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The experience of the past decade has demonstrated the challenges that international capital flows can pose for financial stability. The build-up of global imbalances (large net capital flows) was one of the preconditions for the recent financial crisis. Increased interconnectedness between countries' financial sectors (large gross capital flows) created channels through which the initial shock could spread around the world. In these respects, the scale and volatility of international capital flows were crucial determinants of the depth and breadth of the crisis which followed Lehman Brothers' demise.

These dramatic events demonstrate that it is incumbent upon policymakers to develop strategies to deal with these risks in the future. But however great the challenges policymakers may have faced in the most recent episode, these are set to become even greater in the future as large emerging market economies (EMEs) increasingly integrate into the global financial system.

This paper elaborates on the simulations of Haldane (2010), with the aim of constructing some illustrative thought experiments to describe some potential trajectories for G20 countries' capital flows and external balance sheets over the next 40 years. Some key results from our simulations are as follows:

- The overall size of external balance sheets relative to GDP across the entire G20 increases from a ratio of around 1.3 to 2.2.
- The distribution of external assets shifts to emerging markets. By 2050, more than 40% of all external assets are held by the BRICs, up from the current 10%.
- Non-G7 annual capital outflows are simulated to be more than twice the size of G7 outflows by 2050.
- Global current account imbalances (the sum of deficits and surpluses) rise from around 4% of world GDP to around 8% at their peak.

These simulations focus on two fundamental drivers of capital flows — GDP convergence and demographics. Plainly, other factors which we do not explicitly model — such as financial development, changes in investor preference, exchange rate policies and the development of social safety nets — will also be important in the years to come. Notwithstanding these caveats, it seems reasonable to envisage a future world in which the financial integration of EMEs is accompanied by a substantial rise in international capital flows relative to world GDP.

Developments in the size and volatility of global capital flows are linked to UK financial stability both directly and indirectly. Direct links operate via the United Kingdom's very large gross external balance sheet position, in turn a function of its role as a global financial centre. A more indirect set of channels operate via the International Monetary and Financial System (IMFS), and in particular, through interactions between global capital flows and various frictions that inhibit orderly adjustments to imbalances across countries.

The key challenge for policymakers is to mitigate the potential financial stability risks associated with much larger future international capital flows while simultaneously preserving the key benefits that financial globalisation has to offer. The increase in capital flows will have implications for many policy issues, including, but not limited to: the elimination of data gaps; policies which limit the build-up of balance sheet mismatches; the Basel III international capital and liquidity standards; macroprudential policies; the use of capital controls; and reforms to the international monetary and financial system.

This is clearly a challenging task, not least because the global nature of the problem will demand a co-ordinated policy response. But while policy co-ordination will be a crucial element of any first-best policy response, individual countries may also be able to introduce unilateral measures to mitigate their vulnerability to large and volatile capital flows — including through macroprudential measures. Although the policy challenge is considerable, the experience of the recent crisis shows that the stakes are already high. But if — as the simulations presented in this paper suggest — global capital flows grow to dwarf those experienced in the lead-up to the 2007–08 crisis, the stakes will become higher still.

1 Introduction

Financial globalisation has the potential to increase global welfare by allowing resources to be allocated more efficiently and enabling countries to better share risk. But the experience of the past decade has also demonstrated the significant challenges that large and volatile international capital flows can pose for financial stability and macroeconomic management.

Between 2002 and 2007, annual gross international capital flows rose from 5% to 17% of world GDP, and the network of cross-country financial linkages became increasingly complex (Hoggarth *et al* (2010)). Net international capital flows also rose sharply over this period, with global current account imbalances (the sum of global deficits and surpluses) doubling from 3% to 6% of world GDP. This build-up of large global imbalances was — alongside significant failings in financial regulation — one cause of the current global crisis (Astley *et al* (2009)). Moreover, the increased interconnectedness between countries' financial sectors provided numerous channels through which the initial shock could spread around the world.

As remarkable as the pre-crisis growth in international capital flows was, the collapse post-Lehman was yet more dramatic. In this sense, both the scale and the volatility of global capital flows were crucial determinants of the depth and breadth of the crisis. Gross global cross-border capital flows plummeted to less than 1% of world GDP in 2008, with severe implications for many emerging market economies (EMEs) that had hitherto been reliant on foreign funding. But, in notable contrast to most of the other crises experienced since the Great Depression, advanced economies also suffered — and in many cases to an even greater extent than EMEs. In countries with large, open financial sectors — including the United Kingdom — the implications for financial stability have been particularly severe.

With the recent crisis providing such a clear example of the potential consequences of sudden reversals in large international capital flows for financial stability, it is incumbent upon policymakers to develop strategies to deal with these risks in the future. But this need is revealed to be even more pressing once the medium-term prospects for international capital flows are taken into account. As discussed by Haldane (2010), the increasing integration of large EMEs into the global financial system could well be accompanied by a substantial rise in the volume of global capital flows over the next 40 years. To underscore this point, this paper elaborates on the exercise that was presented in Haldane (2010), and discusses some possible policy implications.

Section 2 sets out a framework for thinking about the evolution of global capital flows by describing the key medium to long-term drivers of international capital flows. Structural factors such as the rate of cross-country economic convergence, demography, financial market development, and changes in the degree of investor 'home bias' are all likely to be important.

Having identified these drivers, Section 3 outlines the methodology used to construct the illustrative thought experiment that was presented in Haldane (2010), and describes the resulting trajectories for G20[1] countries' capital flows and external balance sheets over the next 40 years. Our scenarios focus on the impact of two fundamental drivers of capital flows — GDP convergence and demographics — both of which are powerful economic forces that are relatively well understood. The exercise suggests that — abstracting from other influences — international capital flows could mushroom as the integration of large EMEs into the global financial system progresses.

It should be emphasised that the scenarios are illustrative. They should be interpreted as simulations and certainly not as central forecasts. The simulations are based on a very simple set of assumptions and deliberately and necessarily ignore the impact of numerous potential countervailing factors. In particular, the baseline methodology is built around assumptions about economic convergence and demographic trends. But financial market development and the reduction in home bias — which are also important drivers of global capital flows but which are much more difficult to predict — are not modelled explicitly.

In recognition of this, Section 4 discusses how changes in the pace of financial development in EMEs and/or the rate of reduction in home bias could alter these outcomes. But while these additional factors are certainly important, they would need to play a very significant role in order to offset the substantial increase in global capital flows suggested by the thought experiment in Section 3.

Overall then, it seems reasonable to envisage a future world in which the increasing integration of EMEs into the global economy is accompanied by a substantial rise in international capital flows relative to world GDP. In order to get a sense of the implications of this for the United Kingdom, Section 5 considers the key channels through which the magnitude and volatility of international capital flows could potentially affect financial stability. It discusses direct channels — in particular, risks related to the United Kingdom's large external balance sheet and its role as a major global financial centre — as well as indirect channels via the International Monetary and Financial System (IMFS).

(1) Throughout this paper, G20 refers to G20 countries only ie excluding the European Union as a whole, which is a member of the G20.

Understanding the linkages between international capital flows and financial stability is a crucial first step in designing policies to counter current — and future — risks. Section 6 contains a brief discussion of some possible policy options for mitigating some of these risks, while Section 7 concludes.

2 The medium-term drivers of international capital flows

In order to get a sense of how capital flows might evolve in the future, it is useful to examine the likely medium-term drivers of these flows. These drivers can be grouped into two categories: (1) those that result in efficient capital flows; and (2) those that result in inefficient capital flows due to their interaction with frictions. Though we recognise that international capital flows are also prone to episodes of volatility — particularly when they interact with frictions — we do not discuss the triggers of sudden capital flow reversals here as our focus is on longer-term trends.

2.1 Efficient capital flows

Capital flows that reflect economic fundamentals alone are consistent with an efficient allocation of capital across countries and over time — put alternatively, these flows allow countries to diversify optimally their portfolio of domestic and foreign assets. By directing global savings to their most productive use and facilitating international risk-sharing (across countries, states of the world and over time), these types of capital flows can raise global welfare. Provided that these flows do not interact with frictions (for example, in financial markets) they need not require a policy response.

Standard economic theory suggests that — in the absence of frictions — the net allocation of capital across countries should reflect productivity differentials (Lucas (1990)). From a portfolio diversification perspective, productivity differentials will create scope for gains from cross-country risk-sharing through their impact on the correlation between returns on individual countries' assets. Theory also suggests that the allocation of global capital over time should be consistent with countries' inter-temporal consumption-smoothing requirements (Sachs (1982)). But there may also be scope for gains from international risk-sharing in the absence of *ex-ante* differences in countries' productivity levels and rates of time preferences. In particular, if countries face idiosyncratic income risk, positive holdings of foreign assets could allow them to smooth their consumption across states of the world. Of course in practice, the determinants of optimal portfolio diversification are likely to be influenced by frictions, such as information asymmetries, differences in certainty about enforcement of legal contracts, missing markets and home bias.

2.1.1 Smoothing consumption across countries — the role of productivity differentials

Under benchmark neoclassical assumptions, capital should flow *in net terms* from low-productivity, low-return countries to high-productivity, high-return countries. Assuming diminishing marginal returns, this implies that capital will on average flow 'downhill' from advanced economies with relatively high capital to labour ratios (low marginal products of capital) to EMEs with relatively low capital to labour ratios (high marginal products of capital). In previous episodes of large global imbalances (such as around the time of the Gold Standard) the direction of capital was consistent with 'downhill' flows of capital (from Europe to Asia and the Americas).(1) Although this is less obvious in the recent episode of imbalances, it is still true that private capital has been flowing 'downhill' while official sector capital has been flowing 'uphill'.

Theory also suggests that as these capital inflows are converted into physical capital, output in recipient countries will increase relative to output in donor countries — a process known as cross-country GDP convergence, or 'catch-up' (Solow (1956)). While there is little empirical evidence in favour of 'absolute convergence' — the process by which *all* countries converge to the same level of GDP per capita — there is more evidence in favour of 'conditional convergence' among countries that share sufficiently similar structural features (Barro and Sala-i-Martin (1995)). Put differently, once emerging market countries have passed a threshold level of institutional development, their per capita incomes could, over time, be expected to converge to those of developed economies.(2) In this framework, the pattern of capital flows and GDP convergence will be self-reinforcing — capital will flow to high-growth economies, and facilitate further output growth in these economies. And while the evidence on the *direct* growth benefits of financial globalisation is fairly weak (Eichengreen (2001)), there is more consensus around the view that there are *indirect* benefits, for example, through a catalytic effect on domestic financial market development (Kose *et al* (2006)).

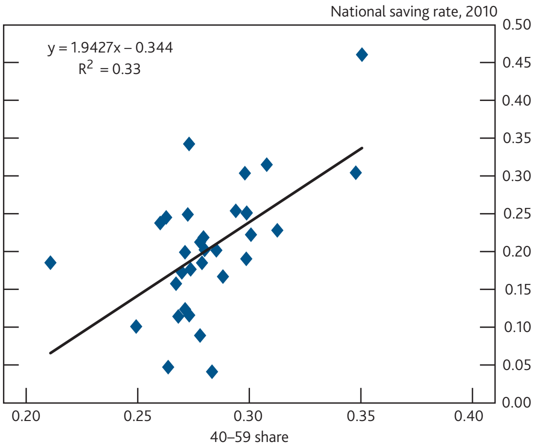
The allocation of global capital *over time* should be consistent with countries' inter-temporal consumption-smoothing requirements. More specifically, global capital flows will, *in net terms*, be influenced by changes in countries' desired saving rates over time. Demographic factors — most notably, a country's *relative* age profile — are frequently cited as being important in this context (Wilson and Ahmed (2010); Higgins (1998)). Countries with large endowments of

(1) For a more detailed historical overview, see Bush, Farrant and Wright (2011).
(2) Recent work by Eichengreen, Park and Shin (2011) has challenged this assertion somewhat, suggesting that history shows that the pace of expansion in fast-growing economies can significantly slow (by more than 2 percentage points) when they reach a threshold level of GDP per capita (around US$17,000).

exhaustible resources may also have strong inter-temporal saving motives (Bems and de Carvalho Filho (2009)).

The standard life-cycle/permanent income theory of consumption predicts that demographic factors can influence a country's aggregate saving requirement (Modigliani (1970)). The simplest version of this theory predicts that households borrow when they are very young, save during their working years, and dis-save when they retire. All else equal, this implies that countries with a relatively high share of the population at working age will save more than those with a relatively low share. There is some evidence of this in the data — in 2010, countries with relatively high shares of the population aged between 40–59 (the so-called 'prime savers' cohort) also tended to have higher national saving rates (**Chart 1**).

Chart 1 Saving rate and population(a)(b)



Sources: IMF, US Census Bureau and Bank calculations.

(a) Gross national saving as a percentage of nominal GDP for advanced economies.
(b) Share of population aged between 40 and 59 years old.

If, for an open economy, a life-cycle induced change in saving requirements is not matched by an equivalent change in desired investment, it will generate a current account imbalance, and therefore, cross-border capital flows. In contrast to saving demand, it has been argued that investment demand is more closely correlated with the share of the population in *relatively young* age groups — a higher share of young people implies faster labour force growth and stronger long-term demand for social infrastructure (Higgins and Williamson (1997) and Cooper (2006)). So, all else equal, as an increasing share of the population moves from the younger cohort to the middle-aged cohort, it may be reasonable to expect to see an increase in desired saving, a decrease in desired investment, and hence, a higher current account balance. And it may be rational for agents in countries with ageing populations to choose to supplement expected declines in their domestic income streams by accumulating foreign assets from countries with relatively young populations (Lane and Milesi-Ferretti (2002)).

A simple pooled OLS regression analysis of G20 countries suggests that, after controlling for cross-country differences in nominal GDP per capita, a 1 percentage point increase in the share of the population aged 40–59 could be accompanied by ⅓ percentage point increase in the current account balance to GDP ratio. But the expected negative relationship between the share of the population aged between 0–24 (ie the 'young' cohort) and the current account balance is not obvious in our data set, with the coefficient close to zero and insignificant (**Table A1** in the annex).

2.1.2 Smoothing consumption across states of the world — the role of idiosyncratic income risk

Even if all countries had identical *ex-ante* productivity levels and consumption time preferences, the presence of idiosyncratic country-specific income risk — for example, the risk of a natural disaster — should also drive gross cross-border capital flows. Under these circumstances, positive foreign asset holdings can improve welfare by allowing residents of these countries to smooth their consumption across good and bad states of the world.

Lucas (1982) formalised this idea by considering a model in which agents in two separate symmetric countries are subject to stochastic endowment shocks. In this stylised example, perfect risk pooling is achieved when agents hold half domestic and half foreign shares in their portfolios. Alternatively, Baxter and Jermann (1998) show that when there is non-diversifiable income (for example, from labour), agents should hold short positions in domestic assets. This is because asset returns and labour income are highly correlated within countries.

2.2 Capital flows and frictions

While there is some empirical evidence to suggest that inter-temporal consumption smoothing is an important determinant of global capital flows, the evidence on the role of cross-country productivity differentials and income risk-sharing appears inconsistent with the standard theory. As was first noted by Lucas (1990), the prediction that capital will flow 'downhill' is at odds with the observed global pattern of net capital flows. Instead, capital has, in aggregate, been apparently flowing 'uphill' from EMEs to advanced economies. The distribution of net capital flows *across* developing economies is also inconsistent with neoclassical theory, as foreign capital appears to flow disproportionately toward countries with relatively low growth in developing countries (Gourinchas and Jeanne (2007)).

There are two key types of explanations for the observed pattern of capital flows. The first is that cross-country productivity differentials are mismeasured, and that greater capital scarcity in EMEs does not translate into a higher marginal product of capital and/or larger investment returns. For example, Lucas (1990) suggests that differences in human capital may also be important, while Gertler and Rogoff (1990) suggest that cross-country investment returns should be risk-adjusted (for example, to take into account the higher risk of sovereign default in EMEs and/or aspects of the institutional environment). The second type of explanation is that in reality, there are some important underlying *frictions* that are not captured by the simple neoclassical model. Capital flows that are either *caused* by frictions, or caused by economic fundamentals but *interact* with frictions are more likely to lower global welfare, including by contributing to financial stability risks. Two types of frictions warrant particular attention over our medium-term time horizon: (1) the interaction between financial globalisation and cross-country differences in financial market development (owing to 'missing markets'); and (2) 'home bias' in investors' international portfolio allocation preferences (owing, for example, to asymmetric information).(1)

2.2.1 Financial development

Differences in national financial market development can create cross-country imbalances in the demand for, and supply of, 'safe' financial assets. As countries become increasingly integrated into the international monetary and financial system, these imbalances can lead to 'uphill' capital flows. But, in addition to providing a mechanism for resolving existing cross-country imbalances in markets for 'safe' financial assets, financial globalisation may also increase the size of those imbalances (and hence the magnitude of the 'uphill' flows). In particular, as financially underdeveloped economies enter the early stages of capital account liberalisation, they may be vulnerable to 'sudden stops' in capital flows, which will further increase the demand for 'safe' financial assets in these economies relative to the supply.

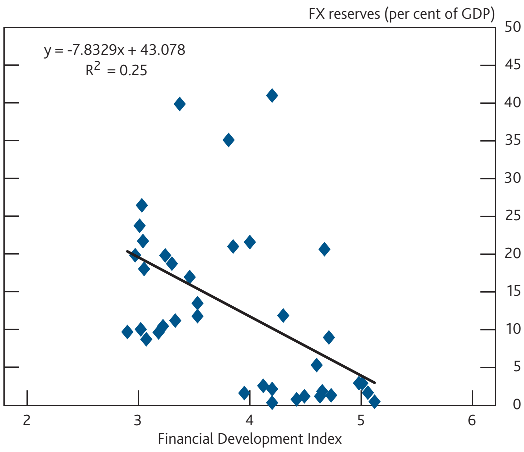
Mendoza, Quadrini and Rios-Rull (2007) show that in the presence of risk, financial market imperfections can increase the *demand* for safe assets into which precautionary savings can flow. Residents in countries with underdeveloped financial markets will have restricted access to instruments that allow them to hedge risk, creating a high demand for 'safe' financial assets. As these countries integrate into global capital markets, their residents gain access to cheaper risk-free assets issued in developed countries, resulting in 'uphill' capital flows. In the model developed by Caballero, Farhi and Gourinchas (2008) financial market imperfections are instead captured as an impediment to a country's ability to *supply* saving instruments. Faced with an insufficient supply of 'safe' financial assets at home, financial globalisation has allowed investors in faster-growing EMEs to accumulate 'safe' assets from advanced economies' financial markets.

But in the early stages of financial globalisation, countries can be vulnerable to sudden stops in capital flows. This vulnerability can be exacerbated if domestic financial markets are underdeveloped, and even more so as these countries become more closely integrated with the global financial network (Durdu, Mendoza and Terrones (2009)). For a given domestic supply of 'safe' financial assets, this increase in risk is likely to increase the demand for 'safe' financial assets. In this situation EME governments may opt to address this *additional* shortage in the domestic supply of 'safe' financial assets by accumulating foreign reserves (ie generating official capital outflows).

This relationship is reinforced by the fact that many countries with relatively low levels of financial development impose restrictions on private capital outflows — in these cases, official outflows from EMEs (or 'uphill' capital flows) are a reflection of governments playing an intermediary role.

There is some cross-country evidence to support the notion that lower degrees of financial development tend to be associated with higher reserve holdings as a share of GDP (**Chart 2**). In part, this is likely to be related to the fact that financial market underdevelopment is often associated with restrictions on *private* capital outflows.

Chart 2 Financial development and foreign exchange reserves, 2008(a)(b)



Sources: IMF *International Financial Statistics*, IMF *World Economic Outlook* and World Economic Forum Financial Development Index 2010.

(a) The World Economic Forum Financial Development Index scores countries' financial sectors against seven 'pillars': institutional environment; business environment; financial stability; banking financial services; non-banking financial services; financial markets; and financial access.
(b) Based on a sample of 37 advanced and emerging economies. Excludes oil exporters, countries with closed capital accounts, as well as Hong Kong and Singapore.

2.2.2 Home bias

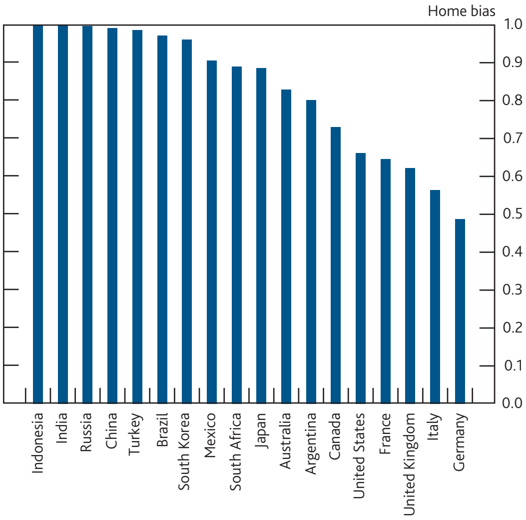
French and Poterba (1991) coined the term 'international home bias' to describe the second key friction which distorts the cross-country allocation of global capital. They observed that investors hold a disproportionately large share of domestic assets in their investment portfolios. The most obvious explanation is that home bias is a result of explicit or implicit regulations that restrict investment in foreign assets or

(1) Other frictions are relevant to explain the volatility of capital flows — for example, the role of information asymmetries in perpetuating boom-bust cycles in asset prices. These are discussed in more detail in Bush, Farrant and Wright (2011).

transaction costs associated with foreign investment. Home bias could also be the result of investors not having full information about foreign assets. In addition to informational asymmetries, home bias may be explained by uncertainty of contract enforcement and the associated moral hazard.

Regardless of whether home bias can be fully explained in theory, empirically it is clear that investors do invest disproportionately more at home than abroad. Taking, for example, home bias in holdings of portfolio equity, the usual benchmark against which to measure a country's holdings of foreign equity is that country's share of total world market capitalisation. Home bias is zero if a country invests in domestic equity in line with its own share of the world market portfolio.[1] **Charts 3** and **4** show home bias across the G20 and the decline in home bias for some major advanced countries, respectively.

Chart 3 Portfolio equity home bias[(a)] in the G20, 2005



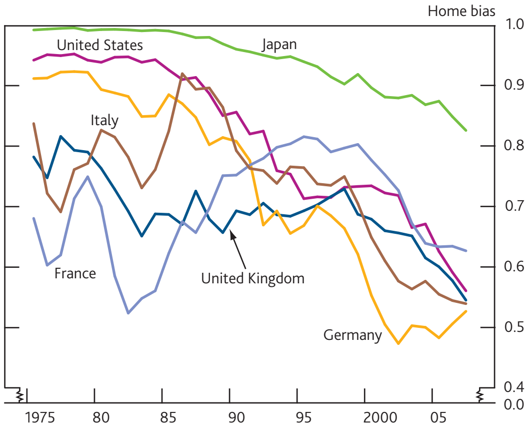
Sources: IMF *International Financial Statistics*, IMF *World Economic Outlook* (October 2010), S&P Global Stock Markets Factbook (2010), updated and extended version of data set constructed by Lane and Milesi-Ferretti (2007) and Bank calculations.

(a) Home bias for a given country is given by: 1 – (Country's holdings of foreign equity as a share of country's total global equity holdings)/(Other countries' total share of world equity market capitalisation).

These illustrate a number of widely cited stylised facts. First, home bias is declining. Second, it remains high, however, and so there is large scope for portfolio reallocation from home to foreign markets — which would increase the scale of gross international capital flows. Home bias, at least for equities, tends to be higher for EMEs than for advanced economies. Indeed, there is striking evidence that home bias in equities tends to decline as countries' per capita income rises (**Chart 5**).

The combination of a structural underinvestment by advanced economies in EMEs and higher growth prospects and positive interest rate differentials in EMEs points to the likelihood of a future structural asset reallocation from advanced countries to EMEs (IMF (2010)). But even within advanced economies,

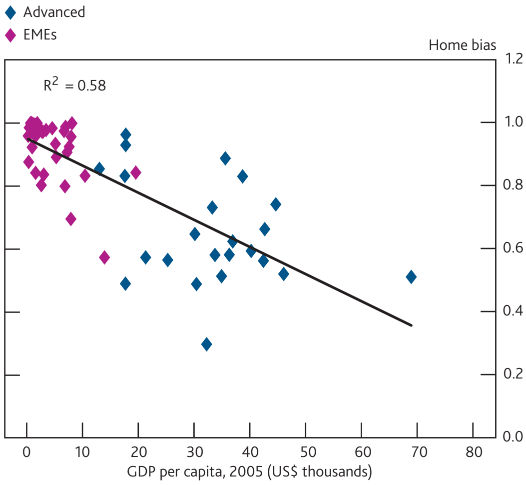
Chart 4 Portfolio equity home bias[(a)] over time



Sources: IMF *International Financial Statistics*, IMF *World Economic Outlook* (October 2010), Thomson Reuters Datastream, updated and extended version of data set constructed by Lane and Milesi-Ferretti (2007) and Bank calculations.

(a) Home bias for a given country is given by: 1 – (Country's holdings of foreign equity as a share of country's total global equity holdings)/(Other countries' total share of world equity market capitalisation).

Chart 5 Portfolio equity home bias and income, all countries



Sources: IMF *International Financial Statistics*, IMF *World Economic Outlook* (October 2010), S&P Global Stock Markets Factbook (2010), updated and extended version of data set constructed by Lane and Milesi-Ferretti (2007) and Bank calculations.

there is scope for reallocation from home markets to other advanced markets as financial markets continue to integrate. It is notable from **Chart 4** that home bias in European countries has declined faster than that of other advanced countries.

The home bias of EME investors must also be considered because as their income grows, the resultant wealth will be invested both at home and abroad. In general, EME investors' degree of home bias differs from that of advanced countries according to the type of instrument. EME investors exhibit greater equity home bias, but lower debt home bias than advanced countries. The former may be explained by many factors including restrictions on capital outflows and the

(1) Our discussion here does not reflect relative risks of investing in different countries. An alternative strand of the literature seeks to calculate risk-adjusted benchmark portfolio weights based, for example, on mean-variance analysis.

availability of financial products in EMEs. The latter is most likely linked to EME central banks' holdings of advanced country government debt, rather than EME private sector investors' holdings of foreign portfolio debt.

All this points to changes in the pattern of cross-border investment. The precise evolution and interaction of these various forces is impossible to predict with any degree of certainty. Nevertheless, they look set to have a profound influence on the future pattern of international capital flows.

3 Simulations of future capital flows

Section 2 outlined some key economic relationships which influence the scale and direction of international capital flows. In this section we undertake some stylised thought experiments to simulate what these forces could imply for the future of international capital flows and global imbalances between today and 2050, holding other factors constant, and elaborating on those of Haldane (2010).

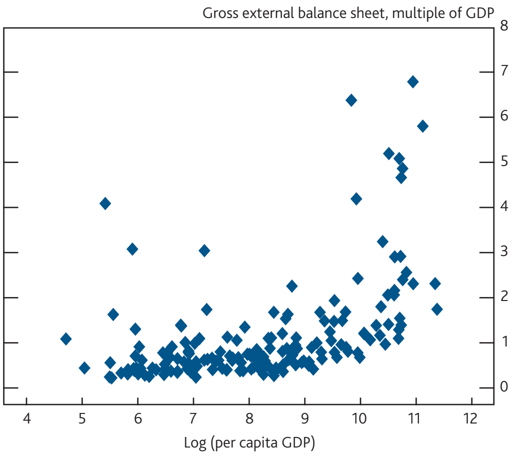
Some key results from our simulations are as follows:

- The overall size of external balance sheets relative to GDP across the entire G20 increases from a ratio of around 1.3 to 2.2 (**Chart 12**).
- The distribution of external assets shifts to emerging markets. By 2050, more than 40% of all external assets are held by the BRICs,[(1)] up from the current 10% (**Chart 14**).
- Non-G7 annual capital outflows are simulated to be more than twice the size of G7 outflows by 2050 (**Chart 17**). By this time, India and China would represent almost half of all annual gross capital outflows (**Chart 18**).
- The average share of 'prime savers' (people aged 40–59) in the G7 falls from 28% in 2010 to 24% in 2050 (**Chart 19**). For EMEs with population explosions it increases rapidly — in India from 20% to 26% and for Saudi Arabia from 16% to 27% (**Chart 20**).
- India's saving rate — already high — increases from 38% to 50% in 2050. In Germany, France, the United Kingdom and the United States the saving rate is below 10% in 2050 (**Chart 21**).
- Global current account imbalances (the sum of deficits and surpluses) rise from around 4% of world GDP to around 8% at their peak (**Chart 24**).

Any exercise in projecting capital flows over such a long period is fraught with uncertainty and as such the results of these simulations should not be considered forecasts. The partial experiments we undertake here are intended only to provide a sense of the scale of capital flows that international policymakers may have to deal with, absent any countervailing forces or policy responses to lean against these trends. There are multifarious other factors that will influence the future scale and direction of international capital flows, some of which are described in Section 4.

In the present simulations, we focus only on the effect of two forces: GDP convergence and demographics. It is reasonable to assume that the force of GDP convergence will continue over the next 40 years. And demographic trends over this period are known with some certainty. As discussed in Haldane (2010), the GDP catch-up process is also likely to be associated with external balance sheet catch-up — as countries develop, they also become increasingly integrated into global capital markets and accumulate larger stocks of gross external assets and liabilities. Cross-country evidence suggests there is a strong positive relationship between countries' GDP per capita and the size of their external balance sheet (**Chart 6**).

Chart 6 Per capita GDP and gross external balance sheet, 2007[(a)(b)]



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), US Census Bureau and Bank calculations.

(a) Includes all countries in the Lane and Milesi-Ferretti database, except Bahrain, Hong Kong, Ireland, Kiribati, Luxembourg and Timor-Leste.
(b) External balance sheet is defined as the average of external assets and liabilities.

Our simulations of countries' future external balance sheet positions are based on this relationship, coupled with projections for nominal GDP and population.

We do not attempt to model explicitly changes in the rate of financial development or in the diminution of home bias. Some changes in these factors are implicit within our mapping of GDP to external assets, and within some simple assumptions we make about the extent to which non-GDP determinants of external asset positions converge across countries over time. Our simulations seek to depict what the

(1) Brazil, Russia, India and China.

impact of convergence and demographic trends might be over the medium-term by projecting G20 countries' GDP, gross external balance sheets, gross capital flows and current account positions out to 2050.

The remainder of this section outlines the process and results of our simulations. First, GDP projections are derived from a labour productivity convergence model and US Census Bureau population projections. Second, gross external balance sheets are simulated using a simple econometric model that relates economic development to the degree of financial globalisation. Third, gross capital flows are backed out from these changes in gross external balance sheets. Fourth, we estimate a relationship between national saving rates and demographics, and use this to simulate future saving rates. Combining this with simple assumptions about future national investment rates, we simulate current accounts and net capital flows.

3.1 Simulations of future GDP

The starting point for our simulations is a model of future output growth for each G20 country (excluding the European Union as a whole) which is based on population growth estimates and convergence in income per working-age population. For each country, we simulate future GDP per working-age capita, assuming steady-state labour productivity growth of the United States of 2% and a speed of convergence parameter of 1.5%[(1)] applied to each country's labour productivity differential with the United States (equation **(1)**).

$$\frac{A_t}{A_{t-1}} = 2\% - \beta \ln\left(\frac{Income\ per\ capita_{country\ x}}{Income\ per\ capita_{USA}}\right) \qquad (1)$$

Labour productivity, A, growth is a function of:

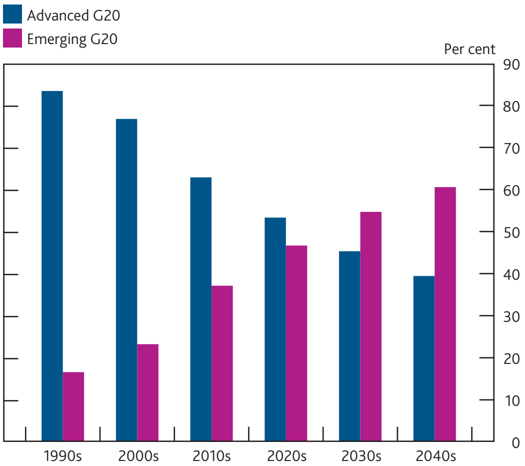
- an assumed steady-state labour productivity growth of the United States of 2%;
- the speed of convergence, β, which we assumed to be 1.5%, in line with the literature; and
- the labour productivity differential with the United States.

In order to account for the Balassa-Samuelson effect (Balassa (1964) and Samuelson (1964)), we adjust the results to reflect that countries' exchange rates will appreciate as their per capita income grows. Some countries, such as Brazil, already have relatively high exchange rates given their current income levels. As such, we scale down the rate of appreciation by taking into account the initial real exchange rate (equation **(2)**).[(2)] The product of our real exchange rate, labour productivity and the population projections thus gives us future real GDP at market exchanges expressed in terms of 2010 US dollars. We convert this to nominal GDP using an assumption for US inflation per year of 2%.

$$RER_t = 1 - \left(1 - \frac{Income\ per\ capita_{country\ x,t}}{Income\ per\ capita_{USA,t}}\right) \times \left(\frac{1 - RER_{2005\text{–}09}}{1 - \frac{Income\ per\ capita_{country\ x,2010}}{Income\ per\ capita_{USA,2010}}}\right) \qquad (2)$$

The results of our GDP simulations broadly accord with similar exercises undertaken by among others such as Goldman Sachs (Wilson and Purushothaman (2003); Wilson and Ahmed (2010)) and HSBC (Ward (2010)). **Tables A3** and **A4** in the annex show our projections for GDP per capita and nominal GDP for all countries. These simulations yield the frequently cited shift in EMEs' share of global output and the associated decline in advanced countries' share. By the 2030s, emerging G20 countries' output exceeds that of advanced G20 countries (**Chart 7**). By 2050, China is the world's largest economy in nominal GDP terms, India is third and Brazil fourth (**Table A**).

Chart 7 Share of total G20 output[(a)]



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

(a) Emerging G20 is comprised of Argentina, Brazil, China, India, Indonesia, Mexico, Russia, Saudi Arabia, South Africa, South Korea and Turkey. Data for Russia are included only from 1992.

The stronger GDP growth rates in EMEs are driven not only by convergence but also by favourable demographics. The contrast between future declines in working-age populations in advanced economies and population explosions in many EMEs is well known (**Chart 8**). China and the United States are exceptions to their respective country groups (**Chart 9**). China's working-age population is expected to decline from

(1) This is in line with convergence parameters generally used in the literature. See for example, Wilson and Purushothaman (2003).
(2) We take the average real exchange rate between 2005–09 as the initial real exchange rate in order to smooth to an extent year-to-year volatility in real exchange rates.

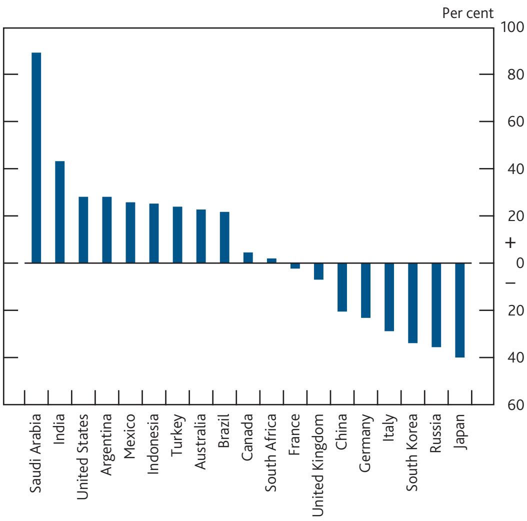
Table A Country ranking of nominal GDP, 2010, 2025 and 2050

Nominal GDP		
2010	2025	2050
United States	United States	China
China	China	United States
Japan	Japan	India
Germany	India	Brazil
France	Brazil	Indonesia
United Kingdom	Germany	Japan
Brazil	France	Mexico
Italy	United Kingdom	Germany
Canada	Italy	France
India	Russia	Russia
Russia	Mexico	United Kingdom
Australia	Indonesia	Turkey
Mexico	Canada	Canada
South Korea	Australia	Italy
Turkey	Turkey	Saudi Arabia
Indonesia	South Korea	Australia
Saudi Arabia	Saudi Arabia	Argentina
Argentina	Argentina	South Korea
South Africa	South Africa	South Africa

Sources: IMF, Penn World Table, US Census Bureau and Bank calculations.

2015 on, in contrast to most EMEs. India's working-age population continues to grow for as long as population projections are available (until 2050). While European countries experience secularly declining working-age populations, the United States is expected to continue to grow.

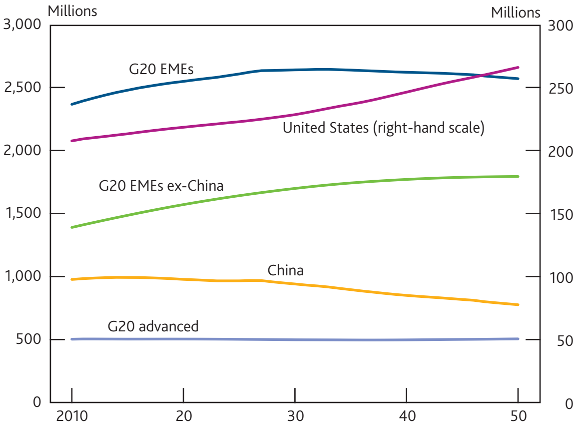
Chart 8 Projected increase in working-age population, 2010 to 2050



Sources: US Census Bureau and Bank calculations.

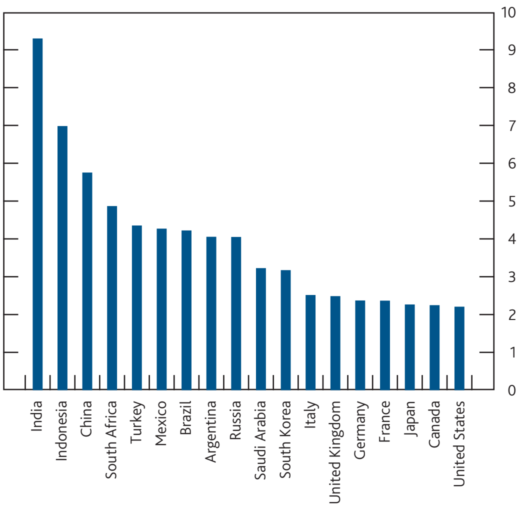
Combined with convergence-driven rapid growth in GDP per capita (**Chart 10**) these favourable demographics produce much stronger growth trajectories and the resultant distributional shift from advanced to EMEs in world output. **Chart 11** shows the average real growth rates across countries, in aggregate and per capita, implied by our simulations.

Chart 9 Projections for working-age populations



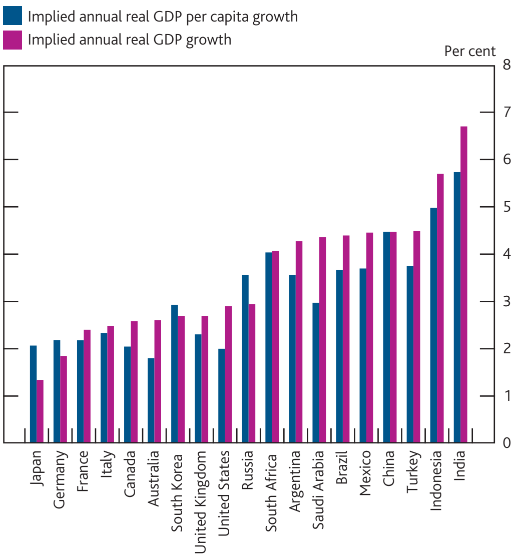
Sources: US Census Bureau and Bank calculations.

Chart 10 Real GDP per capita (working age) at PPP (2010 US$) in 2050 as multiple of 2010



Sources: IMF, Penn World Table, US Census Bureau and Bank calculations.

Chart 11 Implied real growth rates, 2010 to 2050



Sources: IMF, Penn World Table, US Census Bureau and Bank calculations.

3.2 Simulations of gross external balance sheets

As noted in Haldane (2010), this process of convergence is unlikely to be limited to GDP per capita. As discussed in Section 2, as countries become richer, they tend to become more integrated into global financial markets, hence the size (relative to GDP) of their external balance sheets would also converge towards that of the advanced countries of today. Indeed, current cross-country evidence supports a relationship between the size of external balance sheets (as a percentage of GDP) and GDP per capita (**Chart 6**).

We obtain our simulations of future external balance sheet size by first estimating a pooled OLS regression of countries' external balance sheets on a cubic function of real GDP per capita, and a dummy variable for G20 countries (equation **(3)**). Our external balance sheet variable is measured as the average of external assets and liabilities as a share of GDP, while the dummy variable is included to capture similarities between G20 countries (ie levels of financial development above a minimum threshold). The sample contains annual data for 120 countries over the period 2000–07 (the most recent external balance sheet data available), excluding low-income countries and small financial centres. The regression results and a description of the data sources are available in **Table A2** of the annex.

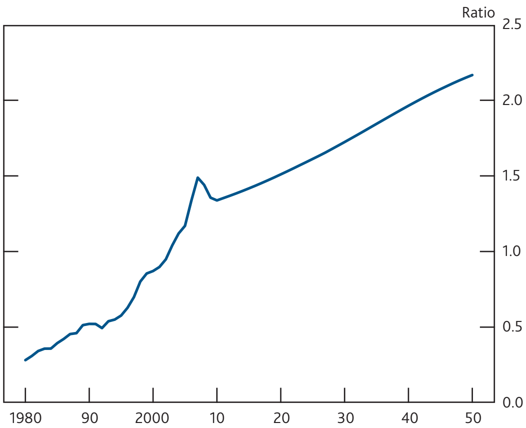
$$EB_t = \beta_0 + \beta_1\ lrgdp_t + \beta_2\ (lrgdp_t)^2 + \beta_3\ (lrgdp_t)^3 + G20 + e_t \qquad (3)$$

Where:
EB is the external balance (average of external assets and liabilities as a share of nominal GDP);
lrgdp is the log of real gdp per capita; and
G20 is a dummy variable which has a value of 1 for G20 countries and 0 otherwise.

We then apply the coefficients from this regression to our convergence-based simulations of future GDP per capita to obtain the size of each G20 country's external balance sheet out to 2050.(1) These simulations are adjusted further to incorporate two additional assumptions: (1) we assume that country-specific residuals from the regression converge to the 2007 G7 average by 2050, for all countries except the United Kingdom, and; (2) for the United Kingdom, which has an exceptionally large positive residual (reflecting its role as an international financial centre) we assume that the residual converges to the 2007 G7 average at a slower pace — in particular that it decays by 50% of its 2007 level by 2050.(2) The first assumption is designed to capture convergence in the non-GDP determinants of external balance sheet size (in particular, the institutional environment). The second assumption is designed to capture the notion that the United Kingdom's 'special' status as international financial centre could limit the pace with which its non-GDP determinants of the external balance sheet converge to those of other G20 countries.

The simulations show that the overall size of external balance sheets relative to GDP increases substantially (see **Tables A3–A5**, annex, for full results). Across the entire G20 the rise is from a ratio of around 1.3 to 2.2 (**Chart 12**), as EMEs' gross balance sheets grow faster than GDP. **Chart 12** also suggests a post-crisis slowdown in the rate of financial globalisation across the G20 as a whole, which persists for some time. But the trend post-2010 is actually quite similar to that seen prior to the 2000s, and in the fullness of time, it is possible that the rapid rate of financial globalisation in the 2000s will turn out to be the anomalous episode. Certainly, the recent crisis has suggested that the pace of growth during this episode was ultimately unsustainable. While we would expect EMEs to become more financially globalised as they develop, the rate at which they do so may be slower than today's advanced countries did — EMEs have presumably learned some lessons about the appropriate pace of financial globalisation from the crisis.

Chart 12 Ratio of external balance sheet(a) to GDP, G20(b)



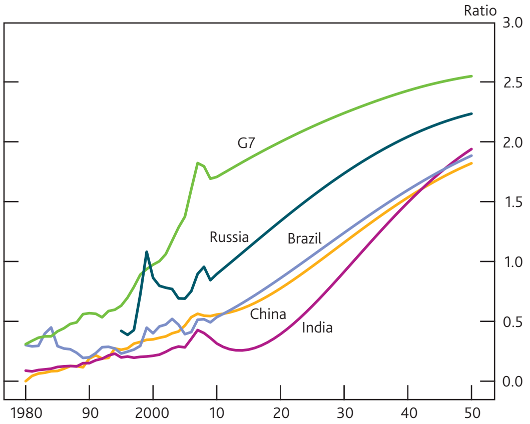
Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

(a) Measured as the average of external assets and external liabilities.
(b) Data for China are only available from 1981. Data for Russia are only available from 1993.

There is divergence across countries. Advanced countries' ratios of external assets to GDP rise relatively modestly, reflecting the slower pace of growth in GDP per capita predicted for these countries by the convergence model (**Chart 13**). In contrast, EMEs' ratios increase more rapidly. India's ratio increases sixfold, China's and Brazil's more than

(1) We project the average of external assets and liabilities. To estimate assets and liabilities separately, we assume that the difference between the external asset/GDP ratio and the external liability/GDP ratio for each country is fixed over time.
(2) We also experimented with a third assumption that imposed an upper limit on countries' external balance to GDP ratio once their GDP per capita rose beyond a threshold level (we chose US$100,000 as a starting point). While this assumption leads to slightly more pronounced shifts in the share of G20 external assets and capital flows accounted for by EMEs over the simulations, the overall story is the same.

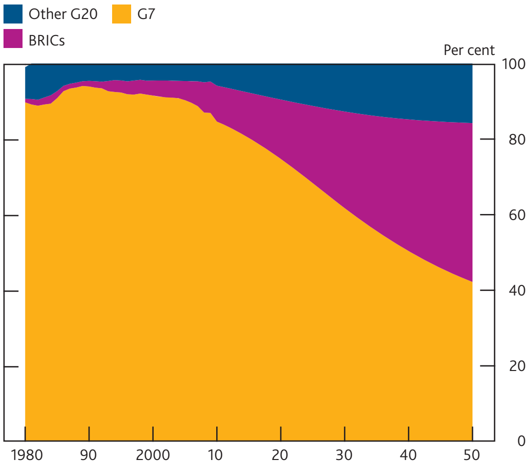
Chart 13 Ratio of external balance sheet[(a)] to GDP



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

(a) Measured as the average of external assets and external liabilities.

Chart 14 Share of G20 total gross external assets, by country group[(a)]



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

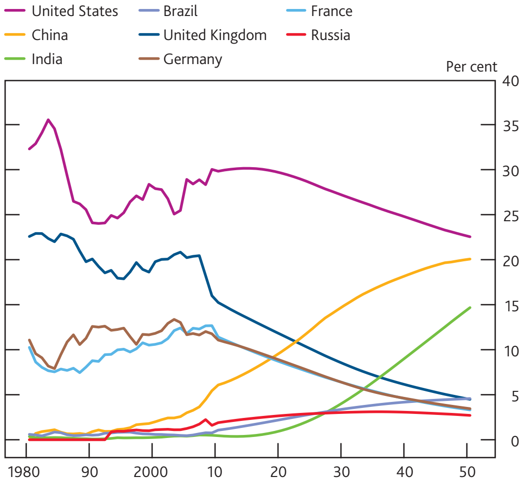
(a) Data for China are only available from 1981. Data for Russia are only available from 1993.

threefold, while Russia's doubles. Although the results of these simulations are striking, they are not out of line with the historical experience of advanced economies at similar stages of development (Box 1).

Financial deepening in EMEs, combined with much stronger GDP growth rates, increases their share of total global external assets dramatically (**Chart 14**). Our simulations suggest that by 2050, more than 40% of all external assets are to be held by the BRICs, up from the current 10%. The share of external assets held by non-G7, non-BRIC countries could treble from around 5% to over 15%.

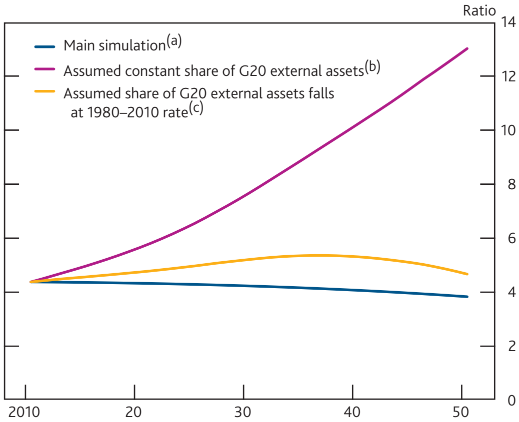
The changes for some individual countries in these simulations are striking. By 2050, China's share of worldwide gross external assets could be around 20%, only slightly lower than the United States, whose share falls from 30% to 23% over the

Chart 15 Share of G20 total gross external assets, by country



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

Chart 16 United Kingdom's ratio of gross external assets to GDP



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

(a) The ratio generated from the model's predictions, assuming that the United Kingdom's large positive residual in 2007 decays by 50% by 2050.
(b) The ratio that would be necessary to maintain the United Kingdom's 2010 ratio of 15% of total G20 external assets.
(c) The ratio that would be necessary to maintain a ratio consistent with the rate of decline between 1980 and 2010 shown in **Chart 15**.

same period (**Chart 15**). India's rise is astronomical — from less that 0.5% to around 15% — while the United Kingdom's share falls from around 15% to less than 5%.

These shifts in external balance sheets may have particular implications for the United Kingdom given its role as an international financial centre. The United Kingdom's gross external assets to GDP ratio is easily the highest in the G20 today. If we were to assume that the United Kingdom will retain its current share of G20 external assets of around 15% — consistent with maintenance of its role as a global financial centre — the United Kingdom's ratio of external assets to GDP would need to rise to roughly three times what it is today by 2050 (**Chart 16**). That is plainly an extreme assumption, given

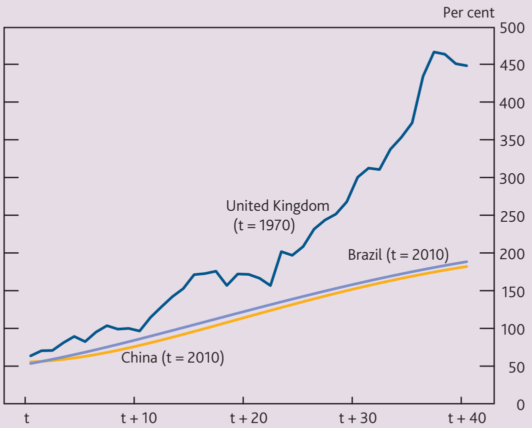
Box 1
How do our simulations compare with the previous path of capital flows?

How do our simulations for the next 40 years compare with the path of capital flows over the previous 40? In aggregate, G7 countries increased their external balance sheet to GDP ratios eightfold between 1970 and 2010. Our simulations indicate that the speed of increase will be lower for BRICs, with a threefold increase between 2010 and 2050. However, starting positions are different: in 1970 the aggregate G7 ratio was 20%, for the BRICs today it is close to 60%. There is also wide divergence across individual countries.

As such, it is instructive to compare advanced countries with similar ratios in 1970 to those of EMEs today. The United Kingdom had a ratio in 1970 of about 65%, similar to that of Brazil and China today (**Chart A**). The United Kingdom's current ratio is well above that projected for China and Brazil in 2050, but this reflects primarily the rapid increase over the past 20 years, consistent with the United Kingdom's role as a global financial centre. In the early 1990s the United Kingdom's ratio was only moderately higher than our projections for China and Brazil in the early 2030s, but the United Kingdom's ratio more than doubled between 1990 and 2010. Prior to this recent surge our simulations for Brazil and China are broadly in line with past developments in the United Kingdom.

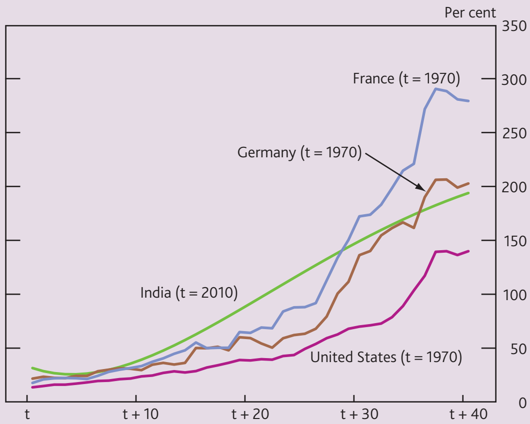
India, on the other hand, is starting in 2010 from only a slightly higher position than France and Germany in 1970 — a ratio of around 30% for India, compared to around 20% for France and Germany (**Chart B**). The path differs, but India's ratio 40 years later is similar to Germany's. In contrast, France's ratio has risen much more rapidly, with a fifteenfold increase over the past 40 years. The United States ratio in 1970 was lower at 14% but increased tenfold to 140% in 2010, similar to the proportional increase of Germany. This underscores the point that there are many factors which determine the precise evolution of external balance sheets which we cannot and do not attempt to incorporate.

Chart A Ratio of external balance sheet to GDP



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

Chart B Ratio of external balance sheet to GDP



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

that the United Kingdom's share of G20 external assets has fallen over the past 30 years (**Chart 15**). An alternative simulation is to assume that the United Kingdom's share of G20 external assets falls at the same rate as that at which it has fallen since 1980. Under this assumption, the United Kingdom holds about 5% of all G20 external assets in 2050 and the size of its balance sheet relative to GDP is fairly constant (**Chart 16**). This latter exercise yields a very similar result to the main simulation.

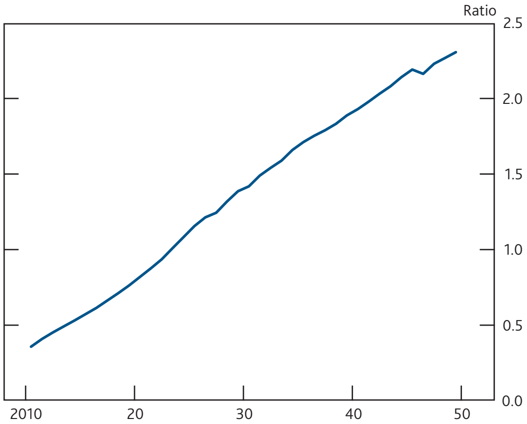
3.3 Simulations of gross capital flows

In the next stage, the capital flows needed to generate the changes in external balance sheet stocks are backed out, adjusting for valuation effects. To account for external assets which rise in real terms we assume that external assets appreciate by one third of annual nominal GDP growth and deduct this in our calculation of the flows.(1)

The flows that would be needed to generate the simulated changes in balance sheets also rise sharply for the G20 as whole. Average annual gross outflows from the entire G20 are around $3 trillion per year between 2005 and 2010 and more than $41 trillion by 2050. However, as a share of GDP, gross G20 capital flows would remain little changed, with increases in EMEs offsetting declines for the G7. Non-G7 capital outflows are by 2050 over twice the size of G7 outflows (**Chart 17**), and by 2050 India and China could account for almost half of annual gross capital outflows (**Chart 18**).

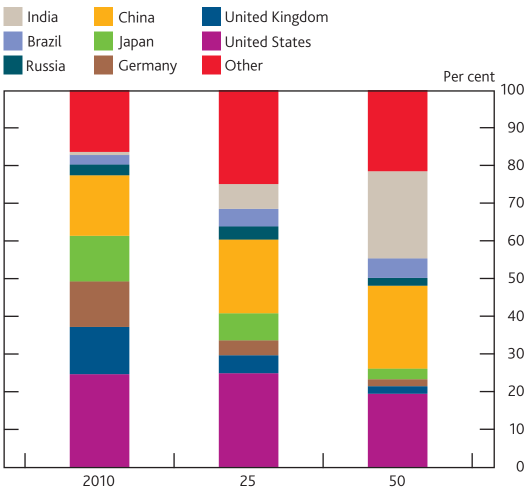
(1) According to data from Lane and Milesi-Ferretti (2007), about one third of external assets are those, such as equities and FDI, which appreciate in real terms.

Chart 17 Ratio of non-G7 to G7 capital outflows



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

Chart 18 Share of total G20 gross capital outflows, by country



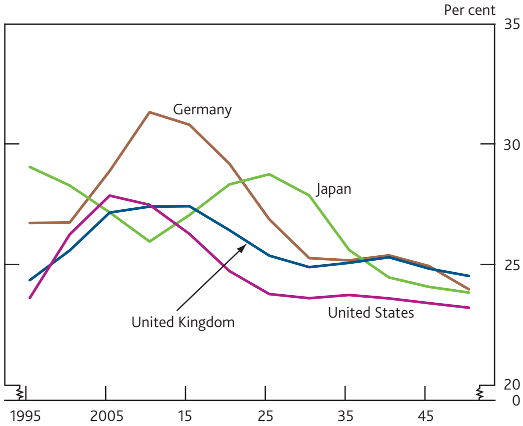
Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

3.4 Simulations of net capital flows

Thus far we have considered only gross flows. But what might the implications of these trends be for net capital flows and global imbalances? An important driver is likely to be differential saving rates across time (Wilson and Ahmed (2010)). Evidence suggests that the pre-crisis build-up of imbalances was driven primarily by trends in saving rather than investment. There are plainly a multitude of factors likely to affect cross-country saving rates that we could not possibly hope to model with precision. Nevertheless, a key medium-term driver of saving rates about which we can be relatively certain in the period ahead is demographic trends.

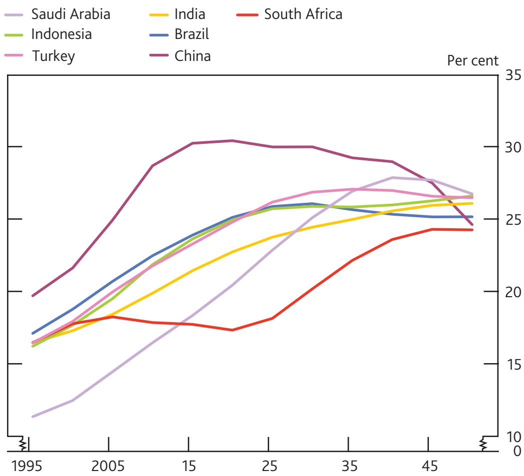
As discussed in Section 2, saving rates are most highly correlated across developed and advanced countries with the share of the population aged between 40 and 59. Accordingly we define this as our 'prime savings' cohort. Population structure is quite variable across industrialised countries. Age structures are set to change sharply around the world in the coming years — the middle-aged share of the population has now peaked in the West but will grow in emerging markets (**Charts 19** and **20**). The increases in the share of prime savers for EMEs are especially striking — in Brazil, India, Indonesia, Mexico, South Africa and Turkey the shares all rise from around 15%–17% in 1995 to about 25%–27% in 2050. In Saudi Arabia, the share rises from 11% in 1995 to 27% in 2050.

Chart 19 Share of population aged 40–59, advanced economies



Sources: US Census Bureau and Bank calculations.

Chart 20 Share of population aged 40–59, EMEs



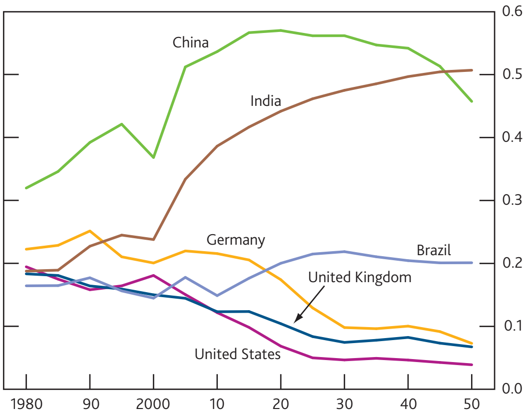
Sources: US Census Bureau and Bank calculations.

On a GDP-weighted basis, the share of 'prime savers' declines in these simulations. This indicates that the demography-induced reduction in developed world saving may outweigh demography-induced increase in saving in the rest of the world.

Differences in population structure actually explain about 30% of the cross-sectional variation in national saving rates in 2010 (**Chart 1**). A 1 percentage point rise in the share of prime savers raises national saving by 1.94 percentage points. We can use this relationship to illustrate potential future pressures on the global pattern of saving. Importantly, we abstract from obvious factors which would influence these trends such as later retirement dates in developed countries and widening social safety nets in EMEs. Although these are very likely to occur, the precise timing and impact are difficult to predict.

Based on demographic and convergence trends alone, saving rates in the BRICs, already high, are simulated to continue to rise. For example, the saving rate in India increases by 10 percentage points of GDP to 50% by 2050, as demographics push a larger fraction of the population into the prime savings cohort (**Chart 21**). Among developed countries, meanwhile, these trends are reversed with further demography-induced falls in saving rates. Given the rising income share of the BRICs, these patterns are even more dramatic when we consider country shares of future global saving. Chinese saving rises to represent around 35% of global saving by 2050 (**Chart 22**). Over the same period, the US share of global saving continues its descent to below 5% by 2050.

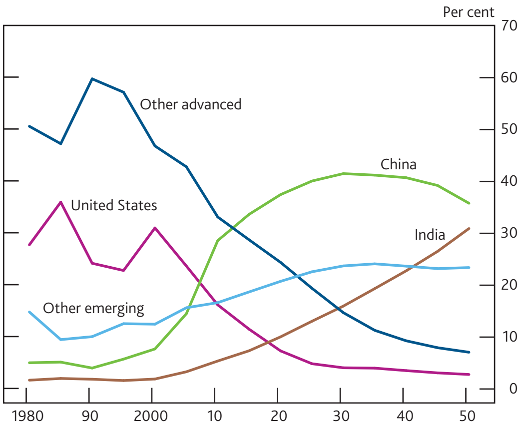
Chart 21 Saving rates by country[(a)]



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

(a) Gross national saving as a percentage of nominal GDP.

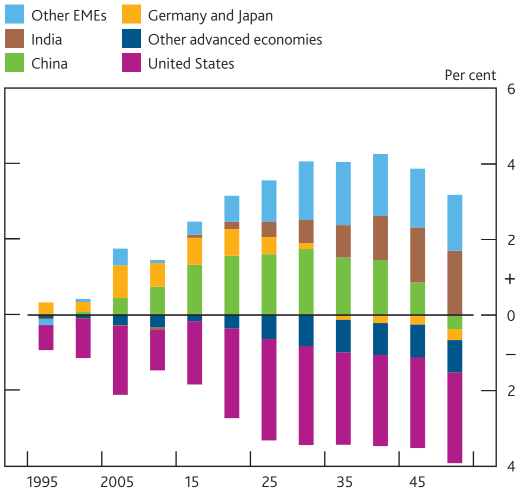
Chart 22 Share of total G20 saving



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

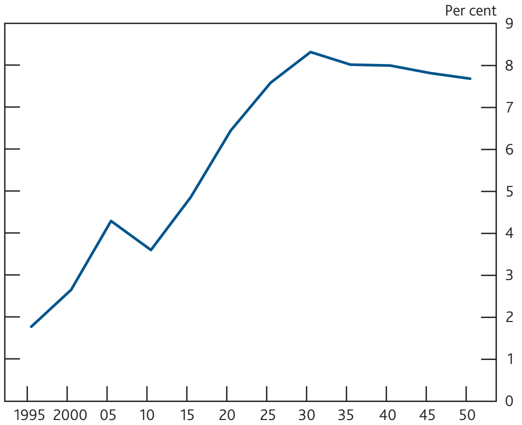
The effect of changes in saving rates on current accounts and global imbalances of course depends on investment rates as well. But providing a simple model of investment to include in our simulations is hampered by the absence of any significant relationship between demographics and investment rates.[(1)] As such, for simplicity's sake we assume that investment rates remain fixed at 2010 levels, but that saving rates evolve as per our projections. In these simulations, current account balances would evolve as shown in **Charts 23** and **24**.

Chart 23 Global imbalances (current accounts in per cent of world GDP)



Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

Chart 24 Global imbalances (absolute sum of G20 current account balances in per cent of world GDP)



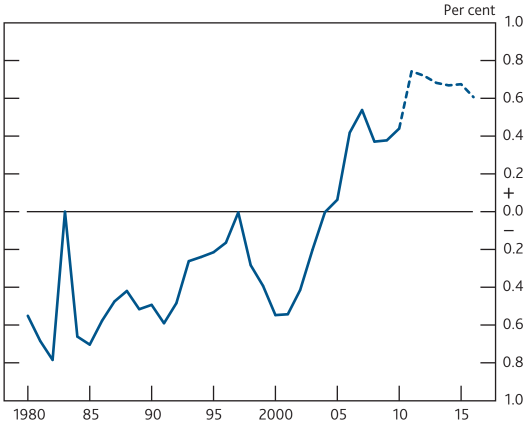
Sources: Updated and extended version of the External Wealth of Nations Mark II database developed by Lane and Milesi-Ferretti (2007), IMF, Penn World Table, US Census Bureau and Bank calculations.

Plainly, the simulation of net flows introduces even more uncertainty, given that the direction of flows and adding up constraints would ideally be modelled. The sum of global current account balances must equal zero, even though this is

(1) In a similar exercise, McKinsey Global Institute (2010) model the link between growth based on the 'rule of 2.5', noting that the cross-country average capital-output ratio is 2.5 and for most countries the ratio ranges between 2 and 3, regardless of GDP per capita.

not the case in reported current accounts today (**Chart 25**).[1] Rather than try to model such constraints, we ignore them, in effect simply assuming that any change in the G20's overall balance is with its balance against non-G20 countries. As such, this is partial equilibrium analysis, intended only to give a sense of the relative scales and directions of imbalances. The future may well look quite different.

Chart 25 Global current account discrepancies (per cent of world GDP)



Sources: IMF *World Economic Outlook* and Bank calculations.

Putting aside those caveats, global imbalances, as approximated by the sum of current account deficits and surpluses, rise rapidly until 2030, and fall back only modestly thereafter (**Chart 24**). Some interesting country dynamics also arise. Deficits continue to rise for the United States and other advanced countries which are currently in deficit. The Chinese current account surplus grows initially but by 2050 China is in deficit. This is illustrative of the powerful force of demographics, as the result is driven by a drop off in China's share of 'prime savers' from around 30% in 2035 to below 25% in 2050. Similarly, India's powerful demographic trajectory transforms the country from its current status as an EME deficit country into the largest surplus country by 2050. Germany and Japan — the current major advanced surplus countries — see shrinking surpluses and ultimately deficits — a result of ageing populations and a lower share of 'prime savers'.

Overall, it is important to note that the tendency for capital to flow 'uphill' and the resultant global imbalances may not be a recent anomaly. On the basis of demographic trends alone, our simulations indicate that they might continue into the future, absent any countervailing forces to offset them.

4 What other factors might influence the path of external balance sheets and capital flows?

As we have reiterated, there are many drivers of gross and net capital flows which we have not sought to simulate in this paper. Our focus has been to expose the influence of a small number of key underlying drivers. This section discusses qualitatively some, but by no means all, of the other factors that will influence the path of external balance sheet sizes and positions in the future. Some would temper the scale of increases in external balance sheets which our simulations show; others may intensify the degree of financial globalisation in the coming years.

First, we do not consider differences in countries' exchange rate policies. While we do account for exchange rate changes in our GDP simulations — exchange rates are assumed to appreciate with GDP growth, as dictated by the Balassa-Samuelson effect — this effect is applied uniformly across all countries. That is, we do not account for the fact that some countries in our sample do not have fully floating exchange rates, or the possibility that some countries could change their exchange rate regimes in the future.

In general, our simulations of the future are based on relationships of the past and thus implicitly assume that the same relationships will hold going forward. For example, we assume that the future relationship between income and the size of external balance sheets is based on the past relationship. In our simulations, we made the conservative assumption that, going forward, there is no more financial globalisation controlling for the level of income. That is, we do not account for the potential diminution in advanced countries' home bias — above and beyond that which can be explained by income — as discussed in Section 2.

However, as the evidence in Section 2 showed, there is a systematic tendency for both advanced country and emerging market investors to over-invest in home markets. Moreover, there is evidence of an 'anti-EM bias' in which advanced countries tend to under-invest in EMEs relative to the world market portfolio even more than they under-invest in other advanced countries.

These features of the international allocation of capital will surely evolve in the future, in ways which we do not attempt to incorporate in our simulations. As discussed in Section 2, financial depth has a relationship with the international allocation of capital. As EMEs grow, they will also develop deeper, more liquid financial markets, especially local debt markets. A number of financial centres are developing in EMEs,

(1) See Box 1.5, IMF *World Economic Outlook*, October 2009 for detailed discussion.

for example in Shanghai, which will provide greater access to credit. Such developments would tend to increase EME home bias to begin with, as opportunities for domestic investment improve. But a by product of this will also be greater investor sophistication and understanding of foreign investment opportunities (in equity, for example) which might ultimately decrease EMEs' home bias.

Advanced countries, for their part, have significant potential to reallocate both debt and equity investment abroad — and to EMEs in particular. That would be driven not only by relative growth prospects but also the increasing size of financial markets in EMEs. Consider the extreme situation when all home bias is eliminated and every country's investors hold assets in accordance with the world market portfolio. Advanced country investors would need to invest substantially more abroad to not only correct for existing biases but also to keep up with EMEs increasing share in world market capitalisation.

Haldane (2011) discusses these trends in greater depth, noting tensions between the speed with which EMEs' capital markets are widening and deepening and the extent to which international investors are seeking to diversify their portfolios into EMEs to spread risk and boost returns. Imbalances between the rate at which international capital is distributed and absorbed could have important implications for the international financial and monetary system. The results of Haldane's simulations of future changes in home bias and future market capitalisation imply an intensification of pressure on the absorptive capacity of EME capital markets.

In addition to assuming past relationships hold, there are a number of factors that are likely to have a material impact on capital flows in the future which we simply do not incorporate at all. These principally relate to policies and discretionary action by authorities which we cannot simulate in any meaningful way. A prime example is that we take no account of countries' varying and changing degrees of capital account openness. Each country's rise in external assets and liabilities is derived in the same way, with no regard for policies that may remain in place, be relaxed, or be subsequently put in place to influence the scale and flow of capital across borders.

We do not consider policies that might influence saving behaviour, such as development of social safety net policies in countries like China and India which will occur as these countries' incomes rise.

In our simulations, saving rates are driven solely by demographics. But there are a host of other non-demographic determinants of saving behaviour. Cultural attitudes are also sometimes argued to be a key determinant of saving behaviour. According to Wei and Zhang (2009), a Chinese cultural preference for sons due to the one child policy of population control, is the driving force in raising the saving rate. It might also be that differences in agents' rate of time preference explain saving imbalances (Buiter (1981)).

5 International capital flows and UK financial stability

Notwithstanding these caveats, it is not difficult to envisage a future world in which the increasing integration of EMEs into the global economy is accompanied by a substantial rise in the size of gross international capital flows. A rise in the magnitude of gross capital flows would further increase financial interconnectedness, leaving the most interconnected countries — including the United Kingdom — more exposed to shocks from elsewhere in the system, *and* more likely to act as conduits for spreading risk. But larger flows may also be associated with larger surges and reversals, increasing the likelihood of disruptive shocks occurring in the first place. While we do not seek to model volatility of capital flows in this paper, it must be true that for a given probability of reversal, the impact of that reversal will be greater the larger the scale of capital flows.

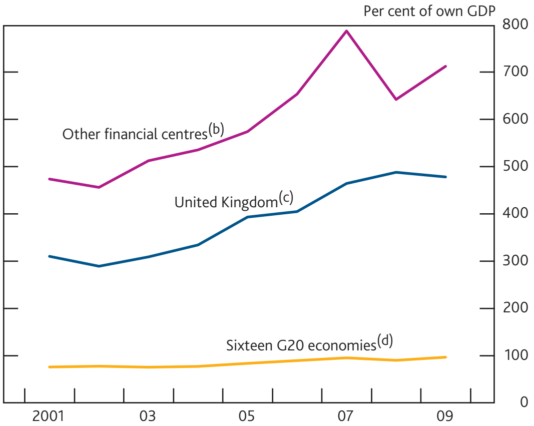
Developments in the size and volatility of global capital flows are linked to UK financial stability both directly and indirectly. Direct links operate via the United Kingdom's very large gross external balance sheet position, in turn a function of its role as a global financial centre. A more indirect set of channels operate via the International Monetary and Financial System (IMFS), and in particular, through interactions between global capital flows and various *frictions* that inhibit orderly adjustments to imbalances across countries (Blanchard and Milesi-Ferretti (2009)).

5.1 Direct channels — the UK balance sheet

The United Kingdom's gross external balance sheet (measured as the average of the economy's gross financial assets and liabilities) amounted to around 480% of GDP in 2009, up from about 300% in 2001.(1) Both the rapid expansion and the large size of the United Kingdom's gross external balance sheet are noteworthy by G20 standards. For the 16 other G20 countries for whom time-series data are available, the average gross financial asset/liability position has risen modestly, from just over 75% of own GDP in 2001 to almost 100% in 2009 (**Chart 26**). The UK experience is more comparable with other major financial centres such as Switzerland, Hong Kong and Singapore. On average, the gross external balance sheets of these economies rose from around 475% of own GDP in 2001 to almost 800% in 2007, before falling back to about 700% by 2009.

(1) This measure excludes financial derivatives, as these data are currently only available from 2006. In order to make international comparisons, no valuation adjustments are made to the UK data. For a discussion of measurement issues relevant for the UK international investment position, see Whitaker (2006).

Chart 26 Gross external balance sheets(a)



Sources: IMF *International Financial Statistics* and *World Economic Outlook*, ONS and Bank calculations.

(a) Average of gross external assets and liabilities, no valuation adjustments are made to IFS data.
(b) Average of Hong Kong, Singapore and Switzerland.
(c) IFS data adjusted to exclude financial derivatives, as data only available from 2006.
(d) Average of all other G20 economies excluding China and Saudi Arabia.

The United Kingdom's position as a large external debtor *and* creditor means that UK financial stability can be affected by financial shocks from abroad, on both the asset and liability sides of the balance sheet. On the asset side, gross capital outflows from the United Kingdom amount to an acquisition of claims *on* foreign residents, exposing UK-domiciled financial institutions to credit and market risks in these countries. Examples of developments that could be interpreted as increasing the risk to UK financial stability would include an increasing share of outflows being directed towards relatively risky countries, or heightened credit and/or market risk in an economy to which UK-resident financial institutions are already exposed.

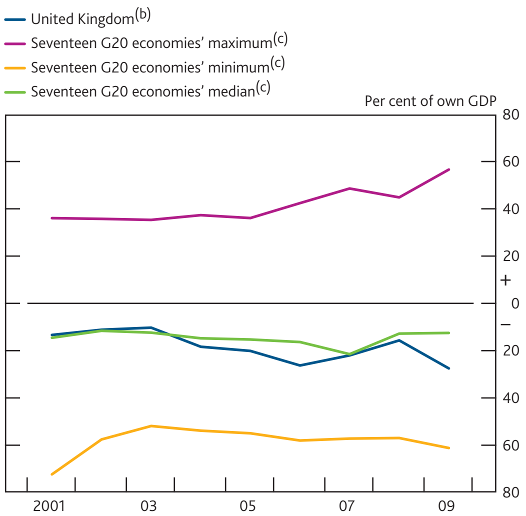
On the liability side, gross capital inflows to the United Kingdom amount to an acquisition of claims on UK residents *by* foreign residents — for example, foreign purchases of debt issued by UK-domiciled financial institutions or cross-border lending to the UK private sector. These transactions expose UK residents to liquidity, risk premia and interest rate shocks from abroad. These shocks could translate into funding difficulties for UK financial institutions, and if sufficiently severe, have adverse consequences for the supply of credit to the UK economy. These effects could be substantial — it is estimated that in the recent crisis, each 1% fall in external funding to UK banks led to a 0.5%–0.6% contraction in domestic credit (Aiyar (2011)).

Risks to domestic financial stability can arise even when resident institutions act merely as intermediaries of international capital flows — rather than as the ultimate source or destination of these funds. Even though the activities of these 'conduit' institutions may not have a direct effect on UK financial stability, they may have an indirect effect through their interactions with other resident institutions. For example, funding difficulties at a UK-domiciled 'conduit' institution could lead to broader strains in domestic interbank funding markets, and higher funding costs for all institutions — including those that provide financial services in the United Kingdom.

While the crisis has demonstrated how a *withdrawal* of capital inflows could impact on financial stability, a *surge* in capital inflows could also be a concern. This channel is more often associated with EMEs; however, capital flow 'bonanzas' may also be accompanied by more volatile macroeconomic conditions in advanced economies, which could have flow-on effects for financial stability (Reinhart and Reinhart (2008)).

The United Kingdom's *net* external balance sheet position is small relative to its gross position, and in comparison to some other G20 economies (**Chart 27**). However, this does not imply that the risks on the asset and liability sides of the balance sheet will also 'net out'. On the contrary, even if a country's net position is zero, mismatches in the composition of its external assets and liabilities — such as in maturity, currency or counterparty — can have significant implications for financial stability.

Chart 27 Net foreign asset positions(a)



Sources: IMF *International Financial Statistics* and *World Economic Outlook*, ONS and Bank calculations.

(a) Assets minus liabilities as a share of GDP. No valuation adjustments are made to IFS data.
(b) Excludes financial derivatives as data only available from 2006.
(c) All G20 economies, except for China and Saudi Arabia.

The offshore US dollar funding shortage that emerged in late 2008 provides a salient example of the risks posed by mismatches — in this case, *maturity* mismatches. European banks that had acquired large portfolios of relatively illiquid, long-term US dollar-denominated assets by relying on short-term US dollar borrowing and/or foreign exchange swaps found themselves exposed to significant liquidity pressures when strains in US interbank markets emerged following the Lehman collapse (Bank for International Settlements (2010)). Absent a significant policy response — most notably, the creation of a network of emergency central bank US dollar swap lines — many of these banks would have exhausted their supply of liquid assets, and may have been forced to cut lending or sell assets. In this example, it was the interaction between maturity mismatches and a shock to the market being used to fund these mismatches that led to financial instability.

5.2 Indirect channels — the IMFS

In addition to direct balance sheet channels, capital flows can also have an indirect effect on the United Kingdom via the IMFS. The risks are most often framed in terms of large *net* capital flows, which can contribute to the problem of global imbalances. However, large two-way *gross* capital flows can also transfer risk within the IMFS, even if the associated net flows are small. The risks created by international capital flows are typically more difficult to manage than those created by intra-national flows, owing to the combination of larger frictions and greater policy co-ordination problems in the international setting.

In a frictionless world, international capital flows would respond to the fundamental forces described in Section 2.1, and *net* inflows and outflows would be accommodated by smooth relative price adjustments. But where there are frictions, these net capital flows may be more prone to disruptive reversals, with adverse consequences for global financial stability.(1) The IMFS lacks an effective automatic mechanism to facilitate smooth adjustment of global imbalances (King (2011) and IMF (2011)). As a consequence, global imbalances — and their attendant risks — can build over time.

It is important to recognise that large two-way *gross* capital flows can also transfer risk within the IMFS, even if they are accompanied by very small (or even zero) net flows. These risk transfers can create pockets of vulnerability that could be transmitted around the IMFS through an increasingly complex network of financial linkages (Haldane (2009)). As a major financial centre within this network, the United Kingdom is therefore also exposed indirectly to the risks created by large gross flows between *third countries*.

To take a concrete example, in the latter half of 2010, there was some evidence that US investors had been buying relatively risky EME assets, while EME central banks had continued to purchase relatively safe US assets (Bank of England (2010)). This amounts to a risk transfer from EMEs to US investors, even though the net flows were small. If risks to EME assets were to materialise, there could be indirect effects on financial stability in the United Kingdom, even if direct balance sheet exposures were small. For example, if US investors' losses on their exposures to the affected EME assets were large enough to impair their ability to service their debt obligations to the rest of the world, this indirect channel would be potent.

6 Policy options

The challenge for policymakers is to simultaneously harness the (potentially large) benefits of capital flows and mitigate the financial stability risks that they present. In view of the potential magnitude of future flows and the complex set of channels through which risks could play out, formulating policy solutions to balance these objectives should be a priority.

6.1 Mitigating direct channels — countries' external balance sheets

In order to *mitigate* the direct financial stability risks posed by countries' external balance sheet exposures, it is first essential to *understand* the nature of those risks. In practice, this underscores the importance of eliminating data gaps. The G20 has commissioned the IMF and the Financial Stability Board to examine the key data gaps that came to light in the recent crisis, and to put forward proposals for addressing them. These efforts should be supported as a crucial first step.

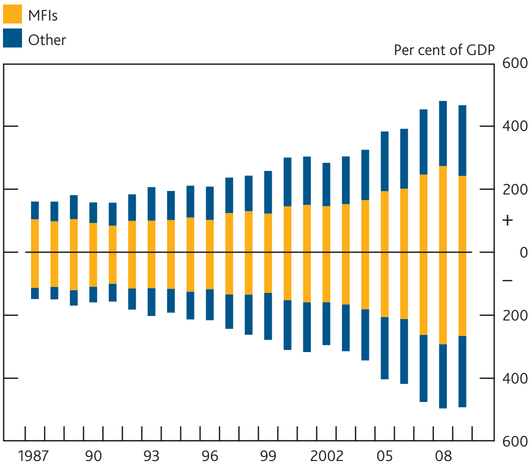
The next step is to implement policies to address the identified risks. But in order to do so, national policymakers should first have a good sense of what the objective should be — in effect, what the 'optimal' balance sheet structure looks like. A sensible starting point would be to develop policies which limit the build-up of balance sheet mismatches — in particular, maturity and currency mismatches — and the accumulation of excessive leverage. Measures to improve the structure of sovereigns' external balance sheets should also be considered.

The new Basel III international capital and liquidity regulations make some attempt to limit mismatches and leverage on *banks*' balance sheets, but additional country-level regulation — and in particular, macroprudential regulation — could also be required. If particular risks are identified from the structure of banks' external liabilities, macroprudential policies could be tailored to address them — for example, by placing restrictions on foreign exchange-denominated lending. Ensuring the soundness of financial institutions' balance sheets is of paramount importance for countries like the United Kingdom, where monetary financial institutions (MFIs) account for a sizable share of international asset and liability positions (**Chart 28**). But tighter future regulation of banks could also incentivise leakages to the non-bank sector, emphasising the need to consider a wider range of policies.

Faced with further increases in the magnitude and/or volatility of capital flows, it is likely that some countries will choose to introduce capital controls. The possibility that capital controls will feature more heavily in some countries' policy frameworks — and the potential for these policies to have spillover effects

(1) These channels are discussed in greater depth in Bush, Farrant and Wright (2011).

Chart 28 UK international investment position by sector[(a)]



Sources: IMF *World Economic Outlook*, ONS and Bank calculations.

(a) Gross assets shown as a positive value, gross liabilities shown as a negative value. Excludes financial derivatives.

on other countries — underscores the importance of developing 'best-practice' guidelines in this area.

6.2 Mitigating indirect channels — IMFS reforms

While individual countries can introduce measures to reduce their direct exposures to large and volatile capital flows, a comprehensive policy solution would also seek to minimise indirect exposures through the IMFS. International policy co-ordination is likely to be particularly important in this context, as these risks are often transmitted in the form of adverse spillovers from individual countries' domestic policies (King (2011)).

As discussed in Section 5, these spillovers are more likely to create financial stability concerns when global capital flows are caused by, or interact with frictions. Policies to deal with these frictions could therefore play an important role in managing the indirect impact of global capital flows on domestic financial stability. Reforms to eliminate missing markets are one promising avenue — for example, by encouraging the development of EMEs' domestic financial markets or improving their access to external insurance facilities. Financial regulatory reform to reduce asymmetric information problems in all countries is also critical. These and other measures are discussed further in Bush, Farrant and Wright (2011).

7 Conclusion

The increasing integration of large EMEs into the global financial system will almost certainly be associated with a dramatic increase in the scale of international capital flows over the medium to long term. While it is impossible to predict precisely how these events will unfold, it seems clear that capital flows will continue to pose risks to financial stability around the world for some time to come.

The key challenge for policymakers is not only to mitigate these financial stability risks, but also to preserve the key benefits that financial globalisation has to offer. To balance these objectives, it will be crucial to understand and analyse the key drivers of these flows, and the numerous channels through which they can have an impact.

This is clearly a challenging task, not least because the global nature of the problem will demand a co-ordinated policy response. But while policy co-ordination will be a crucial element of any first-best policy response, individual countries may also be able to introduce unilateral measures to mitigate their vulnerability to large and volatile capital flows — including through macroprudential measures.

Although the policy challenge is considerable, the experience of the recent crisis shows that the stakes are already high. But if — as the simulations presented in this paper suggest — global capital flows grow to dwarf those experienced in the lead-up to the 2007–08 crisis, the stakes will become higher still.

Annex

Table A1 Current account balance and demographics

Linear regression

Number of obs.	93
F (7, 85)	5.01
Prob >F	0.0001
R-squared	0.2843
Root MSE	2.9452

Dependent variable: cab	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
gdp	-0.0002	0.0000	-3.1800	0.0020	-0.0003	-0.0001
ps	0.3419	0.1849	1.8500	0.0680	-0.0257	0.7095
yp	-0.0303	0.0650	-0.4700	0.6430	-0.1595	0.0990
d1985	-2.8228	1.3409	-2.1100	0.0380	-5.4888	-0.1567
d1990	-1.8772	1.4696	-1.2800	0.2050	-4.7993	1.0448
d1995	-2.6372	1.3727	-1.9200	0.0580	-5.3666	0.0921
d2000	-1.7473	1.2254	-1.4300	0.1580	-4.1837	0.6891
c	-2.5259	6.6642	-0.3800	0.7060	-15.7761	10.7243

Notes: Data observed at five-year intervals between 1985 and 2010 inclusive.
cab is the current account balance as a share of GDP (five-year average).
gdp is nominal annual GDP per capita (measured in US dollars).
ps is the share of the population aged between 40–59 ('prime savers').
yp is the share of the population aged between 0–24 ('young population').
d1985, d1990, d1995 and d2000 are time dummies for the years 1985, 1990, 1995 and 2000 respectively.

Sources: Current account and nominal GDP data are sourced from the IMF *World Economic Outlook*; Population data are sourced from the UN World Population Prospects Population database.

Table A2 Pooled OLS regression of external balance sheet size and real GDP per capita

Linear regression

Number of obs.	897
F (4, 893)	55.80
Prob >F	0.0000
R-squared	0.3238
Root MSE	1.0944

Dependent variable: eb	Coef.	Robust Std. Err.	t	P>|t|	[95% Conf. Interval]	
lgdp	-74.7368	19.4408	-3.84	0.000	-112.892	-36.582
lgdpsq	7.1214	1.9741	3.61	0.000	3.247	10.996
lgdpcu	-0.2220	0.0665	-3.34	0.001	-0.353	-0.092
G20	-0.7184	0.0909	-7.90	0.000	-0.897	-0.540
c	258.2522	63.5057	4.07	0.000	133.6141	328.8903

Notes: Data observed on an annual basis between 2000 and 2007 inclusive.
eb is the external balance sheet size, measured as the average of external assets and liabilities as a share of nominal GDP.
lgdp is log of real GDP per (working-age) capita (measured in PPP terms).
lgdpsq is lgdp squared.
lgdpcu is lgdp cubed.
G20 is a dummy variable with a value of one for G20 countries and zero otherwise.

Sources: External assets and liabilities and nominal GDP data are sourced from the Lane and Milesi-Ferretti External Wealth of Nations Mark II database, and real GDP per working-age capita data are sourced from Heston, Summers and Aten, Penn World Table Version 7.0.

Table A3 Real GDP per working-age capita (2010 market exchange rates)

	Argentina	Australia	Brazil	Canada	China	France	Germany	India	Indonesia	Italy	Japan	Mexico	Russia	Saudi Arabia	South Africa	South Korea	Turkey	United Kingdom	United States
2010	14,091	84,653	15,530	67,939	6,018	61,416	60,980	2,030	4,393	53,412	67,177	14,232	14,652	25,518	11,044	28,489	14,247	54,641	70,598
2015	18,628	92,099	19,323	75,179	8,507	68,206	67,796	3,045	6,111	59,942	74,271	18,094	19,095	31,735	14,127	34,381	17,905	61,286	77,946
2020	24,197	100,322	23,846	83,179	11,805	75,724	75,345	4,497	8,385	67,201	82,110	22,770	24,517	38,956	17,892	41,166	22,302	68,668	86,059
2025	30,916	109,400	29,197	92,019	16,081	84,047	83,706	6,532	11,352	75,266	90,771	28,375	31,037	47,261	22,451	48,930	27,544	76,868	95,016
2030	38,900	119,420	35,487	101,787	21,513	93,260	92,964	9,327	15,167	84,225	100,343	35,029	38,771	56,727	27,922	57,763	33,745	85,970	104,905
2035	48,262	130,479	42,831	112,580	28,280	103,458	103,214	13,090	20,001	94,171	110,918	42,859	47,838	67,440	34,434	67,763	41,027	96,072	115,823
2040	59,113	142,684	51,357	124,503	36,559	114,743	114,560	18,047	26,042	105,210	122,603	51,998	58,354	79,490	42,126	79,036	49,521	107,279	127,878
2045	71,566	156,152	61,201	137,677	46,526	127,231	127,119	24,446	33,488	117,458	135,513	62,586	70,441	92,978	51,146	91,696	59,367	119,708	141,188
2050	85,737	171,014	72,508	152,230	58,350	141,049	141,019	32,543	42,547	131,044	149,777	74,770	84,223	108,015	61,654	105,867	70,715	133,487	155,883

Table A4 Nominal GDP (US$ billions)

	Argentina	Australia	Brazil	Canada	China	France	Germany	India	Indonesia	Italy	Japan	Mexico	Russia	Saudi Arabia	South Africa	South Korea	Turkey	United Kingdom	United States
2010	370	1,236	2,090	1,574	5,878	2,583	3,316	1,538	707	2,055	5,459	1,039	1,465	444	357	1,007	742	2,247	14,658
2015	569	1,541	3,052	1,947	9,324	3,161	4,041	2,776	1,169	2,493	6,299	1,568	2,006	661	493	1,366	1,108	2,784	18,353
2020	855	1,913	4,376	2,380	14,068	3,875	4,824	4,868	1,873	3,032	7,355	2,308	2,677	969	695	1,779	1,615	3,449	22,915
2025	1,261	2,367	6,153	2,887	20,902	4,756	5,670	8,285	2,915	3,632	8,633	3,309	3,534	1,419	969	2,215	2,307	4,221	28,496
2030	1,825	2,925	8,473	3,503	30,079	5,805	6,544	13,696	4,427	4,242	10,003	4,647	4,639	2,070	1,337	2,702	3,216	5,097	35,612
2035	2,585	3,615	11,464	4,326	41,563	7,060	7,582	21,990	6,562	4,890	11,377	6,397	6,094	2,976	1,834	3,262	4,395	6,172	44,970
2040	3,569	4,458	15,298	5,366	56,309	8,562	9,072	34,347	9,509	5,624	12,607	8,636	7,797	4,200	2,502	3,906	5,896	7,551	57,052
2045	4,799	5,504	20,132	6,629	76,100	10,484	10,901	52,365	13,516	6,615	14,175	11,512	9,765	5,797	3,381	4,661	7,772	9,271	72,376
2050	6,371	6,763	26,227	8,140	100,014	12,791	13,001	77,961	18,923	7,923	16,126	15,160	11,973	7,845	4,491	5,462	10,074	11,272	91,537

Table A5 Nominal size of external balance sheet (US$ billions)

	Argentina	Australia	Brazil	Canada	China	France	Germany	India	Indonesia	Italy	Japan	Mexico	Russia	Saudi Arabia	South Africa	South Korea	Turkey	United Kingdom	United States
2010	315	1,703	1,118	1,755	3,271	7,213	6,722	485	223	2,755	5,385	371	1,311	479	289	799	470	10,072	20,509
2015	610	2,374	2,089	2,557	5,866	8,821	8,564	733	254	3,816	7,537	1,033	2,240	895	481	1,482	1,048	12,424	28,884
2020	1,106	3,244	3,764	3,581	10,900	10,773	10,625	1,912	494	5,181	10,298	2,217	3,579	1,555	812	2,411	2,014	15,285	39,847
2025	1,895	4,365	6,452	4,868	20,054	13,116	12,898	5,199	1,183	6,807	13,770	4,136	5,463	2,586	1,326	3,552	3,523	18,527	53,948
2030	3,092	5,806	10,500	6,508	34,837	15,811	15,283	12,511	2,683	8,590	17,812	7,059	8,052	4,163	2,090	4,936	5,722	22,081	72,481
2035	4,816	7,648	16,326	8,730	56,267	18,894	18,067	26,630	5,482	10,558	22,243	11,275	11,591	6,456	3,196	6,602	8,779	26,293	97,315
2040	7,158	9,969	24,419	11,621	86,388	22,374	21,907	51,256	10,197	12,794	26,691	17,067	15,920	9,644	4,750	8,567	12,843	31,493	129,957
2045	10,176	12,904	35,249	15,238	128,710	26,559	26,496	91,057	17,581	15,683	32,108	24,831	21,023	13,863	6,845	10,879	18,023	37,661	171,953
2050	14,056	16,497	49,411	19,671	182,034	31,151	31,570	151,163	28,567	19,380	38,673	34,910	26,750	19,268	9,514	13,358	24,358	44,346	224,854

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