# capital flows and the crisis

## SUMMARY

*The current crisis saw an unprecedented collapse in international capital flows after years of rising financial globalization. We identify the stylized facts and main drivers of this development. The retrenchment in international capital flows is a highly heterogeneous phenomenon: first, across time, being especially dramatic in the wake of the Lehman Brothers' failure; secondly, across types of flows, with banking flows being the hardest hit due to their sensitivity of risk perception; and thirdly, across regions, with emerging economies experiencing a shorter-lived retrenchment than developed economies. Our econometric analysis shows that the magnitude of the retrenchment in capital flows across countries is linked to the extent of international financial integration, its specific nature – with countries relying on bank flows being the hardest hit – as well as domestic macroeconomic conditions and their connection to world trade flows.*

— *Gian-Maria Milesi-Ferretti and Cédric Tille*

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# The great retrenchment: international capital flows during the global financial crisis

Gian-Maria Milesi-Ferretti and Cédric Tille

International Monetary Fund and CEPR; Graduate Institute for International and Development Studies and CEPR

## 1. INTRODUCTION

The global crisis that started in mid-2007 brought an abrupt stop to the sustained rise in international financial integration over the previous decade (Figure 1). Global capital flows had steadily increased from less than 7% of world GDP in 1998 to over 20% in 2007, led in particular by a dramatic expansion of flows to and from advanced economies. These flows simply evaporated during the crisis, turning sharply negative in late 2008 on heavy selling of foreign assets worldwide. This turnaround has been even sharper than the one for trade flows, which has been the object of extensive analysis (Baldwin, 2009): trade flows fell by 'only' a quarter between the third quarter of 2008 and the first quarter of 2009.

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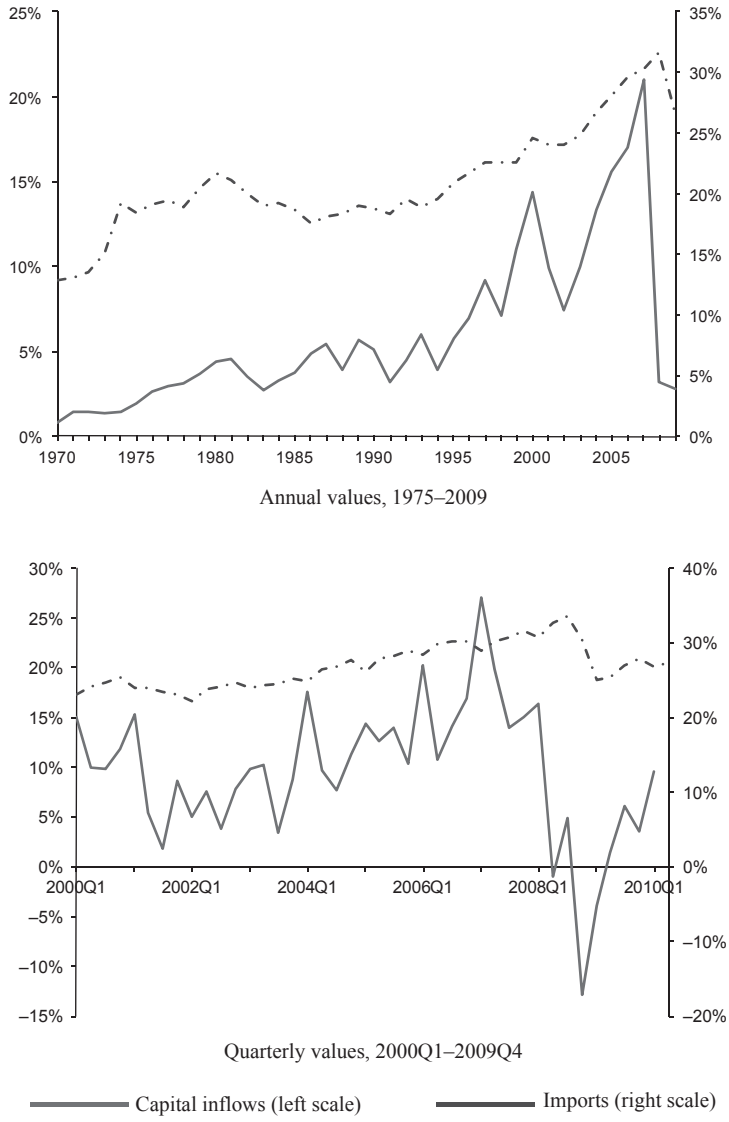


**Figure 1. Global capital flows, 1975–2009, percentage of world GDP**

*Note*: Sum of capital inflows across the world's countries, as a ratio of world GDP.

*Source*: Lane and Milesi-Ferretti, EWN II database, and IMF, Balance of Payments Statistics.

Understanding international capital flows is highly relevant for policy-makers. Economic theory argues that international capital mobility allows for savings to be channelled towards the countries with more productive investment opportunities and for a better sharing of macroeconomic risk between countries subject to different shocks. This reallocation is, however, fraught with risks given the frictions that characterize financial markets. Periods of 'exuberance' – where large financial flows can overwhelm recipient countries' abilities to absorb them and lead to

bubbles – can be followed by periods of 'sudden stops' where foreign investors abruptly cut funding and precipitate a costly macroeconomic adjustment in the recipient countries. Such pullbacks can entail a self-fulfilling element similar to bank runs where a panic by depositors can force a costly liquidation of an otherwise sound bank. The unprecedented decline in capital flows during the crisis thus poses several questions. What lies behind this 'great retrenchment' in capital flows? Did flows fall evenly across countries and categories of flows? Can we link the intensity of the great retrenchment to financial and macroeconomic characteristics of countries? Is the trend towards rising financial globalization over?

In this paper we seek to provide preliminary answers – some of them necessarily speculative – to these questions. We assess the patterns of the retrenchment in international capital flows and the underlying driving forces across a range of developed and emerging economies. We document that the retrenchment led to an increase in portfolio 'home bias', that is, a reduction of the share of foreign assets in investors' portfolio. Our analysis stresses two broad themes. First, there is a high degree of heterogeneity in the patterns of capital flows, across time, types of flows, and countries. Second, international banking flows – particularly among advanced economies – played a central role both during the pre-crisis globalization and in the crisis itself, a finding in line with earlier work (Bank for International Settlements (BIS), 2009a, 2009c, 2009d; Bertaut and Pounder, 2009; Hoggarth *et al.*, 2010).

Our analysis relies on an extensive dataset of capital flows for 75 countries at a quarterly frequency, with data until the last quarter of 2009. These data are integrated with figures on banks' operations through affiliates, and data on domestic financial balance sheets for several countries. To our knowledge this work is the only contribution relying on such an extensive and detailed dataset of balance of payments statistics. Existing studies on international capital flows during the crisis are focused on specific countries, such as the United States (Bertaut and Pounder, 2009) or specific dimensions (such as banking flows – BIS, 2009a; Hoggarth *et al.*, 2010).

We start by documenting the patterns of capital flows before and during the various stages of the crisis. The first stage of the crisis (from August 2007 to the demise of Lehman Brothers and the AIG bailout) saw a slowdown in capital flows that was concentrated in banking flows among developed economies. In contrast, capital flows to and from emerging markets were generally not affected. The second stage of the crisis coincides with the global panic after the fall of Lehman Brothers (last quarter of 2008 and first quarter of 2009), and was characterized by a broad reversal of capital flows, with investors across the globe liquidating holdings abroad. While the reversal occurred for most types of flows, it was most pronounced in banking flows. The retrenchment was broad-based, with emerging markets also hit by a sharp reversal in flows. The third stage of the crisis, starting in the second quarter of 2009, saw a recovery of non-bank capital flows, particularly in Asian and Latin American emerging markets. In contrast, flows among developed economies remained well below pre-crisis levels, with bank flows still contracting.

We then assess the underlying drivers of capital flows. We argue that the main driving force has been a 'risk shock' with investors taking a more cautious view of investment prospects. This reflects higher risk, as demonstrated by the fall of major financial institutions, as well as a reduced tolerance for risk on the part of investors. The impact of this shock on a specific country depends on the extent and nature of its international financial linkages, its macroeconomic conditions, and its dependence on world trade. A reassessment of risk by investors is likely to lead to a more significant pull-back from countries with large net external liabilities, particularly in the form of debt, or those whose external portfolio was more exposed to liquidity risk (for example, countries with large banking positions). Countries that experienced a credit-fuelled boom, or where domestic growth and fiscal prospects worsened, were also likely to be more heavily hit. And finally, with the collapse in global trade countries more dependent on exports, particularly of 'cyclical' goods such as investment goods and durables, were likely to be most affected.

Our formal assessment of the drivers of the capital flow retrenchment proceeds in two steps. We first contrast countries experiencing the largest retrenchments with countries experiencing the smallest ones. This allows us to consider a broad range of variables, but not to isolate their specific roles. Our second step is thus a cross-section econometric assessment of the drivers of capital flows. We find that the changes in capital flows during the crisis are related to the structure of the countries' external portfolios prior to the crisis. In particular, countries with large pre-crisis external assets and liabilities in the form of debt instruments – where banks play an important role – were hit with a deeper retrenchment of flows during the most acute phase of the crisis. These countries, primarily advanced economies in Europe as well as the United States, still faced flows substantially below their pre-crisis levels even in late 2009. The evidence also points to sharper and more persistent declines in capital inflows in countries that entered the crisis with higher net external liabilities, particularly in the form of debt – such as several countries in Central and Eastern Europe.

Looking forward, we conjecture that while the trend to financial globalization will persist, its nature is likely to change. This is because international bank flows are unlikely to regain their pre-crisis magnitude for a variety of reasons, including the fallout from the crisis, ongoing regulatory efforts to rein in large banks, and the fact that the pace of pre-crisis flows among advanced economies implied a dramatic expansion in cross-border financial balance sheets relative to the size of individual economies. In contrast, financial globalization in emerging markets, which had proceeded at a less dramatic pace, could well prove more robust. In most emerging markets financial systems were less affected by the crisis: no dramatic expansion in banks' cross-border activity had taken place, and there is still ample scope for increased portfolio diversification across borders.

The remainder of the paper is structured as follows. In Section 2 we briefly review the pattern of financial globalization in the years before the crisis, focusing on the role of banking flows. We turn to developments during the crisis in Section 3, presenting the main stylized facts for industrialized economies and emerging markets. Section

4 reviews the literature on the financial crisis and discusses our theoretical priors about the driving forces of the retrenchment in flows. Section 5 presents an empirical assessment of the drivers of capital. We conclude and discuss the prospects for the future of globalization in Section 6.

## 2. FINANCIAL GLOBALIZATION BEFORE THE CRISIS

The decade prior to the crisis saw a boom in international capital flows. Figure 1 shows that the pace at which investors purchased foreign assets picked up substantially in the early 1990s. While the dispersion in world current account balances and net external positions expanded significantly – with some countries running large deficits as others ran large surpluses – the increase in two-way international capital flows and total external assets and liabilities was even more dramatic (see, for instance, Lane and Milesi-Ferretti, 2007; Gerlach *et al.*, 2009). In this section we briefly review the salient features of this process of financial globalization, drawing on several complementary measures. Box 1 provides a brief description of international capital flows and their components, and Appendix A lists the data sources. Our analysis highlights the following key points:

### Box 1. Concepts and measures of international financial integration

International capital flows are based on the residency criterion of the balance of payments, and cover transactions where one of the counterparties is a resident of the country (say the euro area) and the other a resident of the rest of the world. *Capital outflows* denote net purchases by domestic residents of financial instruments issued by non-residents, while *capital inflows* denote net purchases by foreign residents of domestic financial instruments. The difference between capital inflows and outflows (the financial account balance) corresponds to the current account balance (up to a statistical discrepancy).
International capital flows (acquisition of claims) and the corresponding stocks (value of outstanding claims) are broken down into several categories.

- Foreign direct investment represents a controlling claim in a company (a stake of at least 10%), either by the setting up of foreign operations or the acquisition of a company abroad by a domestic one.
- Portfolio investment covers holdings of bonds and equity that do not lead to a controlling stake.
- 'Other investment' includes a broad residual array of transactions/holdings between residents and non-residents, such as loans and deposits, trade credits etc. Within this category, we separate out those transactions or holdings in which the domestic counterpart is a bank.

- Reserves denote assets held abroad by the country's government or monetary authority, primarily in the form of liquid assets (this category only exists for outflows).
- Financial derivatives flows are payments and receipts between residents and non-residents related to new or outstanding derivatives positions. In our analysis of capital flows, we classify the value of net transactions in financial derivatives on the inflows side of the balance of payments.

While cross-border holdings represent the most prominent form of international financial integration, there are other channels of financial exposure. In particular, the banks of a country can be exposed to the economic conditions of another either by lending directly (banking capital flows) or by having affiliates in the foreign country that lend using locally raised funds. Finally, cross-border financial holdings offer a picture of wealth held abroad. Their value can be compared with that of residents' domestic assets, that is, the claim on a resident on another one, to assess the extent to which a country's residents are internationally diversified.

- The increase of cross-border asset holdings reflects a higher share of foreign assets in portfolios, in addition to a generalized rise in the value of assets relative to GDP (financial deepening).
- The increase in international capital flows and cross-border holdings was more pronounced in advanced economies than in emerging markets.
- Growing international financial linkages were accompanied by an increase in the dispersion of current account balances and size of creditor and debtor positions.
- Financial globalization was particularly rapid in the banking sector of advanced economies, including for regulatory arbitrage purposes.
- International banking integration took the form of both cross-border lending and operations through foreign affiliates.

While Figure 1 shows increased international capital flows, it does not allow us to distinguish between the underlying drivers. We are specifically interested in distinguishing between financial deepening (an increase in financial assets with unchanged allocation between domestic and foreign assets) and a reduction in home bias (an increase in the share of financial assets invested overseas).

In the last 15 years the world has experienced substantial financial deepening. This is illustrated in Figure 2 which presents the value of total financial assets and GDP for several countries in 1997, 2002 and 2007. There is a clear positive trend in all countries, with a noticeable pickup in the pace of deepening since 2002 in several countries such as the United Kingdom and the United States. This process reflects a variety of underlying factors: for example, sharp increases in asset prices,

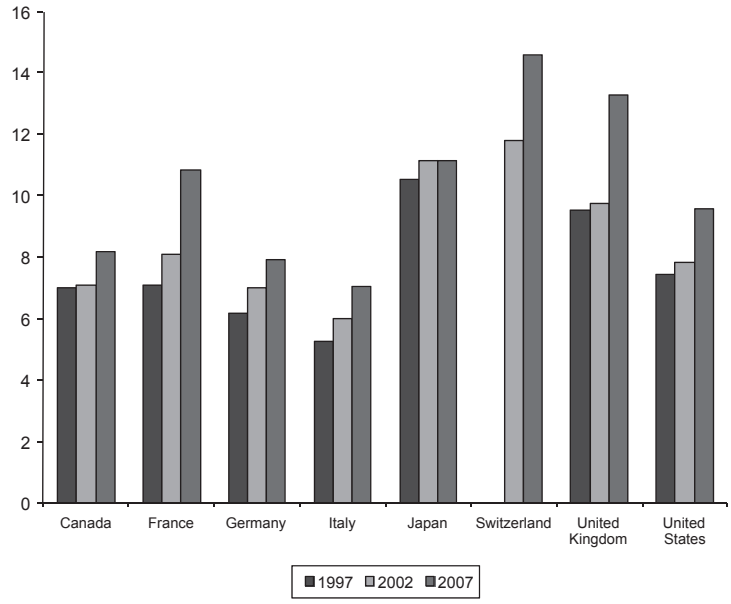


**Figure 2. Financial deepening, advanced economies; ratio of total financial assets to GDP**

*Source*: Financial Accounts Statistics, OECD and Eurostat.

driving up the valuation of financial wealth; higher borrowing, backed by higher valuations of non-financial assets such as property; and a boom in securitization, which raises the total value of financial instruments outstanding.

If countries allocate overseas a stable fraction of financial assets, the process of financial deepening will naturally lead to a pickup of cross-border capital flows, even if investors do not increase the share of their financial wealth that they want to invest abroad (the 'portfolio growth' driver of international capital flows highlighted by Kraay *et al.*, 2005). However, financial deepening can offer only a partial account of the rise in international financial flows; the main driver has instead been an increase in the fraction of wealth invested abroad (the 'portfolio reallocation' channel of capital flows). This is illustrated in Figure 3, which shows the change in the share of foreign assets in residents' portfolios in recent years. Most countries saw this portfolio share increase by between 1 and 2 percentage points annually during the boom of the 2000s (top panel). A finer look at the data shows that this reflected a deliberate investment choice. The share of foreign assets could indeed increase without any action by investors if asset prices increase faster abroad than in the investor country. This impact of asset price changes on the portfolio shares, depicted by the white bars, was generally moderate, reflecting the fact that asset prices increase fairly evenly across the world. The change in the portfolio share was instead the result of active portfolio management: investors stepped up their purchases of foreign assets relative to their acquisition of domestic assets, with the impact of these purchases on the portfolio share shown by the darker shaded bars.

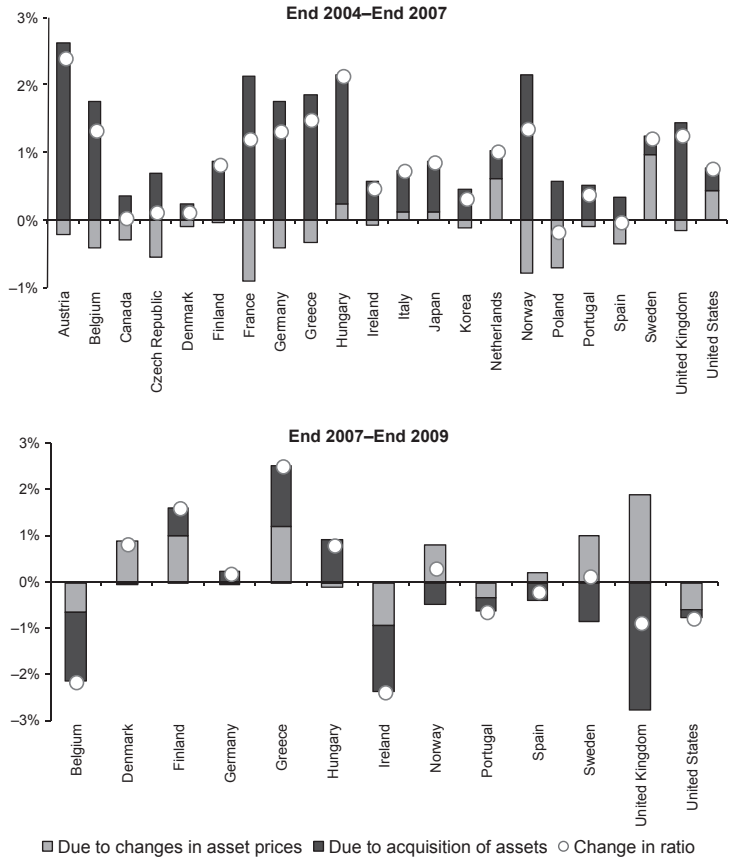


**Figure 3. Evolution of home bias, 2004–2007; change in the ratio of external financial assets to total financial assets, annual rate**

*Note*: The chart decomposes the average annual change in the ratio of external financial assets (*EA*) to total financial assets (*FA*). The component due to the acquisition of assets (capital flows) is calculated as the change in the ratio that would occur if capital flows were the only driver: $[(EA_{t-i} + Flows\_EA_{t-i;t})/(FA_{t-i} + Flows\_FA_{t-i;t}) - EA_{t-i}/FA_{t-i}](1/i)$, where $Flows\backslash EA_{t-i;t}$ ($Flows\backslash FA_{t-i;t}$) is total net purchases of external assets (total financial assets) between year $t - i$ and year $t$. The component due to changes in asset prices is the residual.

The increasing appetite of investors for foreign assets also reflects the reduction of formal restrictions on international capital mobility. Figure 4 presents two measures of international capital mobility, namely the index of restrictions on capital mobility from Schindler (2009) in the top panel, and the index of capital mobility from Chinn and Ito (2008) in the bottom panel. Both measures show a decline in *de jure* restrictions on international capital mobility, with some evidence of a pick-up of the shift in the first half of the 1990s, as shown by the unweighted Chinn–Ito index. Other factors imperfectly captured by these indices include financial harmonization legislation within the European Union and the advent of the euro, which spurred international capital mobility within Europe.

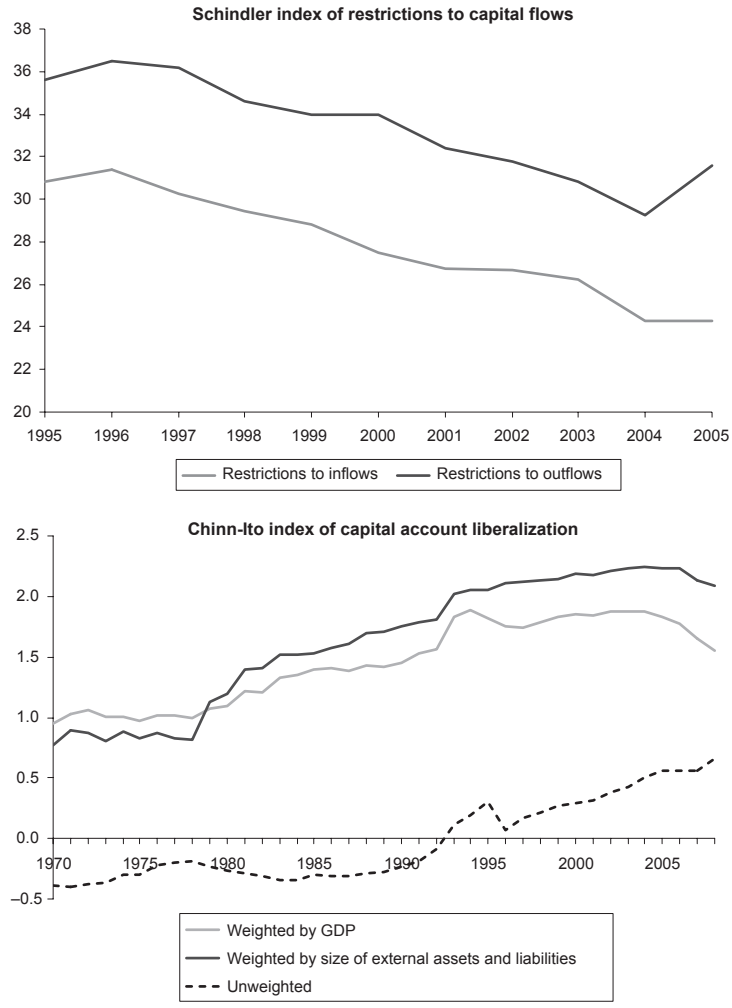


**Figure 4. Measures of capital mobility**

*Source*: Chinn and Ito (2008), Schindler (2009).

Financial globalization led to a polarization of net external positions and flows, with some countries posting large current accounts deficits, while others experienced large surpluses (see, for example, Blanchard and Milesi-Ferretti, 2010). For instance, some economies in the euro area and Central and Eastern Europe experienced a rapid rise of their current account deficits and net external liabilities against a background of easy access to external finance (as shown by a very sharp compression in spreads). Another well-documented aspect of globalization is its concentration in developed economies, where the value of both external assets and liabilities rose at a much faster pace than in emerging markets (Lane and Milesi-Ferretti, 2007; Gerlach *et al.*, 2009). This globalization trend was also accompanied by an increase in flows for regulatory arbitrage purposes, with international financial

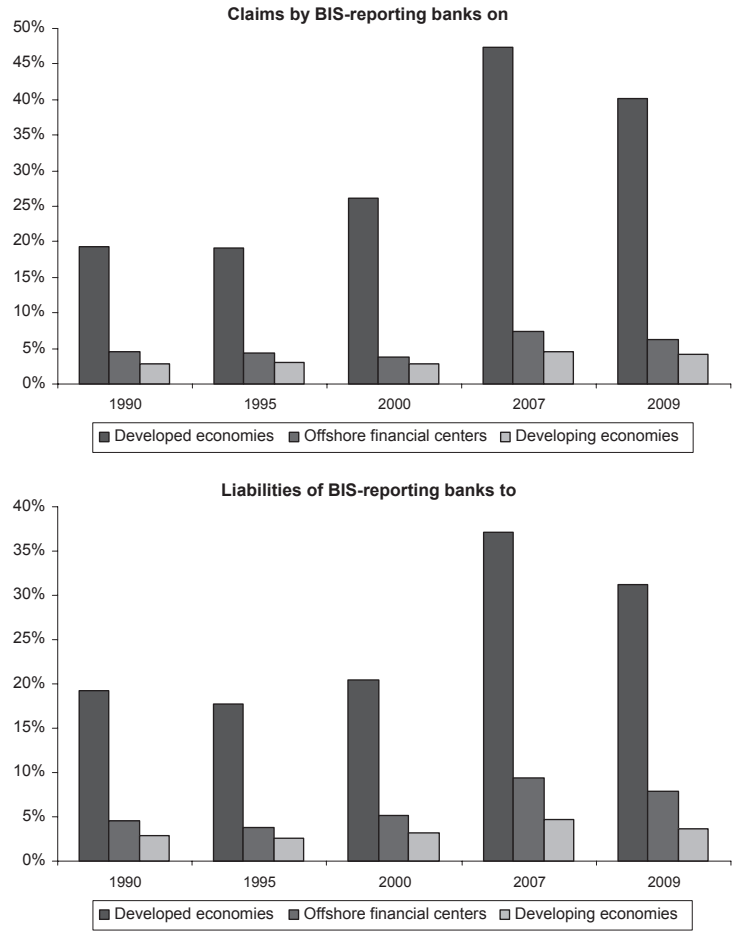


**Figure 5. Cross-border bank lending; holdings at year-end (percentage of world GDP)**

*Source*: BIS locational banking statistics.

centres large and small intermediating sizeable shares of cross-border capital movements (Lane and Milesi-Ferretti, 2010b).[1]

International banking activity played a major role in financial globalization. The Bank of International Settlements compiles detailed data on international bank activity. Its 'locational' data cover the assets and liabilities of banks in different countries using the residency concept of the balance of payments (Appendix A presents the data in more detail). Cross-border bank lending increased substantially since the early 1990s, and particularly between 2000 and 2007, reaching some 60% of world GDP (Figure 5). This activity is heavily concentrated in developed

[1] Examples include the activities of euro area banks conducted through their affiliates in the United Kingdom; the mutual fund industry in Luxembourg as well as Ireland; hedge funds, international banking activity, and structured finance conducted through the Cayman Islands; and the importance of Ireland for the treasury management operations of large multinational companies.

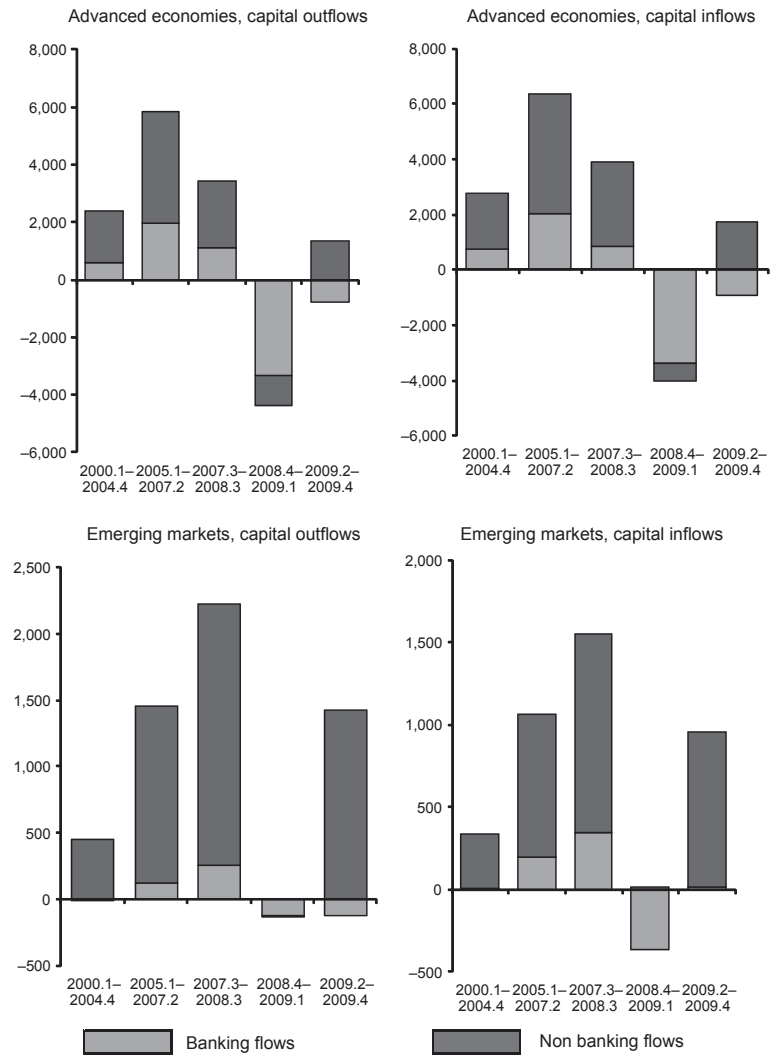


**Figure 6. Role of bank in capital flows (US$ billion, annualized rates)**

*Source*: IMF, Balance of Payments Statistics, authors' calculations.

economies where 80% of cross-border banking assets and a similarly high share of liabilities are located.

The growth of international banking in pre-crisis years is also reflected in their increasing share of capital flows. Figure 6 presents the split of flows between bank and other flows (black and white bars respectively). We contrast the situation between outflows and inflows (left and right panels), between advanced economies and emerging markets (top and bottom panels), and through time. Specifically, we distinguish between an early stage of the pre-crisis boom (from 2000 to 2004), a late stage of the boom (until the middle of 2007), the initial stage of the crisis (from the third quarter of 2007 to the eve of the Lehman Brothers collapse), the 'collapse'

stage (last quarter of 2008 and first quarter of 2009) and a 'recovery' stage (last three quarters of 2009). We defer a fuller discussion of the three crisis stages to the next section.

International bank lending took greater prominence in the last stage of the boom, especially for advanced economies. This reflected the boom in interbank lending activity between advanced financial markets, especially between the United States and Europe as European banks established a substantial presence in the US market, and vice versa (BIS, 2009a, 2010), as well as within Europe where cross-border lending took off with the integration of markets in the European Union. Emerging markets show instead less reliance on bank lending, which represented only 16% of inflows and 9% of outflows on the eve of the crisis. Investment in emerging markets was more reliant on other types of funds, such as FDI and portfolio investment.

The degree of international bank integration is even deeper than what cross-border bank lending indicates. A bank can lend to a foreign borrower either directly across the border, or through an affiliate in the borrower's country. The first strategy entails a claim by a domestic resident (the bank) on a foreign one (the borrower) and thus enters the balance of payments. The second strategy by contrast entails a loan from the foreign subsidiary to the foreign borrower, and thus does not involve the parent bank. It is thus not recorded in the balance of payments. The role of affiliates is captured by the BIS's 'consolidated' statistics, which combine lending activities cross-border and through affiliates. The latter is in turn split between lending in 'local' currency and in other currencies.[2] Lending through affiliates represents a substantial share of international banking activity. Between 1999 and 2007 overall foreign claims of BIS-reporting banks rose from 32% to 62% of world GDP (immediate borrower basis, top-left panel of Figure 7).[3] Operations through foreign affiliates represent a large and growing share of this exposure, totalling 44% of all claims to developed economies and 52% of claims to developing countries on the eve of the crisis (ultimate risk basis, right panels). Table 1 details the growth pattern from end-2005 to end-2007 and shows that both cross-border lending and lending through affiliates grew in parallel in the run-up to the crisis.

[2] The data are available on an 'immediate borrower' basis and an 'ultimate risk' basis (where the latter corrects for the fact that the immediate borrower may benefit from a guarantee from or risk transfer to a third party). While data on an immediate borrower basis covers a longer horizon, they do not isolate cross-border lending. Data on an ultimate risk basis distinguishes between cross-border lending and lending through affiliates, but is only available since 2005 and covers a narrower set of reporting banks (more details are provided in Appendix A).

[3] We focus on the data since 1999 as a break in the data limits the comparability with 1983–98 figures. The total amounts of bank claims on a locational basis, consolidated-immediate borrower basis, and consolidated-ultimate risk basis are not comparable because of differences in the number of countries reporting these banking statistics to the BIS. The figure is highest for locational banking statistics (over 40 countries) and lowest for consolidated, ultimate basis statistics.

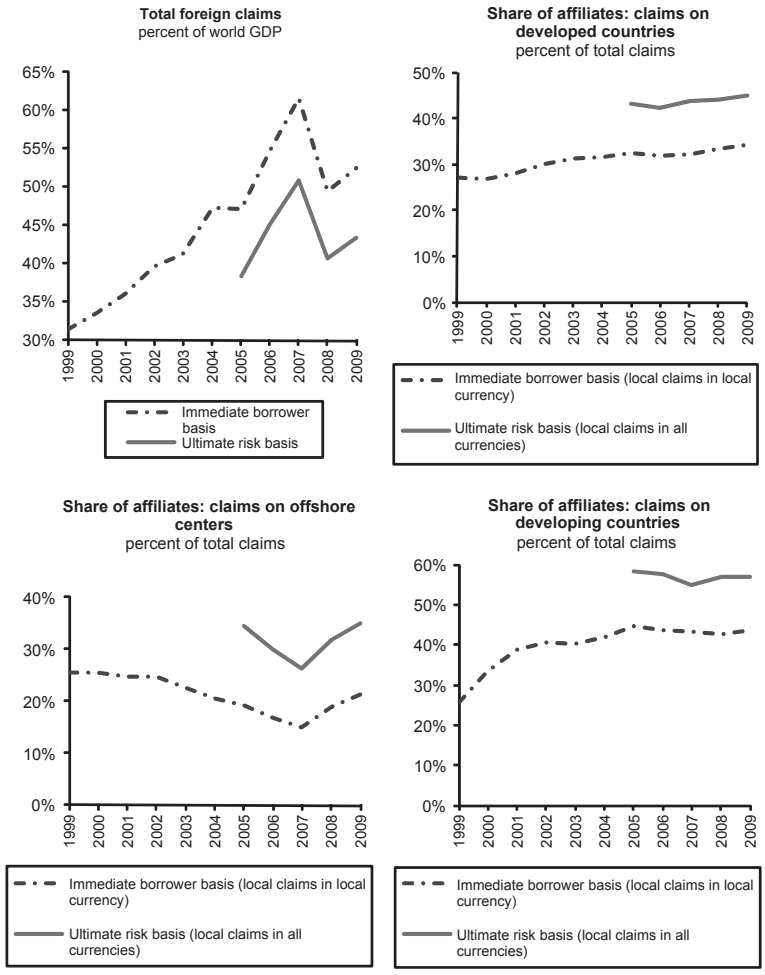


**Figure 7. International bank integration**

*Notes*: International bank exposure (foreign claims) takes the form of (A) cross-border claims, (B) claims through local affiliates in foreign currency and (C) claims through local affiliates in local currency. The data on the 'immediate borrower' basis split 'international claims' (A + B and C) but do not include cross-border claims separately. The data on the 'ultimate risk' basis distinguish between cross-border claims and claims through local affiliates in all currencies (B + C), but start only in 2005 and cover a narrower set of banks. Values are for December.

*Source*: BIS consolidated banking statistics.

## 3. INTERNATIONAL CAPITAL FLOWS DURING THE CRISIS

The long period of buoyant capital flows described in the previous section came to an abrupt halt as the global financial crisis intensified. This section offers a concise review of the major stylized facts in the crisis, with the following six main points emerging:

- The collapse in capital flows reflects an active reduction of the portfolio share of foreign assets by investors, and not just a portfolio adjustment following a reduction in wealth.

**Table 1. Foreign claims of BIS-reporting banks, consolidated basis**
**Annualized percentage change**

| Immediate borrower basis | | | | Ultimate risk basis | | | |
|---|---|---|---|---|---|---|---|
| | Dec. 2005–Dec. 2007 | Dec. 2007–Dec. 2009 | Value Dec. 2009, % world GDP | | Dec. 2005–Dec. 2007 | Dec. 2007–Dec. 2009 | Value Dec. 2009, % world GDP |
| Claims on all countries | | | | Claims on all countries | | | |
| Total foreign claims | 26.2 | −5.6 | 52.6 | Total foreign claims | 27.0 | −5.6 | 43.3 |
| Cross-border | 26.6 | −7.2 | | Cross-border | 26.8 | −7.1 | |
| Affiliates, foreign currency | | | | Affiliates, foreign currency | 27.3 | −3.7 | |
| Affiliates, local currency | 25.5 | −2.2 | | Affiliates, local currency | | | |
| Claims on developed countries | | | | Claims on developed countries | | | |
| Total foreign claims | 25.2 | −7.0 | 41.2 | Total foreign claims | 24.9 | −7.2 | 33.6 |
| Cross-border | 25.4 | −8.5 | | Cross-border | 24.0 | −8.0 | |
| Affiliates, foreign currency | | | | Affiliates, foreign currency | 26.2 | −6.2 | |
| Affiliates, local currency | 24.7 | −3.9 | | Affiliates, local currency | | | |
| Claims on developing countries | | | | Claims on developing countries | | | |
| Total foreign claims | 35.9 | 2.0 | 7.6 | Total foreign claims | 40.2 | 2.2 | 6.9 |
| Cross-border | 37.5 | 1.6 | | Cross-border | 45.4 | 0.2 | |
| Affiliates, foreign currency | | | | Affiliates, foreign currency | 36.3 | 3.8 | |
| Affiliates, local currency | 34.0 | 2.5 | | Affiliates, local currency | | | |

*Notes*: International bank exposure (foreign claims) takes the form of (A) cross-border claims, (B) claims through local affiliates in foreign currency and (C) claims through local affiliates in local currency. The data on the 'immediate borrower' basis split 'international claims' (A + B and C) but do not include cross-border claims separately. The data on the 'ultimate risk' basis distinguish between cross-border claims and claims through local affiliates in all currencies (B + C), but start only in 2005 and cover a narrower set of reporting banks.

*Source*: BIS consolidated banking statistics.

- The overall decline in capital flows during the crisis was not uniform over time, but went through three distinct phases.
- The decline in capital flows was heterogeneous across countries and regions, with the collapse in capital flows being more temporary for emerging markets.
- The decline in capital flows was heterogeneous across different categories of flows, with international bank lending showing the biggest pullback.
- International banking activity contracted both in terms of cross-border lending and in terms of operations through foreign affiliates, with the magnitude being more pronounced for cross-border operations.
- Substantial interventions by domestic authorities and international organizations cushioned the contraction in capital flows and arguably their macroeconomic impact. Interventions took the form of swaps between central banks, use of foreign reserves, and lending from multilateral institutions such as the IMF as well as the European Union.

### 3.1. Shift towards domestic assets

Asset prices have fallen sharply during the crisis, both across asset classes and across countries. To the extent that capital flows are proportional to wealth, such a reduction would naturally have led to a decline in flows. This, however, offers only a partial account of the recent pattern of flows. The crisis has instead been associated with a reduction of the share of assets invested abroad, that is, an increase in the degree of home bias in investors' portfolios.

The retrenchment towards domestic assets is illustrated in the bottom panel of Figure 3 which shows the change in the share of wealth invested abroad between the end of 2007 and the end of 2009. Most countries experienced either a reduction or stabilization in this portfolio share after years of increases prior to the crisis. This setback in international financial integration does not merely reflect movements in asset prices that could have lowered the portfolio share even without any action by investors (to the extent that asset prices fell by more abroad than domestically). Instead investors have actively repatriated funds invested abroad, with the impact of this retrenchment on the portfolio share shown by the darker shaded bars in Figure 3.[4]

### 3.2. A heterogeneous pattern

While commentators often refer to 'the crisis' as a homogeneous global event, a closer look reveals substantial heterogeneity along many dimensions – through time,

[4] The large movements in asset prices and exchange rates during this period imply significant 'valuation effects'. For example, the share of foreign assets in total assets increased in the United Kingdom despite substantial capital repatriation by UK residents, because of the large depreciation of the pound during this period (foreign assets tend to be denominated in foreign currency, and hence rise in value when the domestic currency depreciates).

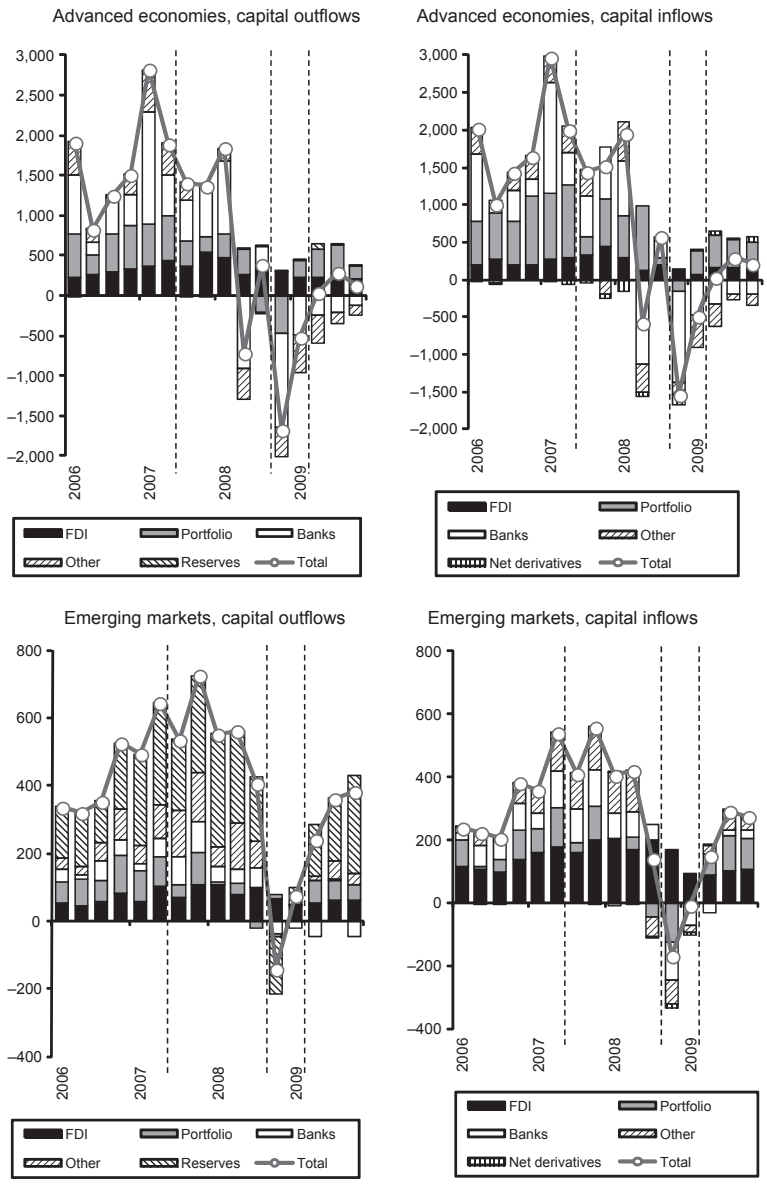


**Figure 8. Capital flows, advanced economies and emerging markets (US$ billions)**

*Source*: IMF, Balance of Payments Statistics, authors' calculations.

across countries, and across types of flows.[5] We document this heterogeneity by focusing on quarterly capital flows since the beginning of 2006, shown in Figure 8 for advanced countries (top panels) and emerging markets (bottom panels).

[5] Lane and Milesi-Ferretti (2010a) and Rose and Spiegel (2010) document a sizeable heterogeneity in the magnitudes of the recession.

Outflows and inflows are broken down into foreign direct investment (FDI), portfolio investment, bank lending, other flows, reserve accumulation (for outflows only) and net derivatives flows.

We split the sample in four distinct periods. The pre-crisis period runs from early 2006 to the second quarter of 2007. The initial stage of the crisis starts with the outbreak of stress in financial markets in the summer of 2007 and runs until the collapse of Lehman Brothers at the end of the third quarter of 2008. The collapse stage of the crisis runs for two quarters following the fall of Lehman Brothers, while the final recovery stage of the crisis covers the last three quarters of 2009. Vertical dashed lines mark the various periods.

Capital flows remained resilient in the initial stage of the crisis. Focusing on advanced economies, the first signs of stress appear in the second quarter of 2008 (following the turmoil at Bear Stearns) where advanced countries experience a sharp turnaround in gross flows, as investors liquidated foreign holdings and repatriated funds. Flows resumed in the third quarter of 2008, but things changed abruptly with the collapse of Lehman Brothers, and gross capital flows turned negative for the two subsequent quarters as investors repatriated funds invested overseas. The final stage of the crisis saw a resumption of capital flows, albeit at levels well short of those observed until mid-2008.

The situation was substantially different in emerging markets. Capital flows proved more resilient in the initial phase of the crisis, with only a slowdown during the Bear Stearns episode, as opposed to an actual turnaround. While the collapse stage of the crisis led to a pullback of capital flows to and from emerging markets, this proved shorter-lived than the one for advanced economies. Flows to and from emerging markets already bounced back in the first semester of 2009, and then rapidly rose to levels only moderately below the ones observed before the crisis.

Turning to the composition of flows, international bank lending (black bars) played a dominant role. The retrenchment of flows in advanced economies in the second quarter of 2009 was driven by banks. While the pullback in the collapse stage of the crisis is observed across various types of investments, bank flows show by far the largest retrenchment. In addition, banks have continued reducing their cross-border exposure in advanced economies even in the final recovery stage.

Although banking flows also played a major role during the collapse stage in emerging markets, their magnitude remains relatively small compared to other types of flows. Capital inflows to emerging markets took mainly the form of FDI and portfolio investment, which quickly resumed after the collapse. On the outflows side, the accumulation of foreign reserves plays a dominant role. In the collapse stage, emerging countries dipped in their war chest so that the sudden stop in inflows could be met by using reserves instead of having the economy go through a costly shift in the net external balance.

A finer geographical breakdown is given in Figures 9 and 10 for advanced countries and emerging markets, respectively. While international bank lending was the

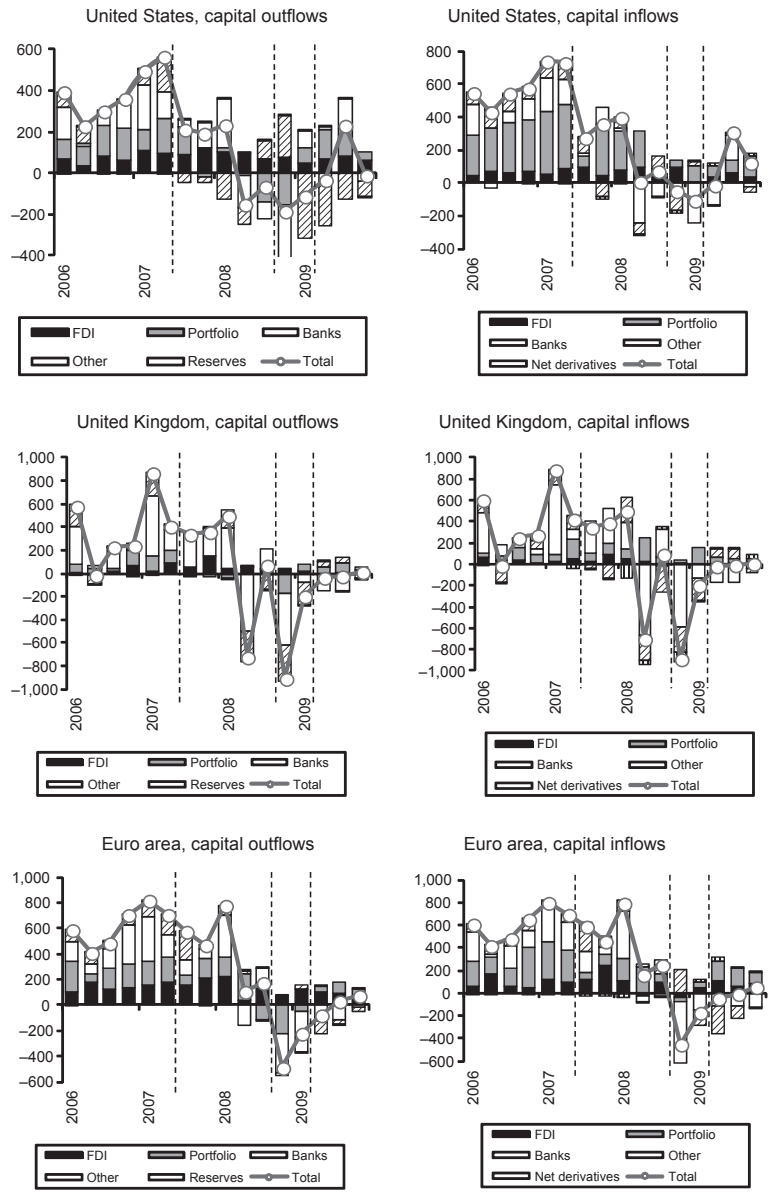


**Figure 9. Geographical breakdown of capital flows, advanced economies (US$ billions)**

*Source*: IMF, Balance of Payments Statistics, authors' calculations.

main driver of the turnaround of flows in the United States, its role was substantially more pronounced in Europe, and especially in the United Kingdom as well as Switzerland, reflecting their nature as international banking centres. The retrenchment of banks from foreign markets has also proved more persistent in Europe than in the United States, where bank outflows and inflows have moder-

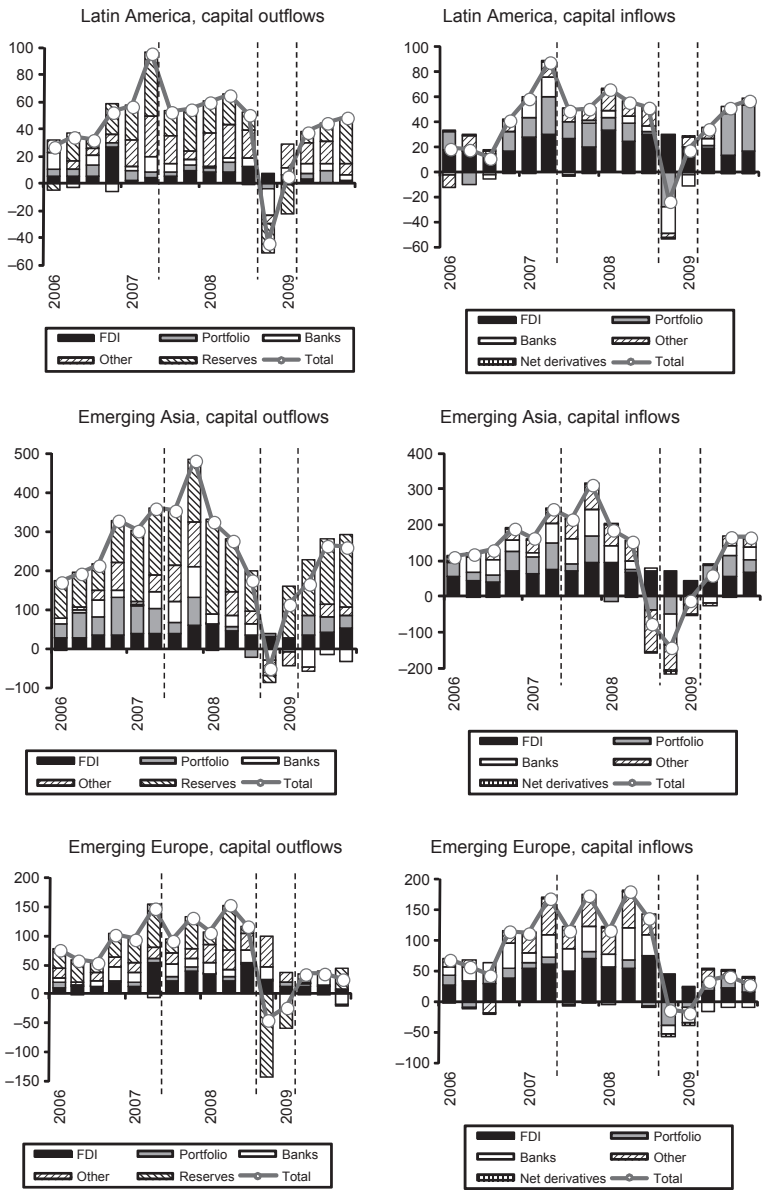


**Figure 10. Geographical breakdown of capital flows, emerging markets (US$ billions)**

*Source*: IMF, Balance of Payments Statistics, authors' calculations.

ately resumed in the recovery stage. Flows to and from emerging markets show marked regional differences. Flows have quickly resumed for Latin America and emerging Asia, nearly reaching pre-crisis levels. By contrast, flows to and from emerging Europe – the region hit hardest by the crisis – remain at a very low level in the recovery stage of the crisis.

### 3.3. International banking in the crisis

International bank lending has retreated markedly during the crisis. The value of cross-border claims fell from 59% of world GDP at the end of 2007 to 51% in December 2009 (Figure 5). This contraction was driven by a sharp retrenchment in bank capital flows, an aspect that is concisely shown in Figure 6, which averages flows across quarters in each of the three crisis stages. In advanced economies, banks pulled back from their foreign investment during the collapse stage, and have continued doing so in the recovery stage. Non-bank flows by contrast bounced back once the worst stage of the crisis passed. Bank flows to and from emerging markets show a similar pattern, but their share of overall flows being much more limited than in advanced economies, they had only a moderate impact on overall flows.

As discussed in the previous section, cross-border lending is only one channel through which banks invest in other countries, and the use of local affiliates also plays a large role. While banks pulled back from international activities across the board, they did so to a lesser extent on their affiliates business – so that the affiliates' share of total claims rose slightly between 2007 and 2009. Table 1 shows that banks' claims on developed economies were reduced primarily through cross-border lending, to a lesser extent through affiliate lending in foreign currency, and even less through affiliate lending in local currency. While cross-border lending to developing economies remained unchanged, business through affiliates picked up, especially in foreign currencies.

### 3.4. Policy response to the retrenchment

Policy-makers did not remain idle in the face of the collapse of capital flows. Figures 8 and 10 show that emerging countries used their foreign exchange reserves to offset the drying up of capital inflows, thereby limiting the impact on the economy. Central banks also reacted to stress in international bank lending by setting up currency swap lines. As the crisis started, it quickly became apparent that European banks needed to raise liquidity in US dollars to fund their (primarily long-term) holdings in the United States (BIS, 2009b). Prior to the crisis, these banks had relied on short-term dollar funding by issuing commercial paper. However, this channel of financing dried up as money market mutual funds, the main purchasers of commercial paper, curtailed their purchases because of concerns about the banks' assets financed through this channel (which included holdings of mortgage-backed securities) and banks' health more generally. They could not obtain funding from the Federal Reserve, and the central bank in their country could only extend loans in local currency. The Federal Reserve lent dollars to the foreign central banks so they could in turn lend them to their own banks. These swaps arrangements were set up in the initial stage of the crisis, reaching over US$50 billion in the summer of 2008 (Board of Governors, 2009; Goldberg *et al.*, 2010). The scale of the swap efforts surged in

**Table 2. IMF assistance under stand-by-arrangements, US$ billions**

| | Arrangement initialized during the | | | |
|---|---|---|---|---|
| | Collapse stage | | Recovery stage | |
| | Amount agreed | Amount outstanding | Amount agreed | Amount outstanding |
| Hungary | 15.9 | 11.5 | | |
| Romania | | | 17.3 | 12.5 |
| Ukraine | 16.6 | 10.6 | | |
| Pakistan | 10.9 | 6.3 | | |
| Other | 9.2 | 4.4 | 9.0 | 2.4 |
| Total | 52.6 | 32.8 | 26.3 | 14.9 |

*Note*: The amounts outstanding are as of 31 March 2010.

*Source*: IMF.

the wake of the Lehman Brothers failure, reaching US$500 billion at the end of 2008. As markets functioning returned to normal, the swaps were not renewed and had essentially expired by the end of 2009. Goldberg *et al.* (2010) find that these arrangements were successful in reducing the strain in dollar funding.

Multilateral institutions were also actively involved. The European Union extended loans to Central and Eastern European countries to help them cope with the drying up of external funding. Similarly, the IMF set up assistance programmes to a broad range of countries. During the collapse stage of the crisis the IMF extended over US$53 billion in credit in the form of stand-by arrangements (Table 2), adding an extra US$26 billion in the recovery stage. This assistance was put to use with US$48 billion being still outstanding at the end of the first quarter of 2010. Additional support was provided through contingent financing in the form of the so-called 'Flexible Credit Line'.

## 4. INTERPRETING THE CRISIS

The unprecedented global crisis has stimulated a burgeoning literature analysing its causes and consequences. In this section, we first provide a concise review of this body of research, as well as drawing on the lessons from earlier episodes of turmoil, such as the Asian crisis of 1997–98, that offer an interesting parallel. We then discuss the possible drivers of international capital flows in the crisis and outline the empirical implications of alternative – albeit not exclusive – mechanisms that we formally assess in the next section.

### 4.1. Studies of the current and past crises

A growing body of research has examined various aspects of the crisis. A first group of studies examined whether the heterogeneity of the crisis across countries (in terms of output and demand contraction, exchange rate depreciation, and/or asset

price changes) can be linked to differences of fundamentals, such as exposure to the United States where the turmoil started. Lane and Milesi-Ferretti (2010a) find that output and domestic demand fell by more in countries which experienced large current account deficits and fast credit growth before the crisis. Rose and Spiegel (2010), while more sceptical about the explanatory power of pre-crisis variables, find that countries with large current account deficits and more deregulated financial markets experienced deeper recessions. The role of credit market regulation is also stressed in Giannone *et al.* (2010). Ghosh *et al.* (2009) and Blanchard *et al.* (2010) focus on emerging economies and document how these were exposed through trade to the collapse of domestic demand in advanced economies, and experienced a 'sudden stop' in capital inflows in the context of a generalized 'flight to safety'.[6] While large holdings of foreign exchange reserves should in principle have helped cushion the shock, by reducing the need for a large current account adjustment through demand compression, findings on this issue are not fully clear-cut. Obstfeld *et al.* (2009) find evidence that countries with large reserves faced less exchange rate pressure. However, Blanchard *et al.* (2010) do not find evidence that countries with large reserves suffered milder recessions.

A striking international aspect of the crisis is the unprecedented degree of international co-movements, with all countries experiencing virtually simultaneous sharp declines in growth (Imbs, 2010). One transmission mechanism has been the collapse in international trade. The primary driver of this collapse has been the postponement of purchases of durable consumption and investment goods following the fall of Lehman Brothers. The highly uncertain environment following this collapse led households and firms to take a 'wait and see' attitude and delay purchases of durable and investment goods. With these goods representing a much higher share of trade than GDP, the postponement led to a sharp collapse in trade flows (Eaton *et al.*, 2010). While other aspects such as the disruption of trade credit also played a role, they proved more secondary (Baldwin, 2009).

Other studies focused on the role of capital flows. Broda *et al.* (2009) focus on the determinants of US flows and the external value of the dollar and stress the role of a flight to the safety of US assets such as Treasury bills in response to an increase in perceived risk of other assets. Bertaut and Pounder (2009) also focus on US capital flows and highlight the important role of banks (including through the activity of European banks vis-à-vis their US affiliates). The role of banks is also stressed by Hoggarth *et al.* (2010). Cetorelli and Goldberg (2010) take a global look at bank lending and assess supply shocks in the crisis. They find a sizeable transmission through cross-border lending, lending through affiliates (use of internal market to direct funds to the parent)

[6] It is well known that emerging-market exposure to US securities backed by sub-prime mortgages was very modest. However, Kamin and Pounder (2010) find that direct exposure to US mortgages does not explain the geographical pattern of the crisis. Instead, what matters is a global risk aversion shock, which affected most severely institutions dependent on short-term funding.

and an impact on local banks. They also find that the so-called 'Vienna initiative' designed to maintain lines of bank credit to countries in Central and Eastern Europe helped, a result corroborated by the findings of Barba-Navaretti *et al.* (2010).

Two key themes emerge from the literature on the crisis. First, its incidence is related to the financial excesses (asset price bubbles, dramatic compression of spreads, lax financial regulation etc.) and associated macroeconomic imbalances and vulnerabilities (such as large current account deficits) that built up before the crisis. Second, international financial linkages were important in explaining the cross-border transmission.

Focusing on crises episodes, an extensive literature has assessed the causes and consequences of 'sudden stops', that is, abrupt dry-ups of external funding in emerging markets. The literature finds that both financial integration, in terms of its magnitude and specific form, and domestic conditions play a role. Calvo *et al.* (2008) document that sudden stops are more likely for countries which rely more on short-term funding from banks or portfolio investment than on foreign direct investment. A high reliance on liabilities in foreign currency is also a factor of risk. The magnitude of integration has a non-monotonic effect: countries that are moderately integrated are at greater risk than countries that either have only shallow financial links with the rest of the world, or are extensively integrated. Countries with larger public deficits are also more at risk of a sudden stop. Kaminsky (2008) argues that a higher extent of financial integration raises the risk of a sudden stop, even in the absence of domestic problems. Edwards (2004) finds that sudden stops are more likely for countries with large current account deficits, a credit boom, or low foreign reserves.

Researchers have also extensively studied episodes of currency crises, most of which entail an element of drying up of capital flows. Pesenti and Tille (2000) present a concise review of the topic. The major episodes of crisis in the 1990s were the so-called Tequila crisis that started in Mexico in 1994 and the Asian crisis of 1997–98. Calvo and Mendoza (1996) review the experience of Mexico, and Corsetti *et al.* (1999) offer an extensive analysis of the Asian episode.

The crises of the 1990s offer interesting parallels with the current turmoil. Specifically, banks were at the heart of the problem with a mismatch between assets and liabilities both in terms of currencies and maturity. Banks in the crisis countries had built large liabilities in foreign currencies while lending in local currency (although some loans were in foreign currencies, this merely displaced the problem as the borrowers' sales were in local currency). In addition, international liabilities were predominantly short term, exposing the countries to a rollover risk similar to a bank run. This was the case for banks' liabilities, but also for other instruments such as the short-term dollar Tesobonos bonds in the Mexican crisis. The build-up of these mismatches had been facilitated by substantial international financial integration prior to the crisis that allowed for large inflows of foreign funds, a development that parallels the global surge of integration before the current crisis.

Despite these parallels, we also observe substantial differences between the earlier crises and the current one. First and foremost, the current crisis was centred in advanced economies – even though some characteristics of financial sector vulnerabilities were clearly reminiscent of past emerging market crises. Second, the sudden stop of gross capital inflows to emerging markets in the past fed directly into net capital flows, with the current account moving from a deficit to a surplus in short order, at the cost of a deep recession. In the current crisis by contrast the movements in capital inflows were largely mirrored in outflows, with in general a moderate impact on net flows. Finally, capital inflows in past crises remained at a depressed level for a sustained period after the sudden stop. In the current crisis emerging markets generally experienced a shorter-lived sudden stop which lasted for six months after the fall of Lehman Brothers, with capital flows then quickly recovering (except in emerging Europe).

### 4.2. What drives capital flows: *a priori* conjectures

While the recent crisis reflects a host of factors, we argue that a general 'risk' shock played a crucial role in driving cross-border capital flows. This entails both an increase in financial risk (actual or perceived), as AAA-rated assets proved much less safe than previously thought and large financial institutions collapsed, as well as a reduction in investors' tolerance for a given level of risk. Our focus is consistent with other studies that point to heightened risk as a factor behind the trade collapse (Baldwin, 2009) and the flight to quality (Broda *et al.*, 2009). The relevance of risk for capital flows can be assessed formally by regressing global capital flows on risk, which we proxy by the VIX index of implied volatility on the S&P 500, while controlling for global growth, which can be expected to boost capital flows, and openness to trade (the ratio of world exports plus imports to GDP) as trade in financial assets can be expected to move in step with trade in goods. Specifically, we get the following results for quarterly capital flows from 1996Q1 to 2009Q4 (where *** and ** denote significance at the 1% and 5% level respectively):

$$\text{World outflows} + \text{inflows} / \text{world GDP} = \underset{-0.0046**}{\text{VIX}} + \underset{2.72***}{\text{World growth}} + \underset{1.46***}{\text{Trade openness}} + \underset{0}{\text{trend}} + \underset{-0.4**}{\text{constant}}$$

That is, we find a statistically significant impact of 'risk' on flows, especially since the late 1990s, as well as a positive link with world trade and world growth. Focusing first on trade, we would expect the sharp decline in exports and imports to be reflected in a decline in associated capital flows (such as trade credit), with the collapse in trade itself reflecting the postponement of durable goods purchases in an uncertain environment. In addition, the sharp decline in commodity prices during

the crisis would have a significant impact on export revenues for commodity exporters, and could hence affect capital flows through that channel.

With regard to the 'risk' shock, we see it affecting capital flows through several complementary channels. First, the risk shock can trigger a selloff of liquid assets, in a similar fashion as a bank run by depositors. In the international banking system such a run would not primarily involve retail depositors, who typically benefit from deposit insurance, but instead short-term wholesale lending among banks. We would then expect the retrenchment of capital flows to be more pronounced in countries where banks account for a larger share of international assets and liabilities. Such a run is likely to have been more acute at the peak of the crisis (the last quarter of 2008 and the first quarter of 2009), but should play a smaller role in subsequent quarters once policy interventions had addressed the liquidity problem. In addition, the impact of the shock is likely to be heterogeneous across types of investment. Arguably, foreign direct investment is more long term in nature, and thus least vulnerable to concerns about liquidity. Banking flows on the other hand are likely to be most sensitive to liquidity runs. Banks operated with a thin capital cushion before the crisis, and the losses they faced raised the spectre of default, leading investors (including other banks) to pull back as they could not assess the banks' solvency with enough confidence. 'Other' flows (which include non-bank financial institutions) can also be expected to be substantially affected. Portfolio investment represents an intermediate case. While it has a shorter-term focus than FDI, it is not as vulnerable to liquidity and counterparty concerns as bank lending is.

Second, the shock can lead investors to take a more critical look of the various countries where they invest. With benign attitudes to risk prior to the crisis, investors arguably underestimated countries' macroeconomic and financial vulnerabilities, bringing spreads to historical lows. The risk shock marked the end of this attitude of benign neglect as the prospect of substantial losses led investors to take a harder look at the specific situation of various countries. This reassessment implies that countries with the weakest fundamentals, such as pre-crisis credit booms, large current account deficits, and large external liabilities faced a larger pullback by international investors. In this context, it is informative to look not only at the decline in flows during the acute phase of the crisis (the last quarter of 2008 and the first quarter of 2009) but also at the subsequent period (the last three quarters of 2009). In practice, we test whether the capital flow retrenchment was deeper for countries with weak external fundamentals (net external debt; net external liabilities; current account deficits, weak credit market regulation).[7]

Finally, with capital flows being forward-looking, we would expect their changes to be related to revisions in expected future economic prospects across countries. For example, the expected deterioration of public deficits and indebtedness in

[7] Weak regulation is particularly important if we think that under more laissez-faire policies the potential for asymmetric information is larger.

several countries is likely to have reduced their appeal to foreign investors. Similarly, we would also expect countries with larger downward revisions to their medium-term growth forecast to have experienced a bigger pullback from foreign investors.

## 5. AN ECONOMETRIC ANALYSIS OF THE DRIVERS OF CAPITAL FLOWS

We now turn to a formal investigation of the channels presented in the previous section. Following the analysis of Section 3, we distinguish between the 'collapse' stage of the crisis (2008 Q4–2009 Q1) and the subsequent 'recovery' stage. For each stage we compute the change in a country's capital flows relative to the pre-crisis situation:

$$\Delta \textit{capital flows}(\textit{collapse})_{k,c} = \frac{\textit{Capital flows}_{k,c}[2008.4 - 2009.1] - \textit{Capital flows}_{k,c}[2006.1 - 2007.2]}{\textit{GDP}_c[2007]}$$

$$\Delta \textit{capital flows}(\textit{recovery})_{k,c} = \frac{\textit{Capital flows}_{k,c}[2009.2 - 2009.4] - \textit{Capital flows}_{k,c}[2006.1 - 2007.2]}{\textit{GDP}_c[2007]}$$

where $\textit{capital flows}_{k,c}[t_1 - t_2]$ is the annualized value of capital flows in category $k$ for country $c$ for the period $t_1$ to $t_2$. We choose to scale the reduction of international capital flows by the country's GDP in order to capture the macroeconomic relevance of capital flows. We also consider an alternative specification where we scale the change in flows by initial (end-2005) positions (external liabilities for inflows, external assets for outflows):

$$\Delta \textit{capital flows}(\textit{collapse})_{k,c} = \frac{\textit{Capital flows}_{k,c}[2008.4 - 2009.1] - \textit{Capital flows}_{k,c}[2006.1 - 2007.2]}{\textit{External liabilities}(\textit{assets})[2005]}$$

$$\Delta \textit{capital flows}(\textit{recovery})_{k,c} = \frac{\textit{Capital flows}_{k,c}[2009.2 - 2009.4] - \textit{Capital flows}_{k,c}[2006.1 - 2007.2]}{\textit{External liabilities}\,(\textit{assets})[2005]}$$

This alternative scaling may better capture portfolio allocation choices, but at the same time may not accurately reflect the extent of economic strain – for instance, a country where foreign investors pulled out half of their holdings, but where these holdings account for a small share of GDP, does not suffer much from the collapse in funding.

We undertake our analysis separately for capital inflows and capital outflows. We exclude 'official' flows, such as reserve accumulation or support from multilateral organizations. Focusing only on overall flows, we would infer that a country with a large inflow in the form of IMF support faced benign conditions, which clearly would

be inaccurate. We also present results focusing on bank inflows as well as bank net flows, in light of the central role of international banking in the crisis. We present results for different samples (all countries, advanced economies, and emerging markets).[8] The analysis proceeds in two steps. We first contrast the countries where the turnaround of flows was largest with the countries where it was smallest. We then proceed to a formal econometric analysis of the retrenchment of flows in the cross-section of countries. While more rigorous, this second step limits the numbers of variables we can consider without significantly lowering the degrees of freedom.

### 5.1. Stylized facts

We start the analysis by establishing some aggregate 'stylized facts' on the relation between the cross-country incidence of the contraction in capital flows and a set of explanatory pre-crisis and crisis variables. Our 'stylized facts' are constructed as follows. We select two groups of countries, each comprising around a quarter of the sample: the countries where the decline in capital flows was smallest, and those that suffered the largest declines (the 'sudden stop' group). We then compare mean and median values of the explanatory variables between the two samples. The sample excludes a set of international financial centres for which changes in inflows and outflows are very strongly correlated, reflecting these countries' role as international financial intermediaries, and take extreme values.[9] We also exclude the smallest countries (those with GDP below US$20 billion). The explanatory variables can be grouped in four categories, corresponding to the four channels discussed in Section 4. For each channel, we also present selected scatter graphs to illustrate salient points.

The first channel reflects *international trade*, as capital flows could simply mirror the collapse of trade since the end of 2008. We first consider the change in trade flows, which is constructed as our measures of capital flows retrenchment, except that the financial flows are replaced by the sum of exports and imports. The next variable is the openness to international trade (the sum of imports and exports over GDP), the most obvious proxy for vulnerability to a global slowdown. We also consider the share of manufacturing in GDP. As widely documented (see, for example, Bems *et al.*, 2010), the collapse in world trade in late 2008 has hit hardest countries more reliant on manufacturing activity. On the one hand, a higher share of manufacturing may imply a more drastic contraction in export revenues, which could be reflected in lower acquisitions of foreign assets. On the other, it may reduce foreign demand for the country's assets, and hence reduce capital inflows. Given the heavy presence of emerging markets in our sample, we also include the commodity trade

[8] Results for an alternative base going until the collapse stage (2006.1–2008.3, instead of 2006.1–2007.2) are similar, and are available from the authors.

[9] The countries are Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, Netherlands, Panama, Singapore, Switzerland and the United Kingdom.

balance as a ratio of GDP, which captures more generally the magnitude of the country's reliance on primary exports, whose prices fell sharply during the crisis. We generally consider these variables as likely to play a more important role in explaining the change in capital flows for emerging economies. Finally, we consider growth in the country's trading partners. This variable can matter not only because a slowdown in the partner countries mechanically weakens exports, but also because the slowdown could be perceived as persistent and thus alter the exporter's growth prospects beyond the current period.

The second channel reflects the countries' *international financial exposure*. The reduction of investors' risk appetite led them to pull back towards their home markets, a development that can be expected to have a larger impact on countries that were initially highly integrated. We thus consider the size of a country's external balance sheet (the sum of its external assets and liabilities), separating out debt instruments, conceivably more affected by the crisis, from equity instruments, such as FDI and portfolio equity. This is motivated by the fact that contingent assets and liabilities, such as FDI and equity, offer better opportunities of risk sharing than non-contingent assets such as bonds or bank loans. For example, countries with large international banking sectors are likely to be most severely affected by the turmoil in global banking. In addition to these *gross* financial positions, we also consider the *net* reliance on foreign funds, which provides a better proxy for solvency risk. We also break the overall net position into equity and debt sub-components, and split debt holdings between bonds and banks on the one hand and foreign reserves on the other hand, as the latter can be expected to be seen as a source of strength by investors, making them less inclined to cut their funding to the country. Importantly, all 'external balance sheet' variables are dated as of end-2005, and therefore prior to the pre-crisis period we consider.

The third channel is related to countries' *macroeconomic characteristics*. For instance, a credit-fuelled expansion before the crisis could have led to excessive borrowing and an asset price bubble, followed by a sustained slump once the boom is over. Investors would then pull back from this country more than from other markets. The first variable reflecting initial conditions is the growth of GDP in the two years before the crisis (2005–2007). We also proxy the reliance on credit by including the ratio of private credit to GDP before the crisis. The third variable is the country's level of development, proxied by the log of per capita GDP. The coefficient on this variable is ambiguous *ex ante*: while richer countries are likely to be seen as safer investment opportunities, and thus less likely to suffer a capital flow turnaround, they also have been the hardest hit by the contraction in world GDP (Lane and Milesi-Ferretti, 2010a).

The final channel is related to macroeconomic performance in the crisis, and more importantly to revisions in *prospects*. We measure the performance during the crisis with the change in growth between 2005–7 and 2008–9. Turning to the country's prospects, we take the change in growth projections for the country for

the period 2009–2012 resulting from the crisis. Pre-crisis growth projections for that period are taken from the April 2007 World Economic Outlook (WEO) and post-crisis projections from the April 2009 WEO. The last two variables capture changes in countries' fiscal prospects as a result of the crisis. Growing fiscal deficits and deteriorating public debt dynamics will reduce the attractiveness of domestic bonds for foreign investors. The fiscal balance variable is defined as the difference in WEO projections for the ratio of the fiscal balance to GDP in 2012 between the April 2009 and the April 2007 WEO. Similarly, the change in projected public debt dynamics is defined as the difference between the April 2009 and April 2007 WEO projections for the ratio of gross government debt to GDP in the year 2012.

**Table 3. Decline in gross capital inflows excluding official flows (in percentage of GDP); mean and median differences in variables between countries not suffering a sudden stop and countries suffering a sudden stop**

| | Difference in means | Difference in medians | *t*-statistic for difference in means |
|---|---|---|---|
| *Change in capital flows* | | | |
| Change in inflows net of official flows (% of GDP) | 33 | 31 | 10.1 |
| Change in outflows (% of GDP) | 18 | 22 | 4.7 |
| *International financial exposure* | | | |
| Financial openness (% of GDP) | −108 | −78 | −2.9 |
| Gross debt (% of GDP) | −73 | −56 | −3.4 |
| Gross debt (banks) (% of GDP) | −68 | −69 | −4.4 |
| Gross equity (% of GDP) | −35 | −42 | −2.0 |
| FX reserves (% of GDP) | −2 | −1 | −0.4 |
| NFA (% of GDP) | 6 | −3 | 0.6 |
| Net debt position excl reserves (% of GDP) | 7 | 5 | 1.0 |
| Net bank debt position (% of GDP) | 13 | 16 | 2.3 |
| Net equity position (% of GDP) | 0 | 5 | 0.0 |
| Net position vis-à-vis BIS banks (% of GDP) | 16 | 14 | 4.4 |
| *Domestic macroeconomic characteristics* | | | |
| GDP per capita | −14207 | −16915 | −2.6 |
| GDP growth 2005–7 | 0.4 | 1.1 | 0.4 |
| Private credit (% of GDP) | −42 | −63 | −3.0 |
| Change in private credit to GDP ratio | −7 | −6 | −1.2 |
| Change in growth (2008–9 to 2005–7) | 3.0 | 0.8 | 1.7 |
| Change in public debt projection (% of GDP) | −16 | −20 | −2.8 |
| Change in fiscal balance projections (% of GDP) | 2.7 | 2.7 | 2.4 |
| Change in growth projections | 1.0 | 0.4 | 2.0 |
| *Impact of international trade* | | | |
| Change in growth in trading partners (2008–9 to 2005–7) | 0.9 | 0.6 | 2.1 |
| Share of manufacturing output | −1.4 | −1.9 | −0.7 |
| Commodity trade balance | 3.8 | 3.7 | 0.9 |
| Trade openness | −35.7 | −24.6 | −2.4 |
| Change in trade flows | 2.8 | 0.2 | 1.1 |

*Note*: The table shows the difference of variables between the countries in the bottom quartile of capital inflows decline (i.e. the smallest decline) and the countries in the top quartile.

Table 3 presents the differences in mean and median values of the indicators mentioned above between countries that experienced small declines in inflows during the collapse stage of the crisis and countries that experienced large ones, as well as a *t*-test for the equality of means. In the table, the decline in inflows is scaled by the country's GDP to capture its macroeconomic relevance – results when the decline is scaled by pre-crisis external liabilities are similar and available from the authors. The first line highlights the very large difference in the change in inflows (netting out official flows such as IMF lending) between the two samples. The sudden stop countries faced a reduction of inflows that was over 30% of GDP larger on an annualized basis, relative to the countries that experienced a small reduction.[10] Also, the second line shows that declines in inflows and outflows generally went together.

Turning to the financial exposure measures, there is strong evidence that countries with larger gross external positions, particularly in debt instruments, suffered more severe declines in inflows. Also, countries whose banks had a more negative net external position, or with an overall external position vis-à-vis BIS banks, suffered more severe declines in inflows, a result consistent with the literature discussion on the central role played by banks in advanced economies in the financial crisis. The relevance of international financial integration through banks is illustrated in Figure 11 which shows our measure of the retrenchment in capital inflows during the collapse stage (vertical axis) against the pre-crisis value of gross bank positions (horizontal axis). We present the results both scaling the capital flows retrenchment by GDP (top panel) and pre-crisis liabilities (bottom panel). We observe a clear connection between bank positions and the retrenchment, with countries that were highly integrated through banks suffering from larger pullbacks of capital inflows.

Among the variables related to macroeconomic characteristics, we find that declines in capital inflows were larger in countries with higher GDP per capita, a result reminiscent of the findings in Lane and Milesi-Ferretti (2010a) and Rose and Spiegel (2010) that output and demand declines were more severe in richer countries. Turning to countries' prospects, countries with a more acute weakening of growth during the crisis, or worsened growth prospects, also suffered more. This is illustrated by Figure 12 which shows that countries with more deterioration in growth prospects saw a larger retrenchment of capital inflows. Prospects for public finances were also important – countries with larger increases in public indebtedness faced larger reversal in flows. This is illustrated by Figure 13 which shows a strong correlation between the pullback of inflows and changes in public debt projections.

Finally, with regard to trade we find that countries more open to trade and countries that suffered a larger decline in growth in trading partners experienced a

[10] Specifically, the mean change in inflows net of official flows was −0.6% of GDP in the countries with the smallest decline, and −34% in the countries with the largest declines.

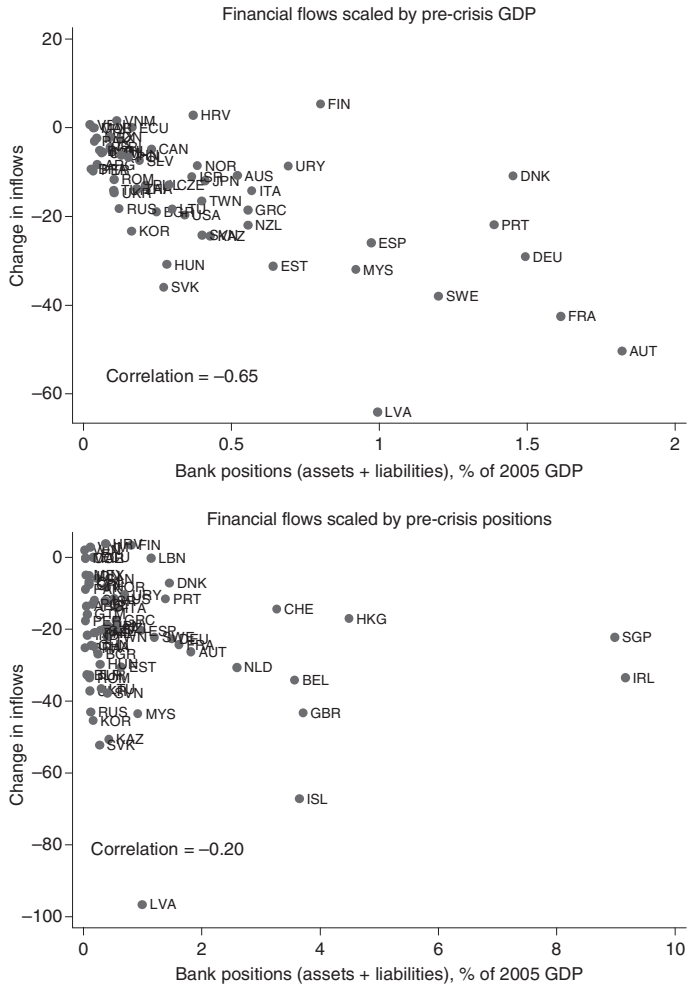


**Figure 11. Decline in capital inflows and initial banking positions**

*Note*: Lower scatter-plot includes financial centres.

sharper decline in inflows, but little evidence that countries that suffered larger declines in trade also experienced larger declines in inflows.

Table 4 presents the corresponding results for capital outflows. Overall, results are similar to those presented in Table 3 for inflows: countries with higher GDP per capita, larger gross external positions, more negative positions vis-à-vis BIS-reporting banks, higher ratios of private credit to GDP and with a worsened fiscal outlook saw a larger compression in total capital outflows. The results also suggest that countries that experienced a sharper decline in trade flows also experienced a sharper decline in outflows.

One noteworthy aspect of the retrenchment in international bank flows is whether these were affected by governments' support to the banking system. As massive public resources were put into banks, it could be that governments asked

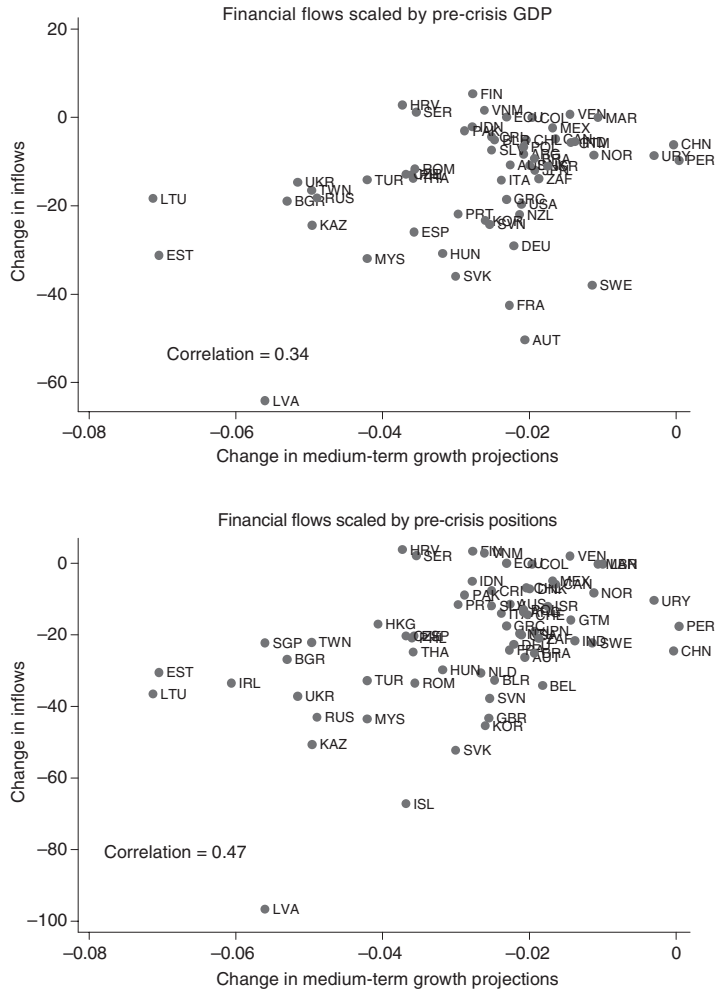


**Figure 12. Decline in capital inflows and revisions to growth projections**

*Note*: Lower scatter-plot includes financial centres.

the recipient banks to keep supporting domestic lending even if this meant pulling back from foreign markets. Hoggarth *et al.* (2010) find that countries where public support for banks was larger (in the form of capital injections, liquidity provision, credit commitments, and guarantees) also experienced a larger reduction in banks' external assets. Using the same data (reported in International Monetary Fund, 2009) we do indeed find a strong correlation between different measures of public support to banks and the size of the reduction in capital outflows, as well as in bank outflows (results available from the authors). We return to this issue in the discussion of our multivariate regression results.

In summary, our results point to a role for the extent and specifics of financial integration, and for growth and public finance prospects. Economic activity in

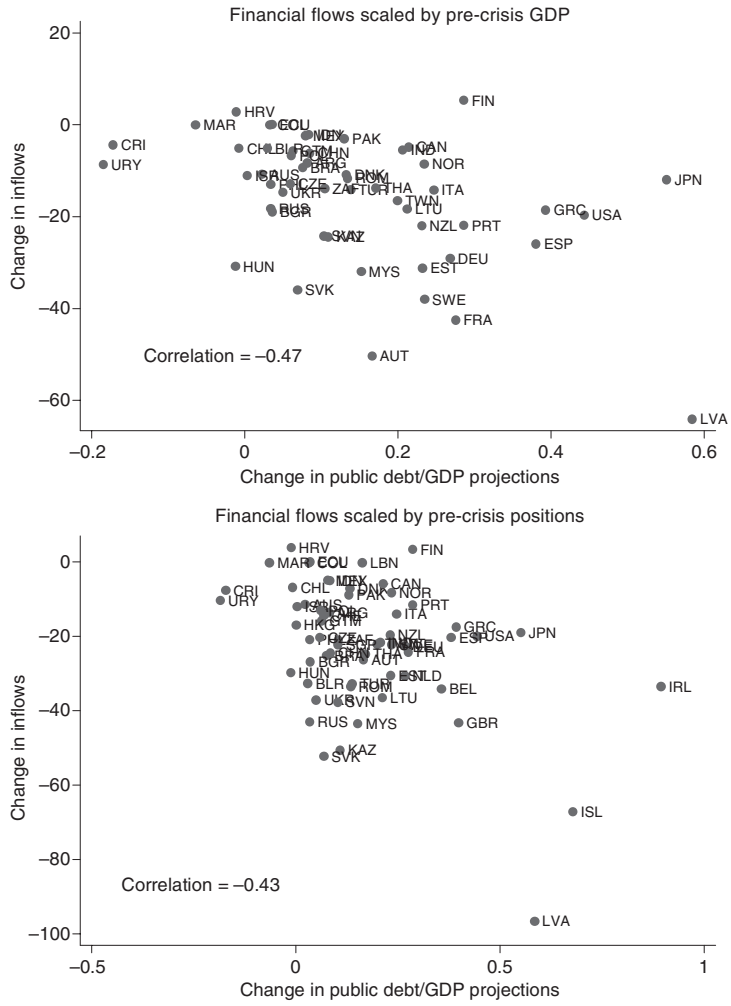


**Figure 13. Decline in capital inflows and revisions to public debt projections**

*Note*: Lower scatter-plot includes financial centres.

trading partners seem to matter, but there is little evidence that countries with larger reductions in exports and imports also suffered larger declines in capital flows during the most virulent stage of the crisis. Of course, the interpretation of these findings needs to be taken with some caution in light of the strong correlation between some of the variables in the sample (for example, GDP per capita and all measures of financial openness). We therefore turn to a more formal multivariate regression analysis to separate the influence of various drivers, at the cost of limiting the number of variables we can consider in order to preserve the degrees of freedom. We first contrast capital flows during the collapse stage of the crisis (2008 Q4–2009 Q1) relative to the ones prior to the crisis (2006 Q1–2007 Q2), and then consider the flows in the recovery stage of the crisis (2009 Q2–2009 Q4).

**Table 4. Decline in capital outflows excluding official flows (in percentage of GDP); mean and median differences in variables between countries without a large reduction in outflows and countries with a large reduction in outflows**

| | Difference in means | Difference in medians | *t*-statistic for difference in means |
|---|---|---|---|
| *Change in capital flows* | | | |
| Change in outflows net of official flows (% of GDP) | 31 | 25 | 11.9 |
| Change in inflows net of official flows (% of GDP) | 17 | 21 | 3.9 |
| *International financial exposure* | | | |
| Financial openness (% of GDP) | −168 | −161 | −5.8 |
| Gross debt (% of GDP) | −95 | −97 | −4.9 |
| Gross debt (banks) (% of GDP) | −68 | −50 | −4.4 |
| Gross equity (% of GDP) | −70 | −69 | −5.7 |
| FX reserves (% of GDP) | 6 | 8 | 1.1 |
| NFA (% of GDP) | −22 | −13 | −1.5 |
| Net debt position excl reserves (% of GDP) | −7 | 1 | −0.9 |
| Net bank debt position (% of GDP) | 14 | 16 | 2.9 |
| Net equity position (% of GDP) | −21 | −28 | −2.2 |
| Net position vis-à-vis BIS banks (% of GDP) | 17 | 21 | 3.3 |
| *Domestic macroeconomic characteristics* | | | |
| GDP per capita | −29180 | −29200 | −5.3 |
| GDP growth 2005–2007 | 2.4 | 3.0 | 3.1 |
| Private credit (% of GDP) | −0.7 | −0.6 | −5.5 |
| Change in private credit to GDP ratio | −0.1 | 0.0 | −1.5 |
| Change in growth (2008–9 to 2005–7) | 1.0 | 0.3 | 0.7 |
| Change in public debt projection | −14 | −17 | −3.4 |
| Change in fiscal balance projections | 1.6 | 1.4 | 1.7 |
| Change in growth projections | −0.1 | −0.6 | −0.1 |
| Exchange rate peg (de facto) | −0.3 | −1.0 | −1.5 |
| Credit market restriction index | −0.7 | −0.9 | −1.9 |
| *Impact of international trade* | | | |
| Change in growth in trading partners (2008–9 to 2005–7) | 0.2 | 0.0 | 0.5 |
| Share of manufacturing output | 3.9 | 3.6 | 2.2 |
| Commodity trade balance | −0.5 | 0.3 | −0.1 |
| Trade openness | −15.3 | −16.7 | −1.0 |
| Change in trade flows | 7.2 | 3.7 | 3.1 |

*Note*: The table shows the difference of variables between the countries in the bottom quartile of capital outflows decline (i.e. the smallest decline) and the countries in the top quartile.

## 5.2. Multivariate regression analysis: collapse stage of the crisis

Our econometric analysis proceeds in three stages for each of the two collapse and recovery periods. We first consider the retrenchment in capital inflows, before turning to outflows, and finally focusing more specifically on banking flows. We focus on private flows[11] and present results for the whole sample, as well as for advanced economies and emerging markets separately. We adopt a parsimonious specifica-

[11] Specifically, we exclude official lending through IMF programmes, other official loans to the government (such as lending by the European Union to Hungary and Latvia), and borrowing by the central bank – for example through swap lines. As discussed above, the rationale for excluding these flows is that they capture the response of official institutions to the crisis.

**Table 5. Collapse stage, capital inflows net of official flows**
Dependent variable: annualized change in capital inflows between 2006Q1–2007Q2 and 2008Q4–2009Q1, scaled by (1). GDP in 2007 (Columns 1–3) (2). Total external liabilities, end-2005 (Columns 4–6)

| | Scaled by GDP | | | Scaled by outstanding positions | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net debt position excl. reserves | 17.29** | 23.92 | 6.47 | 10.47** | 7.88 | 14.07* |
| | [8.247] | [17.376] | [11.775] | [4.162] | [8.381] | [7.261] |
| Foreign exchange reserves | −21.10* | −21.41* | | −8.11 | −21.70 | |
| | [10.990] | [12.073] | | [9.035] | [14.763] | |
| Gross debt (banks) | −17.96*** | −20.65** | −18.57*** | −2.78* | 1.04 | −5.52** |
| | [4.415] | [9.107] | [5.588] | [1.491] | [2.577] | [2.111] |
| GDP growth 2005–7 | −1.49* | −1.32* | −1.70 | −2.40** | −2.28 | −2.26 |
| | [0.760] | [0.775] | [3.305] | [1.138] | [1.459] | [2.871] |
| Change in private credit / GDP | 2.79 | −11.06 | | −8.10 | 5.36 | |
| | [11.442] | [16.408] | | [9.141] | [27.016] | |
| Log GDP per capita | −2.79** | −4.49* | | −3.18 | −4.66 | |
| | [1.349] | [2.367] | | [2.092] | [3.054] | |
| Change in growth in trading partners | 1.98 | 1.03 | | 6.03** | 7.43** | |
| | [1.389] | [1.773] | | [2.480] | [3.001] | |
| Change in trade flows | 0.01 | −0.06 | 0.67 | 0.30 | 0.13 | 0.61 |
| | [0.307] | [0.325] | [1.558] | [0.289] | [0.403] | [0.852] |
| Constant | 42.09*** | 54.05** | 2.30 | 54.99** | 73.72** | −2.70 |
| | [15.441] | [21.857] | [8.088] | [23.897] | [29.556] | [5.713] |
| Observations | 57 | 40 | 17 | 66 | 43 | 23 |
| R-squared | 0.59 | 0.68 | 0.47 | 0.48 | 0.49 | 0.65 |

*Note*: Regressions (1)–(3) exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland, and the United Kingdom); regressions (4)–(6) exclude Cyprus and Luxembourg only. Robust standard errors in square brackets.
***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

tion, particularly so for the advanced economies regressions, in light of the limited number of observations. Our choice of variables is guided by the results presented in Tables 3–4. Relative to the variables considered in those tables, we omit those that refer to the crisis period, with the exception of growth in trading partners. While there seems to be a clear link between the behaviour of flows during the crisis and the reassessment of growth and fiscal prospects in each country, there are thorny endogeneity and causality issues. For example, revisions to public debt dynamics and worsened output prospects reflect factors such as the bursting of bubbles, financial sector losses, as well as changes in global risk aversion and external financing conditions. These problems are arguably less severe for changes in growth in trading partners, with the exception of 'large' economies (and hence we exclude this variable from the advanced-country regressions).

Table 5 shows the results when the dependent variable is the change in inflows during the collapse stage, relative to the value of inflows before the crisis. The dependent variable in Columns 1–3 is the change in flows scaled by GDP, in

percentage points (so a value of −5 indicates a reduction by 5% of GDP). Financial exposure variables are measured in per cent. The coefficient of −18 on gross bank debt in Column 1 then indicates that a country with an extra 10% of GDP in gross bank assets and liabilities in debt instruments saw a larger reduction of inflows by $0.1 \times 18 = 1.8\%$ of GDP. The dependent variable in Columns (4)–(6) is the change in flows scaled by outstanding liabilities at the end of 2005, also in percentage points.

The results show clearly that the sudden stop in capital inflows was more severe for countries with a larger size of gross positions in debt instruments (a negative coefficient on the 'gross bank debt assets + liabilities' variable) and, for the whole sample, larger net liabilities in debt instruments (a positive coefficient on the 'net debt assets' variable), which is in line with the priors discussed in Section 4.[12] The effects are statistically and economically significant: for example, other things being equal, a country with a pre-crisis net position in debt instruments (securities, loans, deposits etc.) stronger by 10 percentage points of GDP experienced a reduction in flows of about 1.7 percentage points of GDP. It is also interesting to note that higher pre-crisis reserve holdings are not associated with a smaller decline in inflows – if anything, the opposite is true. This result can be explained by the fact that countries used foreign exchange reserves to limit the need for drastic corrections in net flows – the reduction in reserves allowed other sectors to access foreign exchange and reduce external liabilities, implying a reduction in capital inflows.[13] We also find that the decline in inflows relative to GDP was larger in countries with faster pre-crisis growth and higher GDP per capita. The coefficient on growth in trading partners during the crisis period has the expected positive sign (faster growth in trading partners associated with a smaller decline in inflows) and is significant when the decline in inflows is scaled by outstanding liabilities. The coefficient on the trade retrenchment is not significant, indicating that financial flows are not merely the cash flows counterpart to trade flows.

We present an analogous set of results for gross capital outflows in Table 6. We again exclude official flows (such as reserve accumulation and changes in monetary authorities' claims vis-à-vis non-residents). The change in flows is scaled by GDP in Columns (1)–(3) and by initial outstanding asset in Columns (4)–(6). The specification is slightly different relative to the one for capital inflows. In particular, given the presence of some oil exporters in our sample and the dramatic decline in oil prices during the crisis period, we include among the explanatory variables a dummy for oil exporters. Our results show some differences between advanced

[12] The 'Net debt assets' variable is the country's net position in debt instruments (securities, loans, deposits etc.), with a positive value indicating that it is a net creditor vis-à-vis the rest of the world in these instruments. The positive coefficients in Table 4 thus indicate, for example, that countries that were net creditors experienced a smaller decline in inflows compared to net debtors.

[13] Remember that capital inflows are net acquisitions by non-residents of claims on domestic residents. Hence, if a domestic firm repays a foreign loan the transaction is recorded as a negative capital inflow.

**Table 6. Collapse stage, capital outflows net of official flows**
Dependent variable: annualized change in capital outflows between 2006Q1–2007Q2 and 2008Q4–2009Q1, scaled by
1. GDP in 2007 (columns 1–3)
2. Total external assets, end-2005 (columns 4–6)

| | Scaled by GDP | | | Scaled by outstanding positions | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net debt position (excl. reserves) | −15.19** | −14.35 | −23.50* | 14.76** | 3.1 | 11.22 |
| | [7.352] | [13.672] | [12.305] | [7.044] | [15.733] | [7.780] |
| Foreign exchange reserves | 10.85 | 11.8 | | 16.94 | 48.71 | |
| | [11.218] | [16.323] | | [16.547] | [37.001] | |
| Gross debt (banks) | −14.21*** | −9.28 | −17.87*** | −4.62** | −5.3 | −3.45 |
| | [3.746] | [14.236] | [4.175] | [1.766] | [3.959] | [2.691] |
| GDP growth 2005–7 | 0.38 | 0.65 | −4.12 | 0.02 | 2.83 | −5.29 |
| | [0.676] | [0.785] | [2.864] | [1.867] | [2.553] | [4.175] |
| Oil exporter dummy | −3.16 | −1.00 | | −18.17 | −19.37 | |
| | [6.408] | [8.202] | | [21.283] | [26.920] | |
| Log GDP per capita | −2.23* | −1.84 | | −1.8 | −4.87 | |
| | [1.311] | [1.599] | | [3.882] | [4.995] | |
| Change in growth in trading partners | 0.59 | 1.12 | | 5.73 | 7.09 | |
| | [1.032] | [1.433] | | [4.490] | [6.213] | |
| Change in trade flows | 0.42 | 0.47 | 0.51 | −0.19 | −0.61 | 0.89 |
| | [0.290] | [0.329] | [1.268] | [0.573] | [0.861] | [1.128] |
| Constant | 11.63 | 7.79 | −0.39 | 27.61 | 34.27 | −0.58 |
| | [12.591] | [17.788] | [10.981] | [38.177] | [41.246] | [8.090] |
| Observations | 57 | 40 | 17 | 66 | 43 | 23 |
| R-squared | 0.59 | 0.33 | 0.59 | 0.21 | 0.23 | 0.52 |

*Note*: Regressions (1)–(3) exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland, and the United Kingdom); regressions (4)–(6) exclude Cyprus and Luxembourg only.

Robust standard errors are in square brackets.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

economies and emerging markets. In particular, for advanced economies there is strong evidence of a larger decline in outflows when pre-crisis gross cross-border debt positions were large (the coefficient on the 'gross debt assets + liabilities' variable is more negative and statistically significant for the advanced economies sample), which drives the significance of the gross debt variable in the whole sample regression. We also find some evidence that advanced economies with net liabilities in debt instruments experienced larger declines of outflows. For emerging markets the regression coefficients have generally the expected sign, but they are imprecisely estimated and the overall fit of the regression is weak.

In Table 7 we focus more specifically on banking inflows and on net banking flows, and present results scaled by GDP only. Changes in bank flows are related to gross and net banking positions, the stock of reserves, as well as to a parsimonious set of pre-crisis variables (GDP per capita, output growth, oil dummy) and, for emerging markets, the change in growth rate for trading partners during the crisis

**Table 7. Collapse stage, bank flows**
Dependent variables: annualized change in flows between 2006Q1–2007Q2 and 2008Q4–2009Q1, scaled by 2007 GDP

| | Total inflows | | | Net inflows | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net bank position | 14.75 | 42.07** | 1.14 | 17.12* | 40.80** | 7.43 |
| | [9.378] | [16.695] | [11.450] | [9.862] | [18.378] | [13.981] |
| Foreign exchange reserves | −4.67 | −13.14 | | −13.42 | −19.92** | |
| | [8.024] | [8.347] | | [9.449] | [8.468] | |
| Gross debt (banks) | −15.92*** | −16.87* | −15.67*** | −6.78** | −12.34** | −4.11 |
| | [3.467] | [9.626] | [3.844] | [2.975] | [5.716] | [3.642] |
| GDP growth 2005–7 | −0.90 | −1.00 | 0.48 | −1.33* | −1.43 | −0.66 |
| | [0.563] | [0.639] | [2.598] | [0.759] | [0.890] | [2.206] |
| Log GDP per capita | 0.18 | 0.49 | | 0.18 | 1.03 | |
| | [0.977] | [1.379] | | [1.293] | [1.636] | |
| Oil exporter dummy | −3.59 | −5.80* | | −4.27 | −5.62* | |
| | [3.273] | [2.901] | | [2.923] | [3.050] | |
| Change in growth in trading partners | 1.46 | 0.21 | | 1.23 | −0.18 | |
| | [1.228] | [1.150] | | [1.259] | [1.099] | |
| Change in trade flows | −0.16 | −0.22 | −0.17 | | | |
| | [0.358] | [0.331] | [1.070] | | | |
| Constant | 11.82 | 6.38 | 0.12 | 14.04 | 3.59 | 3.09 |
| | [9.839] | [11.449] | [8.487] | [12.008] | [12.990] | [7.687] |
| Observations | 55 | 39 | 16 | 55 | 39 | 16 |
| R-squared | 0.59 | 0.60 | 0.61 | 0.34 | 0.49 | 0.08 |

*Note*: Regressions exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland and the United Kingdom). Robust standard errors in square brackets.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

period relative to the pre-crisis period. The results suggest that emerging economies with larger gross bank debt positions and more negative net bank debt positions suffered sharper declines in gross and net banking inflows. For advanced economies, for which two-way banking flows are dominant, we find a sharper contraction in total flows for countries with larger gross bank positions. The pattern for net banking flows is similar, but the estimates are not statistically significant. Estimates relying on a more complete advanced economies sample that includes financial centres (results available from the authors) point to a positive and statistically significant relation between the net bank position at end-2005 and the change in net banking inflows during the crisis period, again in line with our priors.

We have also experimented with adding measures of public support for banks to the capital outflows and bank flow regressions. The strong correlation between measures of bank support and the reduction in capital outflows and in bank net flows mentioned earlier reflects the fact that bank support was larger in countries with larger bank positions – and the latter variable is the one playing the key role in a multivariate setting, with measures of government support generally correctly signed, but not statistically significant. In addition, causality is clearly problematic

as the retrenchment is a symptom of a large banking sector under acute pressure, which is then most likely to need public support.

### 5.3. Multivariate regression analysis: recovery stage of the crisis

We turn now to examining the patterns of flows during the last three quarters of 2009, again relative to the pre-crisis period. Considering this period after the height of the crisis allows us to establish whether some of the patterns we identified in the previous subsection are primarily related to the global panic following the events of September 2008, or whether they persist during the recovery stage.

Table 8 presents the results for the decline in capital inflows, and is constructed along similar lines as Table 5. Results are broadly consistent to those we obtained for the crisis period – in particular, the decline in inflows is larger for countries with larger gross debt positions and slower growth in trading partners. There is no statistically significant correlation between pre-crisis net debt positions, but instead a strong negative correlation between pre-crisis credit growth and changes in capital

**Table 8. Recovery stage, capital inflows net of official flows**
Dependent variables: annualized change in capital inflows between 2006Q1–2007Q2 and 2009Q2–2009Q4, scaled by (1). GDP in 2007 (Columns 1–3) (2). Total external liabilities, end-2005 (Columns 4–6)

| | Scaled by GDP | | | Scaled by outstanding positions | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net debt position excl. reserves | −3.42 | 16.86 | −6.31 | 0.64 | 5.76 | −8.06 |
| | [8.649] | [15.513] | [8.859] | [4.122] | [7.129] | [6.617] |
| Foreign exchange reserves | 4.13 | 6.18 | | −11.85 | 7.16 | |
| | [13.001] | [11.710] | | [15.858] | [20.256] | |
| Gross debt (banks) | −9.16* | −11.20* | −10.83* | −2.20* | −6.25*** | −2.71 |
| | [5.117] | [6.396] | [6.065] | [1.160] | [2.270] | [3.368] |
| GDP growth 2005–7 | 0.53 | 0.08 | 1.09 | 0.29 | 0.48 | 0.62 |
| | [1.002] | [0.945] | [2.213] | [1.353] | [1.558] | [1.698] |
| Change in private credit / GDP | −15.07** | −30.52** | | −30.16*** | −49.97* | |
| | [7.426] | [12.808] | | [8.827] | [24.681] | |
| Log GDP per capita | 1.34 | −1.58 | | 1.43 | −0.70 | |
| | [1.131] | [2.266] | | [2.027] | [2.647] | |
| Change in growth in trading partners | 4.18** | 1.66 | | 6.02** | 3.98 | |
| | [1.709] | [1.586] | | [2.381] | [3.282] | |
| Change in trade flows | 0.19 | 0.43** | −1.32*** | 0.51* | 0.76** | −1.36*** |
| | [0.274] | [0.182] | [0.424] | [0.283] | [0.328] | [0.350] |
| Constant | 0.58 | 19.84 | −5.59 | 8.51 | 14.02 | −9.56 |
| | [10.753] | [18.134] | [8.275] | [20.825] | [21.746] | [5.546] |
| Observations | 57 | 40 | 17 | 66 | 43 | 17 |
| R-squared | 0.38 | 0.54 | 0.52 | 0.48 | 0.50 | 0.50 |

*Note*: Regressions (1)–(3) exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland and the United Kingdom); regressions (4)–(6) exclude Cyprus and Luxembourg only. Robust standard errors in square brackets.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

**Table 9. Recovery stage, capital outflows net of official flows**
Dependent variables: annualized change in capital outflows between 2006Q1–2007Q2 and 2009Q2–2009Q4, scaled by
1. GDP in 2007 (columns 1–3)
2. Total external assets, end-2005 (columns 4–6)

| | Scaled by GDP | | | Scaled by outstanding positions | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net debt position (excl. reserves) | −11.52 | 0.49 | −21.33 | 11.30* | 3.56 | 17.07** |
| | [7.950] | [12.802] | [13.581] | [6.560] | [6.139] | [7.563] |
| Foreign exchange reserves | 4.14 | −3.62 | | 0.08 | 10.88 | |
| | [11.730] | [11.986] | | [12.231] | [19.869] | |
| Gross debt (banks) | −10.75* | 4.78 | −15.79** | −4.61*** | −2.94* | −5.16*** |
| | [5.565] | [9.292] | [6.883] | [1.536] | [1.624] | [1.682] |
| GDP growth 2005–7 | 1.20 | 0.95 | −1.55 | 1.31 | 3.32 | −2.07 |
| | [0.808] | [0.761] | [2.058] | [1.801] | [2.647] | [1.861] |
| Oil exporter dummy | −7.89** | −5.24 | | −22.06*** | −22.43** | |
| | [3.862] | [3.567] | | [6.734] | [9.043] | |
| Log GDP per capita | −0.62 | −1.50 | | −0.24 | −2.35 | |
| | [1.167] | [1.765] | | [2.125] | [3.049] | |
| Change in growth in trading partners | 0.96 | 1.32 | | 1.25 | 1.92 | |
| | [1.120] | [1.048] | | [2.700] | [2.800] | |
| Change in trade flows | −0.10 | 0.09 | −0.88 | 0.19 | 0.12 | −0.83 |
| | [0.172] | [0.173] | [0.513] | [0.246] | [0.280] | [0.774] |
| Constant | 0.90 | 10.83 | −0.36 | −0.85 | 2.67 | 5.16 |
| | [10.562] | [15.538] | [11.356] | [19.453] | [20.516] | [6.636] |
| Observations | 57 | 40 | 17 | 66 | 43 | 23 |
| R-squared | 0.44 | 0.17 | 0.55 | 0.24 | 0.21 | 0.51 |

*Note*: Regressions (1)–(3) exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland, and the United Kingdom); regressions (4)–(6) exclude Cyprus and Luxembourg only.

Robust standard errors are in square brackets.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

inflows – a result reflecting continued weak capital flows to Central and Eastern European countries during the recovery stage. Also, for emerging markets there is a positive and statistically significant conditional correlation between change in trade flows and capital inflows, but for advanced economies the sign is reversed.

Table 9 presents the results for capital outflows. Again, results are similar to those obtained for the crisis period, with a sharper contraction in outflows for countries with larger gross debt positions. Oil producers experienced a significantly larger contraction in outflows, likely reflecting the full pass-through of the fall in oil prices during the crisis. Finally, Table 10 presents the result for banking flows. Results are similar to the ones for the collapse stage: in particular, emerging markets with higher net and gross external bank debt pre-crisis still show larger gross and net declines in bank inflows. The evidence also suggests sharper declines in gross and net bank inflows in oil exporters, a result consistent with the recovery in oil export prices relative to the crisis period reducing the need for external finance.

**Table 10. Recovery stage, bank capital inflows**
Dependent variables: annualized change in flows between 2006Q1–2007Q2 and 2009Q2–2009Q4, scaled by 2007 GDP

| | Total inflows | | | Net inflows | | |
|---|---|---|---|---|---|---|
| | All | Emerging | Advanced | All | Emerging | Advanced |
| Net bank position | 16.00** | 27.20** | 16.47 | 10.96 | 26.57** | 3.31 |
| | [7.517] | [10.685] | [11.398] | [8.190] | [10.487] | [13.295] |
| Foreign exchange reserves | 1.83 | 1.91 | | 7.60 | 8.01 | |
| | [5.259] | [4.770] | | [7.062] | [5.460] | |
| Gross debt (banks) | −8.35*** | −9.22* | −5.46 | −0.15 | −9.22* | 1.96 |
| | [2.337] | [5.186] | [3.632] | [3.125] | [4.801] | [4.308] |
| GDP growth 2005–7 | −0.04 | −0.11 | 1.24 | −0.06 | 0.04 | −0.45 |
| | [0.403] | [0.339] | [2.151] | [0.421] | [0.337] | [2.912] |
| Log GDP per capita | 1.30 | 0.97 | | 1.15 | 1.56* | |
| | [0.874] | [0.751] | | [0.943] | [0.912] | |
| Oil exporter dummy | −5.83* | −6.70* | | −2.55 | −5.01** | |
| | [3.222] | [3.657] | | [2.761] | [1.845] | |
| Change in growth in trading partners | 2.26*** | 1.70* | | 3.14*** | 2.03* | |
| | [0.796] | [0.931] | | [1.024] | [1.074] | |
| Change in trade flows | 0.02 | 0.20 | −1.28** | | | |
| | [0.193] | [0.197] | [0.541] | | | |
| Constant | −0.74 | −0.33 | −4.08 | 2.55 | −4.47 | −1.38 |
| | [8.353] | [7.158] | [5.911] | [9.511] | [8.684] | [8.174] |
| Observations | 55 | 39 | 16 | 55 | 39 | 16 |
| R-squared | 0.55 | 0.70 | 0.53 | 0.37 | 0.67 | 0.03 |

*Note*: Regressions exclude all financial centres (Belgium, Cyprus, Hong Kong SAR, Iceland, Ireland, Lebanon, Luxembourg, the Netherlands, Panama, Singapore, Switzerland and the United Kingdom). Robust standard errors in square brackets.

***$p < 0.01$, **$p < 0.05$, *$p < 0.1$.

Finally, countries whose trading partners experienced smaller declines in growth also experienced smaller declines in bank inflows and net bank flows.

Overall, our simple econometric analysis makes the following points. First, international financial exposure matters. Countries with large holdings of debt and bank positions saw a larger contraction in capital inflows during the crisis, as well as in the immediate post-crisis period. This points to a role for a global flight to quality, which was most pronounced among banks. Second, we find that countries that were less dependent on external finance, that is, with a stronger net external position in debt instruments, were less affected by the turnaround of capital flows. Third, movements in capital flows are linked to macroeconomic developments in trading partners, but not tightly to the decline in trade flows during the crisis. Trade factors matter in an additional respect – declining export revenues for commodity exporters were associated with a decline in their financial investment overseas. Finally, macroeconomic conditions also play a role, especially for emerging economies. In particular, there was a larger decline in inflows in countries with higher GDP per capita, faster pre-crisis growth rates and – for inflow changes relative to the recovery period – with higher pre-crisis credit growth. Perhaps even more importantly, we documented how capital inflows fell most in countries which saw

a marked deterioration in their growth prospects and in the outlook for their public finances. While untangling causality is clearly problematic, these findings are clearly consistent with the notion that a reassessment of risk and future prospects was an important driver of changes in capital flows during the crisis.

## 6. CONCLUSIONS AND PROSPECTS FOR FINANCIAL GLOBALIZATION

Our analysis of the patterns of capital flows during the financial crisis stresses common elements, as well as several dimensions of heterogeneity. We document how the crisis evolved in distinct stages, with capital flows collapsing only in the wake of the Lehman Brothers bankruptcy. Emerging and developed economies fared very differently, with many emerging markets experiencing only a temporary, albeit sharp, disruption in international capital flows. The diversity of experiences across countries can be linked to the size of gross and net external exposures, and particularly to the reliance on debt instruments and the importance of bank cross-border activity.

With regard to the questions raised in the introduction, the evidence we presented points to the following tentative answers:

- What lies behind the retrenchment' in capital flows? Primarily the dramatic contraction in cross-border banking activity and global deleveraging, including by non-bank financial institutions. The contraction in flows during the first year of the crisis was concentrated among banking flows. These flows also played a prominent role during the collapse stage.
- Did flows fall evenly across countries and categories of flows? No. Emerging markets were essentially spared until the collapse stage. Even then, some experienced a recovery in flows shortly after the crisis, whereas flows in other regions still remain well below the pre-crisis levels. The contraction in flows was concentrated in banking flows, with smaller declines in portfolio investment and especially FDI.
- Can we link the intensity of the retrenchment to financial and macroeconomic characteristics of countries? Yes for financial characteristics: countries with high degrees of financial integration through debt and banking were more affected, and countries with large net liabilities in debt instruments suffered sharper declines in capital inflows. While it is more difficult to pinpoint a strong systematic relation between the magnitude of the capital flow retrenchment and other pre-crisis macroeconomic conditions, the evidence suggests that the decline in capital inflows was linked to the extent of downward revisions to the growth and fiscal outlook, as well as to growth declines in trading partners. For emerging markets, we also find some evidence of a link between trade and capital flows operating through the impact of oil prices on export revenues.
- Is the trend towards rising financial globalization over? Of course we do not know whether the trends we have highlighted will gradually unwind as the world

economy recovers, or whether the crisis of 2008–9 will have marked a watershed in the evolution of international capital flows. Still, relying on the main features of growing cross-border capital flows discussed in Section 2 we provide some (necessarily speculative) views on whether the impact of the crisis on those underlying factors is likely to be long-lasting.

1. *'Financial deepening' within countries, reflected in sizeable increases in financial balance sheets (both domestic and cross-border).* The process may well suffer a setback in advanced economies for several reasons: a potentially reduced use of securitization; limits on large and complex financial institutions; the impact of declines in the valuation of non-financial assets, such as real estate, on debt. In the main advanced economies, one of the legacies of the crisis is a significant expansion in public sector balance sheets, and an important question for the dynamics of cross-border flows will be the role played by non-resident investors in financing of this expansion. The past decade saw an unprecedented increase in foreign ownership of domestic debt instruments, associated first with the massive global increase in foreign exchange reserves by emerging markets, which are primarily invested in advanced economies' government paper; second, with the advent of the euro, which triggered a sharp increase in demand for government paper from other euro area countries; and third, with the overall trend towards international financial integration. It is an open question whether this trend will be resilient to the significant deterioration in fiscal prospects for advanced economies. The scope for financial deepening is clearly stronger in emerging markets, but could well take place only gradually, particularly given governments' concerns about 'financial excesses' following the global crisis.
2. *Rising international portfolio diversification, reflecting a decline in home bias.* The scope for portfolio diversification remains significant, particularly for emerging markets. On their asset side, the process may be associated with a decline in the role of reserve accumulation and an increase in alternative types of flows. On their liability side, demand for emerging market assets is likely to increase after the financial crisis, in light of the resilience of these countries to the global turmoil on financial markets, their growth prospects, and strong macroeconomic fundamentals. However, an open question is whether changes in financial regulation in response to the crisis could be associated with increasing home bias, particularly for advanced economies.
3. *Increased cross-border activity by international financial institutions (including for regulatory arbitrage purposes).* In the years before the crisis, international banking played a major role in the process. Banks in advanced economies were also at the core of the turmoil since 2007. First in the initial stage of the crisis, where capital flow disruption was essentially limited to banking flows among developed economies, but also in the collapse stage as banking flows show the sharpest retrenchment across a broad range of countries. Bank flows have also remained weak in the

later stage of the crisis, with continuing retrenchments in many regions. The ongoing efforts aimed at reforming banking and financial regulation could also hinder a return to large banking flows. The crisis has clearly demonstrated the risks posed by large global financial institutions that can be too big to rescue, and one of the main themes of reform is how to limit the size of banks, which would likely limit their international operations as well. In addition, a question mark relates to the future scope for cross-border financial flows driven by regulatory and tax arbitrage considerations, which played a very significant role in the expansion of global flows during the pre-crisis period. On the other hand, cross-border activity by financial institutions domiciled in emerging markets, which is so far relatively limited in comparison to advanced economies, may well increase. These banks have weathered the global financial crisis well, also in light of their limited external exposures, and have a strong domestic deposit base. The likelihood and size of their cross-border expansion is of course dependent on the evolution of their domestic regulatory regimes.

4. *Increased financial integration within the euro area following EMU, and within the European Union more generally*. The process has already run its course to a significant extent, and the sovereign debt market crisis of early and late 2010 suggests a decline in substitutability between assets issued by different euro area governments and financial institutions. At a minimum, this factor is unlikely to provide the same boost to international capital flows as during the past decade.

# Discussion

## Gianmarco I.P. Ottaviano

Bocconi University and CEPR

The paper starts from the observation that, during the crisis, the retrenchment in international capital flows has been a 'highly heterogeneous phenomenon' across time, types of flows and countries. Along the first dimension, the retrenchment has been especially dramatic in the wake of the Lehman Brothers failure. Along the second dimension, banking flows have been the hardest hit. Along the third and last dimension emerging economies have experience a shorter-lived retrenchment than developed economies.

This initial observation is substantiated and enriched by the econometric analysis, showing that the decline in inflows has been larger in countries with: large holdings of debt and bank positions; weaker net external position in debt instruments; higher GDP per capita and faster pre-crisis growth rates; trading partners who have suffered steeper declines in growth rates relative to the pre-crisis period. Moreover, macroeconomic conditions and the exposure to international trade have also played

a role, especially for emerging economies. Lastly, trends in oil prices are important in explaining capital outflows from emerging markets.

Overall, this is a timely paper. Its contribution is fairly accurately placed into context. At the same time, while building on the existing literature, the version presented to the Panel does not really try to take stock and systematize it. Findings are generally convincing but hardly thought provoking. More effort should have been put in their interpretation and the discussion of their policy implications.

In particular, the paper provides an attempt at sketching an analytical framework. Its logic seems to be based on three logical steps: first, country characteristics are exogenous to the crisis; second, the crisis is a common shock to 'risk aversion', exogenous to country characteristics; third, country characteristics filter the common shock into idiosyncratic outcomes across countries.

The econometric analysis looks little more than descriptive statistics taking the reader from univariate to multivariate correlations. What is more troubling is the fact that there is no real discussion of the 'risk aversion shock' story against alternative stories. Specifically, there is no attempt to identify (even verbally) the risk aversion story and no discussion of the relative importance of 'filtered' common versus idiosyncratic shocks for idiosyncratic outcomes. Interestingly, several related issues can be found also at the centre of the literature on the 'great trade collapse' but there is only one reference to this debate.

From a policy point of view, the version of the paper presented at the Panel fails to argue why one should care about its findings: Are the documented swings 'good' or 'bad' or 'irrelevant' from a welfare point of view? Is there any market failure to target? Are the countries that experienced the largest declines in inflows also the ones that will experience the largest increase in inflows after the recovery? Is there any persistent effect related to country characteristics?

To summarize, the authors should have put more effort into challenging their *a priori* story that the crisis resulted in a dramatic reassessment by investors of macroeconomic imbalances and financial vulnerabilities in different countries. In so doing, they should have stressed which specific findings support this story against (currently untold) alternatives. This is crucial as different stories typically have different policy implications. That said, the paper shows a lot of potential to be exploited in future revisions.

## Morton O. Ravn

University College London and the CEPR

> "One of the challenges of the 21st century is for the world to put in place an international architecture that would sustain economic growth and the expansion of capital flows, while improving crisis prevention and resolution", IMF (2001).

## I. INTRODUCTION

The great recession that hit much of the world economy in late 2007/early 2008 witnessed a sharp adjustment of international capital flows especially amongst rich economies. The current paper provides evidence on how the impact of the crisis upon capital flows varies across country groups, across time, and across different types of assets. The authors also examine the determinants of the adjustment of capital flows. The insights are instructive and will surely stimulate further research into this topic. It is a first class piece of work that follows in the tradition of high quality policy papers published by ***Economic Policy***.

The authors argue that the main driver of the decline in capital flows can be thought of as a "risk shock" which reflects both higher riskiness of foreign investment positions *and* lower tolerance of risk. Armed with this insight, the authors then carry out statistical analysis of the impact of the crisis on capital flows. The authors' discussion of their results is very rich so I shall not repeat here but only highlight the central findings which are:

- The crisis impacted negatively both on capital inflows and outflows and thus lowered international portfolio diversification.
- Bank flows were the most affected by the crisis.
- There is a lot of heterogeneity in how the crisis impacted on capital flows. The heterogeneity is evident in almost all the relevant dimensions.
- Developed economies were more significantly affected than emerging markets.
- Countries with higher financial integration were more affected and those with large net liabilities in debt instruments witnessed large and sudden declines in capital inflows.

By any means, this list of results constitutes a challenging set of stylized facts for any economic theorist that wishes to build structural models.

## II. DISCUSSION

The paper clearly looks at an important and relevant topic. International economists have spent much energy on analyzing international capital flows over the last couple of decades and it remains an intriguing topic. Capital flows are important determinants of economic development and can provide insurance against idiosyncratic shocks. Yet, it is fair to say that we still do not have a deep understanding of the pattern of capital flows although much progress have been made over recent years. Two key concerns about capital flows is that sudden stops can bring countries to their knees in times of crisis and that large imbalances may bring with them significant macroeconomic risks. The quote at the beginning of this discussion (triggered by the experiences that followed the Asian crisis) shows that policy makers have been keenly aware of these issues.

There are three main points that I will discuss. First, should it come as a surprise that the crisis gave rise to a large drop in international capital flows? Second, how much faith should we put in the conclusion that the authors draw about the sources of the financial retrenchment? Third, how does the extent of heterogeneity impact on the analysis?

## A. The crisis and capital flows

Over the last couple of decades, international capital flows have grown very significantly. This is true both within closely linked economies such as the European Union member countries and across widely different economies as reflected in North-South (and South-North) flows. This process reflects many different issues such as structural flows for long term investment purposes (FDI and related flows), portfolio flows, and trade in debt instruments including bank flows.

There is a host of different factors that help explain the process of increased capital flows. I find it useful to think of these in terms of three aspects and to have in mind a small toy model. Consider the hypothetical question of how to allocate an investment portfolio across assets and how to adjust this portfolio to changes in the returns. An investor will clearly consider the relative returns and riskiness of alternative assets. Secondly, adjustment costs (that drive a wedge between returns) are important for determining both the allocation of the portfolio and the speed with which the portfolio is adjusted to changes in returns. We can think of the liberalization of capital flows that has occurred in much of the world economy as having impacted on these adjustment costs and therefore made capital flows more responsive to return differences while structural aspects such as the growth of China, India and other economies having affected relative returns. We can summarize this in a relationship like:

$$A_{ij,t} = F(R_{ij,t}, X_{ij,t}, A_{ij,t-1})$$

where $A_{ij,t}$ denotes the capital flows between countries i and j in period t, $R_{ij,t}$ denotes return (and risk) differences, $X_{ij,t}$ denotes other factors (such as bilateral trade that will impact on trade credits), and $A_{ij,t-1}$ are past capital flows included in order to allow for gradual adjustment of capital flows. Liberalization of capital flows and other factors can be thought of as having impacted both on $\partial F/\partial R$ (made flows more sensitive to return differences) and on $\partial F/\partial A$ (increased the speed of adjustment). The process of growth in China and India and other countries (due to various policy reforms) can be thought of as impacting directly on returns (and possibly through the factors included in X).

In this light, we could ask ourselves whether it should come as a big surprise that the crisis was reflected in a large retrenchment of capital flows? There are three main reasons for why I think the retrenchment was to be expected. First, as I have

just mentioned, the decrease in adjustment costs has meant that the speed at which capital flows adjust to changes in risk and in relative returns has increased a lot and especially so for debt flows (which are of a more short-term nature than say FDI flows). Therefore, the changes in returns and in risk that occurred during the crisis should have been expected to impact on capital flows much faster than in the past. It is interesting to note that the authors' finding that capital flows fell the most for countries that are more integrated in international financial markets seems consistent with this prediction. Secondly, the crisis also witnessed a large decrease in international trade which would, other things equal, also lower capital flows (most directly in terms of trade credits). Third, and this is somewhat unrelated to the previous arguments, interbank markets dried up in many countries during the crisis leading banks to hold much more liquidity than previously.

Thus, it is not clear to me that it should come as a big surprise that international capital flows decreased significantly during the crisis. However, I think two things stand out. First, if the arguments put forward above are true, then we should not expect to see any permanent effects of the crisis on international capital flows unless reforms of impediments to capital flows are reversed. Secondly, it still remains to be seen whether one can come up with a satisfactory explanation for the decrease in international portfolio diversification that the authors document in their paper.

## B. The sources of the great retrenchment

The authors argue that the source of the great retrenchment can be understood as a risk shock that simultaneously lowered tolerance towards risk and increased actual risk. They reach this conclusion by regressing the sum of world capital inflows and outflows as a fraction of world GDP on an index of realized stock price volatility, the growth rate of world GDP, trade openness, and deterministic terms. They find that the coefficients on each of these main three determinants are statistically significant. Since the crisis was also associated with a large drop in output growth and in world trade, it thus does not follow immediately that it was the risk factor that was the determining factor. For that reason, I think it would have been useful to at least quantify the relative importance of the three factors.

But, more importantly, it is not immediately clear that a "risk shock" should lead to a retrenchment of international capital flows. Say that we think about this shock as an increase in risk aversion. In this case, investors would pull out of risky assets (such as short term debt) and into safer assets. This seems inconsistent with the decrease in portfolio diversification: More risk averse investors should be more eager to diversify their portfolio in order to lower the risk exposure. Presumably, to the extent that there are country-specific components to returns, one way achieving this aim is to increase the international diversification of the portfolio. Alternatively, we can think of the "risk shock" as an increase in actual risk. Again, is it clear that this should lead to less diversification? For this to be the case, it would have to be

the case that the risk of foreign assets should increase more than the risk of domestic assets and it is hard to see how this could be the case across the board.

I would add to this that it is hard to think of theories of why risk aversion should suddenly increase. Do investors suddenly all wake up finding themselves more reluctant to take on risk? That seems hard to believe. Alternatively, one might think that the composition of investors changed so that more risk averse agents became more important. But, the speed at which things happened makes this a tricky proposition. Personally, I find it more plausible that investors' beliefs changed rapidly but this seems to me to be a rather different story.

Finally, it is worth pointing out that all variables in the regression are endogenous – thus it is hard to say much about causality from this reduced form approach. I think it would be important and interesting to bring structural analysis into the picture in order to gain some more insights.

### C. Heterogeneity

One important aspect stressed by the authors is the heterogeneity (in all dimensions) of the impact of the crisis on capital flows. This heterogeneity applies across time, across assets groups, and across advanced economies and emerging markets.

Such heterogeneity makes it not only hard to summarize the main facts but also implies that identifying a small set of determining factors is very hard. Moreover, a lot of heterogeneity presents serious problems for estimation. First, it makes it hard to pool (across countries, assets etc.). Pooling in the face of heterogeneity can lead to parameter estimates that are associated with all sorts of problems. One can attempt to deal with this by making use of sample splits but this quickly implies that one runs out of degrees of freedom, a problem that is of real concern in the present application. Secondly, as mentioned already, lots of heterogeneity makes it hard to give the reader a clear take-away. The authors should, in this light, be complimented for writing up the paper in such a clear way. Third, the heterogeneity is to a large extent unobserved which implies the need for fixed (or random) effects and the use of panel estimators.

In summary, it is interesting to notice that the impact of the crisis on capital flows is highly heterogeneous but the extent of heterogeneity also presents serious econometric problems.

## III. CONCLUSION

There are other factors that I would have been interested in seeing included in the analysis. Global imbalances have been much discussed over the last few years. I think it might be worthwhile to entertain the idea that the factors driving global imbalances also were relevant for understanding both the crisis and its impact on capital flows. In particular, the large supply of "cheap" funds from China fuelled

capital inflows to, in particular, the United States. These capital flows may have been partially responsible for the fact that house prices became quite inflated which appears to be one of the key factors of the economic crisis. Thus, it would have been of some interest to examine how global imbalances not only impacted on the capital flows retrenchment but also on the incidence of the economic crisis in the first instance. Added to this is fiscal policy which – given the binding constraints on short-term interest rates in many countries – was an important policy instrument in many countries. It is well-known that fiscal policy often is reflected in capital flows (twin deficits). Moreover, debt positions differed significantly across countries thus making debt sustainability an issue in some countries but not in others. The results of these differences are visible today and it would be very interesting to dig much further into these issues in the future.

But let me reiterate that the authors have written an insightful, timely, and stimulating piece on international capital flows and the crisis. They put together a new comprehensive dataset and the paper contains first class data analysis. It is important to understand the determinants of the heterogeneity of the impact of the crisis on capital flows that the authors document. Perhaps the most interesting reflections of the heterogeneity concerns the differences between advanced economies and developing countries (the former were affected a lot more than the latter) and between bank flows and other types of flows. Where do there differences come from? Are they likely to persist? What are their consequences? These are important questions to be addressed in the future. I will look forward to the authors work future work on the topic.

## Panel discussion

Richard Portes was not convinced by a number of explanations for the change in capital flows since the crisis. On the link between capital flows and the global trade collapse he suggested the authors should include a current account variable in their regressions. However, he accepted that it is a highly endogenous variable. Richard Portes did not believe it was risk aversion but risk itself which had changed and this is what the VIX variable is capturing in their model. He advised the authors to consider other indicators of volatility to control for changes in risk. He also felt the role of global deleveraging should be given greater attention in the paper. Focusing on the composition of capital flows he noted that portfolio flows were as big as bank flows and that portfolio inflows are increasing in emerging countries. He added that 'original sin' is unlikely to be as significant a concern compared to past experiences since emerging countries are able to issue debt in their local currency. As a final comment he urged the authors to make a greater effort to tackle the endogeneity problems in the model specifications.

Marco Pagano also questioned the role of risk aversion as an explanation for capital flows during the global financial crisis. He proposed that it was uncertainty aversion which was affecting capital flows. When there is a macroeconomic shock this creates doubt over the probability distribution of asset returns and therefore investors invest in more familiar assets with known returns. He accepted that uncertainty aversion was difficult to proxy for in their empirical analysis and suggested the authors could complement their results with a model which captures this uncertainty aversion effect. Michalis Haliassos agreed with the views of Morten Ravn and Marco Pagano and believed people have become less certain of the underlying process generating asset returns. He suggested one approach to measure the change in uncertainty would be to use measures of subjective expectations of people regarding asset performances. A greater dispersion of these measures would indicate less understanding of the process.

Fabrizio Perri suggested that to develop an understanding of how much of the movement in capital flows relates to retrenchment out of international activity and to retrenchment from the collapse of asset prices the authors should express capital flows in terms of stock market capitalization. Jon Danielsson urged the authors to provide a greater discussion of the policy implications of this great retrenchment in capital flows. He noted that some commentators suggested there was perhaps an excessive amount of cross-national banking before the crisis and that subsequent trends were a correction towards a more sustainable level. He noted that in regulatory circles, there is much concern regarding the development of an appropriate cross-national banking resolution framework.

Gian-Maria Milesi-Ferretti and Cédric Tille agreed with the views expressed that there was a global reassessment of risk and would make this point clearer in the paper. They agreed there was a number parallels to be made with the literature on the global trade collapse. Cédric Tille commented that analysis using bilateral capital flows would be very difficult as such data is very limited and capital flow information tends to be only available for the first counterparty. Gian-Maria Milesi-Ferretti noted that it would be difficult to assess the impact of the two quarters of dramatic two-way retrenchment in capital flows on growth. However, there is some correlation between the reassessment of growth prospects of countries and declining capital flows of the country over a longer time period. He noted that the reassessment of growth prospects was worse for advanced countries compared to developing countries.

## APPENDIX A: DATA SOURCES

### International capital flows

Capital flows are taken from the International Monetary Fund's Balance of Payments Statistics database ('standard presentation'). Capital flows are measured at a quarterly frequency. Our sample consists of 75 economies, which account for 95%

of the world's GDP; 28 are developed economies: United States, United Kingdom, Euro area (further broken down into 16 members: Austria, Belgium, Cyprus, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Malta, the Netherlands, Portugal, Slovakia, Slovenia, Spain), Japan, Canada, Australia, New Zealand, Denmark, Iceland, Norway, Sweden and Switzerland; 47 economies are emerging markets: 13 in Latin America (Argentina, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Mexico, Paraguay, Peru, Uruguay, Venezuela), 11 in Asia (China, Hong Kong SAR, India, Indonesia, Korea, Malaysia, Philippines, Singapore, Taiwan province of China, Thailand, Vietnam), 15 in Europe (Albania, Belarus, Bulgaria, Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Russia, Serbia, Turkey, Ukraine), and 8 in other regions (Armenia, Azerbaijan, Israel, Kazakhstan, Lebanon, Morocco, Pakistan, South Africa). For China, quarterly flows are calculated by interpolating semi-annual data from national sources, using quarterly data on the trade balance, foreign exchange reserves, and banking flows from the BIS. For Taiwan province of China the balance of payments data is obtained from the Central Bank's website. The only countries of global relevance for international capital flows that are not included in our sample are large Middle Eastern oil exporters, such as Saudi Arabia and the United Arab Emirates, for which quarterly balance of payments data are not available.

As the crisis saw a substantial use of swap lines between central banks and support from multilateral institutions, we break the 'other' category further between central banks swap lines, IMF lending, and official lending. While the balance of payments statistics do not include a specific line for the swaps between central banks, we estimate them as the sum of the loans, deposit and other assets by the monetary authority, both for gross outflows and inflows. The gross outflows under these categories are distinct from exchange rate reserves. Our estimates are consistent with data from the major central banks (United States, Switzerland, Euro area). The balance of payments data for the United Kingdom do not indicate the capital outflows and inflows linked to the monetary authorities. Our estimate for the gross swap inflows are then built based on the changes in the 'other liabilities' category reported on the Bank of England's balance sheet.

On the capital inflows side, IMF lending (use of Fund credits and loans) is recorded as a liability of monetary authorities, while official lending from other sources (for example, EU loans to Hungary and Latvia) are recorded as other investment liabilities of the government. Another adjustment to the data is related to the issuance of IMF Special Drawing Rights (SDR) to member countries in the third quarter of 2009, which totalled over $250 billion. This allocation was recorded as an increase in foreign exchange reserves in that quarter, offset by a corresponding increase in the liabilities of monetary authorities. Our 2009Q3 data on total capital inflows and outflows – as well as on reserve flows and flows related to monetary authorities' transactions – net out the impact of the SDR allocation.

### International bank claims

The BIS publishes data on international banks' exposure under two complementary concepts. Data under the *locational* concept cover the international assets and liabilities of all banks located in a country. These banks include banks headquartered in the country, as well as affiliates of foreign banks. For instance, the Czech subsidiary of a German bank is counted as a Czech entity. These data correspond to the residency concept of the balance of payments.

The *consolidated* basis considers the international exposure of a country's banks through cross-border lending, as well as lending through the affiliates (*local* claims under the BIS definition). Under that basis the Czech subsidiary of a German bank is counted as a German entity. The consolidated data encompass three types of lending: (a) cross-border lending, (b) lending through affiliates in another currency than the local one, and (c) lending through affiliates in the local currency. The data are available on two bases: the 'immediate borrower' basis which considers the geographical location of the entity the bank lends to, and the 'ultimate risk' basis, which takes into account net risk transfers (such as derivatives or guarantees) which can shift the geographical location of the entity ultimately responsible for the liability. The immediate borrower basis includes a longer horizon (since 1983) but only indicates 'international' lending, either cross-border or in foreign currency through an affiliate (a and b above), and lending through affiliates in local currency (c). In contrast, the ultimate risk basis distinguishes cross-border lending (a) from lending through affiliates (b and c), but is only available since 2005 and covers a narrower set of reporting banks.

### Foreign and domestic holdings

We contrast international and domestic holdings using data from financial accounts/flow of funds statistics. The data present the value of an economy's financial assets and liabilities by sector (households, non-financial businesses, government, financial sector, and rest of the world). The assets of the rest of the world correspond to the liabilities of the country to foreign investors. Similarly, the liabilities of the rest of the world represent assets held abroad by the country's residents. The value of financial assets held by residents is the sum of financial assets held by domestic sectors. The share invested by residents abroad is the ratio of rest of the world liabilities to assets held by domestic residents.

Our analysis uses annual data for 22 countries (Austria, Belgium, Canada, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Japan, Korea, the Netherlands, Norway, Poland, Portugal, Spain, Sweden, United Kingdom and United States). The data are taken from the OECD and Eurostat. The sample starts at different dates for different countries, but all are covered from 2003 onwards. The data cover the value of assets at the end of 2007 for all 22

countries, but the values at the end of 2009 are available only for 13 countries (Belgium, Denmark, Finland, Germany, Greece, Hungary, Ireland, Norway, Portugal, Spain, Sweden, United Kingdom and United States).

## APPENDIX B: DEFINITION OF VARIABLES

- *GDP per capita*: GDP per capita in current US dollars, 2007. Source: IMF, World Economic Outlook (WEO) database.
- *GDP growth 2005–2007*: average GDP growth during the period 2005–2007. Source: IMF, WEO database.
- *Financial openness*: Sum of external assets and liabilities over GDP for end-2005. Source: Lane and Milesi-Ferretti, External Wealth of Nations Mark II (EWN II) database.
- *Gross debt*: sum of debt assets (including reserves) and liabilities divided by GDP, end-2005. Source: Lane and Milesi-Ferretti, EWN II database.
- *Gross debt (banks)*: sum of bank external assets and liabilities in the form of debt instruments divided by GDP, end-2005. Source: authors' calculations based on IMF, Balance of Payments Statistics and BIS, locational banking statistics.
- *Gross equity*: sum of portfolio equity and FDI assets and liabilities divided by GDP, end-2005. Source: Lane and Milesi-Ferretti, EWN II database.
- *Net debt (excluding reserves)*: difference between debt assets (excluding reserves) and debt liabilities, divided by GDP, end-2005. Source: Lane and Milesi-Ferretti, EWN II database.
- *Net debt (banks)*: difference between bank external assets and liabilities in the form of debt instruments divided by GDP, end-2005. Source: authors' calculations based on IMF, Balance of Payments Statistics and BIS, locational banking statistics.
- *Net equity*: difference between the sum of portfolio equity and FDI assets and portfolio equity and FDI liabilities divided by GDP, 2005. Source: Lane and Milesi-Ferretti, EWN II database.
- *NFA/GDP:* Net foreign asset position divided by GDP, end-2005. Source: Lane and Milesi-Ferretti, EWN II database.
- *Net position vis-à-vis BIS banks*: net position vis-à-vis BIS-reporting banks divided by GDP, December 2005. Source: BIS, locational banking statistics.
- *Foreign exchange reserves*: ratio of foreign exchange reserves to GDP, end-2005. Source: IMF, International Financial Statistics.
- *Trade openness*: Sum of imports and exports of goods and services over GDP. Source: IMF, WEO.
- *Share of manufacturing output*: Share of manufacturing output in total output. Source: United Nations.
- *Commodity trade balance*: Balance of trade in commodities divided by GDP. Source: authors' calculations based on United Nations data.

- *Private credit/GDP and change in private credit/GDP*: World Bank Financial Structure database (Beck *et al.* (2000, 2009) and updates in Lane and Milesi-Ferretti (2010a).
- *Change in trade flows*: difference between the sum of annualized exports and imports during the crisis period (2008Q4–2009Q1 or 2009Q2–2009Q4) and annualized exports + imports during the period 2006Q1–2007Q2, scaled by 2007 GDP.
- *Change in growth*: difference in GDP growth between the 2008–9 average and the 2005–7 average. Source: IMF, WEO database.
- *Change in growth in trading partners:* difference in GDP growth in trading partners between the 2008–9 average and the 2005–7 average. Source: IMF, WEO database.
- *Change in public debt projections*: difference in the projected ratio of gross government debt to GDP for 2012 between the April 2009 April 2009 WEO and the April 2007 WEO. Source: IMF, WEO database.
- *Change in fiscal balance projections*: difference in the projected ratio of the fiscal balance to GDP for 2012 between the April 2009 WEO and the April 2007 WEO. *Source*: IMF, WEO database.
- *Change in growth projections*: difference in the projected average growth rate for the period 2009–12 between the April 2009 April 2009 WEO and the April 2007 WEO. Source: IMF, WEO database.
- *Credit market restriction index*: Economic Freedom of the World index of credit market regulation (Giannone *et al.*, 2010).

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