. "Loans" are net loans, which is gross loans minus loan loss reserves. Panel A aggregates the sample credit institutions from all regions. It reveals rapid growth in

credit: the total amount more than doubled from 2001 to 2007. As we saw earlier, credit institutions financed this rapid growth in loans with both non-core liabilities and deposits. Loans fell after the onset of the GFC. Panel B shows bank loans in Asia, which behave differently from the overall pattern. Bank loans in Asia continue to grow despite the GFC. The robust growth in China is a factor behind this growth. The patterns for EU and Anglo-Saxon countries are close to the aggregated figure. Recall that the composition of non-core deposits was higher in EU and Anglo-Saxon countries. At face value, the declines in loans for the last two regions lend support to the conjecture that non-core liabilities were the transmission channel of the financial shock.

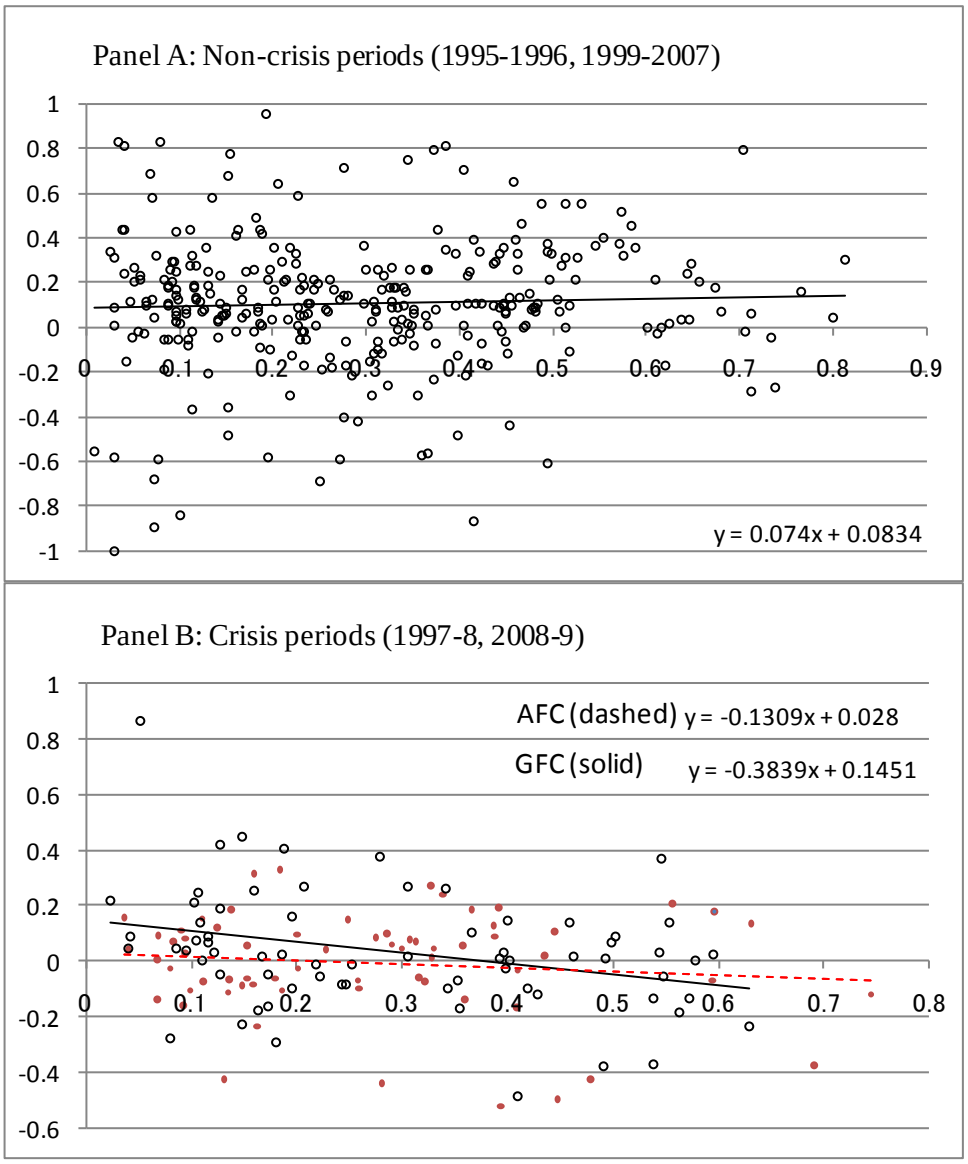
Figure 2. The Aggregated Bank Loans by Region



Note: Total amounts of net loans (gross loans minus loan loss reserves) of the base sample credit institutions by relevant regions. The unit in Panel A is in trillions of US dollars. The unit in Panels B, C and D is in 100 billions of US dollars.

Figure 3 presents a preliminary look. The figure plots loan growth on the y-axis against lagged wholesale dependencies on the x-axis. Both loan growth and wholesale dependence are computed by aggregating relevant balance-sheet items of the base sample credit institutions over country and time. Each "dot" thus represents the country–year (weighted) average of those variables. Negative net loans are not used in computation. The figure is based on all countries except Brunei and Myanmar that exhibited unusually fast loan growth. Loan growth of more than 100 percent is also excluded because of small cross-year differences in the coverage. Panel A is for "non-crisis" periods (1995–96 and 1999–2007). Some loan growth is still large even with the aforementioned selection, possibly due to changes in sample coverage in small countries. The pattern reveals no systematic relationship between two variables. If anything, the coefficient from a simple regression is 0.074, suggesting a positive relationship between wholesale dependence and growth of loans when business is as usual. The coefficient is not statistically significant.

Figure 3. The Correlation Between Loan Growth and Lagged Wholesale Dependencies



Note: Both loan growth and wholesale dependence are computed by aggregating relevant balance-sheet items of the base sample credit institutions over country and time. In Panel B, clear and filled dots represent observations from the GFC and the AFC respectively.

Panel B is for the two "crisis" periods (1997–98 and 2008–09). The filled dots are for the AFC and the clear dots are for the GFC. Here, the correlation seems to be negative, and the regression coefficient from a simple regression on a two-crisis combined sample is –0.257 and is statistically significant (not presented). Excluding

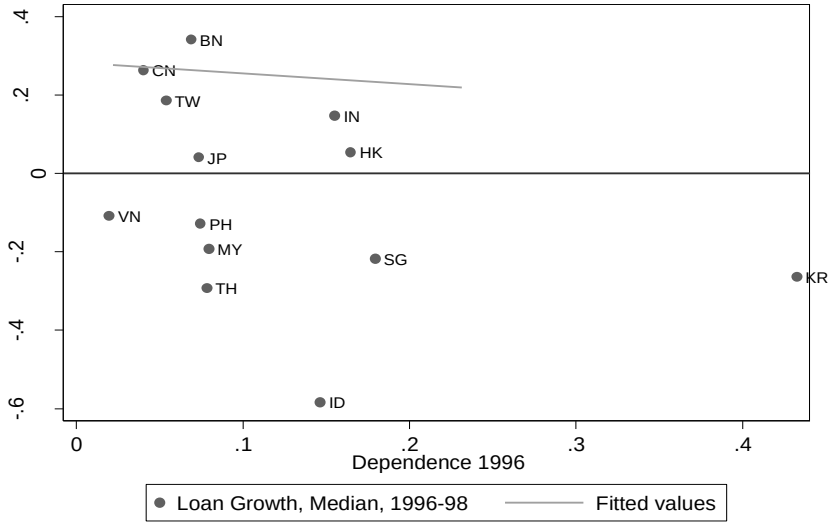
an outlier, Laos, does not affect the significance level, though the coefficient falls to –0.210. While a few countries exhibit large declines in loans during the AFC (Australia, Thailand, Indonesia and the United Kingdom), the relationship between the two variables is not apparent and the regression coefficient of –0.13 is not significant. During the GFC, in contrast, the variable exhibits a strong correlation of –0.38 and is statistically significant. Thus, a simple examination suggests that wholesale dependence mattered more during the GFC, perhaps due to the global nature of the crisis and also due to the increasing integration of financial markets across the regions. It would appear, however, too hasty to dismiss the wholesale market channel in the AFC since the regional, rather than global, nature of the crisis might have had a limited impact on countries outside Asia.

To focus on Asia, Figure 4 plots median growth in net loans of individual credit institutions for each country against averages of pre-crisis wholesale dependence of individual credit institutions. In Panel A for the AFC, pre-crisis is taken to be 1996, and the y-axis shows loan growth over 1996–98. Laos, Myanmar and Cambodia are not in this plot because they lack sufficient data. The epicenter countries—Indonesia, Korea and Thailand—are more severely affected in terms of the decline in loans. Notably, Korea is highly dependent on wholesale funding and also experiences a large loan decline. The fitted line to this sample of 13 countries has a negative slope of –0.873. While not statistically significant, this suggests that the dependence on wholesale funding could have been a potential source of vulnerability then as it was during the GFC. Panel B is for the GFC, where the pre-crisis period is taken to be 2007, and the y-axis shows loan growth over 2007–09. Myanmar is not in this plot because of data unavailability. Wholesale dependence had visibly declined in Korea,

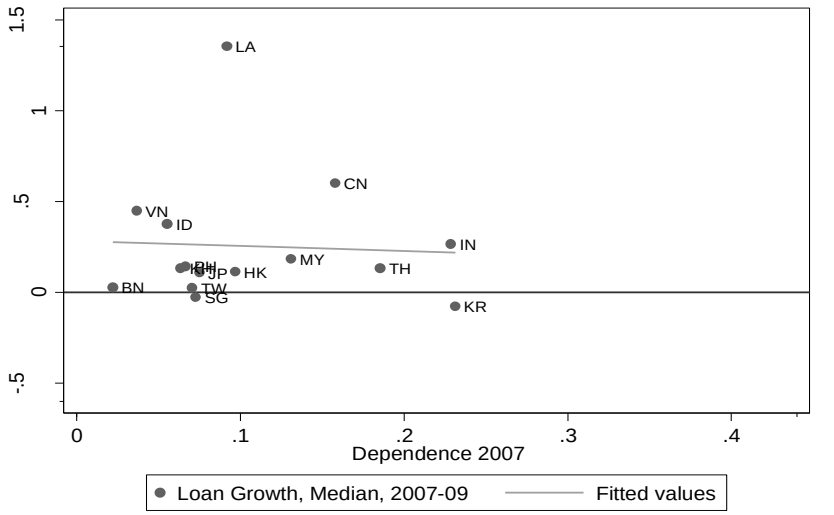
suggesting that Korean credit institutions might have become more cautious after the AFC and started to manage risks more carefully.

Figure 4. The Correlation Between Loan Growth and Wholesale Dependence in Asia

Panel A. The Asian Financial Crisis



Panel B. The Global Financial Crisis



Note: Median growth in net loans of individual credit institutions for each country against averages of pre-crisis wholesale dependence of individual credit institutions.

4. Empirical Analysis

Our goal is to examine the transmission of the GFC and the AFC through the money-market channel on bank lending behavior. We adopt a modified version of Raddatz's (2010) cross-section regression analysis. Our aims here are twofold: first is to check the robustness of findings in Raddatz (2010) with respect to a different sample, to a sample extended to 2009, and to specification checks; second is to examine possible heterogeneity across regions not considered in his study. Our version considers the following empirical model:

$$\ln(Loans_{i,c,t}) = \varphi_c + \beta_1 \ln(loans_{i,c,t-1}) + \beta_2 X_{i,c,t-1} + \gamma W_{i,c} + \varepsilon_{i,c,t}, \quad (1)$$

where $\ln(loans_{i,c,t})$ represents total loans in log of bank i from country c at time t. Time t is a crisis period. φ_c is a country fixed effect. $loans_{i,c,t-1}$ is the total loans from a period before the crisis, included to capture the dependence in the level of lending activities across time.[2] $X_{i,c,t-1}$ is a vector of bank i balance-sheet variables before the crisis and other controls. We have considered total assets in log, cost-to-income ratio in log, return on average assets, interbank ratios, and net interest margins. Control variables include country dummies to capture country-specific loan growth, and specialization dummies to capture the common impacts of crisis on, for example, investment banks. $\varepsilon_{i,c,t}$ is a random error term. $W_{i,c}$ is our measure of wholesale funds dependence for bank i from country c. Raddatz (2010) uses a logarithmic transformation for the wholesale dependent variable to reduce noise and we follow his procedure: -log(1+total-customer-deposits/total-fundings). The parameter of interest is γ. If wholesale fund-dependent credit institutions reduced lending relatively faster, we would expect γ to be negative and significant.

[2] We have estimated the model in difference, rather than in level. The result is the same. This alternative is equivalent to restricting the coefficient on lagged loans in equation (1) to 1. Here we report the general specification.

We estimate a cross-section regression using this model on the 2009 data for the GFC, taking the pre-crisis period as 2007. The model for the AFC is estimated for the 1998 data, taking 1996 as a pre-crisis period.

5. Results

Table 3 presents the estimate of model (1). Columns 1–4 show the estimates for the GFC. In the examination of the GFC, financial institutions from the United States are excluded from the estimation. Column 1 presents the results that pool across all regions. The coefficient on the wholesale dependence is negative and significant at the 10 percent level. This estimate implies that, other things held constant, a bank with a higher wholesale dependence (0.1) of one standard deviation reduced its lending by 0.6 percentage points on average. To examine regional differences, we interacted the dependence measure with geographical regions (columns 2–4). The base category is the European Union excluding the United Kingdom, so that the coefficients on the interaction terms represent the difference in the money-market effects between Asia/Anglo-Saxon countries and the European Union. We already include country dummies so region dummies are redundant and are not included. The coefficient on the wholesale dependence then represents the effects for the European Union. The results indicate non-significant coefficients for EU and Anglo-Saxon countries. The interaction term for Asia has a large and significantly negative coefficient (column 2), suggesting that the result from the whole sample was driven by Asia. This result is robust to inclusion of balance-sheet variables, as column 3 shows, but becomes marginally insignificant, with a p-value of 10.6 percent, after allowing for clustering of standard errors within each country (column 4).

Table 3. Regression Analysis

Table Z
Approach (1)
(Dependent variable Log of Loans)

	GFC(2009)				AFC(1998)				PLACEBO(1996)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
MM Dep	-0.066+	-0.008	0.016	0.016	-0.043	0.045	0.077	0.077	-0.049	0.042	0.043	0.043
	(0.035)	(0.04)	(0.047)	(0.046)	(0.041)	(0.047)	0.052	0.052	(0.037)	(0.042)	(0.050)	(0.040)
Asia		-0.337**	-0.254**	-0.254		-0.479**	-0.540**	-0.540**		-0.058	-0.096	-0.096
		(0.085)	(0.103)	(0.153)		(0.105)	(0.109)	(0.120)		(0.095)	(0.133)	(0.235)
Anglo ex US		0.157	0.060	0.060		-0.112	-0.309	-0.309		0.228+	0.518**	0.518**
		(0.143)	(0.157)	(0.107)		(0.163)	(0.193)	(0.186)		(0.138)	(0.195)	(0.056)
Additional Controls												
Intial Size	0.006	0.004	0.007	0.007	-0.004	-0.004	0.006	0.006	0.028	0.028	0.034	0.034
	(0.006)	(0.006)	(0.007)	(0.011)	(0.008)	(0.008)	(0.009)	(0.014)	(0.007)	(0.007)	(0.009)	(0.012)
Intial Loans	0.999**	0.999**	0.996**	0.996**	1.000**	1.000**	0.996**	0.996**	0.974**	0.974**	0.967**	0.967**
	(0.006)	(0.006)	(0.007)	(0.010)	(0.008)	(0.008)	(0.009)	(0.015)	(0.007)	(0.007)	(0.008)	(0.011)
Initial Net cost to income ratio			-0.006	-0.006			0.007	0.007			-0.003	-0.003
			(0.012)	(0.022)			(0.014)	(0.015)			(0.012)	(0.023)
Intial ROAA			0.015*	0.015*			0.035**	0.035**			0.014**	0.014+
			(0.005)	(0.005)			(0.005)	(0.007)			(0.004)	(0.007)
Initial Interbank ratio			0.000	0.000			0.000	0.000			-0.000*	-0.000*
			(0.000)	(0.000)			(0.000)	(0.000)			(0.000)	(0.000)
Intial Net Interest Margin			0.004	0.004			0.004	0.004			0.004	0.004
			(0.003)	(0.003)			(0.003)	(0.007)			(0.003)	(0.004)
Constant	0.164*	0.279**	0.253*	0.253*	0.109+	-0.110	-0.281**	-0.281**	0.466**	0.426**	0.390**	0.390+
	(0.056)	(0.083)	(0.107)	(0.116)	(0.062)	(0.077)	(0.109)	(0.089)	(0.058)	(0.075)	(0.107)	(0.209)
Observations	2220	2220	1974	1974	2566	2566	2349	2349	2345	2345	2075	2075
Adj R-squared	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99	0.99

Note: MM Dep is the wholesale dependence defined as: -log(1+total-customer-deposits/total-fundings), following Raddatz (2010). Initial size is measured as two-period lagged of (log) total assets. Initial loans are measured as two-period lagged of (log) net loans. The regression includes country dummies, and specialization-type dummies. Robust standard errors in parentheses. Significance levels: + 10%; * 5%; ** 1%.

Columns 5–8 show the results for the AFC. This time, financial institutions from Korea, Indonesia and Thailand are excluded from the estimation. The coefficient on the wholesale dependence is negative but insignificant for the pooled analysis (column 5). To examine regional differences, once again, we interacted the dependence

measure with geographical regions taking the European Union excluding the United Kingdom as the base sample (columns 6–8). EU and Anglo-Saxon countries have insignificant coefficients. Asia in contrast has a large and significantly negative coefficient (column 6). This result is robust to inclusion of balance-sheet variables, as column 7 shows, and to clustering of standard errors within each country (column 8).

Taken as a whole, the results from this analysis suggest the possible importance of the money-market channel in Asia for both episodes of crisis but less so for European and Anglo-Saxon countries, including US credit institutions.

6. Sensitivity Analysis

To see if this is an artifact of the analytical framework, we estimated the model on 2006 data as a placebo test. If the results were driven by the estimation procedure, we should also observe significant and large negative coefficients for Asia. Columns 9–12 show the result of the placebo test. The coefficients for Asia are negative but insignificant for all specifications. The Anglo-Saxon countries have a positive and high coefficient on wholesale dependence (column 10). This result is robust to the inclusion of additional controls (column 11) as well as to clustering of standard errors within each country (column 12). This estimate implies that, other things held constant, an Anglo-Saxon bank with a 1 standard deviation point higher wholesale dependence on average had a 5 percentage point faster loan growth than its European peer over 2004–06. This suggests the importance of non-core deposits in expanding loans in Anglo-Saxon countries prior to the GFC.

We have considered an extension to this sensitivity analysis. In brief, we pooled

the crisis and non-crisis periods and implemented a difference-in-difference analysis. The objective was to see if, controlling for an average loan growth of money-market-dependent banks prior to the GFC, the dependence on the money market was still associated with a lower growth rate in loans during the crisis. We have found similar results. For brevity, the estimation results are not reported here.

We have also considered an alternative analysis that focused on abnormal changes in loans. If the money market mattered during the GFC, the dependent banks should experience a larger shortfall in loan growth relative to an expected level of growth. In this analysis, we first estimated for each bank deviations from expected loan growth in 2007–08 and 2008–09. The estimated deviations ("abnormal growth/contraction") were then regressed on the dependence measure. Once again, we have found results suggesting that the impacts of dependence were felt more severely in Asia. Once again, the estimation results are not reported here for brevity.

7. Conclusion

This report examined the money-market transmission hypothesis in Asia during the GFC and the AFC. The data are based on the individual balance sheets of credit institutions from the Bankscope database for 1995–2009. The base sample included 7,119 credit institutions from Asian, EU and Anglo-Saxon countries. We first explored the large panel data set of credit institutions to document stylized facts about the behavior of credit institutions during crises. We then estimated a cross-section model relating the levels of loans at a period after the onset of a crisis to a measure of wholesale dependence, controlling for pre-crisis loan levels, bank characteristics and

financial performance. The regression analysis, with a restriction on homogenous regional effects, showed that on average credit institutions with high wholesale dependence reduced lending during the GFC but not during the AFC. A model that relaxed the homogeneity restriction suggested that money-market transmission was at work in Asia but not in other regions during both the AFC and the GFC.

The finding on the overall importance of the money-market channel is in agreement with prior studies. While further work needs be done to ascertain this conclusion and to verify the results on heterogeneous effects across regions—particularly the large estimated impact for Asian credit institutions—there is an important message to supervisors and policymakers in Asia that the region might be particularly susceptible to the impact of large changes in conditions in wholesale markets for bank liquidity. New international rules that encourage banks to maintain liquidity in other forms might therefore have particular relevance to Asia.

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