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Cross-Cutting Themes in Economies with Large Banking Systems

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This paper examines cross-country perspectives on economies with large banking systems relative to GDP. As such economies tend to have domestic institutions with major foreign currency cross-border activities, strong links are generated between the health of the financial system and sovereign sustainability. These links are of central interest to the paper. It does not cover off-shore centers as their international links tend to be relatively unrelated to domestic activities.

To make the analysis more concrete, the experience of five economies—Hong Kong SAR, Iceland, Ireland, Singapore, and Switzerland—are featured (plus a Box on the Benelux region). These economies had large and relatively diversified international banking sectors compared to their fiscal capacity before the global financial crisis of 2007–09, and divergent experiences over the crisis. The paper analyzes the reasons for these outcomes. (A range of private and public sector individuals were interviewed during missions to Belgium, Hong Kong SAR, Ireland, Singapore, Switzerland, and the United Kingdom.)

Using “top-down” (macro) and “bottom-up” (banking) analyses, three issues are explored:

- *The run-up to the crisis—how and to what extent did bank vulnerabilities build?* In some cases, vulnerabilities came from macro imbalances, reflecting domestic real estate or other bubbles. In others, banking systems bought into bubbles in other economies.
- *Crisis response—what were the similarities and differences?* The varying severity of the crisis influenced the range of tools and policies employed to shore up the banking sector. Generally, guarantees of liabilities tightened links between sovereigns and banks while early bank resolutions and international liquidity support lowered such links.
- *What accounts for the different outcomes?* The paper evaluates the extent to which these economies were able to offset the externalities associated with systemic risks from large international banks through strong buffers, better risk controls, and liquidity assistance. The role of international coordination and its limits in the sharing of risks and burdens are considered.

The paper finds that, in the absence of well-defined cross-border burden sharing arrangements, economies with large banking systems can help defray crisis risks through:

- *Effective regulation and supervision.* This can be achieved through a more “hands on” approach and/or more stringent regulatory ratios. Subsidiarization of foreign operations may also help in these types of economies by lowering fiscal and foreign currency risks, although other considerations are important for this choice.
- *Macroeconomic buffers.* Large cross-border banking systems are vulnerable to potential pressures, which puts a greater premium on foreign exchange and fiscal buffers, which can increase the credibility of potential sovereign support for domestic banks’ liquidity and capital.
- *International liquidity support.* Even in the absence of international arrangements, swap lines between central banks can alleviate market pressures in times when liquidity is stressed.

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I. VULNERABILITIES AND THE CRISIS¹

A. Underlying Issues

1. **What makes economies with large banking sectors vulnerable to a crisis?** The literature has identified three characteristics. An economy that (i) has a significant cross-border dimension to its banks with (ii) limited fiscal resources, and (iii) that issues a (non-reserve) currency or adopts a reserve currency as its legal tender. All the economies in this study have these attributes to varying degrees.

Box 1: Is There an “Optimal Size” of the Financial Sector?

The theoretical benefits of an efficient financial sector are well known. They can lower borrowing costs and promote growth by: a) producing information, b) pooling savings and allocating capital, c) managing, intermediating and allocating risks, d) monitoring businesses, and e) easing external financing constraints facing firms. A large financial sector is then appropriate to the extent that the above benefits outweigh the costs of diverting resources from other sectors, and financial stability risks.

The link between a large banking system and better investment choices and growth has been difficult to establish in the literature. See, for example, Chapter 4 of the September 2006 *World Economic Outlook, September 2006*. As the crisis has vividly illustrated, rapid financial sector growth can reflect unsustainable asset booms rather than improved intermediation. The benefits from having more ways to allocate savings have to be set against risks of a costly crisis. The policy response has been two-fold. To create a safety net to minimize the costs of a crisis while domestic regulation minimizes the resulting moral hazard.

Countries with large internationally active financial sectors face an additional important question—what is the appropriate size of international financial activities? Again there is a trade-off. International banking is a high-value added and geographically concentrated business that boosts GDP and incomes. Against these benefits, the accumulation of external liabilities by banks add external and fiscal risks for the sovereign. The additional externality that this risk creates can be offset via tighter regulation of banks, additional external and fiscal buffers, and burden sharing agreements with other countries.

¹This report was prepared by a team comprising Sergei Dodzin, Christoph Duenwald, Srikant Seshadri (all SPR), Alberto Buffa di Perrero, Mangal Goswami, Anna Ilyina, Silvia Iorgova, Turgut Kisinbay, Vanessa Le Lesle (all MCM), led by Tamim Bayoumi (SPR), Martin Mühleisen (SPR), and Inci Otker-Robe (MCM). Malika Pant (SPR), Morgane de Tollenaere, Siret Dinc, and Ivan Guerra (all MCM) provided able research assistance, and Ola Melander (SPR), Sylwia Nowak, Neil Saker, and Miguel Segoviano (MCM) inputs. It draws on findings of missions to Hong Kong SAR, Ireland, Singapore, Switzerland, and the United Kingdom that benefited from participation by Bergljot Barkbu, Andre Meier (EUR), Mahmood Pradhan (APD), and Kevin Ross (EUR).

2. **These characteristics can render an economy vulnerable even if the domestic banking system is well capitalized.** A crisis could occur if external retail or wholesale depositors create a funding crisis, and/or if shocks lower the liquidity of assets relative to foreign liabilities. The underlying vulnerability comes from the fact that the economy cannot guarantee the (foreign currency) liquidity needs of a large banking sector. Further, liquidity crises can quickly morph into solvency crises, bringing the fiscal capacity of the sovereign to recapitalize the banks into question. In recent years, the increased size of banking, securitization, and the trend to a “shadow” banking system exacerbated these vulnerabilities, by creating new and less transparent, ways for banks to expand operations.

3. **The economies studied in this paper combine a similarity—large banking systems—with a variety of outcomes over the crisis of 2007–09.** At one extreme, *Iceland* suffered a banking collapse. *Ireland* avoided a financial collapse, but faces a significant increase in costs of government borrowing as debt is projected to rise rapidly. *Switzerland* intervened in one of its two major banks, but the fiscal consequences have been more modest. Finally, *Hong Kong SAR* and *Singapore* came out of the crisis largely unscathed. The rest of this paper explores how offsets from private sector regulation, public sector prudence, and international cooperation (or their absence) before and during the crisis affected these outcomes.

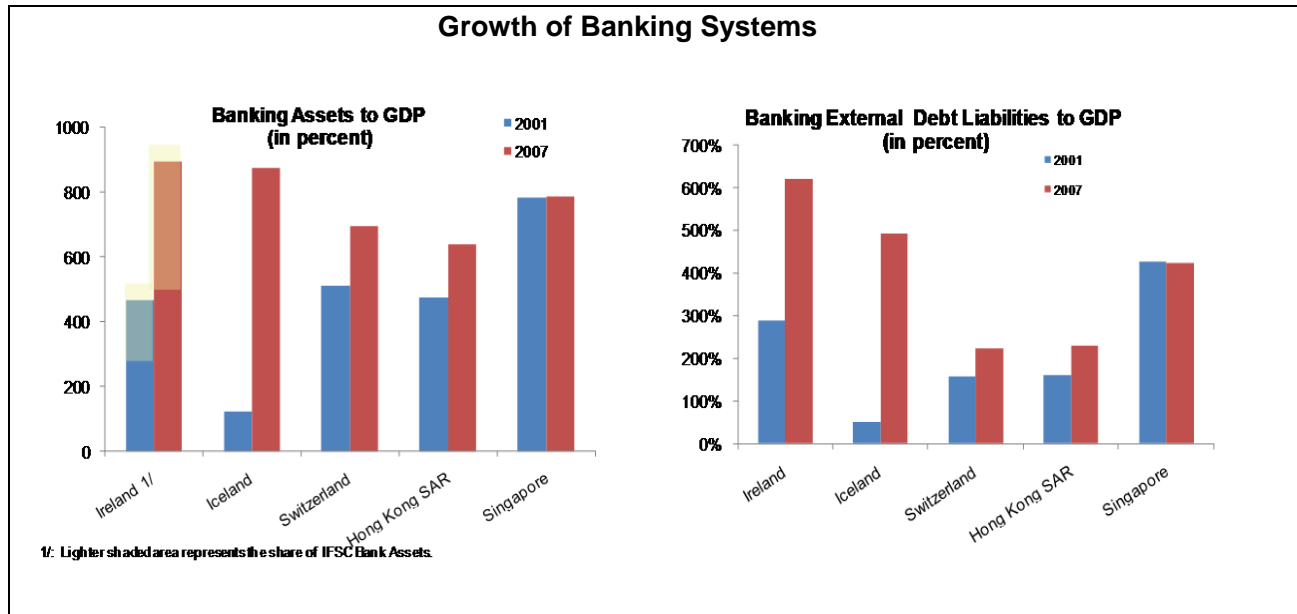
B. The Run up to the Crisis

Evolution before the crisis

4. **In explaining the evolution of the macro-financial vulnerabilities across our sample, it is useful to highlight certain distinguishing features** (Table 1 and Figure 1):

- *Rapid bank growth driving (and being driven by) domestic bubbles, resulting in growing international activities, rising leverage and macro risks.* Icelandic bank assets rose to over eight times GDP by 2007—a striking six times the 2001 ratio—and foreign debt shot up even faster. While Ireland also had rapid banking sector growth, it was different from Iceland in many respects—lending was more domestic, funding was more via retail deposits, and banks were less dependent on trading income. Also, a high share of bank assets was held in the International Financial Services Centre (IFSC) whose banks did not have significant domestic operations. As in the U.S. and U.K., Ireland’s boom featured unsustainable domestic house price rises, current account deficits, and growing fiscal vulnerabilities that were partly obscured by cyclical and boom-related revenues.
- *Slower foreign banking expansions accompanied by strong macroeconomic fundamentals and large government buffers.* Hong Kong SAR and Singapore already had large banking systems in 2001 (with bank assets of some 470 and 780 percent of GDP, respectively). The rate of increase of this ratio after 2001 was significantly below Iceland and Ireland and, for that matter, that of the Euro area and the United States (although not Japan). Foreign debt remained contained, and the regulatory agencies helped head off macroeconomic risks by tightening lending standards for property loans. Strong fiscal and foreign exchange positions also helped support market confidence.

- *Expansion driven by investment banking operations.* Swiss bank assets relative to GDP expanded slowly—slower than the Euro area and United States, albeit from a larger base. Macroeconomic conditions were favorable, featuring external and government surpluses. However, leverage, foreign debt, and assets (including off-balance-sheet items) rose rapidly as investment banking expanded, mainly in the United States. In short, the two large Swiss banks bought into the unsustainable U.S. bubble.



Bank strategies

5. **The evolution of large complex financial institutions (LCFIs) in sample economies is central to understanding these trends** (Table 2 and Figure 2). LCFIs were the main force driving banking systems, with the largest three banks representing over half of assets in all of the sample countries except Singapore and Ireland, where assets of foreign banks without domestic ties (the IFSC) grew rapidly. Also, LCFIs dominated the external borrowing and lending that lay behind the rapid expansion (or lack of the same) in each economy's international presence.

6. **The balance sheets of Icelandic, Irish and Swiss LCFIs were significantly more stretched than the Asian banks over 2001–07** (Box 2). Based on their financial indicators, banks in the sample can be grouped according to the broad parameters of their business models and attendant vulnerabilities:

- *Large Icelandic and Irish banks sought to generate returns through rapid expansion of loan portfolios (at home and/or abroad, organically and/or through acquisitions).* Icelandic banks were much more dependent on foreign wholesale funding than Irish banks. While access to wholesale funding liabilities was the immediate problem for both sets of banks in the crisis, concerns were triggered by deteriorating assets as Icelandic and Irish banks overextended their loan books to firms and property markets respectively.

Box 2. Asset Quality, Profitability, Capital Adequacy and Liquidity Indicators of LCFIs in the Sample Economies During 2001–07

A comparison of the banks' financial ratios suggests that the balance sheets of Icelandic, Irish and Swiss banks were more stretched than those of the Asian banks in the run up to the crisis (see Table 2 and Figure 2). More specifically:

The assets of Icelandic and Irish banks expanded much faster than the loan books of banks in Hong Kong SAR and Singapore (Figure overleaf). The Irish banks' asset expansion was focused mainly on domestic and U.K. markets, with most credit exposures related to real estate, regardless of the geographic location. The Icelandic bank assets expanded at an even faster pace, mainly through acquisitions and, by end-2007, were equally split between domestic and foreign operations (branches and subsidiaries, principally in the Nordic countries and in the U.K.). In the Swiss case, bank asset growth was driven mainly by cross-border investments (notably, to the United States). Though much slower than in Iceland and Ireland, loan growth in Hong Kong SAR was also largely real estate-related, and more recently, driven by lending to entities—particularly SMEs—in mainland China. In both Hong Kong SAR and Singapore, banks' cross-border exposures were limited mainly to the rest of Asia.

Profitability indicators for Icelandic and Irish banks tended to be higher, but also more volatile than those of other banks in the sample (Figure 2). In the case of Icelandic banks, the volatility of profitability measures was because roughly 20 percent of their income was derived from trading. In contrast, the share of trading income at any of the three Irish banks never exceeded 5 percent, with profitability indicators mainly driven by loan growth. The Asian banks' ROEs looked more modest, with the contribution of trading income at less than 10 percent. That said, local banks in Hong Kong SAR had better profitability indicators than banks in Singapore.

Capital buffers—as measured by the tangible common equity (TCE) ratios—were the largest in the case of local Asian banks (Figures 2 and 7). While most banks in the sample were above the regulatory minimum capital requirements, there appears to be more variation based on the TCE ratios. The Asian banks had the highest TCE ratios, while the investment banks had the lowest TCE ratios in the sample (e.g., local banks in Hong Kong SAR had an average TCE ratio of 8 percent, while the Swiss banks had an average TCE ratio of only 2 percent).

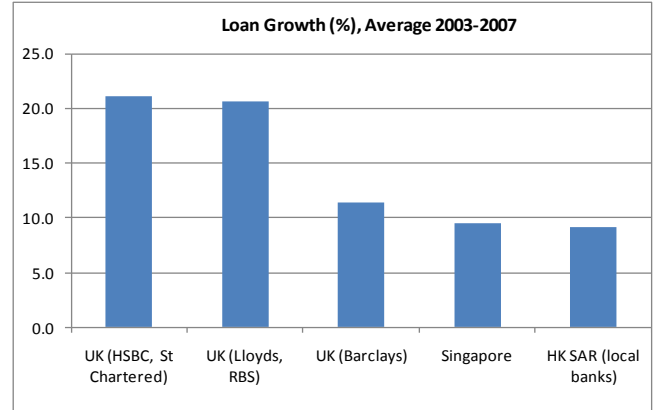
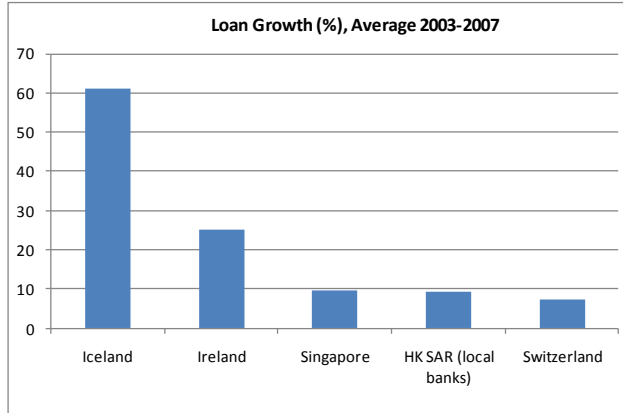
Leverage ratios of LCFIs that followed the investment banking model were the highest in the sample (Figure 2). Banks with significant investment banking operations (UBS, Credit Suisse) tended to have high (rising) leverage ratios during 2001–07. Asian banks and also Icelandic banks seemed to be on the other end of the spectrum, with fairly low (stable) leverage ratios, with Irish banks somewhere in between.

Funding strategies of Swiss and Icelandic banks seem to have been heavily skewed towards external/wholesale funding (Figure 2). Given the limited deposit base, Icelandic banks had to rely heavily on wholesale funding to finance their asset expansion: at over 70 percent, their share of wholesale funding in total liabilities was comparable only to that of investment banks in the sample. In contrast, banks in Hong Kong SAR and Singapore had relatively low dependence on wholesale funding. In the case of Hong Kong SAR, local banks were less reliant on wholesale funding than the subsidiaries of UK banks operating there. For HSBC and Standard Chartered, wholesale funding accounted for 20–30 percent of total financing against an average of around 15 percent for local Hong Kong SAR banks.

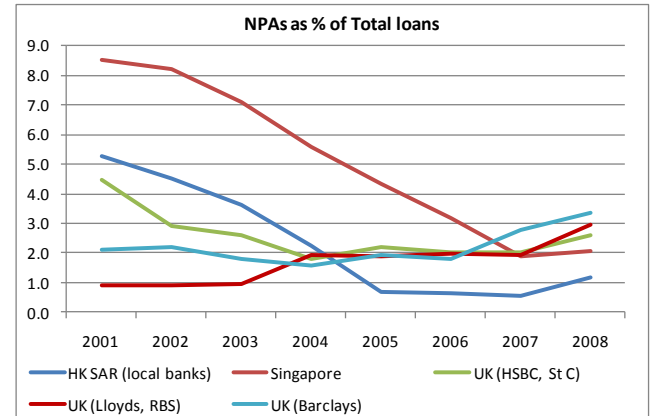
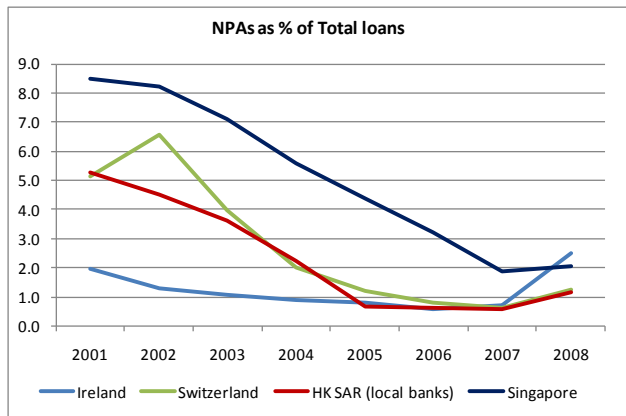
Liquidity buffers of Icelandic and Irish banks were not as strong as those of other banks in the sample (Figure 2). Icelandic and Irish banks had the highest loan-to-deposit ratios and the lowest liquid asset ratios (share of liquid assets in total assets) in the sample, with local banks in Hong Kong SAR being on the opposite end of the spectrum.

Box 2. (concluded) LCFI Asset Quality

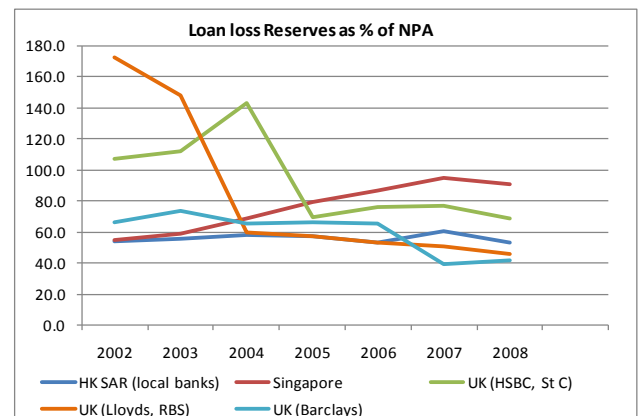
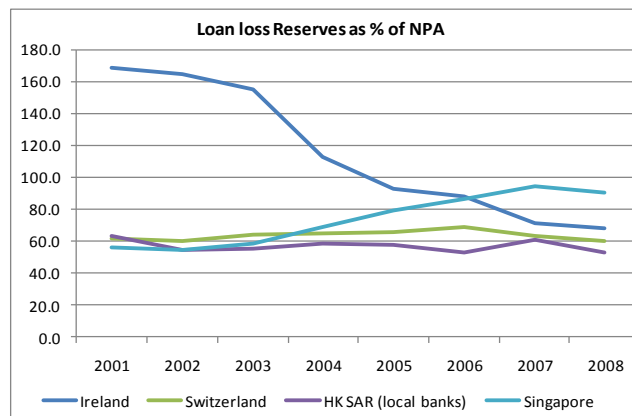
The loan books of Icelandic and Irish banks have expanded at a much faster rate than those of the local banks in Hong Kong SAR and Singapore.



Nonperforming assets (as a share of total loans) of European banks have picked up more sharply after the onset of the crisis than those of Asian banks, including the subs of the U.K. banks operating in Asia...



...while NPAs rose sharply in 2007–08, loan-loss reserves ratios remained flat.



Sources: Bloomberg, Company Reports, and Fund staff estimates.

- *Large Asian banks produced acceptable returns from a diversified deposit base while keeping relatively large capital and liquidity cushions.* Local Hong Kong SAR banks and the subsidiaries of HSBC and Standard Chartered operating there were subject to the same regulations and had broadly similar characteristics (including an Asia-focused asset mix), however the subsidiaries of U.K. banks had a somewhat higher share of wholesale funding, possibly due to easier access to such funding through their parents.
- *Swiss LCFIs sought higher returns on equity by taking on leverage via investment banking (on or off-balance sheet) that relied on wholesale funding.* The combination of major trading activities and wholesale funding exposed the banks to risks on both the asset and liability sides of their balance sheets.

Summary of Banking Sector Characteristics

	<i>Rapid growth of domestic bank assets</i>	<i>Rapid growth of foreign bank assets</i>	<i>Significant reliance on trading income by banks</i>	<i>Significant reliance on external funding</i>	<i>Significant reliance on wholesale and/or short-term funding</i>
Iceland	✓	✓	✓	✓	✓
Ireland	✓	✓	NO	✓	✓
Switzerland	NO	✓	✓	✓	✓
Singapore	NO	NO	NO	NO	NO
Hong Kong SAR	NO	NO	NO	NO	NO

7. **Differences in governance and internal risk management procedures also help explain why some LCFIs stretched their balance sheets more than others.** This point is illustrated by rating agency analyses of the two Swiss LCFIs. They concluded that UBS had a decentralized structure that relied heavily on external assessments of credit quality. They relied on agency ratings when warehousing and packaging of CDOs, used insurance from monoline entities to limit counterparty risks, and allowed Dillon Read Capital Management hedge fund (a UBS-owned entity that failed in the early days of the crisis) significant autonomy. By contrast, Credit Suisse used more effective hedging strategies for its leveraged finance exposure, and exited the U.S. property market relatively early.

Financial regulation and the boom

8. **Financial liberalization and “light touch” regulation helped catalyze growth.** After being privatized in 2002, Icelandic banks embraced a more aggressive approach to lending and foreign asset acquisitions. The authorities had insufficient supervisory and regulatory experience and lacked the instruments to effectively oversee complex bank ownership structures, or to

monitor connected lending and large exposures. The expansion in Ireland began after euro area membership lowered financial barriers, and was supported by U.K.-style principles-based regulation.

9. **Banking regulation was inadequate in addressing the accumulation of risks through investment banking activities.** In common with many European banks, UBS and Credit Suisse took on large and highly leveraged exposures both on- and off-balance sheet. Swiss bank supervisors appear to have relied heavily on the banks' risk models. While off-balance sheet entities were legally separate, markets (correctly) assumed that they would be supported for reputational reasons (so-called "moral recourse"). Banks and regulators did not fully take the associated risks into account.

10. **By contrast, tighter prudential supervision likely played a role in slower credit expansion in Hong Kong SAR and Singapore.** Bankers felt that, partly as a reaction to the Asia crisis, Hong Kong SAR and Singapore regulators were more focused on loan growth within and across market segments and on understanding and assessing individual banks' internal risk management compared to regulators in the European countries in the sample. For example:

- *Measures to mitigate rapid growth of credit in property loans:* Regulators imposed a relatively stringent 70 percent cap on loan-to-value (LTV) ratios in Hong Kong SAR that limited the blow to bank capital following the 1998–2002 slumps in residential property prices, and lessened risks when house prices subsequently recovered. LTV caps were also in place in Singapore, China, Korea, and Malaysia. In comparison, the Irish authorities introduced a requirement for Irish banks to assign higher risk weights to mortgage loans with LTV above 80 percent only in May 2006. Bankers felt that regulators in Hong Kong SAR and Singapore followed banks' commercial real estate loans closely as well.
- *Capital ratios were higher and better composed:* The higher ratios of tangible common equity to Tier 1 capital in Hong Kong SAR and Singapore banks suggest that closer attention was paid to the composition of capital by banks and regulators. By contrast, Icelandic regulations allowed the banks' Tier I capital to include up to 30 percent of hybrid capital compared with the Nordic limitation of 15 percent. In Singapore, banks were required to maintain capital adequacy ratios of 10 percent and Tier 1 ratios of at least 6 percent, two percentage points above minimum standards set by the Basel Committee.

Foreign Branches or Subsidiaries?

11. **The choice between foreign subsidiaries and branches largely reflected bank business decisions rather than lender of last resort considerations.** These different ownership structures mattered for the potential fiscal liabilities of home countries over the crisis. Subsidiaries are independently capitalized and under the host country supervision, while home regulators are typically responsible for branches (particularly in Europe). Banks generally chose the ownership structure based on the form of expansion (existing business with franchise or "Greenfield" investments), tax, and regulatory requirements (and arbitrage).

12. **In the European Economic Area (EEA, comprising EU and most EFTA members) the passport system may have made it easier for banks to choose branch structures.** As part of the push for an integrated European financial system, the passport system put branches clearly under the jurisdiction of the home country. U.K. regulators felt its provisions factored into the decision to accept IceSave as a branch in 2006. IceSave was used by the Icelandic bank, Landsbanki, to replace “hot money” wholesale funds with “hot deposits” attracted via high internet deposit rates (other authorities, however, have argued the U.K. could have blocked the application). By contrast, Swiss banks’ U.S. broker-dealers used for investment banking operations had to be independently capitalized subsidiaries, helping to cushion the blow to Swiss taxpayers when the crisis hit.

Macroeconomic environment

13. **Cross-border banking activities exposed the economies in the sample to external shocks** (Box 3). Network analysis of cross-border interbank linkages finds that the sample economies were relatively more sensitive to financial shocks emanating in the United States and the United Kingdom than other economies included in the analysis. Feedback onto money centers or between sample economies was limited, except a combined Swiss credit and liquidity shock, which had some impact on the United States.

14. **Private sector macroeconomic imbalances built in Iceland and, to a much lesser extent, Ireland** (Figures 3–4). Expanding bank balance sheets were accompanied by domestic credit booms and real estate bubbles, significant increases in household and corporate debt, and rising current account deficits. By contrast, Switzerland, Singapore, and Hong Kong SAR ran current account surpluses, remained net external creditors, and had stable private sector debt ratios. Indeed, although land prices started to rise in Hong Kong SAR and Singapore after 2006, private sector credit as a percent of GDP was still lower in 2007 than in 2001.

Summary of Macroeconomic and Policy Stances

	Iceland	Ireland	Switzerland	Singapore	Hong Kong SAR
Fiscal Balance/GDP (end-2007) (%)	5.4	0.2	0.9	12.4	7.7
Fiscal Balance/GDP (end-2009) (E) (%)	-14.4	-11.8	-0.5	1.5	-0.9
Reserves/GDP (Beginning 2007) (%)	12.8	...	16	98	70.1
Reserves/GDP (End-2009) (%)	42	...	26	117	121.4
Net IIP (end-2007, % of GDP)	-127.2	-16.5	139	100.5	252

15. **The Asian economies built up fiscal and external buffers to cover large short-term debts from their large financial systems.** In Hong Kong SAR and Singapore, prudent fiscal and external management created significant fiscal and foreign exchange buffers. In Hong Kong SAR, with its currency board arrangement, the 30 percent coverage of gross short-term external debt

Box 3: Cross-Border Spillovers¹

Scenarios: This box analyzes cross-border spillovers through bank exposures for economies with large banking systems. The assessment considers the impact of two hypothetical shocks: (1) a credit shock in which the initial default by an institution may trigger additional rounds of defaults; and (2) a credit and liquidity shock, in which each credit shock is compounded by a liquidity shock.

Sample: The analysis concentrates on three groups of countries, for which the cross-country interbank exposure data are available from the BIS: (1) economies with large financial systems that are covered in this paper (Belgium, Netherlands, Ireland, and Switzerland); (2) three other economies with developed financial systems (Austria, Spain, Sweden); (3) systemically significant economies with large financial systems (France, Germany, United Kingdom, and the United States). The inclusion of the major global liquidity and capital providers in the interbank network enables realistic simulations of inward and outward cross-border spillovers and provides useful benchmarks for comparison.

Data: The interbank exposure data used in the simulations are from the BIS's consolidated banking statistics reported on an *immediate borrower basis* (IBB).² The BIS dataset is supplemented with the Bankscope capital data for large commercial and investment banks. The simulations are based on figures reported at the end of 2006, 2007, and 2008 as well as the average capital and foreign claims over these three years.

Key results: While the economies covered in the paper are unlikely to generate significant negative spillovers to other countries in the sample, they appear to be more vulnerable to inward spillovers from credit and/or liquidity shocks originating in other countries. More specifically:

- **The credit shock scenario** focuses on spillovers from a credit shock, where the default of the trigger country generates outward spillovers within the network (Box Tables 1 and 2 overleaf present results for the average period 2006–08). Box Table 1 shows that a default on a large part of the foreign liabilities by banks in Belgium, Ireland, Netherlands, and Switzerland would not result in large losses for the network as a whole. However, even when the domino effects do not lead to systemic failures, the results in Box Table 2 suggest that an initial hypothetical failure of French and German banks would lead to average losses of 30.8 and 45.6 percent of capital, with Switzerland and Belgium most affected. On average, the hypothetical Dutch failure would produce a projected capital loss to Belgian banks of 72.4 percent of their initial capital.
- **The credit and liquidity shock scenario** assumes that institutions are unable to roll over all of the funding previously granted by the defaulted institutions, thus triggering a fire sale of assets. The impact of the liquidity squeeze increases the systemic role of Netherlands, France, and Germany (Box Tables 3 and 4 overleaf present results for the average period 2006–08). The default of Netherlands would induce one hypothetical default (Box Table 3), while for France and Germany, these numbers increase from zero and one (in the credit shock scenario, Box Table 1) to nine and two, respectively (Box Table 3). On average, the hypothetical default of the Dutch, French, and German financial systems would lead to losses of 7.3, 54, and 7 percent of the total capital (Box Table 3). Compared to the credit shock, the combined credit and liquidity shock significantly increases the impact of Switzerland on the U.S. (see Box Tables 2 and 4).

¹Prepared by Sylwia Nowak using the methodology developed by Marco Espinosa and Juan Solé (see GFSR April 2009, Chapter 2 and the forthcoming IMF working paper by Espinosa and Solé (“Cross-Border Financial Surveillance: A Network Perspective.”))

²The IBB dataset is consolidated by the residency of the immediate borrower and reflects the total exposures of the reporting banks to banks, nonbank private sector, and public sector in other countries (Table 9B).

Box 3: Cross-Border Spillovers (concluded)

Table 1: Simulation Results under Credit Shock Scenario

Country	Failed Capital (% of total capital)	Induced Failures	Contagion Rounds	Absolute Hazard 1/	Hazard Rate 2/
Belgium	2.58	0	0	2	20
Netherlands	4.73	0	0	2	20
Switzerland	2.66	0	0	2	20
Ireland	3.18	0	0	2	20
Austria	1.17	0	0	2	20
Spain	5.64	0	0	2	20
Sweden	0.98	0	0	3	30
France	10.48	0	0	2	20
Germany	5.82	1	1	2	20
UK	54.00	9	2	1	10
USA	100.00	10	2	0	0

Source: IMF staff calculations

1/ Number of simulations in which the banking system of that particular country fails.

2/ Percentage of failures as a percent of the number of simulations conducted.

Table 3: Simulation Results under Credit and Liquidity Shock Scenario

Country	Failed Capital (% of total capital)	Induced Failures	Contagion Rounds	Absolute Hazard 1/	Hazard Rate 2/
Belgium	2.58	0	0	4	40
Netherlands	7.30	1	1	3	30
Switzerland	2.66	0	0	3	30
Ireland	3.18	0	0	3	30
Austria	1.17	0	0	4	40
Spain	5.64	0	0	3	30
Sweden	0.98	0	0	4	40
France	54.00	9	3	2	20
Germany	6.99	2	1	3	30
UK	54.00	9	2	2	20
USA	100.00	10	2	0	0

Source: IMF staff calculations

1/ Number of simulations in which the banking system of that particular country fails.

2/ Percentage of failures as a percent of the number of simulations conducted.

Table 2: Credit Shock Scenario - Post Simulation Capital Impairment (in percent of pre-shock capital)

	Belgium	Netherlands	Switzerland	Ireland	Austria	Spain	Sweden	France	Germany	UK	USA	Average
Trigger Country:												
Belgium		-43.2	-14.2	-3.5	-3.7	-3.5	-5.8	-19.4	-15.4	-4.0	-0.4	-11.3
Netherlands	-72.4		-36.4	-7.4	-18.6	-6.3	-14.3	-22.8	-55.1	-9.8	-0.9	-24.4
Switzerland	-6.0	-6.1		-1.5	-13.0	-1.4	-6.7	-8.9	-22.5	-2.9	-0.3	-6.9
Ireland	-47.1	-12.9	-19.0		-7.8	-4.8	-8.2	-13.7	-61.3	-16.8	-0.5	-19.2
Austria	-5.2	-3.0	-9.5	-4.0		-0.8	-2.8	-3.7	-34.0	-1.2	-0.1	-6.4
Spain	-25.9	-38.3	-13.6	-15.0	-9.2		-11.2	-31.4	-84.3	-10.9	-0.5	-24.0
Sweden	-1.7	-3.3	-7.5	-2.7	-1.8	-0.7		-2.7	-12.7	-1.5	-0.1	-3.5
France	-65.0	-39.7	-62.6	-12.4	-14.1	-12.3	-14.0		-67.6	-19.6	-1.0	-30.8
Germany	-40.4	-57.9	-67.1	-32.0	-67.2	-13.0	-116.6	-46.9		-13.7	-1.6	-45.6
UK	-353.3	-277.8	-460.3	-190.9	-163.1	-136.5	-246.3	-224.7	-546.7		-9.5	-260.9
USA	-424.9	-404.1	-1243.2	-237.5	-191.1	-169.6	-315.1	-364.6	-775.6	-189.7		-431.5
Average	-104.2	-88.6	-193.3	-50.7	-49.0	-34.9	-74.1	-73.9	-167.5	-27.0	-1.5	

Table 4: Credit and Liquidity Shock Scenario - Post Simulation Capital Impairment (in percent of pre-shock capital)

	Belgium	Netherlands	Switzerland	Ireland	Austria	Spain	Sweden	France	Germany	UK	USA	Average
Trigger Country:												
Belgium		-57.1	-16.2	-16.9	-7.7	-7.6	-7.4	-25.0	-22.6	-8.7	-1.8	-17.1
Netherlands	-100.2		-56.4	-31.0	-30.5	-25.1	-27.2	-54.1	-96.3	-25.6	-7.2	-45.4
Switzerland	-11.1	-13.2		-7.1	-20.6	-3.6	-13.8	-14.5	-34.0	-15.4	-16.1	-14.9
Ireland	-48.6	-14.7	-19.6		-11.6	-7.8	-11.2	-15.0	-68.0	-24.0	-1.6	-22.2
Austria	-5.8	-4.6	-11.5	-5.0		-1.5	-3.5	-4.3	-39.5	-1.8	-0.3	-7.8
Spain	-28.5	-41.0	-14.6	-18.0	-10.6		-12.6	-33.7	-89.3	-21.4	-2.0	-27.1
Sweden	-2.5	-4.3	-8.3	-3.6	-2.6	-1.3		-3.1	-21.0	-2.8	-0.7	-5.0
France	-439.0	-356.2	-504.1	-302.8	-252.0	-216.1	-307.0		-658.9	-157.5	-69.2	-326.3
Germany	-57.1	-83.2	-93.8	-70.6	-117.2	-40.5	-142.1	-62.6		-35.4	-10.8	-71.3
UK	-439.0	-356.2	-504.1	-302.8	-252.0	-216.1	-307.0	-269.3	-658.9		-69.2	-337.4
USA	-513.1	-485.4	-1288.6	-351.9	-281.2	-250.7	-378.0	-410.7	-892.5	-272.2		-512.4
Average	-164.5	-141.6	-251.7	-111.0	-98.6	-77.0	-121.0	-89.2	-258.1	-56.5	-17.9	

before the crisis was well within standard prudential norms—similar considerations apply to Singapore. In Iceland and (to a lesser extent) Ireland, bubble-related revenues obscured the weakness in underlying fiscal positions from the government and most analysts (including the Fund which sharply revised downwards, the estimated structural fiscal position after the crisis). Irish banks’ access to European Central Bank operations, as part of the Euro area, shielded them from serious liquidity risks. Switzerland ran significant structural fiscal surpluses but maintained limited foreign exchange reserves and a floating exchange rate regime (as did Iceland).

16. **Fund surveillance generally recognized growing macroeconomic imbalances, but underestimated inward and outward spillovers.** In Iceland and Ireland the need to enhance bank supervision was highlighted—but not forcefully enough—and (as elsewhere) the impact of asset bubbles was underestimated. Bank stress tests in Ireland and Iceland (conducted by the authorities) and in Switzerland, were sanguine compared to outcomes. For Hong Kong SAR and Singapore, prudent macroeconomic policies were praised, even if the links to the banking sector were not emphasized. Except in Switzerland, external spillovers received limited attention.

II. HOW DID BANK RISKS SHIFT TO THE GOVERNMENT DURING THE CRISIS?

17. **The crisis rapidly exposed the close links between banks and sovereign risk in the chosen sample of economies.** This section explores how this process evolved and, in particular, the role played by policy decisions.

Crisis Impact

18. **Reflecting their underlying vulnerabilities, post-Lehman turbulence affected Iceland most, then Ireland and Switzerland (through banks’ external operations):**

- *Early on in the crisis, Icelandic banks were effectively shut out of the bond and foreign exchange swap markets. After Glitnir bank was unable fund a foreign payment due in October 2008 an agreement was reached to provide the bank with new equity amounting to €600 million (23 percent of reserves) from the Central Bank, and a Fund program was rapidly arranged.*
- *Irish banks’ access to wholesale funding came under growing scrutiny over the crisis as they were hit by asset quality concerns. Projected loan losses rose with the bursting of the domestic and U.K. housing bubbles, in which the banks were heavily invested, and capital eroded as provisions exceeded banks’ operating incomes.*
- *The Swiss financial system was affected mainly through the international exposures of UBS and, to a lesser extent, Credit Suisse. In both cases, stability concerns were centered on the need for significant write-downs and credit losses on their exposures to (largely dollar-denominated) “toxic assets.”*

- *The Hong Kong SAR and Singapore banking systems were relatively resilient to external turbulence.* Aside of a short-lived and minor bank run in Hong Kong SAR, the main impact was through the domestic and global slowdown. The crisis also affected the broader financial sector through a contraction in the asset management industry.

19. **The lack of effective cross-border resolution mechanisms increased sovereign risks for countries with large banking systems.** Box 4 discusses these issues using the example of the highly financially integrated Benelux region—Belgium, Netherlands, and Luxembourg. The lack of cross-border resolution frameworks led to *ad hoc* and inefficient solutions. In particular, Fortis bank was split on national, rather than business, lines.

Macroeconomic Policies

20. **Rapid global monetary easing provided support to bank profitability particularly as financial conditions normalized.** The Swiss National Bank guided policy interest rates to zero, while Hong Kong SAR, Ireland, and Singapore all imported lower interest rates through various exchange rate arrangements (currency board, currency union, and basket float, respectively). Indeed, Hong Kong SAR had to buy dollars to offset *inflows* from repatriation of local funds and safe haven effects as concerns mounted about core western markets. Switzerland also intervened (for the first time since 1995) to stem upward pressures on the franc from safe haven flows.

21. **Rapid and forceful financial policies were introduced in the European part of the sample, while fiscal stimuli were limited.** Faced with major risks to government finances, the sample European countries swiftly implemented forceful financial policy responses compared to other jurisdictions facing similar situations (helped, in the case of Switzerland, by support for U.S.-based subsidiaries through efforts to stabilize U.S. markets). This helped to contain the crisis. The resulting large (actual and contingent) fiscal claims limited the attractiveness of direct fiscal stimulus. Indeed, Ireland bucked the global trend and tightened fiscal policy in 2009. By contrast, the authorities in both of the Asian economies provided significant fiscal support from 2008. In Singapore, the package amounted to some 8 percent of GDP.

Summary of Financial Support Measures

	Extension of retail deposit insurance	Debt Guarantees	Liquidity Support (intern'l)	Liquidity Support (domestic)	Capital Injections	Asset Purchases /Swaps	Capital Controls
Iceland	✓	✓	✓	✓	✓	✓	✓
Ireland	✓	✓	✓	✓	✓	✓	NO
Switzerland	✓	NO	✓	NO	✓	✓	NO
Singapore	✓	NO	✓	✓	NO	NO	NO
Hong Kong SAR	✓	NO	NO	✓	NO	NO	NO

Box 4. The Case of the Benelux Region

Benelux’s financial landscape was transformed in the 1990s and 2000s, as deregulation spurred a wave of mergers and acquisitions, creating large complex financial institutions (LCFIs). The Benelux region has a long history of economic integration. A key regional business strategy was the integrated *bancassurance* model, combining banking and insurance activities. Over the 1990s LCFIs such as ABN Amro, Fortis, Dexia, KBC, and ING dominated regional banking and insurance and expanded their international banking networks. Hence, cross-border resolution was added to the typical risks from rapid bank expansion—growing involvement in structured finance markets, higher leverage, greater use of wholesale funding, and international expansion.

Benelux countries were also particularly exposed to the global financial crisis, given large financial sectors and strong global trade and financial linkages (Figures overleaf). Real GDP growth turned sharply negative as the crisis deepened, with exports and investment collapsing. Credit spreads widened, bank stock prices fell, lending standards tightened, and credit dried up. Banks’ credit ratings were repeatedly cut after October 2008.

Write-downs associated with the subprime crisis in late 2007 led to the beginnings of deposit runs and severe liquidity problems, prompting intervention by the three national authorities. This took the form of liquidity support and loan guarantees, but also nationalization, recapitalization, and restructuring of several large financial institutions, including Fortis Group, Dexia, KBC, and ING.. Banking supervisory cooperation among national regulators was close before the crisis, with stress tests run regionally on cross-border banks. However, in the absence of explicit burden-sharing arrangements cooperation rapidly soured, partly reflecting unexpected liquidity flows within banking groups from differing local requirements.

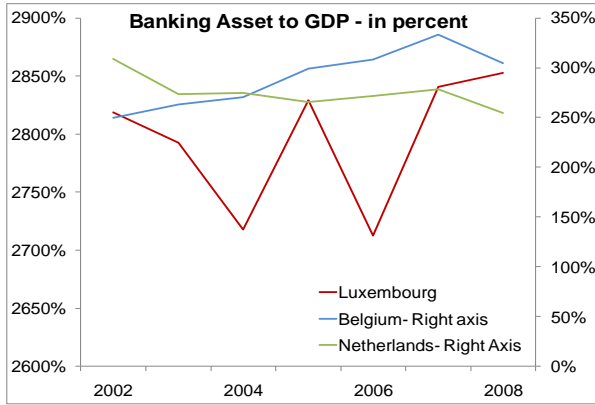
The Fortis case illustrates how the absence of established cross-border frameworks and burden sharing arrangements complicated such intervention. Fortis was a Belgian/Dutch financial conglomerate with substantial presence in all three countries. Following the failure of Lehman Brothers in September 2008, Fortis lost access to the overnight interbank market and was intervened by the National Bank of Belgium. But with the national authorities unable to rapidly agree on a rescue plan that could maintain the group structure, the banks was split up along geographical borders, rather than a more cost effective division across business lines. This was not inevitable. In the case of Dexia, a Franco-Belgian bank that collapsed due to its ownership of a U.S. monoline insurer, the governments agreed in similarly hurried circumstances to a plan that preserved the group.

EU competition policy currently represents the main platform for coordinating cross-border resolution in Europe, although the EU plans a more structured and binding approach in the future. The European Commission’s Directorate General for Competition vets bank rescue plans to ensure they restore long-term viability and that any state aid leads to a streamlining of business activities. As a result, ING was required to separate its banking and insurance businesses, sell its U.S. banking operations, and reduce its presence in other markets. One result of the Fortis and ING interventions is that Benelux banks have retrenched by focusing on their core domestic retail franchises (“back-to-basics banking”), a major structural change.

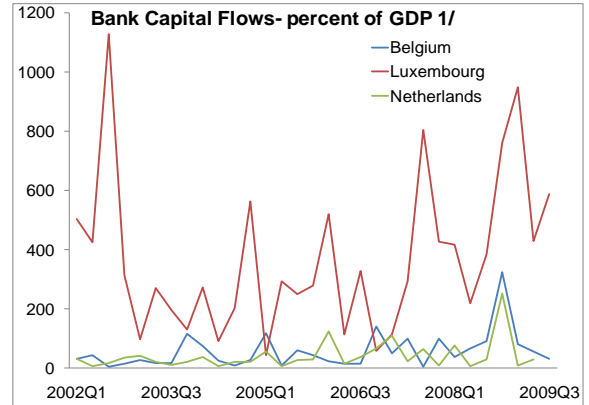
National fiscal policies and bank supervision creates incentives for policy makers in crises to resolve cross-border banks along national lines regardless of the costs to other jurisdictions and shareholders. Ideally, sensible international burden-sharing arrangements should be negotiated so that the costs resulting from cross-border resolution can be fairly shared among the stakeholders (both public and private), at least within relatively financially integrated areas such as the EU.

Benelux Countries: Impact of the Crisis

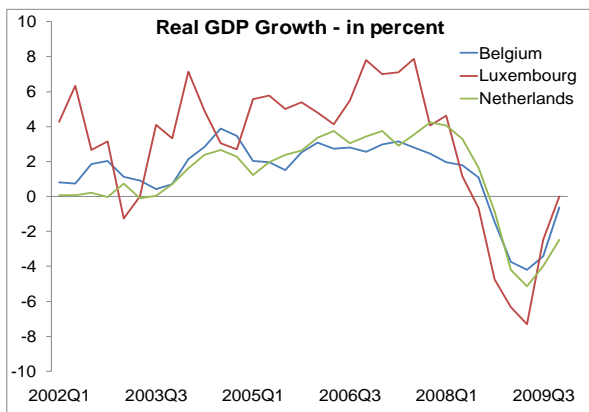
Benelux's financial sector-dominated...



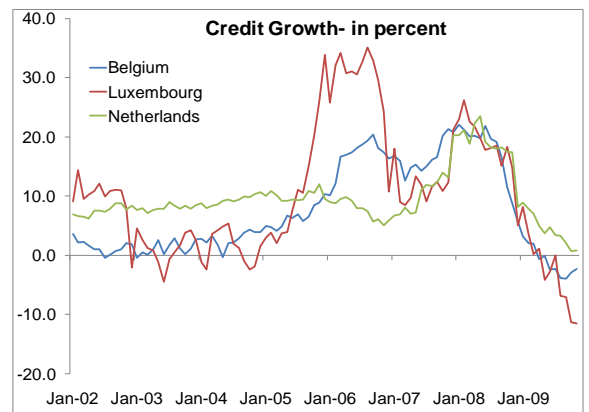
...and internationalized economies...



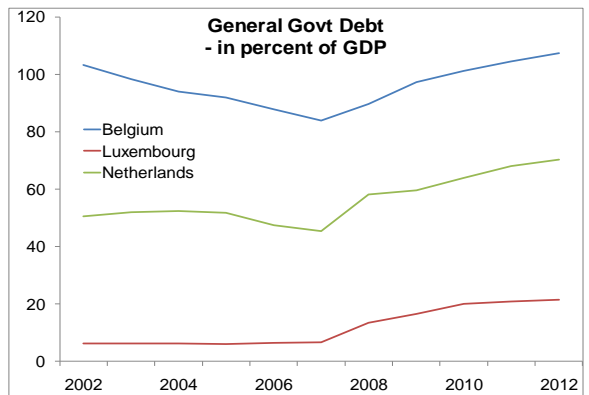
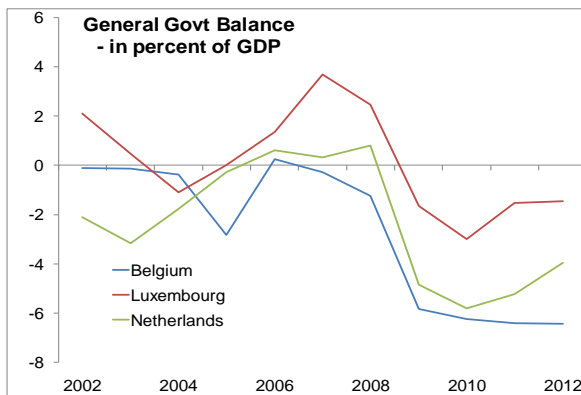
...experienced steep growth declines,...



...amid sharp credit contractions.



Automatic stabilizers and discretionary measures have undermined fiscal positions.



Sources: WEO, IFS, and Fund staff estimates.

1/ Absolute values of Inflows and outflows used to get the sum total.

Bank-Sovereign Risks

22. **Differing types of government support for large banking systems over the crisis created varying transfers of risk between private banks and the government.** To illustrate this, the left side of Figure 5 shows the relationship between bank and sovereign CDS spreads. It also identifies key financial support via: (i) protection of liabilities to prevent bank runs marked in red (e.g., extending deposit insurance, providing guarantees of other types of liabilities); (ii) support for impaired assets to shore up bank solvency in blue (e.g., capital injections and asset purchases/swaps); and (iii) provision of external liquidity by foreign central banks in green. The right side of Figure 5 reports estimated probabilities that a CDS event in bank (sovereign) leads to an event in a sovereign (bank). While the limited liquidity in Singapore and Hong Kong SAR CDS contracts warrants caution in interpretation, broad observations can be made.

23. **While government liability guarantees generally transferred risk from banks to governments, asset and external liquidity support tended to insulate sovereigns:**

- *The rapid collapse of the Icelandic financial system (all three major banks were intervened) focused attention on the liability of the sovereign for foreign depositors. Retail liabilities in foreign subsidiaries were paid by host governments. However, faced with large liabilities on retail deposits at foreign branches, the government proposed unlimited support for depositors in domestic branches but only limited support for branches in the EEA. This triggered an (as yet unresolved) dispute with the United Kingdom and the Netherlands.*
- *Risks of a wholesale funding run on Irish banks after Lehman collapsed were quelled via a guarantee on deposits and debt, which transferred risks to the sovereign. The guarantee covered retail and wholesale deposits, as well as senior debts, of major banks. In addition to unleashing similar responses elsewhere in Europe, this move socialized the risks from banks and for a period CDS spreads on several Irish banks and the sovereign became highly connected. This link gradually weakened following plans to recapitalize three banks in December 2008 and after growing public discussion from February 2009 onwards regarding the creation of a bad bank. Such a scheme was announced in April 2009. Even so, bank and sovereign risks have remained elevated and strongly correlated.*
- *By rapidly dealing with UBS's troubled assets, the Swiss authorities partially insulated the sovereign from bank risks. Switzerland was affected by the market turmoil that ensued in September-October 2008. However, the speedy construction of a "bad bank" funded by the central bank (backed by a Fed swap line that ensured the dollar liquidity needed to deal with mainly dollar-denominated toxic assets) seems—albeit with a lag—to have lowered investor concerns about sovereign risk. This reconfirms past experience that early and well-designed intervention on bank assets generally lower the fiscal cost of a bank crisis, while limiting moral hazard by ensuring troubled banks pay a significant proportion of the eventual costs.*
- *The crisis appears to have linked government to banks risks in Hong Kong SAR (Figure 5). A large transfer of risk from banks to the government first occurred in Hong Kong SAR in early 2008 as a result of the Bear-Stearns collapse but then subsided.*

Another such transfer of risk occurred after the announcement of blanket guarantee of retail deposits and a contingency facility for bank capital. This link has remained elevated.

- *Singapore also appears to have had a transfer of risks from banks to the government.* Such transfers occurred after upward shifts in risk perception (such as after Bear Stearns' rescue in 2008) and also after Singapore announced a blanket guarantee of retail deposits. The impact was likely mitigated by the announcement soon after of a swap line with the Federal Reserve. That said, market concerns over the link between local banks and the sovereign seem to have risen over time.

24. **International links reflect global financial conditions and depend more on the size and riskiness of the banking system than on the chosen policy measures.** Figure 6 shows estimated likelihoods that distress in banks and sovereigns in our sample would be followed by distress in a broader set of international banks and sovereigns. Contagion risks from banks and sovereigns of countries in the sample to major foreign LCFIs rose significantly in mid-2007 as international liquidity became constrained. Sovereign-to-sovereign spillovers rose more slowly, plateauing after the Lehman collapse. These risks are highest from the larger (Switzerland) and less risky (Hong Kong SAR, and Singapore) banking systems. International linkages are also discussed in Box 3.

25. **The fiscal costs are likely to remain a lasting legacy of the crisis in Iceland and Ireland, but the costs to the Asian economies and, strikingly, Switzerland are modest.** The crisis is projected to generate a major rise in public debt in Iceland and (to a lesser extent) Ireland (see Figure 3). As a result, sovereign bond spreads remain relatively high in Ireland. The impact on the Asian economies debt is projected to be much more modest. This is also true of Switzerland. While partly reflecting the sound state of non-financial balance sheets, the swift and well-designed resolution of UBS's problem assets that likely lowered long-term cost also helps explain this outcome.

III. EXPLAINING DIFFERENT OUTCOMES AND THE ROAD AHEAD

A. Two Issues Central to Explaining Differences in Outcomes

Why were Asian banks so much less affected by the crisis than European ones?

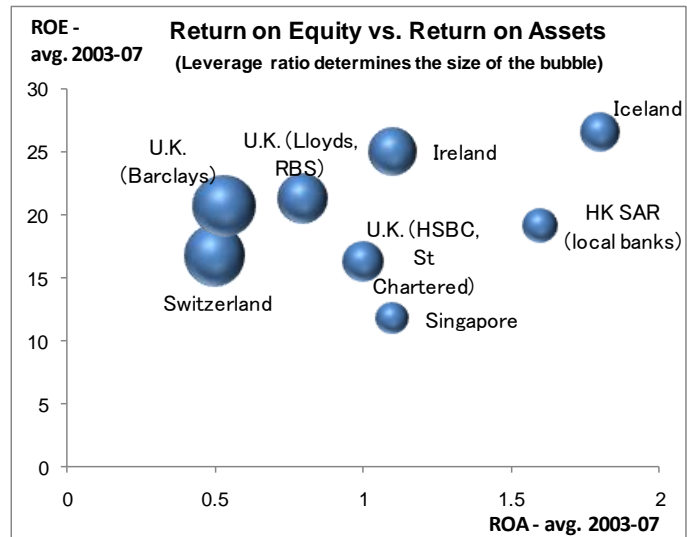
26. **A striking feature of the sample is that none of the Asian countries intervened in any major banks while all of the European countries did.** More generally, between the Lehman bankruptcy and the March 2009 global market trough, share prices of a typical major European financial institution fell by 80 percent (in U.S. dollars) compared with 50 percent for Singapore and 33 percent for Hong Kong SAR. Three basic explanations for the stronger performance of Asian banks have been suggested:

- *They operated in a high-saving and fast-growing region.*
- *They were more tightly supervised and regulated.*
- *They had strong internal management.*

27. **Ample retail deposits and fast growth provided an easier operating environment, but the Asia crisis shows that such conditions can still lead to severe banking problems.** While

the resilience and rapid rebound of activity following the recent crisis helped to limit risks to banks, this partly reflected more prudent behavior. After all, Asia was a high-growth and high-saving region in the run-up to the Asia crisis as well, when rapid borrowing growth and overstretched corporate balance sheets led to widespread bank interventions (although Hong Kong SAR and Singapore were relatively less affected than many other economies by the crisis). The main (and lasting) change in regional behavior after the Asia crisis is a fall in investment as a ratio to GDP rather

than a rise in the saving ratio. A more plausible underlying explanation of the better performance of Asian banks over 2008/09 crisis seems to be the more cautious attitude of regulators, banks, households, and the corporate sector, particularly after the difficulties in 1997/98—a response that may be repeated more generally after the recent global crisis.



28. **Bank regulators in Hong Kong SAR and Singapore seem to have used a more “hands-on” supervision and regulation to limit risk.** Discussions with a range of bankers confirmed that supervisors took an active role in monitoring banks’ internal management, limiting leverage in specific markets (such as property loans), while questioning and guiding bank behavior. In addition, regulators in Hong Kong SAR and Singapore subjected banks to strict liquidity requirements (minimum monthly average liquidity ratios of 25, and 16 percent respectively). This left financial institutions in a better position to cope with deposit runs, and reduced leverage. A combination of these factors produced safer financial systems, but with less innovation (various new mortgage products that could lead to less prudent borrowing were banned in Singapore) and likely less competition (tighter regulation tends to increase costs of market entry). Bankers and regulators generally agreed that such tighter supervision may have been easier to implement because banks based in neighboring countries were typically similarly constrained, limiting peer pressure to make risky loans or have market share competed away.

29. **Stronger regulation appears to have been supported by more prudent behavior by the rest of the private sector.** Hong Kong SAR and Singapore corporates and households gradually rebuilt their balance sheets after the Asia crisis, and generally kept this cautious attitude to borrowing even as easy financial conditions stoked bubbles elsewhere. Similar patterns are seen in some other parts of emerging Asia.

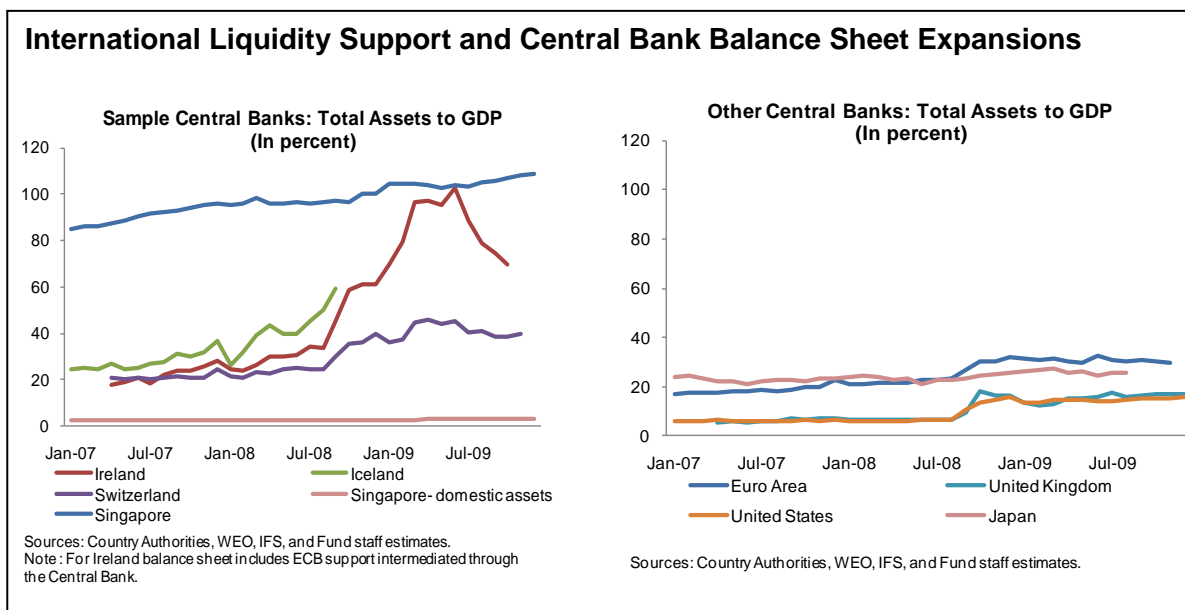
30. **Tight micro-prudential measures were further supported by prudent macroeconomic policies that created prudent macroeconomic buffers.** In the face of large short-term liabilities, both Hong Kong SAR and Singapore built foreign currency buffers of around the size of GDP by 2007. In addition, fiscal surpluses supported market confidence, perhaps by giving investors reassurance that these economies could support bank capital.

31. **Hong Kong SAR and Singapore banks appear to have also had strong internal management.** Differentiating tighter home regulation in Asia from stronger internal bank management is difficult, as both generate less risky balance sheets. A promising approach is to look at the behavior of the global banks with Asian roots. These banks—HSBC and Standard Chartered—were headquartered in London and hence subject to “light touch” U.K. home regulation while being badly affected by the Asia crisis, particularly as their operations were more Asia-focused at that time. Rating agency reports emphasize internal management and a diversified retail deposit base as a relative strength of both banks. In addition, these global banking groups appear more conservative than typical U.K. focused banks but less conservative than typical “local” Hong Kong SAR or Singapore banks based on a range of indicators (Table 3 and Figure 7). This suggests a role for both tighter regulation and stronger internal management.

What was the role of foreign currency support in divergent European outcomes?

32. **A second issue is the extent to which the divergent European outcomes reflected domestic conditions and policy responses as against liquidity support from elsewhere.** With Iceland and Switzerland holding much smaller foreign exchange reserves as a ratio to GDP than the Asian economies (in part reflecting floating exchange rate regimes), and the Irish government under strong market pressure, access to external liquidity was important for crisis response. Iceland, with limited fiscal capacity and banks that were not globally systemic, was only able to negotiate swap arrangements with the Nordic countries (worth some 12 percent of GDP) before its banking system collapsed. By contrast, Switzerland had a stronger fiscal position and banks that were more systemically significant, including in U.S. markets, and received an unlimited dollar swap line from the Federal Reserve. Finally, as part of the Euro area, Irish banks had access to ECB liquidity in return for eligible collateral, whose definition loosened over the crisis.

33. **Switzerland’s direct access to dollars supported the crisis response, but seems unlikely to have been crucial given favorable market perceptions of sovereign risk.** The Swiss central bank used nearly \$40 billion (some 10 percent of GDP and 8 percent of M3) of the dollar swap line to finance the Stabilization Fund that bought bad UBS assets and recapitalized the bank, a sum about equal to Swiss foreign exchange reserves at the time. Given severe market stress, this provided significant temporary support for the bad banks approach. However, Switzerland did not suffer the market stresses of many other European sovereigns. The Stabilization Fund was smoothly refinanced by the central bank from February 2009 onwards, by issuing dollar denominated bills to local banks. It should also be noted, however, that the Swiss bank’s U.S. subsidiaries obtained significant support from the U.S. authorities.



34. **Irish banks obtained large amounts of liquidity support from the ECB at a time when the Irish sovereign was under market pressure.** Liquidity support for banks located in Ireland from ECB repo operations (which were intermediated through the Central Bank of Ireland's balance sheet) peaked in mid-2009 at more than 80 percent of GDP, with well over half going to domestic banks or foreign banks with domestic operations. This support from the ECB is much larger (as a ratio to GDP) than the expansion of other central bank balance sheets in the sample, the Euro area, or the U.S., U.K., and Japanese central banks. The support also came when the sovereign spreads indicated significant concerns about the government's solvency.

B. The Road Ahead

35. **While detailed advice for countries with large banking systems requires more information on future international bank regulation, a range of lessons can be drawn.** The clearest message coming from the experience of the economies studied in this paper relates to the risks from rapid expansion of the banking sector, and hence the need to consider safeguards over and above international norms. These norms will be shaped by the broad agenda for reforming financial regulation that was outlined in the G20 Statement from the September 2009 Pittsburgh Summit. The recent crisis (arguably the first global bank run) underlined the fiscal vulnerabilities of countries with large banking systems. In 1990, the world's ten largest banks had an average balance sheet size of 14 percent of their home countries' GDP, a figure that mushroomed to an average of 92 percent by 2007. In addition to its benefits, globalization of finance created risks that countries with large banking systems would need to provide major foreign currency liquidity and/or capital. Absent strong safeguards, international banks increasingly "banked on the state."

36. **An effective global resolution regime and binding international burden sharing mechanism would define and likely diversify the risks of a large banking sector.** In other

areas of international commerce—most notably international shipping—treaties define financial responsibilities across private parties and governments. A transparent way to effect a smooth and controlled failure of international banks and automatically share the associated costs (e.g., through harmonized rules for early intervention) would lower moral hazard and enhance market discipline. It would also help limit the exceptionally disruptive effects on economies with large banking systems by lowering the uncertainty regarding the public costs that result from a crisis. However, the barriers to reaching a global—or even a regional—solution are well understood. Financial institutions are international, while regulatory, legal, and political institutions are national, as the example of the Benelux region shows. Building on the Basel Committee’s Cross-Border Bank Resolution Group’s recommendations (March 2010), Fund staff are preparing a paper on cross-border bank resolution.

37. Absent progress on effective burden sharing, the territorial nature of the risks posed by a large, internationally active banking sector must be internalized. As discussed in the introduction, the added fiscal and external risks can be lowered through tighter regulation combined with prudent macroeconomic policies, ideally backstopped by international cooperation. Hong Kong SAR and Singapore appear to have internalized these risks, resulting in banking systems that emphasized liquidity and capital safeguards much more than other countries in the sample.

38. In a world with recurrent wholesale funding runs, liquidity is the first line of defense. Partly reflecting their history of operating in volatile emerging markets, local banks in Singapore and Hong Kong SAR maintained considerably higher liquid assets than their European counterparts. The two cross-border “Asian/U.K. hybrid” banks (HSBC and Standard Chartered) also had business models that emphasized a liquid global balance sheet, as well as dedicated pools of liquidity for their branches and subsidiaries. Their widely dispersed retail deposit base also reduced reliance on wholesale funding. By contrast, Swiss banks developed significant currency funding gaps in the process of expanding their U.S. dollar trading (over 10 percent of assets by mid-2006 according to BIS calculations).

39. Tight supervision and regulation can encourage sounder international banks, reducing potential demands on domestic fiscal resources to support their capital:

- *The relative success through the crisis of economies like Hong Kong SAR and Singapore suggests the merits of a more robust supervisory approach.* The philosophy enhanced by the Asia crisis was generally driven by a more pro-active approach of understanding individual banks’ risk profiles—engaging with them, and requiring explanations of business plans—than the European countries in the sample.
- *Robust supervision can be complemented by strong regulation.* In the aftermath of the crisis the Swiss are requiring the two large banks to hold twice the internationally agreed minimum regulatory capital. Taxes and levies could also be used to shrink the banking sector (this is an area of active work by Fund staff).

- *The contrasting outcomes of resolutions of Icelandic bank subsidiaries versus branches suggest subsidiarization can lower fiscal risks for countries with large banking systems.* Encouraging subsidiaries relative to branches, however, does not reduce the need for strong and coordinated supervision and effective burden sharing arrangements. Other considerations are also important, such as “trapping” capital and liquidity which increases costs for the whole banking group, fragmenting markets and potentially reducing cross border flows (this is an area of ongoing work by Fund staff).
- *The size of the banking sector needs to match the resources of the home regulator.* The small fiscal resources of Hong Kong SAR and Singapore, the main Asian money centers, may have constrained the scale of banks they can credibly place under their supervisory umbrella. Indeed, it is notable that—albeit by historical happenstance—the only two “global” Asian banks were both headquartered in the (larger) UK jurisdiction.
- *Swift and well-designed actions to resolve bad assets of troubled institutions during a crisis can help decouple the sovereign from bank risk.* While protection of liabilities (deposits, debt) may be needed to stem possible runs, such moves generally increase the link between bank and sovereign risks. By contrast, even if resolving bad bank assets requires government support, sovereign risks can be lowered as a healthier banking system balance sheet is likely to lower the long-term fiscal costs of bank support.

40. **Strong external and fiscal buffers can provide a macroeconomic backstop to tight regulation and supervision.** Hong Kong SAR and Singapore, with less flexible exchange rate regimes, entered the crisis with levels of foreign reserves within usual prudential norms given their high levels of short-term debt. The reserve coverage of Switzerland (which did, however, have a solid overall external position) and of Iceland (which did not) was lower, partly reflecting their floating exchange rates. Building stronger external buffers does not necessarily imply reserve accumulation. The swap lines extended by the U.S. Fed to several economies, as well as liquidity support from the ECB and the Swiss National Bank, alleviated market pressures. Countries with large banking systems may want to pursue such agreements more durably. Turning to potential need for capital support, all the economies considered in this paper entered the crisis with reasonably low public debt levels. However, in the cases of Iceland and Ireland apparently healthy fiscal positions masked underlying structural weaknesses.

41. **International supervisory cooperation can significantly mitigate market pressures especially if burden sharing arrangements are clear.** Cross-border supervisory colleges are helpful when supervisors from home and host countries can meaningfully exchange information. However, to avert the kind of abrupt loss in cooperation that occurred after the crisis hit the Benelux region, these colleges will be of most value if they can help in agreeing enforceable burden sharing arrangements.

Table 1. Financial Systems Before the Crisis
(Average 2003–07, unless indicated otherwise)

	Iceland	Ireland	Switzerland	Hong Kong SAR	Singapore ¹
Banking Sector					
Bank Loans (in % of total bank assets)*	69	48	41	25	26
Bank Assets (in % of GDP, 2007)	876	894	664	641	789
Bank Assets (in % of GDP, 2001)	121	468	518	474	784
Bank Deposits (in % of GDP, 2007)	370	234	255	363	296
Bank Deposits (in % of GDP, 2001)	n.a.	181	128	262	258
Bank Foreign Assets (in % of GDP, 2007)	367	574	451	386	447
Bank Foreign Assets (in % of GDP, 2001)	4	292	306	243	452
Bank Foreign Debt Liabilities (in % of GDP, 2007)	491	618	223	230	422
Bank Foreign Debt Liabilities (in % of GDP, 2001)	52	287	156	159	427
Financial Sector Size and Growth					
Financial Sector Assets (in % of GDP, 2007)	1071	1129	873	931	876
Financial Sector Assets (in % of GDP, 2001)	218	711	706	574	836
Private Sector Credit (in % of GDP, 2007)	295	221	184	114	215
Private Sector Credit (in % of GDP, 2001)	125	147	168	123	195
Financial Sector Structure					
Bank Assets (in % of Financial Sector Assets)*	72	76	66	71	91
Banking Sector Concentration* (share of the 3 largest banks)	79	34	67	55	31
(*) 2003-07 average					

¹ The data for Singapore include both the domestic and the Asian Dollar Markets, as provided by MAS.

Sources: EIU, WEO, IFS, National authorities, Company Reports and Fund staff estimates.

Table 2: Large Complex Financial Institutions (Sample countries)

	LCFI Assets (2003-07 avg) (in % of GDP)	LCFI Assets (2003-07 avg) (in % of total banking system assets)	Loan Growth (2003-07 avg) (in %)	Loan-to- Deposit Ratio (2003-07 avg) (in %)	Wholesale Funding (2003-07 avg) (in % of liabilities)	Short-term borrowing (2003-07 avg) (in % of liabilities)	Foreign Revenues (2003-07 (2007) (in % of total revenues)	Regional Breakdown of Foreign Revenues	Business model
Ireland									
Bank of Ireland	98	16	19	151	48	15	39	U.K. (38%); rest of the world (1%)	Commercial Bank
Anglo-Irish Bank	34	5	37	128	37	15	42	U.K. & Isle of Man (32%), USA (9%)	Commercial Bank
Allied Irish Banks	82	13	20	137	48	31	42	U.K. (23%); Poland (16%)	Commercial Bank
Iceland 1/									
Kaupthing	247	46	72	317	76	15	73	Scandinavia (35%), UK (20%), Luxembourg (12%), Other (US, Europe and others) (6%)	Universal Bank
Glitnir	137	27	54	343	76	11	66	Scandinavia (34%), Europe (28%), International (4%)	Universal Bank
Landsbanki	137	27	57	231	65	12	42	U.K. and Ireland (20%), Other Europe, (15%), US, Canada and others (7%)	Universal Bank
Switzerland									
UBS	280.	47	9	17	75	62	41*	Europe (26%), Asia-Pacific (11%), USA (32%), Rest of the world (4%)	Universal Bank
Credit Suisse	100	16	5	19	72	70	70*	Americas (37%); Asia Pacific (9%); EMEA (28%)	Universal Bank
Hong Kong SAR									
Hong Kong & Shanghai Banking Corporation (HSBC)	204	36	11	52	29	n.a.	33	Rest of Asia-Pacific (33%)	Commercial Bank
Standard Chartered	28	5	2	63	23	n.a.	0	----	Commercial Bank
BOC Hong Kong	66	11	11	63	14	10	n.a.	----	Commercial Bank
Hang Seng	47	8	7	54	12	5	7	Americas (7%)	Commercial Bank
Bank of East Asia	21	3	23	73	16	9	32	China (27%), other Asian Countries (5%)	Universal Bank
Singapore									
DBS	96	39	12	68	28	23	36	Hong Kong SAR (13.9%), China (4.1%), India (3.5%), U.K. (2.9%), South Korea (2.6%)	Universal Bank
UOB	74	30	9	86	33	28	36	Malaysia (9%), Thailand (5.6%), China (4.4%), Indonesia (2.3%)	Universal Bank
OCBC	66	27	8	89	42	16	34	Malaysia (7.0%), U.K. (5.1%), China (2.4%), South Korea (2.3%), Indonesia (2.0%), Australia (1.6%)	Universal Bank

(1/) in the case of Iceland, the three banks listed in the Table are the largest commercial banks (not LCFIs).

(*) As of 2006.

(***) HSBC Holdings has a special legal structure, which includes Hong Kong and Shanghai Banking Corporation and HSBC Bank PLC (UK operations) as separate legal entities.

Sources: EIU, WEO, Company Reports and Fund staff estimates.

Table 3: Large Complex Financial Institutions (UK and Asia)

	LCFI Assets (2003-07 avg) (in % of GDP)	LCFI Assets (2003-07 avg) (in % of total banking system assets)	Loan Growth (2003-07 avg) (in %)	Loan-to- Deposit Ratio (2003-07 avg) (in %)	Wholesale Funding (2003-07 avg) (in % of liabilities)	Short-term borrowing (2003-07 avg) (in % of liabilities)	Foreign Revenues (2007) (in % of total revenues)	Regional Breakdown of Foreign Revenues	Business model
Hong Kong SAR									
Hong Kong & Shanghai Banking Corporation (HSBC)	204	36	11	52	29	n.a.	33	Rest of Asia-Pacific (33%)	Commercial Bank
Standard Chartered	28	5	2	63	23	n.a.	0	----	Commercial Bank
BOC Hong Kong	66	11	11	63	14	10	n.a.	----	Commercial Bank
Hang Seng	47	8	7	54	12	5	7	Americas (7%)	Commercial Bank
Bank of East Asia	21	3	23	73	16	9	32	China (27%), other Asian Countries (5%)	Universal Bank
Singapore									
DBS	96	39	12	68	28	23	36	Hong Kong SAR (13.9%), China (4.1%), India (3.5%), UK (2.9%), South Korea (2.6%)	Universal Bank
UOB	74	30	9	86	33	28	36	Malaysia (9%), Thailand (5.6%), China (4.4%), Indonesia (2.3%)	Universal Bank
OCBC	66	27	8	89	42	16	34	Malaysia (7.0%), UK (5.1%), China (2.4%), South Korea (2.3%), Indonesia (2.0%), Australia (1.6%)	Universal Bank
U.K.									
HSBC Holdings (group) (***) <i>of which</i> : HSBC Bank PLC (UK operations)	175 64	44 16	23 17	97 91	45 47	13 n.a.	76* 0	Europe (32%), Americas (29%), Hong Kong SAR (24%), rest of Asia-Pacific (16%) ----	---- Commercial Bank
Standard Chartered	16	4	19	90	39	16	96	Asia (64%), India (12%), Middle East(13%), Africa (7%)	Commercial Bank
RBS	130	26	32	120	52	28	38	Europe (15%), Americas (16%), rest of the world (7%)	Commercial Bank
Lloyds	30	8	9	131	55	21	2	----	Commercial Bank
Barclays	142	32	11	118	67	26	54	Europe (21%), Americas (14%), Africa (10%)	Investment Bank

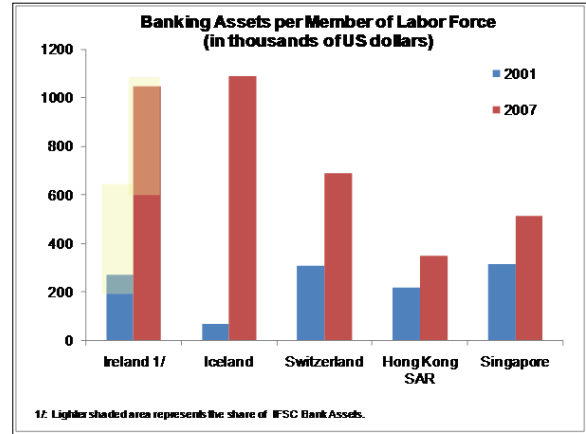
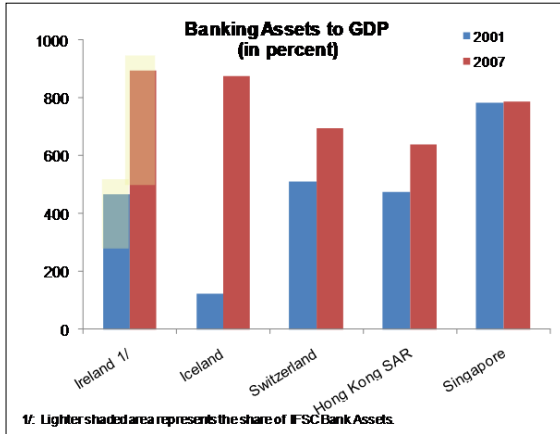
(*) As of 2006.

(***) HSBC Holdings has a special legal structure, which includes Hong Kong and Shanghai Banking Corporation and HSBC Bank PLC (UK operations) as separate legal entities.

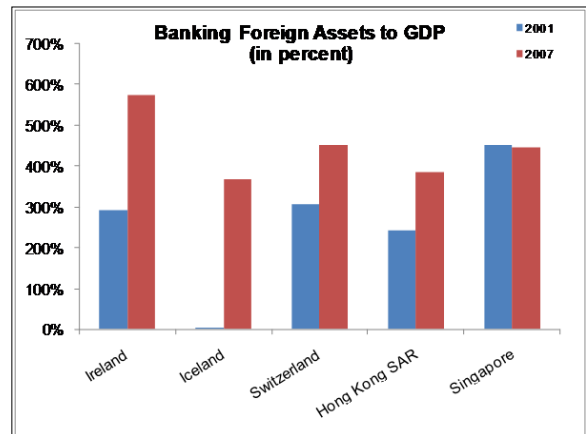
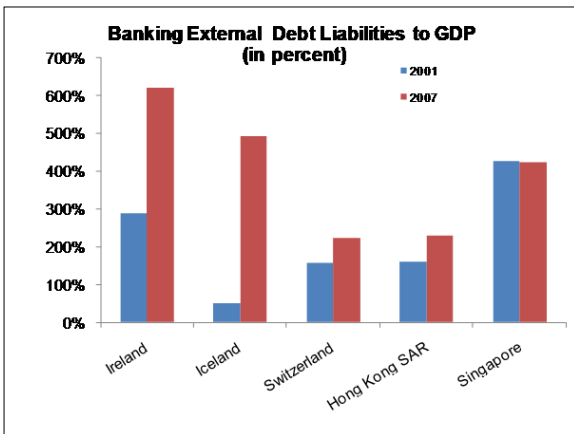
Sources: EIU, WEO, Company Reports and Fund staff estimates.

Figure 1. Growth of Financial Systems Before the Crisis

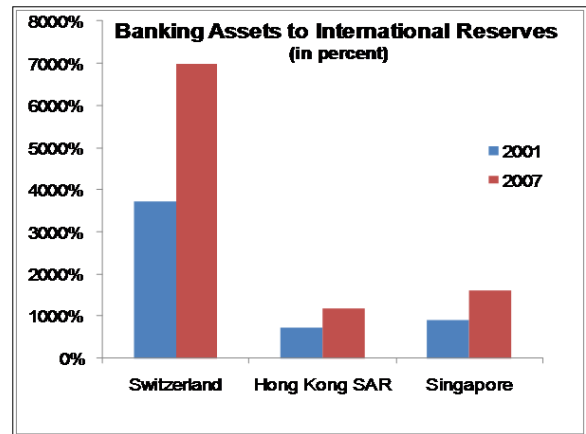
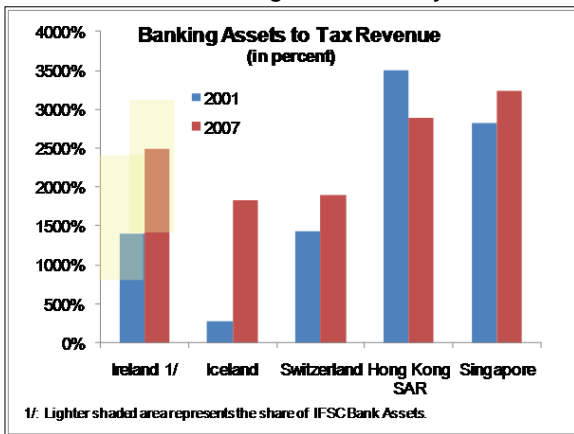
Banking system assets of Iceland, and to a lesser extent Ireland, grew rapidly, both as a ratio to GDP and relative to the labor force—from the lowest to the highest ratios in the sample.



Sharp increases in banking systems' assets were accompanied by increases in external bank debt liabilities, which were a significant source of asset acquisition.



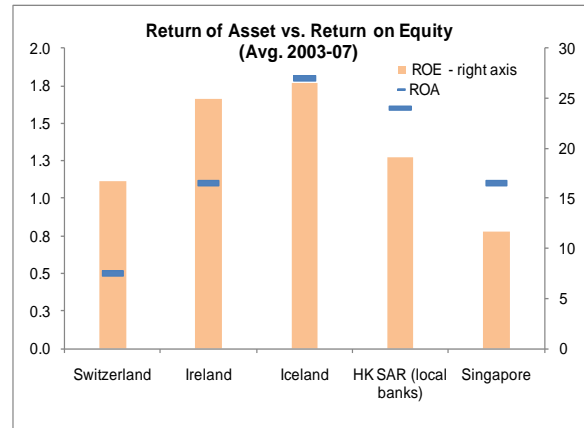
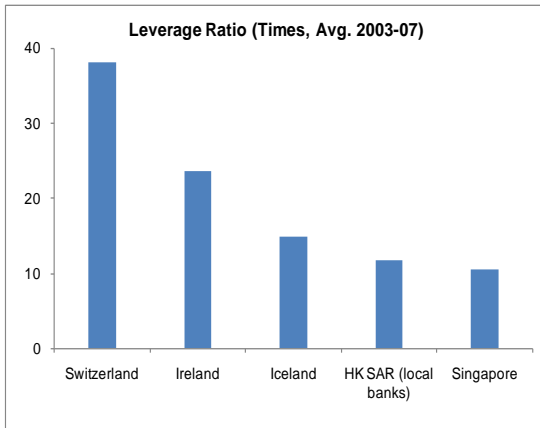
Bank assets were very high both relative to tax revenue and to international reserves. Singapore reserve coverage was notably better than in other countries.



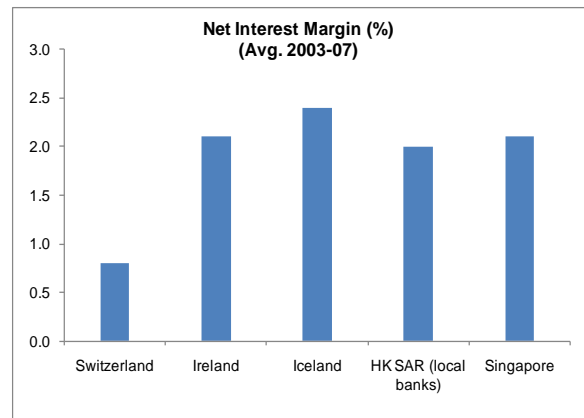
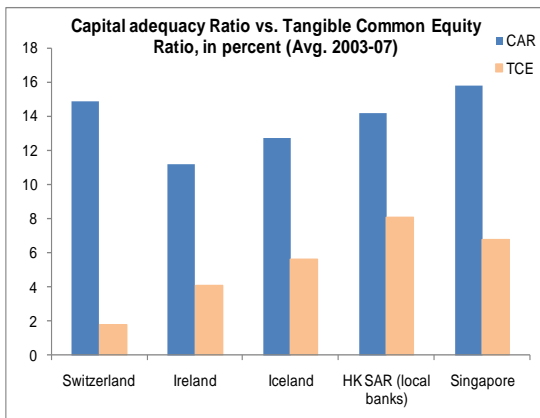
Sources: Country Authorities, WEO, IFS, and Fund staff estimates.

Figure 2. Financial Indicators—Sample Countries

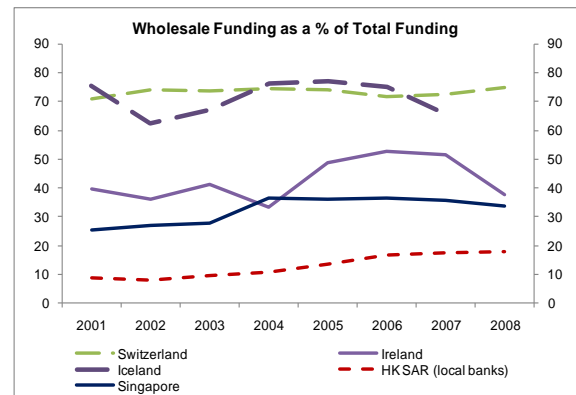
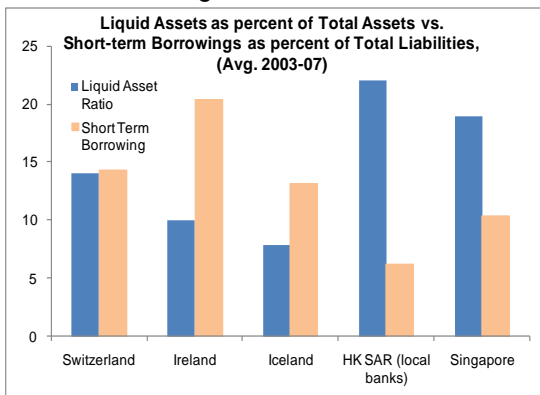
Asian banks had high RoAs, but were less leveraged...



...while maintaining higher capital ratios that were better composed.



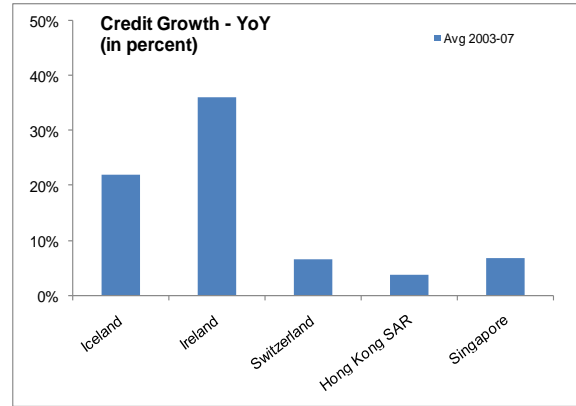
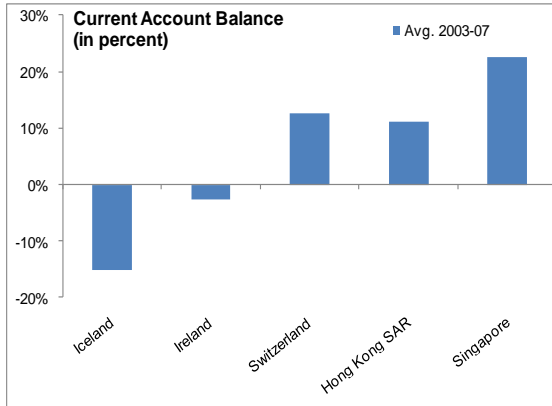
Asian banks also placed greater emphasis on a liquid balance sheet that relied less on short-term and wholesale funding.



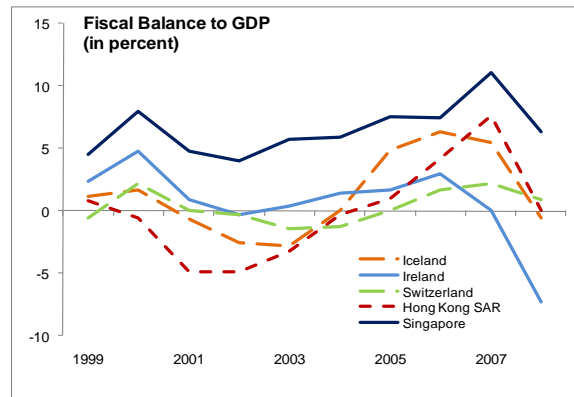
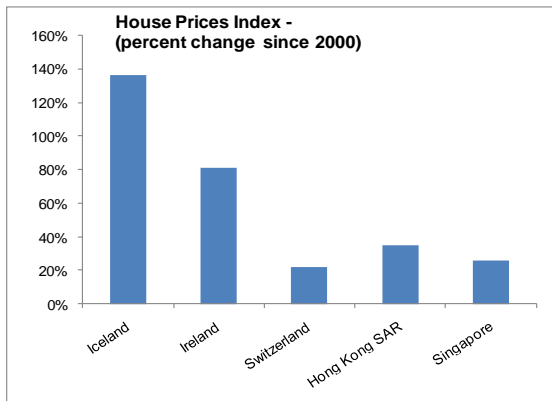
Sources: Bloomberg, Company Reports and Fund staff estimates.

Figure 3. Macroeconomic Implications of Financial Systems Growth

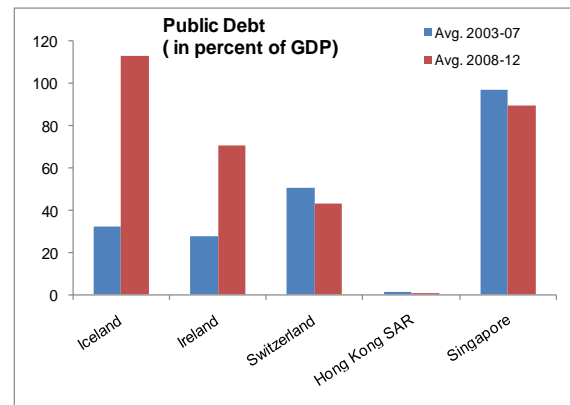
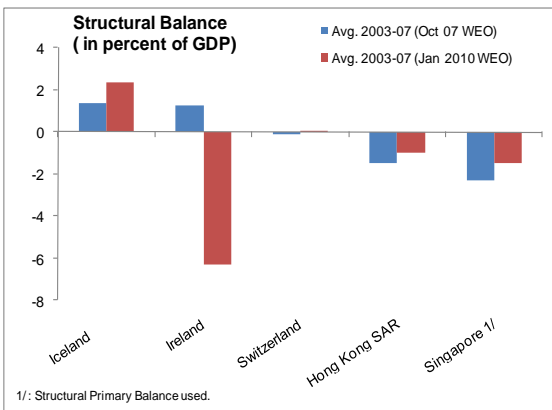
Iceland, and to a much lesser extent Ireland, ran current account deficits financed in part by the banking systems and accompanied by domestic credit booms.



The credit booms resulted in unsustainable house price growth, construction activity, and deteriorating competitiveness.



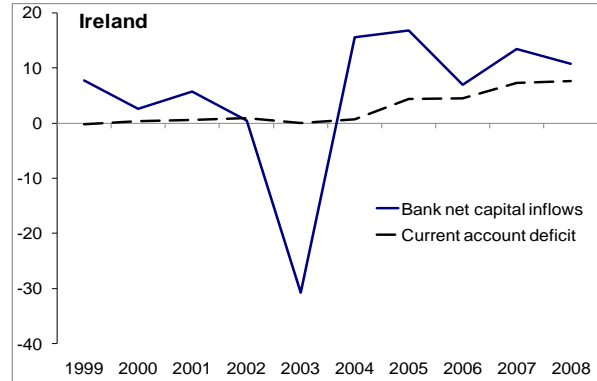
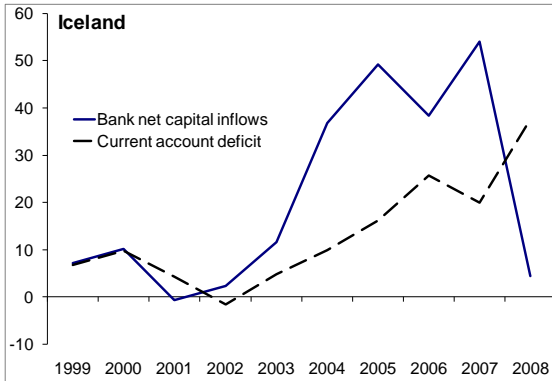
Fiscal positions in Iceland, and to a lesser extent Ireland, looked comfortable, but masked reliance on unsustainable boom-related fiscal revenues, and pro-cyclical fiscal policies.



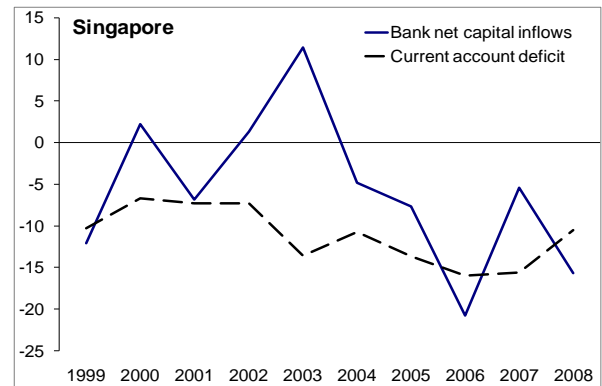
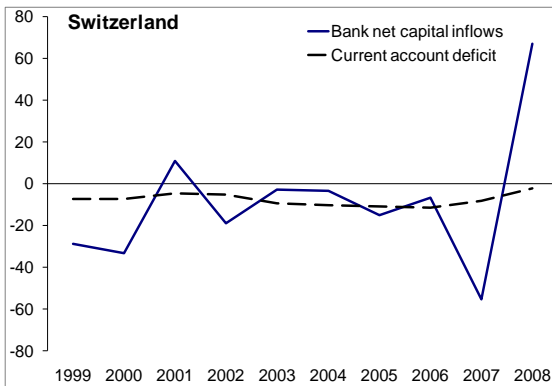
Sources: Country Authorities, WEO, IFS, and Fund staff estimates.

Figure 4. Bank BoP Financial Flows and the Current Account

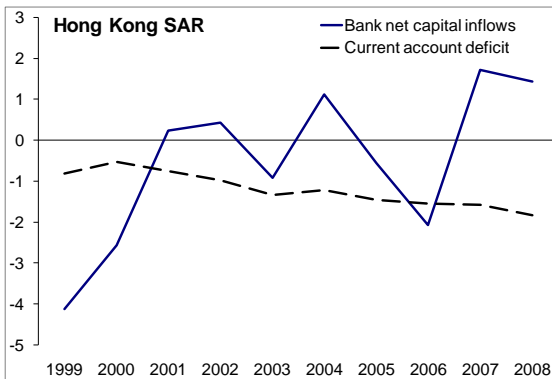
The banking system provided net external inflows into Iceland, and to a lesser extent Ireland, thereby financing current account deficits and domestic credit expansion.



Both Switzerland and Singapore ran current account surpluses and banking system produced net external outflows.



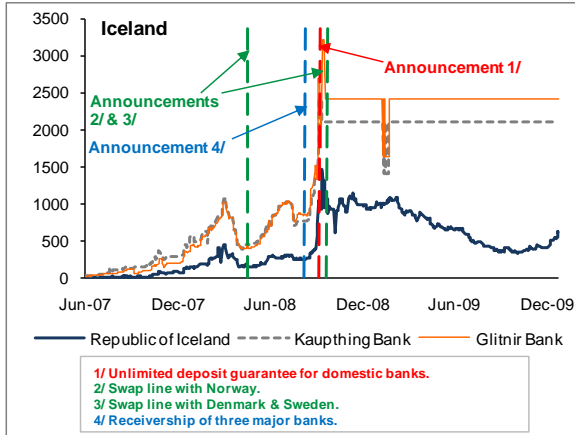
In Hong Kong SAR, banking system external flows oscillated around zero. The economy overall ran a current account surplus.



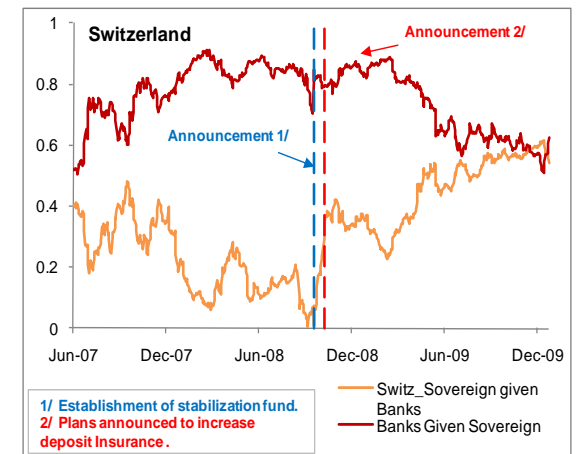
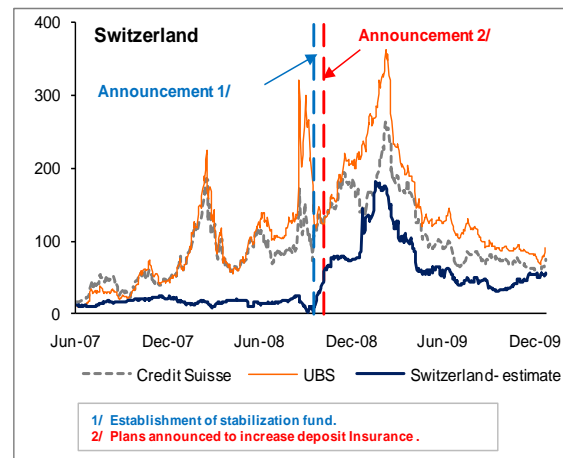
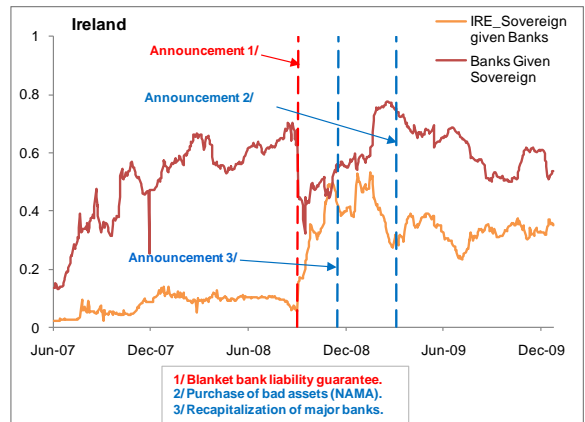
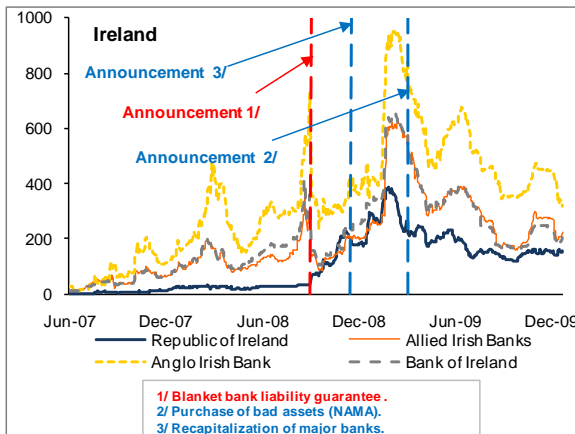
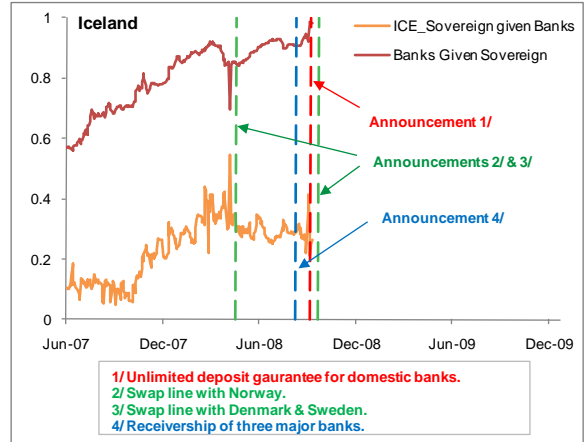
Sources: Country Authorities, WEO, IFS, and Fund staff estimates.

Figure 5. Domestic Transfer of Risks from Banks to Sovereigns

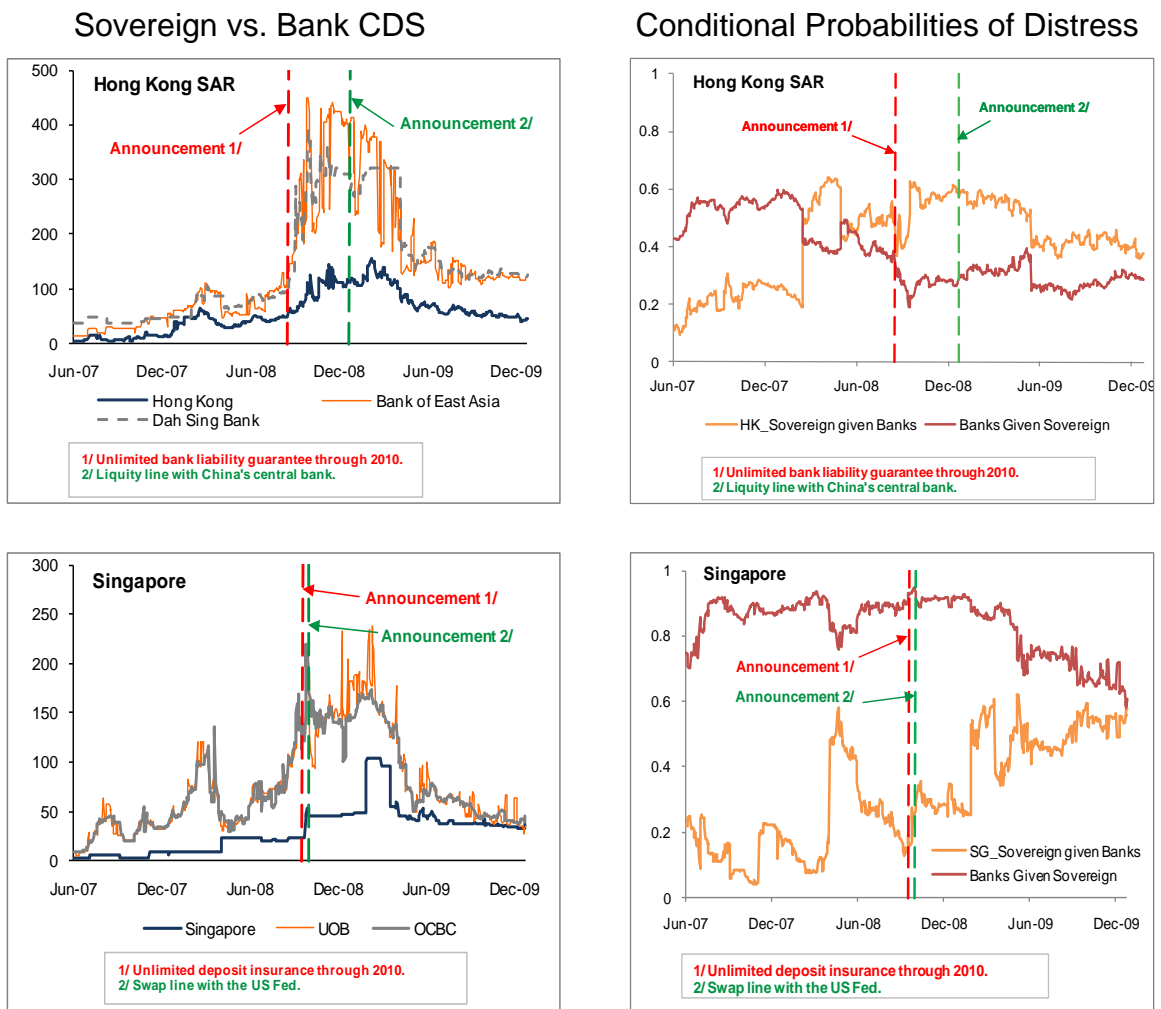
Sovereign vs. Bank CDS



Conditional Probabilities of Distress



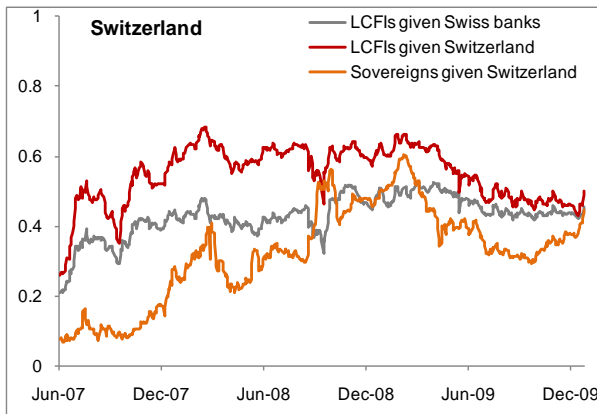
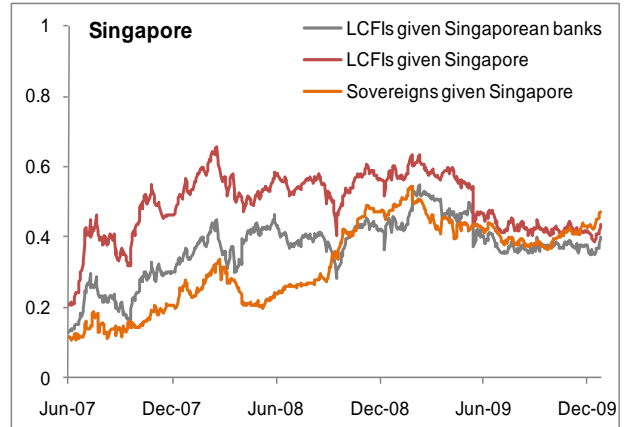
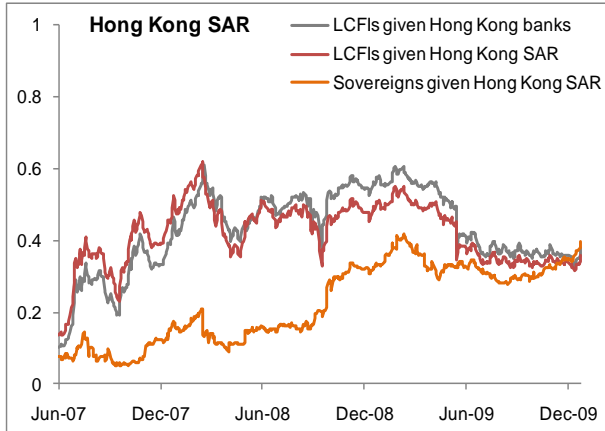
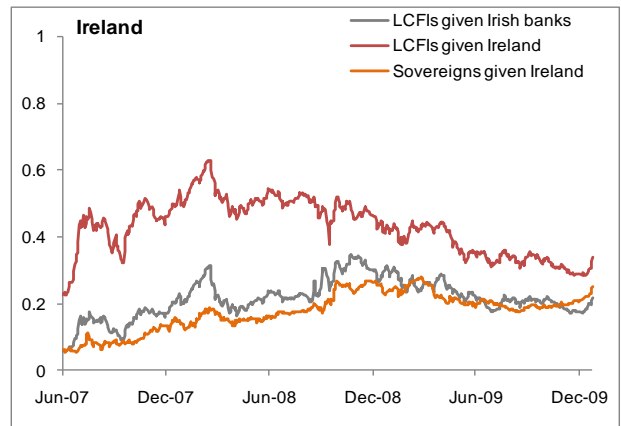
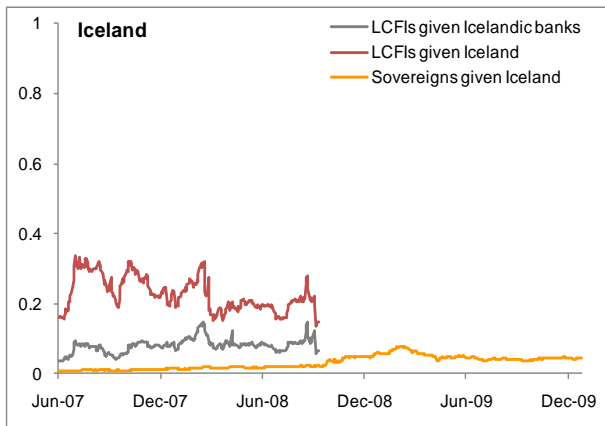
Sources: Datastream, Bloomberg, Markit, and Fund staff calculations.

Figure 5. Domestic Transfer of Risks from Banks to Sovereigns (concluded)

Sources: Datastream, Bloomberg, Markit, and Fund staff calculations.

Note: The estimation of conditional probabilities of distress uses a methodology developed by Miguel Segoviano. For a description of the methodology, see Segoviano (2006) "[The Conditional Probability of Default Methodology](#)," Financial Markets Group, London School of Economics (LSE), Discussion Paper No. 558; Segoviano (2006) "[The Consistent Information Multivariate Density Optimizing Methodology](#)," Financial Markets Group, LSE, Discussion Paper 557; Segoviano and Goodhart (2009) "[Banking Stability Measures](#)," IMF WP/09/4; and Segoviano (2008) "The CIMDO-Copula. Robust Estimation of Default Dependence Under Data Restrictions," Financial Markets Group, LSE, forthcoming Discussion Paper.

Figure 6. International Links from Sample Countries to LCFIs and Sovereigns 1/
(Conditional Probabilities of Distress)



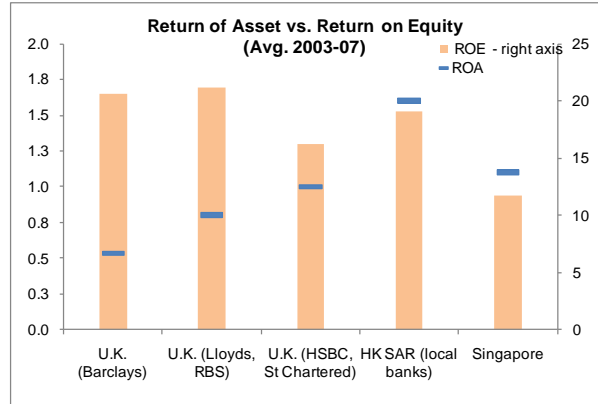
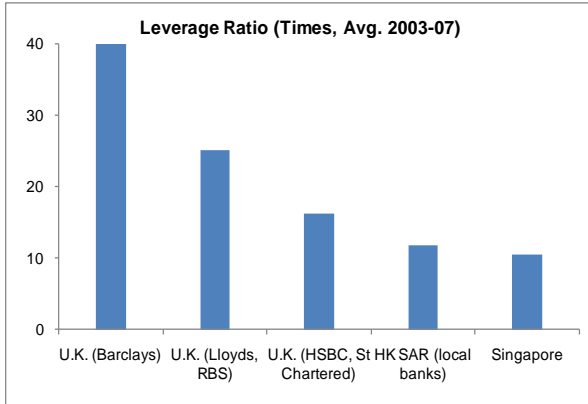
Sources: Datastream, Bloomberg, Markit, and Fund staff calculations.

1/ LCFIs include Citibank, Bank of America, JP Morgan, Morgan Stanley, Goldman Sachs, Royal Bank of Scotland, Australia and New Zealand Banking Group, Mitsubishi UFS, HSBC, Standard Chartered, UBS and Deutsche Bank. Sovereigns include all the other economies in the sample, and the U.S., U.K., Germany, France, and Japan.

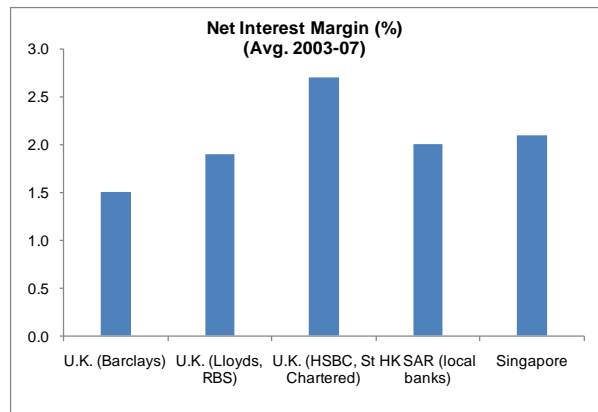
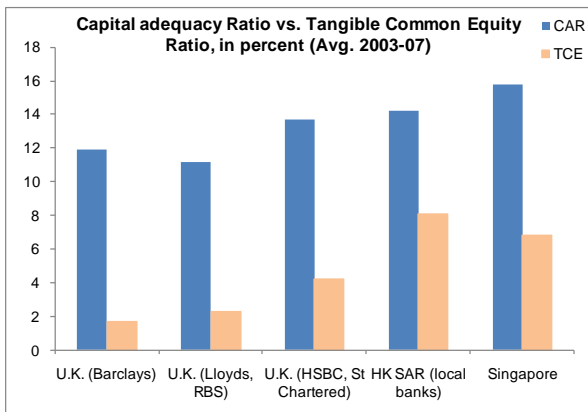
Note: See Figure 5.

Figure 7. Financial Indicators of Asian, “Hybrid-Asian,” and U.K. LCFIs

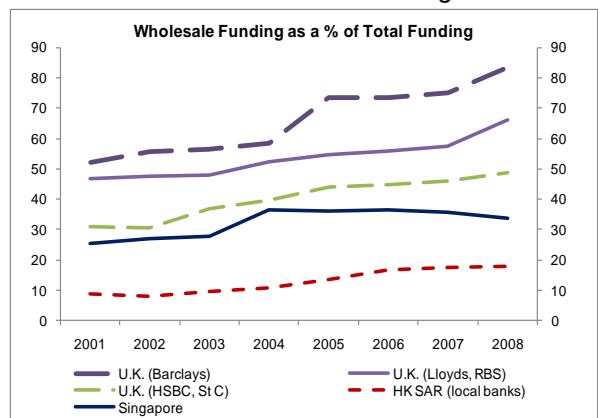
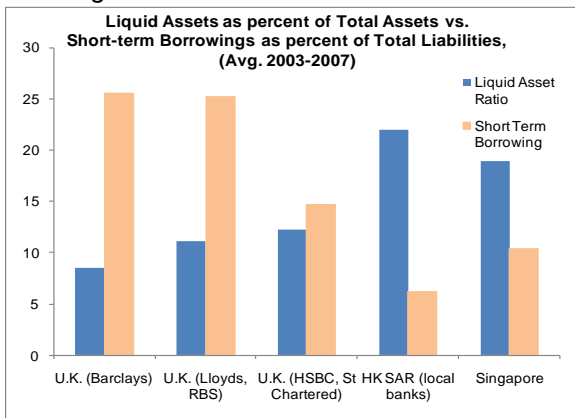
The two “hybrid-Asian” banks—HSBC, and Standard Chartered—looked more like Hong Kong SAR and Singapore banks and less like U.K. banks in terms of lower leverage and higher RoAs.



While the “hybrid-Asian” banks were less capitalized—both in quality and quantity—relative to Hong Kong SAR and Singapore banks, they were more capitalized than U.K. banks.



The “hybrid-Asian” banks resembled U.K. banks in terms of the liquidity of their balance sheets, but their funding structure was more similar to Asian banks with less short-term and wholesale funding.



Sources: Bloomberg, Company Reports, and Fund staff estimates.