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International Financial Integration and Crisis Intensity

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Abstract

This paper analyzes the causes of the 2008–2009 financial crisis together with its manifestations, using a Multiple Indicator Multiple Cause (MIMIC) model. The analysis is conducted on a cross-section of 85 economies; I focus on international financial linkages that may have both allowed the crisis to spread across economies, and/or provided insurance. The model of the cross-economy incidence of the crisis combines 2008–2009 changes in real gross domestic product (GDP), the stock market, economy credit ratings, and the exchange rate. The key domestic determinants of crisis incidence that I consider are taken from the literature, and are measured in 2006: real GDP per capita; the degree of credit market regulation; and the current account, measured as a fraction of GDP. Above and beyond these three national sources of crisis vulnerability, I add a number of measures of both multilateral and bilateral financial linkages to investigate the effects of international financial integration on crisis incidence. I ask three questions, with a special focus on Asian economies. First, did the degree of an economy's multilateral financial integration help explain its crisis? Second, what about the strength of its bilateral financial ties with the United States and the key Asian economies of the People's Republic of China, Japan, and the Republic of Korea? Third, did the presence of a bilateral swap line with the Federal Reserve affect the intensity of an economy's crisis? I find that neither multilateral financial integration nor the existence of a Fed swap line is correlated with the cross-economy incidence of the crisis. There is mild evidence that economies with stronger bilateral financial ties to the United States (but not the large Asian economies) experienced milder crises. That is, more financially integrated economies do not seem to have suffered more during the most serious macroeconomic crisis in decades. This strengthens the case for international financial integration; if the costs of international financial integration were not great during the Great Recession, when could we ever expect them to be larger?

JEL Classification: E65, F30

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1. INTRODUCTION

The purpose of this paper is to analyze the causes of the 2008–2009 financial crisis, with a special focus on the role of international financial integration. In particular, I ask the question “Did economies with deeper international financial ties experience more (or less) intense crises?” This is an interesting question to ask, since a number of authors have asserted that crises can be imported or exacerbated through international financial linkages. A finding that more integrated economies suffered worse recessions implies that policymakers should think twice before encouraging deeper financial ties between economies. This topic is of special importance in Asia, which is slowly continuing its movement towards deeper regional monetary and financial ties.

I use a number of different measures of both multilateral and bilateral financial linkages on a large cross-section of economies. There is a special focus on Asian economies; I ask whether economies with stronger financial ties to the People’s Republic of China (PRC), Japan, and the Republic of Korea (henceforth Korea) were affected more (or less) than economies with weaker ties. For contrast, I compare the importance of these linkages to linkages with the United States (US), both through the private sector (cross-holdings of bank-loans and assets) and through the public sector (access to a Federal Reserve swap line). This allows me to contrast the importance of intra-regional linkages with US connections. Throughout, I control for a number of domestic determinants of crisis intensity using sources of vulnerability that have worked well in the literature. Methodologically, I treat crisis intensity as a latent variable that can only be measured with error. Accordingly, I use a Multiple Indicator Multiple Cause (MIMIC) model to link together the causes and consequences of the crisis.

My empirical findings are weak, since it is not easy to model the causes of the 2008–2009 crisis in a way that works well for a large number of economies. Richer economies were harder hit by the crisis, as were economies with larger current account deficits. There is some evidence that tighter credit market regulations also moderated crisis intensity. However, none of the (six) measures of multilateral financial integration I use is significantly correlated with crisis intensity across economies. I also employ (seventeen) measures of bilateral financial integration, and find only weak signs of significance. Curiously, economies with stronger bilateral financial ties to the US experienced milder crises, though the same is not true of economies that are more integrated with the large Asian economies. This is interesting both because the crisis first broke out in the US, and because of the special financial role that the US plays in the World and especially Asia. It also underlines the continuing importance of the US in global financial markets.

In the large, I find little evidence that economies which were more deeply financially integrated experienced substantially worse recessions. This is actually a strong result, since eminent scholars (like Stiglitz, Rodrik, Bhagwati, and others) have criticized financial integration primarily because it is said to be associated with volatility. However, the absence of any clear linkage between international financial integration and the most profound business cycle of generations constitutes a strong counter-argument.

In the next chapter I review the data set that I use and discuss my empirical strategy more broadly. The results of a baseline empirical specification (that includes only domestic factors) are contained in Chapter 3. The next chapter assesses the empirical importance of international financial linkages in understanding crisis incidence, and constitutes the most important chapter of the paper. I find evidence that closer financial linkages with America (but not Korea, the PRC, or Japan) seem to have alleviated the intensity of the 2008–2009 crisis. Chapter 5 is more

speculative and focuses on the special role of the US. It brings the preceding analysis to bear on two important policy-related questions: a) what are the challenges to US-lead global financial stability, and how should America view continued East Asian monetary and financial cooperation? The paper ends with a brief summary and conclusion.

2. DATA: IDENTIFYING CROSS-ECONOMY DIFFERENCES IN CRISIS SEVERITY

I am interested in examining a broad cross-section of economies. I wish to include all the economies that have been dramatically affected by the crisis as well as a number of other economies that have not been affected as badly (as controls). Since the incidence of the crisis was notable among high-income economies, I include all of them as well as a large number of developing economies. In particular, I examine all economies with real gross domestic product (GDP) per capita of at least US\$10,000 in 2003. To this set of economies, I add those with real GDP per capita of at least US\$4,000 and a population of at least one million.¹ After eliminating economies with missing data, I am left with a sample of 85 economies; their names are tabulated in Appendix Table A1.

Identifying the incidence of any financial crisis (currency, asset, banking, or other) across economies is no simple matter, let alone determining its severity (e.g., Berg et al. 2004). Any reasonable methodology should take into account the fact that potentially serious measurement error is inherently present.

Mine is a non-structural approach. In particular, I consider four observable indicators of the crisis, and model the incidence and severity of the crisis as being a latent variable that is manifest through these variables (though only imperfectly). When measuring these manifestations of the crisis, I restrict myself insofar as possible to data from 2008–2009.²

Real GDP growth is an obvious indicator of the crisis, and I used the backcasts for 2008–2009 real GDP growth that were available in late April 2010 from the Economist Intelligence Unit. Since financial variables are intrinsically forward-looking and the crisis was financial in nature, I also use three different manifestations from important financial markets. In particular, I use 2008–2009 changes in: a) the national stock market (measured in local currency, from national sources); b) the multilateral (SDR) exchange rate (from the International Monetary Fund [IMF]'s *International Financial Statistics*), measured as the price of a Special Drawing Right (SDR); as well as c) the two-year difference in economy credit ratings (between March 2008 and March 2010) as measured by Euromoney. The latter range in principle from 0 to 100; in March 2010, the most highly ranked economies were Norway (94.1), Luxembourg (92.4), and Switzerland (90.7), while the lowest-ranked economies were Haiti (18.4), Swaziland (26.0), and Ecuador (28.0).³ The data set is presented in more detail in Appendix Table A2.

¹ I use 2003 since I use the Penn World Table Mark 6.2 which ends in 2004 and has a number of missing values for that year. The measure of income in the PWT6.2 is "rgdpl". US\$4000 is approximately the cutoff for World Bank "upper middle income" economies.

² I restrict my attention to crisis causes from 2006 and earlier to avoid any overlap between causes and consequences of the crisis, with the one exception of the Federal Reserve swap lines.

³ "To obtain the overall country risk score, *Euromoney* assigns a weighting to seven categories. These are political risk (30% weighting), economic performance (30%), debt indicators (7.5%), debt in default or rescheduled (5%),

One could reasonably dispute the relevance of these particular manifestations of the crisis. Why not de-mean the 2008–2009 growth rate by subtracting some earlier growth rate? For that matter, why not use the output gap, or the consumption growth rate instead? Why three financial indicators instead of more or less, and why those indicators? I employ the MIMIC methodology precisely to acknowledge such measurement issues.

The four measures of the consequences/manifestations of the crisis are presented for sixty economies in Table 1, sorted by the size of the 2008–2009 stock market decline. These four variables collectively seem to deliver a reasonable view of the economies most affected by the crisis. For instance, Iceland appears as a country dramatically affected by the crisis in all four sectors, as are countries like Ukraine, Estonia, Latvia, Ireland, and the United Kingdom (UK). One will notice that Asian economies have not been particularly hard hit; while the PRC experienced the most severe stock market decline, its bond ratings improved and real GDP growth was phenomenal. Japan, on the other hand, experienced a large decline in its stock market, a decline in its bond ratings, and a severe recession (though its currency appreciated as the “carry trade” ended). Indonesia; Korea; Malaysia; Taipei, China; and Thailand are in the sample but are not even listed in Table 1 since their stock market declines were relatively mild.

credit ratings (7.5%), access to bank finance/capital markets (10%), discount on forfeiting (10%).” Further details are available at <http://www.euromoney.com/Print.aspx?ArticleID=2404432>.

Table 1: Crisis Manifestations
(Top 60 Economies Ranked by Equity Decline, 2008–2009 Changes)

	<i>2008–2009 changes in:</i>	Stock Market	Euromoney Credit Rating	SDR Exchange Rate	Real GDP
1	Iceland	-91.4	-23.4	100.3	-5.6
2	Russia	-81.2	-1.6	22.2	-2.7
3	Bulgaria	-75.8	-6.4	1.7	.7
4	United Arab Emirates	-69.9	-4.4	-.8	4.5
5	Cyprus	-66.9	-1.0	1.4	1.8
6	Macedonia (FYR)	-64.3	-3.7	1.6	4.1
7	Slovenia	-64.1	-4.0	1.4	-4.6
8	Croatia	-61.7	5.2	1.3	-3.5
9	Greece	-58.3	-9.8	1.4	-.0
10	Bermuda	-57.3	-15.3	-.8	.4
11	Ireland	-57.1	-15.3	1.4	-9.8
12	Latvia	-53.9	-15.8	.2	-21.8
13	Romania	-52.3	-6.6	18.6	-.5
14	Ukraine	-51.2	-8.3	56.9	-13.0
15	Lithuania	-49.1	-11.0	1.2	-12.6
16	Bahrain	-47.1	-2.1	-.8	9.4
17	Italy	-46.6	-7.7	1.4	-6.3
18	Finland	-46.2	-4.1	1.4	-6.7
19	Kuwait	-46.0	-6.7	4.2	6.7
20	Belgium	-46.0	-7.8	1.4	-2.2
21	Estonia	-45.5	-12.1	1.3	-17.2
22	Austria	-44.8	-5.8	1.4	-1.8
23	Saudi Arabia	-44.5	-3.1	-.8	4.6
24	Luxembourg	-43.3	-7.5	1.4	-4.8
25	Egypt	-40.7	-1.8	-1.1	12.2
26	Slovakia	-40.1	5.8	1.4	1.2
27	Czech Rep	-38.4	.6	.8	-1.8
28	PRC	-38.3	4.3	-7.3	19.1
29	Netherlands	-37.9	-7.1	1.4	-2.1
30	Portugal	-35.0	-11.2	1.4	-2.7
31	Costa Rica	-34.7	1.1	12.6	1.5
32	Japan	-34.0	-9.2	-19.9	-6.3
33	Kazakhstan	-32.9	-6.7	22.4	4.5
34	France	-32.2	-6.2	1.4	-1.9
35	Malta	-29.9	-.8	1.4	-.7
36	Oman	-29.5	-2.4	-.8	16.7
37	New Zealand	-29.4	-6.6	6.4	-1.2
38	Germany	-28.6	-6.5	1.4	-3.8
39	Norway	-28.4	-3.4	6.0	.3
40	Poland	-27.6	-4.2	16.1	6.8
41	Qatar	-27.4	4.4	-.8	24.2
42	US	-24.6	-9.0	-.8	-2.0
43	Switzerland	-24.4	-5.6	-9.2	.3
44	Bahamas	-24.3	-9.1	-.8	-5.5
45	Denmark	-24.1	-4.8	1.4	-5.8
46	Australia	-24.0	-5.4	-2.5	3.7
47	Spain	-23.5	-9.9	1.4	-2.7
48	El Salvador	-23.4	-3.4	-.8	-1.2
49	Barbados	-22.4	-6.2	-.8	-4.9
50	Ecuador	-22.2	-5.7	-.8	6.2
51	Jamaica	-22.1	-3.7	25.5	-4.1
52	Trinidad & Tobago	-22.1	-8.5	-.3	-.1
53	Hong Kong, China	-20.0	-1.3	-1.4	-.7
54	Peru	-19.0	3.1	-4.3	10.8
55	UK	-18.8	-9.5	22.7	-4.4
56	Singapore	-18.7	-7.0	-3.4	-.6
57	Hungary	-17.8	-6.6	8.1	-5.7
58	Morocco	-17.7	-.7	1.1	11.1
59	Canada	-17.4	-4.1	5.1	-2.2
60	Namibia	-16.9	7.2	7.5	2.3

Source: Author

3. RESULTS: A BASELINE DOMESTIC MODEL

In Table 2, I report MIMIC estimates of γ when I include only the three control variables as potential causes in (2); I use the four default indicators as measures of crisis manifestations. Standard errors are recorded in parentheses, and coefficients significantly different from zero at the .05 (.01) level are marked by one (two) asterisk(s). I also provide sensitivity analysis in Table 2. First, I drop the exchange rate indicator from the four manifestations of the crisis, since some economies use the exchange rate as a tool of monetary policy (especially in Asia). Second, I restrict the sample of economies used for the estimation to the 22 economies in Asia or the Pacific, as well as the US.

Table 2: MIMIC Model Estimates with only Control Variables

Control	MIMIC Default	Drop Exchange Rate Conseq.	Asian/Pacific	OLS, Growth	OLS, Stocks
Log (2006 real GDP p/c)	-12.6** (4.36)	-13.5** (4.4)	-6.0 (3.2)	-3.0** (.8)	-13.2** (3.9)
2006 Credit Market Regulation	-2.5 (3.5)	-2.0 (3.5)	-.4 (3.1)	-2.2** (.7)	-1.4 (2.8)
2006 Current Account, %GDP	.56* (.26)	.53* (.26)	-.22 (.27)	.21** (.06)	.53* (.25)

Notes: Coefficients, with standard error displayed in parentheses. Coefficients significantly different from zero at .05 (.01) significance level marked by one (two) asterisk(s). Each of the cells in the two left columns represents MIMC estimation on cross-section; each of the cells in the two right columns represents OLS estimation on cross-section (regressand in column header), with intercept not recorded and robust standard errors. Default: 4 consequences (2008–2009 change in Stocks, 2008–2009 Growth, 2-year change in *Euromoney* rating, 2008–2009 Exchange Rate change), fixed loading on stocks. Adaptive quadrature estimation; 85 observations.

Source: Author

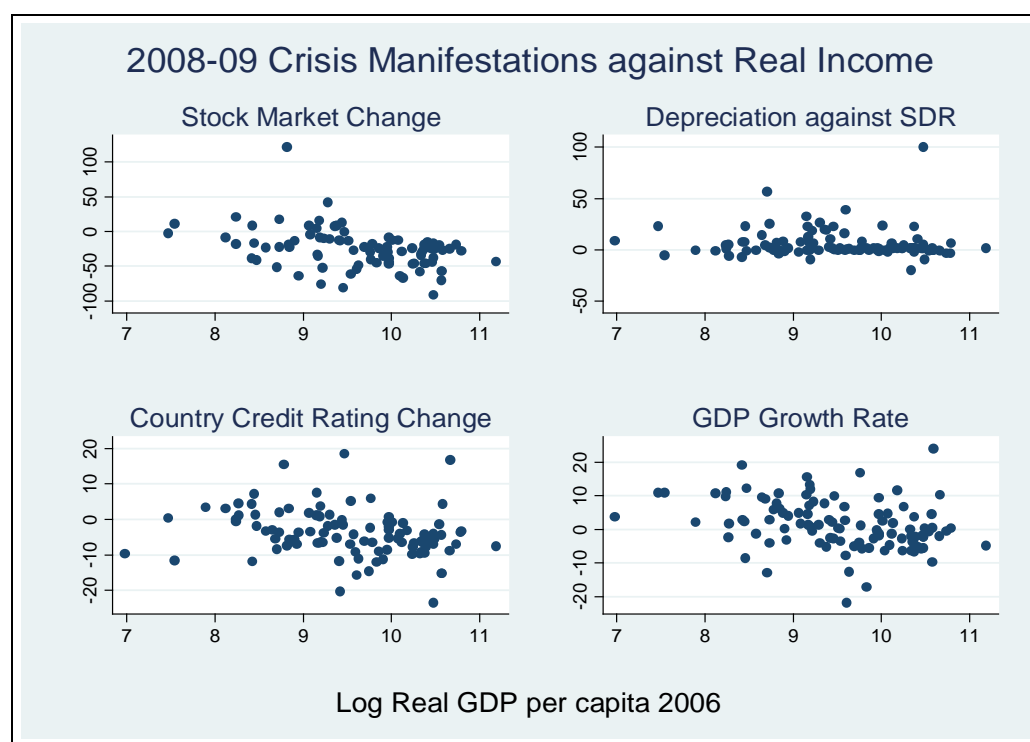
The final two columns at the extreme right-hand side of Table 2 record regression coefficient estimates from a simple linear model

$$y_i = \alpha + \delta_k x_{i,k} + u_i \quad (3)$$

where α is an intercept and $\{\delta_k\}$ are the coefficients of interest. There are two columns of results at the right of Table 2, for two key regressands which I use on the left-hand side of (3): a) the 2008–2009 real GDP growth rate; and b) the 2008–2009 growth rate of the stock market.

The results of Table 2 echo those of Rose and Spiegel (2010). Real GDP per capita has a negative and significant effect since the 2008–2009 financial crisis was progressive; richer economies were systematically hit more intensely than poorer economies. This negative relationship can also be seen in Figure 1, which scatters the four different manifestations of the 2008–2009 crisis (on the four y-axes) against the log of real GDP per capita (on the x-axis). Figure 1 also demonstrates clearly the variation in the intensity of the crisis across economies. While many economies experienced stark stock market declines, quite a few national stock markets actually rose over 2008–2009.⁴ The same spread is apparent in GDP growth, exchange rate depreciations, and economy credit rating changes.

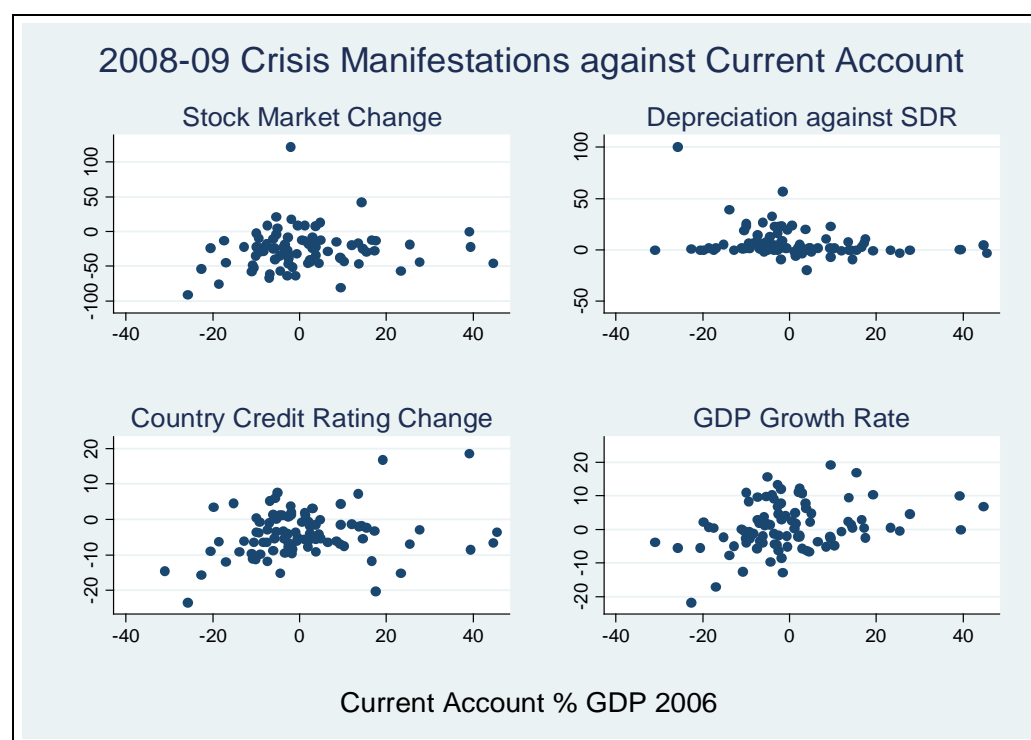
⁴ The Tunisian stock market rose by over 100% during the period.

Figure 1: The Progressive Recession

Source: Author

The degree of credit market regulation (much emphasized by Giannone et al. 2010) also has a negative effect on crisis intensity, indicating that looser credit market regulation might have exacerbated the financial crisis. However, this effect is not always statistically significant at conventional levels.

Finally, the coefficient on the current account term is generally significantly positive, indicating that economies with current account surpluses generally had milder crises than economies entering with large current account deficits. The positive relationship between the current account and crisis indicators can also be seen in Figure 2, which is the analogue to Figure 1, but uses the current account (measured as a percentage of GDP) on the x-axis in place of real income.

Figure 2: Insulation from the Current Account

Source: Author

All these results fall into line with those in the existing literature (discussed in Rose and Spiegel 2010). The results seem generally insensitive to the econometric perturbations that I consider, though (unsurprisingly) nothing is statistically significant when I throw away three-quarters of my sample and restrict my attention to the US and Asian/Pacific economies. This gives me some confidence that the underlying econometric model of crisis incidence—the *ceteris paribus* conditions from a statistical viewpoint—seems reasonable. The question to which I now turn is whether measures of international financial linkages matter, above and beyond these underlying domestic factors.

4. RESULTS: HOW IMPORTANT ARE INTERNATIONAL FINANCIAL LINKAGES?

I now add international financial linkages to the default MIMIC model of Table 2. I begin with a variety of measures of multilateral integration before proceeding on to consider bilateral measures.

Since there is no single perfect measure of integration, I test a number of that have been used in the literature. My only requirement is that the measure be quantifiable and available for a large number of economies in 2006; both stock and flow measures are included. The measures that I examine include: a) net foreign assets; b) external debt; c) short-term external debt; d) financing via international capital markets; and e) international reserves. All five of these proxies are measured in 2006 as ratios to domestic GDP. I also include a dummy variable for economies that were part of a monetary union in 2006. I proceed by adding, one by one, each of these six measures of international financial integration to the default MIMIC model of Table 2. The coefficient estimates for the different measures of international financial integration are tabulated in Table 3. Standard errors are recorded parenthetically, and the four columns to the

right of the “MIMIC Default” estimates present sensitivity analysis along the same lines as Table 2.

Table 3: Adding Multilateral Financial Linkages

Multilateral Linkages (2006)	MIMIC Default	Drop Exchange Rate Conseq.	Asian/Pacific	OLS, Growth	OLS, Stocks
Net Foreign Assets /GDP	-8.3 (6.3)	-8.6 (6.3)	3.9 (4.8)	.29 (1.28)	-9.0 (8.0)
Debt /GDP	.11 (.31)	.03 (.32)	.05 (.10)	.00 (.04)	.01 (.31)
Short-Term External Debt /GDP	-1.0 (.8)	-1.0 (.8)	-5.6** (1.4)	-.36* (.14)	-.98 (.55)
Financing via International Capital Markets/GDP	-.9 (1.1)	-1.0 (1.1)	-1.8* (.8)	.12 (.18)	-1.11 (.86)
Reserves /GDP	-.2 (.2)	-.2 (.2)	.3 (.2)	-.00 (.03)	-.18 (.16)
Currency Union Member	-3.9 (7.5)	-4.6 (7.5)	n/a	-.48 (1.41)	-4.3 (4.4)

Notes: Coefficients, with standard error displayed in parentheses. Coefficients significantly different from zero at .05 (.01) significance level marked by one (two) asterisk(s). Each of the cells in the two left columns represents MIMC estimation on cross-section; each of the cells in the two right columns represents OLS estimation on cross-section (regressand in column header), with intercept not recorded and robust standard errors. Default: 4 consequences (2008–2009 change in Stocks, 2008–2009 Growth, 2-year change in *Euromoney* rating, 2008–2009 Exchange Rate change), fixed loading on stocks. Three control causes (log 2006 real GDP p/c, 2006 credit market regulation, 2006 current account %GDP) included in all runs but not recorded. Adaptive quadrature estimation.

Source: Author.

The results of Table 3 are generally poor; they provide little indication that standard measures of multilateral international financial integration affected crisis incidence, at least after the three national factors of Table 2 are taken into account. Of the thirty estimates, only one is significantly different from zero at the 1% significance level, and an additional pair at the 5% significance level. The ratio of short-term external debt to GDP takes a consistently negative sign (and is large economically and statistically when the sample is restricted to the Asian/Pacific economies), indicating that economies more exposed to short-term foreign obligations experienced more intense crises; these findings echo Blanchard et al. (2010). However the effect of this source of vulnerability is statistically weak, in part because it is only available for developing economies.

Given the weak evidence that indicators of multilateral financial integration affected crisis severity, I now turn my attention to bilateral linkages. Those results are presented for 17 measures of bilateral linkages in Table 4, which is analogously formatted to Table 3.

Table 4: Adding Bilateral Financial Linkages

Bilateral Linkages (2006)	Exposure to	MIMIC Default	Drop Exchange Rate Conseq.	Asian/Pacific	OLS, Growth	OLS, Stocks
CPIS Asset Share	US	.44** (.12)	.48** (.12)	.10 (.12)	.02 (.03)	.48** (.10)
CPIS Asset Share	Japan	1.5 (1.2)	1.9 (1.2)	.11 (.61)	.36 (.20)	1.9 (1.5)
CPIS Asset Share	Korea	.26 (2.80)	.3 (3.1)	4.7 (2.6)	-.18 (.61)	.5 (2.9)
CPIS Asset Share	PRC	4.7 (7.8)	4.7 (7.8)	1.5 (2.8)	2.79** (.56)	4.7 (4.2)
CPIS Debt Share	US	.39** (.11)	.43** (.11)	.17 (.14)	.02 (.03)	.44** (.09)
CPIS Debt Share	Japan	-.62 (1.27)	-.59 (1.34)	.0002 (.0007)	.39 (.22)	-.60 (1.52)
CPIS Debt Share	Korea	-.38 (2.56)	-.27 (2.54)	2.3 (2.1)	-.10 (.41)	-.2 (2.2)
CPIS Debt Share	PRC	1.0 (1.2)	1.0 (1.2)	.4 (1.0)	.40** (.08)	1.06* (.44)
CPIS Long Debt Share	US	.38** (.12)	.44** (.12)	.26 (.19)	.02 (.03)	.45** (.10)
CPIS Long Debt Share	Japan	-1.74 (1.5)	-1.6 (1.6)	.0001 (.0009)	.16 (.22)	-1.6 (1.7)
CPIS Long Debt Share	Korea	.17 (2.05)	.30 (2.04)	2.4 (1.7)	-.08 (.30)	.3 (1.6)
CPIS Long Debt Share	PRC	1.1 (1.1)	1.0 (1.1)	2.0 (3.4)	.43 (.07)	.98* (.47)
BIS Consolidated Banking Share	US	191. (122.)	202. (122.)	-224. (212.)	-13.6 (18.8)	207.** (69.)
BIS Consolidated Banking Share	Japan	59. (48.)	57. (49.)	-18. (33.)	10.0** (3.8)	57** (18.)
% PPG Debt in US\$	US	.11 (.24)	.08 (.23)	n/a	-.01 (.04)	.07 (.25)
% PPG Debt in yen	Japan	.15 (.50)	.12 (.50)	-.11 (.27)	.10 (.09)	.10 (.28)
Federal Reserve Swap Line	US	7.2 (8.1)	7.2 (8.2)	-1.7 (7.0)	-.8 (1.6)	7.5 (6.7)

Notes: Coefficients, with standard error displayed in parentheses. Coefficients significantly different from zero at .05 (.01) significance level marked by one (two) asterisk(s). Each of the cells in the two left columns represents MIMC estimation on cross-section; each of the cells in the two right columns represents OLS estimation on cross-section (regressand in column header), with intercept not recorded and robust standard errors. Default: 4 consequences (2008–2009 change in Stocks, 2008–2009 Growth, 2-year change in *Euromoney* rating, 2008–2009 Exchange Rate change), fixed loading on stocks. Three control causes (log 2006 real GDP p/c, 2006 credit market regulation, 2006 current account %GDP) included in all runs but not recorded. Adaptive quadrature estimation.

Source: Author.

I examine all the bilateral financial linkages of relevance that are available, to the best of my knowledge. There are three basic variables which are available for a large number of economies in 2006: a) data on international cross-holdings of assets, taken from the Coordinated Portfolio Investment Survey collected by the IMF (and others); b) data on consolidated international banking claims collected by the Bank for International Settlements (BIS) (and others); c) and the fractions of public and publicly-guaranteed debt denominated in different currencies, collected by the World Bank (and others).

The CPIS data set covers total portfolio assets and assets broken down into various asset-classes; accordingly, I examine cross-holdings of both total and long-term debt, as well as total

asset cross-holdings. These are available for four countries of relevance to this study: the three large regional economies of the PRC, Japan, and Korea, as well as the US. The US remains the anchor of the international financial system in a number of different metrics (it provides a disproportionate amount of the world's international reserves), and is the monetary anchor of choice in much of East Asia. The US is also of special interest because the financial crisis first broke out there, in the late summer of 2007, and also because of the unexpected and dramatic appreciation of the US dollar through the peak of the crisis in 2008. By examining linkages between Asian economies, the US and the three most important regional economies, I should be able to pin down more precisely the nature of the linkage between crisis incidence and financial integration.

The first row of Table 4 adds to the default specification (of Table 2) the share of external assets (taken from the IMF's 2006 Coordinated Portfolio Investment Survey data set⁵) that are held in the US. At the end of 2006, Canada held a total of US\$633.05 externally in total portfolio investments, of which some US\$325.84 billion (or 51.5%) were held in the US. Canada was thus more heavily exposed to US financial risk than say the UK, which held only 26.6% of its external financial assets in America. The top left cell in Table 3 is the (γ) coefficient for the marginal effect of the share of foreign assets held in the US on the latent variable of crisis incidence (ξ).⁶ The coefficient is positive and significantly different from zero at the .05 level; economies with more exposure to US financial assets seem to have experienced *less* intense crises. Dropping the exchange rate manifestation of financial crises does not substantially change the size or significance of the coefficient, although it fades in both economic and statistical significance when the sample is restricted to the Asian/Pacific economies. While the CPIS share of US assets matters in an OLS regression of stock market growth, it does not when real GDP growth is the regressand.

The next rows of Table 4 sequentially add the remaining measures of bilateral financial linkages, for different economies and asset classes. In total, there are twelve different measures of CPIS financial linkages (= four economies x three asset classes). They all tell the same story in essence. First, there is weak evidence that more exposure to American assets actually alleviated the intensity of the financial crisis, as manifest in positive and significant coefficients in Table 4. This result does not depend much on the precise asset class considered. Second, exposure to either Japanese or Korean assets never has a consistent or significant effect on crisis intensity across economies. Third, the sample of Asian/Pacific economies never delivers statistically significant coefficients, possibly because the sample of economies is so small. Finally, there is weak evidence that economies with greater exposure to PRC assets experienced higher growth in both real GDP and stocks, though this finding is sensitive and is driven by a few outliers.

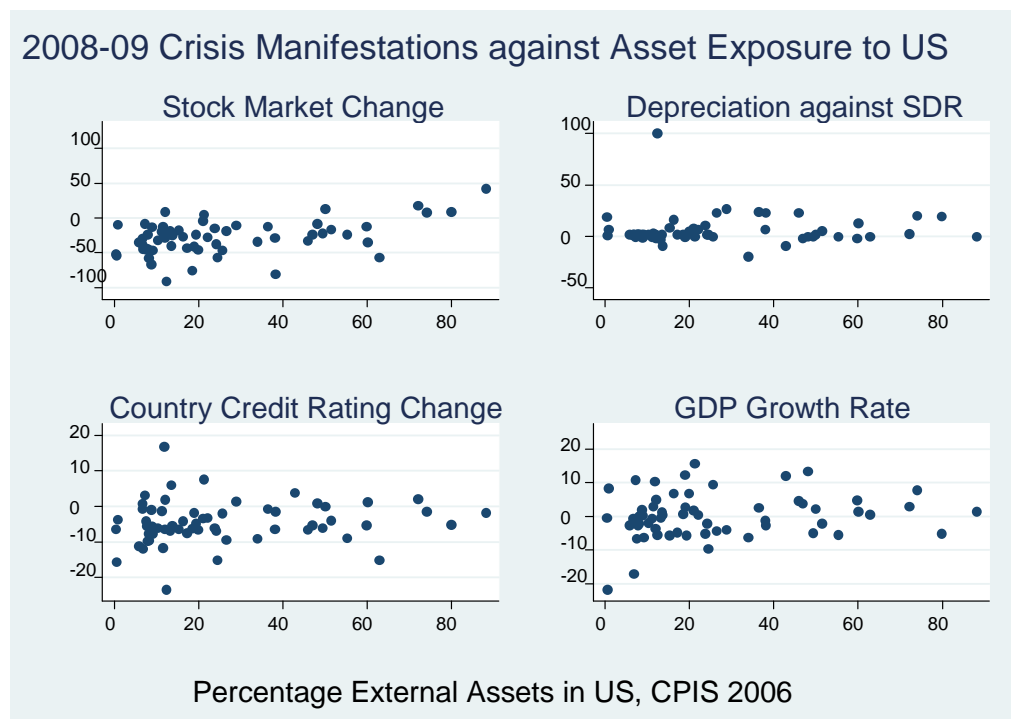
The result that economies with greater exposure to US assets experienced less severe crises may seem initially surprising, especially given the wide-spread chatter in the popular press about toxic US assets. However, it seems to be loosely present in the data and is not a mere statistical illusion. Figure 3 provides simple scatter-plots of the four manifestations of the crisis graphed against the share of external assets held in the US. Economies that had larger shares of their 2006 foreign wealth in the US seem systematically to have experienced smaller stock

⁵ <http://www.imf.org/external/np/sta/pi/cpis.htm>

⁶ The number of observations available varies by cause because of data availability.

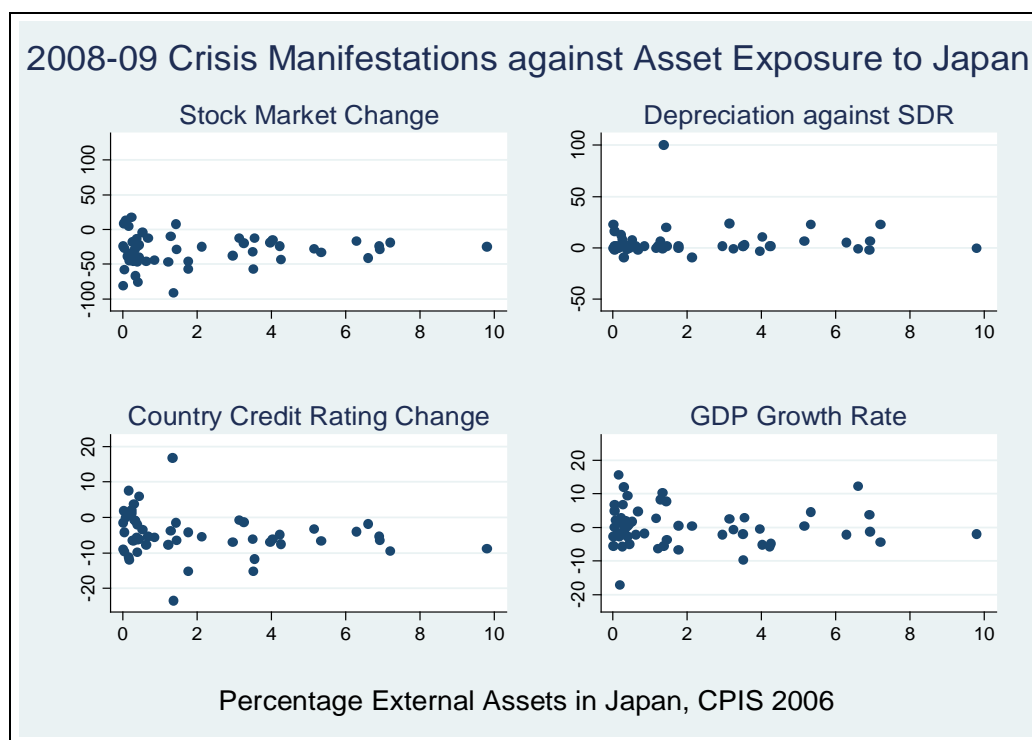
market declines in 2008.⁷ The relationship is loose, if also apparently linear. Analogues for the three Asian regional economies of interest are in Figures 4–6.

Figure 3: Asset Exposure to the US

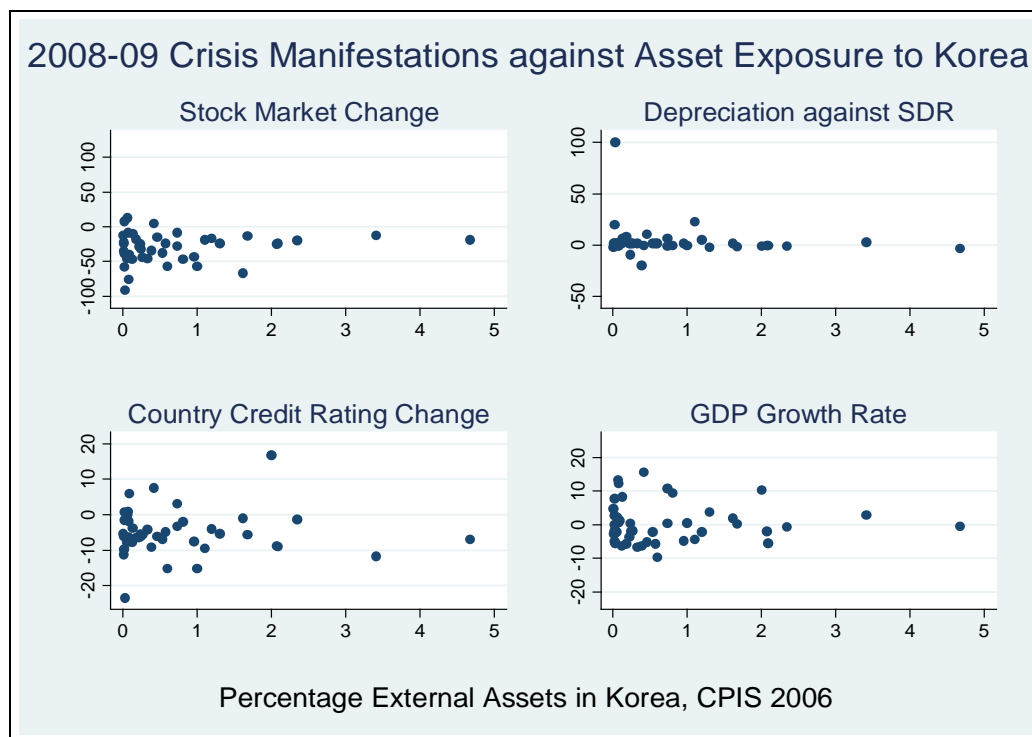


Source: Author

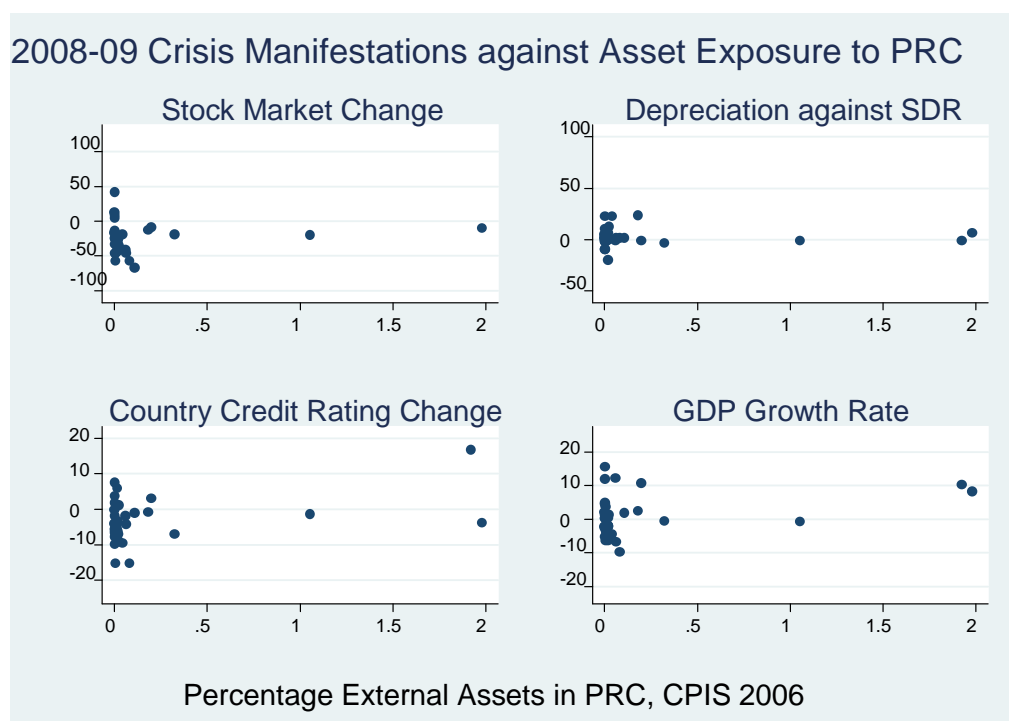
⁷ Venezuela, Mexico, Colombia, Bermuda, and Costa Rica all had more than 60% of their foreign assets in the United States, and had relatively small stock market declines compared with economies with less than 10% of their foreign wealth invested in America (which include Romania, Latvia, Czech Republic, Estonia, Spain, Austria, and Cyprus).

Figure 4: Asset Exposure to Japan

Source: Author

Figure 5: Asset Exposure to Korea

Source: Author

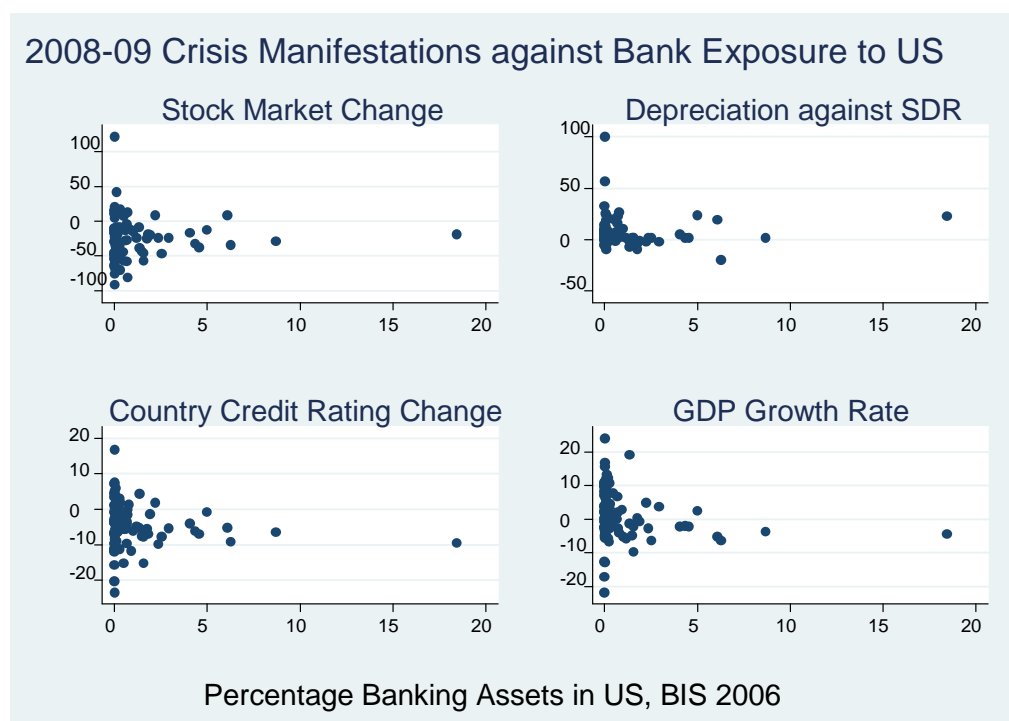
Figure 6: Asset Exposure to PRC

Source: Author

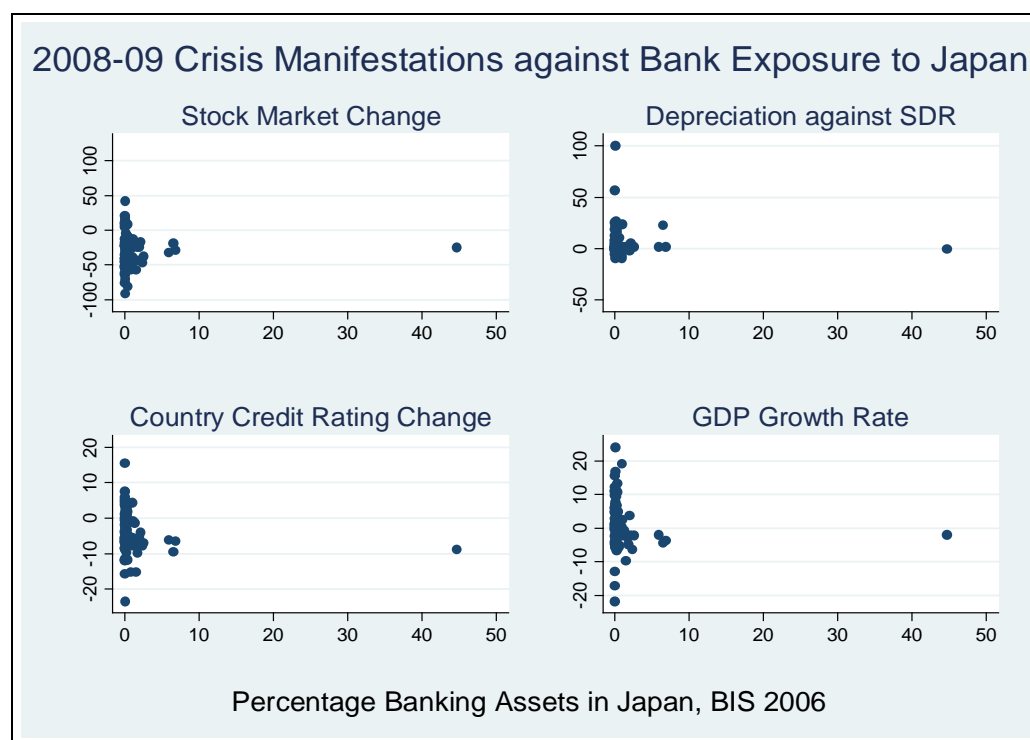
Next, I narrow my interest to the banking sector and take advantage of data on consolidated banking statistics produced by the BIS. These data cover banks' on-balance sheet financial claims on foreign economies, and thereby provide a measure of the exposures of lenders' national banking systems. The data set I use covers contractual lending by the head office and all its branches and subsidiaries on a worldwide consolidated basis, so that they are net of inter-office accounts, and are reported on an ultimate risk basis.⁸ I average the quarterly 2006 data, and normalized individual economies' exposure to the US and Japan by dividing by total foreign exposure.⁹ However, I am unable to find consistent effects from foreign bank exposure to these crisis measures. The measure is significantly positive for US exposure when ordinary least squares (OLS) is used with stock market growth as the dependent variable, but it is insignificantly different from zero in the four other perturbations and inconsistent in sign. The coefficients for Japanese exposure are somewhat stronger and positive for both OLS regressions, but are insignificantly different for all three MIMIC models. The fragility of these results is shown in Figures 7 and 8 which show that a few outliers are especially important for the BIS series in the case of Japan.

⁸ Further details are available at <http://www.bis.org/statistics/consstats.htm>.

⁹ These data are not reported to the BIS for the PRC and Korea.

Figure 7: Bank Exposure to the US

Source: Author

Figure 8: Bank Exposure to Japan

Source: Author

My next pair of bilateral financial linkages is taken from the World Bank's *Global Development Finance* data set. Both refer to the currency composition of public and publicly-guaranteed

(PPG) debt; I have shares of PPG debt denominated in both yen and US dollar. I add both of these series to the basic specification of Table 2, and record the estimates in the penultimate rows of Table 4. There seems to be no strong consistent relationship between crisis intensity and the share of PPG debt denominated in either dollars or yen.

In the bottom row of Table 4 I add the coefficients for a binary dummy variable which is one if the Federal Reserve extended a swap line to the economy and zero otherwise. These liquidity swaps were first created by the Federal Reserve in December 2007 and were eventually extended to a total of fourteen central banks by late October 2008. Since these bilateral swaps were explicitly created as part of the endogenous policy response to the crisis the coefficients may be seriously affected by simultaneity bias. Thus the reported correlations reported should be viewed as just that; non-structural correlations. Perhaps unsurprisingly, none of them are significantly different from zero at any conventional level of confidence.

Succinctly, while there is some evidence that economies with tighter financial linkages to the US experienced milder crises; the same cannot be said of economies more closely tied to the larger Asian economies. Of course, finding a lack of evidence that financial integration can be tied to crisis incidence does not mean that no linkage exists.¹⁰ Perhaps a more subtle researcher could find it, perhaps with a different model or data set. Still, the fact that I have searched unsuccessfully for a linkage in a variety of different ways lends some validity to the exercise.

5. POLICY IMPLICATIONS AND INTERPRETATION

In this chapter, I extrapolate from the results of Chapter 4 and bring their evidence to bear on a couple of important policy-relevant issues. I ask two related questions of policy relevance. First, what are the challenges to US-lead global financial stability? Second, what is a reasonable US view of continued East Asian monetary and financial cooperation?

5.1 Challenges to US-lead global financial stability

The results from Chapter 4 offer some evidence that economies with closer ties to the US experienced more mild crises, *ceteris paribus*. There is little comparable evidence of the importance of linkages to the other economies I examine, the larger East Asian economies. Does this constitute definitive proof that a financial Pax Americana persists of late?

Certainly it is reasonable to consider challenges to US-lead global financial stability. For one thing, a number of the findings in Chapter 4 are of marginal (and sometimes negligible) statistical significance. It is particularly striking that the existence of Federal Reserve swap lines do not seem to have mattered in a purely statistical sense. Then again, the coefficients indicate that the existence of swap lines seems to have been economically beneficial to the economies that received them, though the effects were not estimated very precisely. In any case, it is perhaps more striking that no one else offered them, an implicit but strong signal of the continuing unique role of the US in the global financial system. There are many other such indications. The IMF remains a US creature, with a US veto, a US senior deputy managing director, and a US mind-set in many ways. The US continues to play a leading role in both the other Bretton Woods institutions and the new developing institutions (The Group of Twenty, Financial Stability Forum).

¹⁰ I thank Josh Felman for pointing this out to me forcefully.

More generally there are few rivals to the US. Continuing European and Japanese fiscal stresses (recently showing up in European bond market spreads) lead one to believe that no rich country will pose a serious challenge soon to US leadership in the financial sphere any time soon. Political paralysis in both Japan and Europe deepens this conviction. Other rich economies which are in better economic shape (such as Canada, Sweden, and Australia) are simply too small to be viable competitors. Many developing economies weathered the 2008–2009 financial storm better than their richer counter-parts, most notably the PRC, India, and Brazil. Still, no developing economy with a dependent monetary policy, immature financial system, or significant capital restrictions will pose a serious threat to the US' financial leadership any time soon; many emerging markets have all three. So there do not seem to be obvious foreign competitors to US-lead Global Financial Stability.

This broad-brush picture seems even more plausible when it is examined in even slightly finer detail. Consider the important sector of banking, and East Asia, the most obvious potential regional economic rival to the US. After the 1997–98 crisis, there was certainly banking reform in East Asia, though it was limited. This is clearly manifest in the fact that the world's largest banks (measured by assets) continue to be dominated by Europeans and Americans, more than a decade after the Asian crisis. A few Japanese remain in the list of the world's biggest banks and PRC banks have entered of late. This underlines the point that access to large integrated markets seems to matter a lot. The world's biggest bank is French, and the Netherlands, Switzerland, Belgium, and Denmark all have top-50 banks; economies can be small and host big banks, if they have access to large markets. However, there is no contender from Korea; Hong Kong, China; or Singapore.¹¹ So the patterns indicate that access to a large internal or integrated market (in the case of the Europeans) seems to matter a lot for banking. Given the lack of any serious policy moves towards deeper integration in East Asia (about which more below), East Asian banks (especially those outside Japan and the PRC) do not seem to pose any serious threat to the status quo any time soon.

The same is true of most capital markets in East Asia, especially outside Japan. Asian markets have evolved in the past 15 years, but remain under-developed compared to the US. Governance problems remain generic, especially the rights of creditors and shareholders. Capital accounts have not been fully liberalized by the policy authorities, in part to protect exchange rate stability. Since the latter is still widely viewed (though not universally seen) as a driver of export and overall economic growth, US capital markets seem unlikely to be challenged by Asian capital markets in the short run.

So there is no obvious alternative to US-lead global financial stability. This does not mean that no problems exist; there is no guarantee of global financial stability. A different way to say this is that the biggest possible threat to US-lead financial supremacy is probably the US. Eichengreen (2011) argues convincingly that the US' primary fear in this sphere is itself. Continued fiscal stress may slowly be starting to undermine US financial credibility. The Republican Party refuses to raise taxes and has not specified substantial spending cuts, while the Democratic Party remains addicted to government spending and has never presented a credible alternative. Meanwhile, US government and external indebtedness have both continued to climb for more than a decade. This depressing state of affairs reminds one of Kindleberger's (1973) insight that interwar financial chaos in the 1930s took place in the policy vacuum between British- and US-lead global financial leadership.

¹¹ I draw on data from *Global Finance*; <http://www.gfmag.com/tools/best-banks/10619-worlds-50-biggest-banks.html#axzz1FSdFXUzA>.

5.2 Continued East Asian monetary and financial cooperation: a US view

Americans have little to fear from East Asia (or indeed, the rest of the world) insofar as rivalry for financial leadership is concerned, at least in the short run. Indeed, it seems safe to think that the US welcomes further Asian efforts towards integration. The main problem is that these efforts seem to be too slow and too shallow.¹²

Consider efforts aimed at deepening and integrating financial markets in East Asia. Official policy initiatives in this forum have been among the more successful undertaken since the 1997–1998 crisis. Most notably, Asian bond markets continue to grow and deepen as a result of policy. Much effort has gone into creating Asian index bond funds that can be used easily by the private sector, but these efforts have not yet borne much fruit. The first Asian bond fund (ABF1) was created in 2003, while another followed in 2005. But while the Asian bond market initiative is welcome, these markets still have a long way to go before they acquire the depth and resilience of the US treasury markets. More generally, a number of related difficulties persist: capital is far from completely mobile in the region, the governance structures differ a lot across economies, and more generally there is a large national component associated with capital returns in East Asia.

The other big official success exists on the intra-regional monetary front. The most important is a set of international reserve swaps and repurchase agreements for emergency assistance (initially bilateral, later multilateral). The Chiang Mai Initiative was begun in 2000 by the ASEAN economies along with their three larger economies to the North (the PRC, Japan, and Korea—collectively ASAEAN+3). But the Chiang Mai Initiative has not really been put to the test and can certainly not be considered a proven success at this point. Much of it is still reliant on the still-despised IMF; an economy that wishes to move beyond an initial tranche must have an IMF program in place. More importantly, most East Asians now hold so many reserves individually that they do not really need access to the resources of the Chiang Mai Initiative.

In terms of more conventional monetary frameworks, Asia continues to move slowly. An Asian system of fixed exchange rates, let alone an Asian currency union, Asian currency unit, or Asian monetary fund still seems far away. ASEAN surveillance, such as it is, has even less effect on domestic policies than IMF surveillance. This is part of a long tradition of deference to domestic interests; ASEAN economies are generically touchy about intrusive interventions with their neighbors.

If anything, East Asian economies have moved away from closer international monetary ties over the last decade. A number of important East Asian economies (including Indonesia, Korea, the Philippines, and Thailand) have engaged in domestic inflation targeting; this typically entails exchange rates that float (albeit not freely). This domestically-oriented monetary policy is perhaps the diametric opposite of the European experience of increasingly close monetary integration, which eventually led to monetary union. Inflation targeting has proven to be sustainable and successful in East Asia, as it has elsewhere in the world; no economy has switched away from inflation targeting as a result of the 1997–98 “Great Recession.” Even economies that do not formally practice inflation targeting (such as Japan; Singapore; and Taipei, China) maintain exchange rate regimes with considerable flexibility. Official moves towards deeper monetary integration in East Asia seem increasingly unlikely. It is also notable that where Asians continue to care about their exchange rates, they are often most concerned

¹² Park and Wyplosz (2008) provide a lucid introduction to recent events.

with the bilateral dollar rates (most overtly in the cases of Hong Kong, China; and mainland PRC).

To summarize, East Asia is moving slowly on most financial and monetary fronts. This is in large part because it is part of an evolving Darwinian process that seems to work. The Asian financial crisis of 1997–1998 led to looser monetary stances (avoiding pegged exchange rates), and financial development (most notably shunning short-term foreign debt which led to well-known problems with maturity and currency mis-match). The crisis also encouraged East Asia to accumulate large war-chests of international reserves. While some of the latter can then be shared, in practice there seems little reason to do so. One of the big lessons from the 1997–1998 crisis seems to be that East Asian economies should be more self-reliant in monetary and financial matters. No government wishes to return cap in hand to the IMF. This nationalistic bent is the opposite of financial integration, and is likely to continue. Consistent with the results of Chapter 4, many economies seem to be taking the message that less financially integrated economies did better through the 2008–2009 crisis (e.g., the PRC and India). If this lesson is broadly swallowed, it will slow regional integration even further.

Official Asian efforts to integrate financial and monetary policies have been halting and of limited efficacy. Insofar as further Asian integration is desirable, it seems that the lowest-hanging fruit lie on the real side of the economy. Official efforts to loosen trade barriers seem, if anything, to be lagging those in financial and monetary markets; a significant Asian customs union seems far away now. As McKinnon has long pointed out, freer trade tends to precede financial and monetary development; the European single market of 1992 preceded European Monetary Union by years. If one issue tends to unite economists (especially US-trained economists) it is that trade barriers are typically harmful and counter-productive. Insofar as East Asian officials wish to seize the policy initiatives, regional trade liberalization seems to be a more effective use of official effort than integration on the financial or monetary fronts. Such a reorientation might have dramatic effect, as the recent North American Free Trade Agreement example shows. In the case of East Asia, trade is becoming increasingly tight integrated, but been mostly the result of technological rather than policy-driven initiatives. That is, Asian trade integration has been mostly driven by “natural” rather than “unnatural” causes to use Samuelson’s terminology. If there is a tradeoff between the two, renewed efforts towards regional trade liberalization seem more likely to enhance welfare than official efforts to deepen Asian financial or monetary integration.

6. SUMMARY AND CONCLUSION

In this short paper, I model the causes of the international financial crisis that hit much of the world in 2008–2009. This was the most severe financial crisis and global recession for three generations, and seems to be a “natural experiment” to deepen our understanding of the importance of international financial linkages. The fact that the crisis occurred only a few of years ago allows us to see if the impact of increasing financial integration is actually visible in the recent data. I am particularly interested in seeing if economies that were more deeply integrated in international finance and banking experienced systematically more (or less) severe financial crises, after taking into account other domestic factors of relevance.

I use a flexible econometric methodology that takes into account the facts that the intensity of the crisis varies across economies, is only imperfectly measured, and may have multiple causes and manifestations. I rely on my previous work (with Spiegel) and the literature to model the national causes of the crisis, using data from 2006 and earlier on real GDP per capita, the tightness of financial market regulation, and the current account. Above and beyond these

national causes, I search for evidence that the incidence and intensity of the 2008–2009 financial crisis across economies was systematically linked to their degree of international financial integration.

I find little evidence that multilateral financial linkages across economies help explain the incidence or intensity of the crisis across economies. There is some evidence that economies with stronger bilateral linkages with the US weathered the crisis better, though it is by no means enough to be conclusive. There is no comparable (let alone superior) indication that economies with closer financial ties to any of the three regional East Asian powers (the PRC, Japan, and Korea) fared better during the crisis. Thus, even though the financial crisis originated in the US in 2007, my results are quite consistent with the enduring financial importance of the US.

Where does one end up as a result of all this? It is often said that financial integration may have long-term benefits (in the form of greater risk diversification, a more efficient allocation of capital, and so forth), but certainly has short-term costs in the form of greater exposure to crises and associated business cycle volatility. In this paper, I have searched for but found no evidence of the latter; more financially integrated economies do not seem to have suffered more during the most serious macroeconomic crisis in decades. This leads one to conclude that the costs of international financial integration may have been over-stated; if they were not great during the Great Recession, when could we ever expect them to be larger? Since long-term benefits are often under-valued by myopic policymakers, I conclude that further steps towards international financial integration continue to seem reasonable (though further integration may be even more beneficial). Succinctly, one of the minor lessons from the Great Recession is that continuing international financial integration both within Asia and between Asia and the US seems warranted.

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METHODOLOGY APPENDIX: LINKING INCIDENCE AND CAUSES WITH THE MIMIC MODEL

My primary interest is in linking crisis *incidence* to its *causes*. We know that most economies went into serious recession after the worldwide financial crisis which followed the bankruptcy of Lehman Brothers in September 2008; the question is whether we can map plausible cross-country indicators of vulnerability before Lehman to crisis intensity afterwards. To avoid endogeneity issues, I restrict myself to data from 2006 and earlier for crisis determinants (sources of vulnerability). I link 2006 causes of the crisis with 2008–2009 measures of its intensity using a Multiple Indicator Multiple Cause (MIMIC) model.

I emphasize at the outset that this project has a limited scope. My analysis is cross-sectional in nature, and is focused deliberately on a period of time when we all *know* that there was a major financial/economic crisis that affected a large number of economies. That is, I make no attempt at all to model the *timing* of the crisis. I consider the latter to be a challenging objective than mine, which is merely to study the *incidence* of the 2008 crisis across economies.

The MIMIC model was introduced to econometrics by Goldberger (1972); see also Aigner et al (1984) and Gertler (1988). The model consists of two sets of equations:

$$y_{i,j} = \beta_j \xi_i + v_i \quad (1)$$

$$\xi_i = \gamma_k x_{i,k} + \zeta_i \quad (2)$$

where: $y_{i,j}$ is an observation on crisis indicator j for economy i , $x_{i,k}$ is an observation for potential crisis cause k for economy i ; ξ_i is a latent variable representing the severity of the crisis for economy i ; β and γ are vectors of coefficients, and v and ζ are mutually uncorrelated well-behaved disturbances with zero means and constant variances.¹³ Equation (1) links J consequences and manifestations of the crisis (denoted by y) to the unobservable measure of crisis severity. In practice, I model this *measurement* equation using the ($J = 4$) indications of the crisis (the 2008–2009 national changes in: a) real GDP, b) the stock market, c) the credit rating, and d) the exchange rate). The second equation models the *determination* of the crisis as a function of K causes (x 's, dated 2006 or earlier).

By substituting (2) into (1), one derives a model which is no longer a function of the latent variable ξ . This MIMIC model is a system of J equations with right-hand-sides restricted to be proportional to each another. These proportionality restrictions constrain the structure to be a “one-factor” model of the latent variable; with the addition of normalization, they achieve identification of the parameters in (1) and (2). One of the features of the MIMIC model is that it explicitly incorporates measurement error about a key variable—the incidence and severity of the crisis—in a non-trivial and plausible way. Indeed, this is one of the attractions of the MIMIC model.¹⁴

¹³ The normalization implies that the latent variable estimate should be interpreted as decreasing in crisis severity.

¹⁴ Much of the previous literature on the determinants of financial crises (e.g., Berg et al. 2004) has used discrete characterizations of economies as being in or out of crisis, either in an ad hoc way or based on some objective criteria; this variable as then treated as observed without error. In actuality, the severity of a crisis is like to be a continuous variable, and one that is only observed with error. The MIMIC framework accounts for both measurement error and continuity.

I estimate my MIMIC models in STATA with GLLAMM; Rabe-Hesketh et al. (2004a, 2004b) provide further details. The iterative estimation technique begins with adaptive quadrature which is followed by Newton-Raphson.¹⁵ I normalize and achieve identification by imposing a factor loading of unity on the stock market change.¹⁶

In Rose and Spiegel (2009a, 200b, 2010), hereafter “RS,” we examined more than 140 possible national determinants of the crisis suggested by the literature and other researchers.¹⁷ We found that only three variables worked with any plausible consistency for the 2008–2009 crisis; the natural logarithm of 2006 real GDP per capita; the degree to which capital markets were tightly regulated in 2006 (a variable measured by the Fraser Institute and disseminated by the Heritage Foundation); and the 2006 current account, measured as a fraction of GDP. I include all three as controls in the analysis which follows, and thus use them as x’s in equation (2). Most sources of vulnerability suggested by researchers simply do not line up well in the data for more than a couple of economies; I ignore such variables in what follows.¹⁸

¹⁵ Occasionally I use a different iterative technique to achieve convergence.

¹⁶ I follow Breusch (2005) in choosing to load first on the stock market because it delivers a better fit in a bivariate regression than our three other crisis indicators.

¹⁷ As well as a large number of financial and macroeconomic features, this work extensively tests a variety of measures of international trade linkages; they typically have little effect in explaining crisis incidence across economies.

¹⁸ This means in practice that I ignore measures of bank leverage, real estate and other asset prices, measures of indebtedness, and so forth; the interested reader is referred to Rose and Spiegel (2009a, 2009b, 2010).

Appendix Table A1: Sample of**Economies**

Argentina	Finland	Lebanon	Russia
Armenia ^a	France	Lithuania	Saudi Arabia
Australia ^a	Georgia ^a	Luxembourg	Singapore ^a
Austria	Germany	Macedonia	Slovakia
Barbados	Greece	Malaysia ^a	Slovenia
Belgium	Guyana	Malta	South Africa
Botswana	Hong Kong, China ^a	Mauritius	Spain
Brazil	Hungary	Mexico	Sri Lanka ^a
Bulgaria	Iceland	Morocco	St. Kitts & Nevis
Canada	Indonesia ^a	Namibia	Swaziland
Chile	Iran	Netherlands	Sweden
PRC ^a	Ireland	New Zealand ^a	Switzerland
Colombia	Israel	Norway	Thailand ^a
Costa Rica	Italy	Oman	Trinidad & Tobago
Croatia	Jamaica	Panama	Tunisia
Cyprus	Japan ^a	Papua New Guinea ^a	Turkey ^a
Czech Rep	Kazakhstan ^a	Paraguay	UK
Denmark	Korea ^a	Peru	Ukraine
Ecuador	Kuwait	Poland	US ^a
Egypt	Kyrgyzstan ^a	Portugal	Uruguay
El Salvador	Latvia	Romania	Venezuela
Estonia			

Note: ^a indicates an Asian/Pacific economy

Appendix Table A2: Key Data Sources

Many of the data series were extracted in June 2010 from the World Bank's *World Development Indicators*.¹⁹ Other key data sets are listed below. The entire (STATA 10.0) data set is available at <http://faculty.haas.berkeley.edu/arose/MIMIC2Data.zip>.

National Sources

- Percentage change in 2008, 2009 broad stock market index

International Monetary Fund, *International Financial Statistics*

- Percentage change in 2008, 2009 SDR exchange rates

Euromoney magazine

- Country credit ratings

International Monetary Fund, *CPIS*

- Table 8: international cross-holdings of portfolio assets, debt, long-term debt

Bank for International Settlements, *Consolidated Banking Statistics*

- 2006 ultimate risk basis financial claims

World Bank, *Global Development Finance*

- Percentages of Public and Publicly-Guaranteed Debt denominated in dollars and yen in 2006

Federal Reserve website Swap line data available

at http://www.federalreserve.gov/monetarypolicy/bst_liquidityswaps.htm

¹⁹ This includes series on: population; real GDP per capita; current account/GDP; stock market capitalization/GDP.