Mapping global gross capital flows through 2030*

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Abstract
This background paper for the World Bank report Global Development Horizons: Capital for the Future documents the methodology behind the scenarios of gross capital inflows presented in the third chapter. A model of gross capital inflows across countries and time is estimated econometrically, and used to project gross capital inflows country by country (or residual region) to build a global picture of gross flows through 2030. We map the global pattern of gross capital flows under two scenarios, assuming different speeds of convergence for developing countries in terms of economic growth, financial market development, and integration. Under both scenarios—gradual and fast convergence—we project that, by 2030, developing countries will account for a significantly greater share of global gross capital inflows, and, by implication, outflows.

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I. Introduction

The post-war era of financial globalization was characterized by a strong upswing in international capital flows, mainly between a small number of advanced economies at the core of the Bretton Woods system. In the mid-1990s, global gross capital flows began to grow much more rapidly than net flows and economic output. Initially, this trend also was mainly an advanced country phenomenon, but since the early to mid-2000s a number of developing countries have begun to follow a similar pattern.

While a fairly large body of literature has looked at determinants, trends, and projections of net capital flows, gross flows are surprisingly understudied. From the perspective of financial market development and integration, gross flows are a much more relevant metric than net flows. Net capital inflows, defined as the difference between total capital inflows and outflows, are a reflection of the difference between a country’s investment and savings, while gross capital flows more closely reflect behavior of foreign investors (gross capital inflows are defined as net purchases of domestic assets by foreign agents) and domestic agents (gross capital outflows are defined as net purchases of foreign assets by domestic agents). Capital flows encompass foreign direct investment (FDI); equity and debt portfolio investment; and “other investment,” mainly consisting of bank loans. On the outflows side, some flows are instead classified as reserve accumulation (primarily debt portfolio investment, from the perspective of the destination country). International financial integration implies growth in both gross capital inflows and outflows, *ceteris paribus*, as investors at home and abroad diversify and their countries share risk.

Given that volumes of gross capital flows have been growing much more rapidly than net balances globally, and that the path of gross flows is both an essential underpinning of investment and a potentially destabilizing force with important policy implications, thinking about how gross flows may evolve in the future is a valuable exercise. Greater gross flows to and from developing countries can mean greater diversification of risk, and improved access to finance for productive projects even taking net capital flows as given, since the composition of inflows and outflows tend to differ significantly. At the same time, there is evidence suggesting that in the presence of financial frictions, increasing international financial linkages can destabilize the system as a whole. Large inflows can lead to exchange rate misalignments, and contribute to domestic credit booms and busts (Alberola, Erce, and Serena 2012). Sharp changes of capital flows have triggered financial crises and sudden stops in many developing countries since the 1990s. The type of flow matters for stability as well; bank lending tends to be highly procyclical and generally less supportive of risk sharing than foreign direct investment (FDI) or equity portfolio investment (Committee on International Economic Policy and Reform 2012). Thus it is crucial to monitor the magnitude and composition of gross capital flows, understand the key drivers, identify emerging trends, and consider how gross capital flows may evolve in the future.

In this paper, we produce forecasts of gross capital inflows and outflows through 2030 in a three-step process. We focus on inflows, since these tend to face fewer restrictions and are probably less affected by foreign exchange regimes, and thus likely depend more on economic and institutional fundamentals. First, estimates of gross capital inflows are obtained from alternative specifications of a model capturing determinants along five broad categories: country-level demographic factors, domestic macroeconomic factors, country-level structural factors, global economic factors, and country group controls. The model is estimated for 158 developing and developed countries for the period 1980–2010.

Second, using the results of the preferred specification of the model (column 4 in table 1), forecasts of capital inflows to 172 countries through 2030 are constructed, treating countries in each
income group with distinct assumptions regarding the paths of the right-hand-side variables. These paths differ by scenario, and are drawn from two corresponding scenarios in Bussolo, Lim, and Maliszewska (2013), with the exception of one variable (openness) which does not appear in that model. The two scenarios considered are one with gradual convergence between developing and high income countries, and one with more rapid convergence.

Finally, estimates of gross capital outflows are inferred from the difference between gross inflows, and net flows (the current account) implied by projections of saving and investment obtained from Bussolo, Lim, and Maliszewska (2013).

The key result is that developing countries are likely to account for a much greater share of gross capital inflows and outflows than they do today. Under the gradual and rapid convergence scenarios, in 2030 developing countries will account for 47 and 60 percent of global gross inflows, respectively, up from 23 percent in 2010. This will be driven by relatively favorable demographic conditions and faster growth in developing countries, increased openness and greater scope for strengthening financial sector institutions in developing countries than in high income countries. A major factor will be the sheer increase in developing countries’ relative economic size; indeed, the increase in their gross capital flows does not appear as dramatic when measured against their output. Under the gradual convergence scenario, in 2030 developing countries’ gross capital inflows will be 6 percent of their GDP, roughly equal to its current level. Under the rapid convergence scenario, gross capital inflows to developing countries will reach 11 percent of GDP, somewhat greater than the historical peak of 9 percent in 2007.

The rest of the paper is organized as follows:

Section two reviews the literature on the determinants and projection of gross capital flows. Section three describes the data and the characteristics of gross capital flows for developing and developed countries since 1980. Section four presents the econometric analysis of the determinants of global gross capital inflows. Section five presents the projected paths of the determinants of capital inflows, describes the projection methodology, and presents the projections of global gross capital inflows and outflows. Section six concludes.

II. Literature review

There is a strong link between gross flows and the literature on home bias in international portfolios. It has been a longstanding stylized fact that international portfolio diversification has occurred much less than implied by models of risk sharing. Lucas (1990) compares international diversification to that predicted by a portfolio model, and reviews a range of possible sources of home bias. Kraay et al. (2000) incorporate sovereign risk in such a model to reconcile the predictions of the model to the data. Home bias is thought, broadly, to reflect frictions to capital reallocation; thus, a key aspect of financial integration is the reduction of frictions that impede international diversification, such as exchange rate and other capital controls, but perhaps even more importantly informational asymmetries. There is a strong connection between financial market development and financial integration, in large part due to the relationship between frictions to capital movements and financial institutions and structure. For example, as domestic stock and bond markets develop, as credit agencies are formed, and as accounting methods are standardized, informational asymmetries are reduced for foreign investors, and cross-border capital flows can be expected to increase. A reduction in frictions would imply a large increase in gross flows

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1 Bussolo, Lim, and Maliszewska (2013) model saving and investment in a computable general equilibrium (CGE) framework, using the Linkage CGE model (van der Mensbrugghe 2005).
into and out of a given country, as domestic agents diversify by sending capital abroad and foreign agents diversify by sending capital in. Advanced countries seem to have been following this pattern at least until the onset of the 2007-09 global financial crisis, as their financial markets integrated and gross flows expanded rapidly. More recently, developing countries have seen a dramatic expansion in inflows and outflows as well, suggesting a reduction in the frictions that give rise to home bias similar to that experienced in advanced economies. These changes might include, for example, the relaxation of exchange rate and other capital controls; standardization of accounting conventions; and, broadly, the regional and global integration of financial markets. In addition, the risk-adjusted return to investment has likely been rising relative to that in advanced economies, attracting foreign investors, due to robust economic growth, human capital accumulation, a growing working-age population, reduced policy uncertainty and expropriation risk, and broad improvements in governance.

Only a handful of literature has looked at gross inflows and outflows explicitly. Fernandez-Arias (1996) tests a portfolio allocation model against inflow data, distinguishing between “push” factors, proxied by US bond yields, and “pull” factors, proxied by the secondary market price of a country’s debt and a measure of its investment climate. Both are found to be important, but especially external returns. Taylor and Sarno (1997) and Mody, Taylor, and Kim (2001) extend this approach by accounting for a larger set of country-specific and global factors, including measures of financial market development and U.S. growth. Lane and Milesi-Ferretti (2001, 2007) document the global expansion of gross flows, and also a transition in the composition of emerging markets’ international balance sheets to a large FDI and portfolio equity component of liabilities, and heavy reserve accumulation on the asset side. Devereux (2007) examines this large two-way flow with a focus on East Asia, showing that over time it is getting closer to an efficient pattern of international risk sharing implied by a country portfolio model. Speller, Thwaites, and Wright (2011) project gross inflows and outflows based solely on scenarios of growth convergence and demographic change. Broner et al. (2011) document that gross flows are very large and volatile compared to net flows, and pay special attention to changes in gross inflows and outflows during crises and the heterogeneity in the behavior of domestic and foreign agents, building a case that asymmetric information and sovereign risk are important factors in explaining changes in flows in response to shocks. The Institute of International Finance (2013) estimates determinants of volumes of gross inflows to emerging markets, based on a varied set of domestic and external economic variables, and finds that both types matter.

The notion that asymmetric information is an important friction to the free flow of capital is also supported by research on the relationship between capital flows and geographic distance. A strong portfolio diversification motive for investing abroad might imply a positive relationship between the distance between countries and bilateral capital flows, since the correlation of business cycles tends to decrease with distance. However, Portes, Rey, and Oh (2001) and Portes and Rey (2005) find the opposite, that bilateral flows decrease with distance, with information asymmetries being the most likely explanation. They find that market size and transactions technologies are important. More direct proxies for informational frictions than distance also come in significant, for example telephone call volume, degree of overlap of trading hours, multinational bank branches, and an index of insider trading. These

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2 The push vs. pull approach built on research looking at the impact of external vs. domestic factors on capital flow reversals and sovereign debt prices; see Calvo, Leiderman, and Reinhart (1993), and Dooley, Fernandez-Arias, and Kletzer (1996).
results suggest a strong link between the expansion of gross flows, and integration via overcoming informational problems.\(^3\)

Economic theory indeed suggests that market size and integration can raise asset returns, and thus stimulate gross capital inflows. For example, Martin and Rey (2004) build a theoretical model incorporating transaction costs, in which financial assets are imperfect substitutes and the number of assets is endogenous, which gives rise to a link between market size and integration, and asset returns.\(^4\) Thus, a country’s levels of financial market depth and integration may have multiple roles to play in attracting capital inflows. Innovation and structural change in financial markets can reduce informational frictions and other types of transaction costs; and growth in the scale of financial markets, and an increase in the share of firms and households with access to credit and financial services, can increase the effective market size, offering international investors higher returns and greater opportunities for diversification.

The large literature on net capital flows is also pertinent, notwithstanding that not all of the factors that drive net capital flows are relevant to gross flows, and the mechanisms by which a given variable impacts gross and net flows can differ in important ways. One strand of research has focused on the relationship between demographics and capital flows. Relatively young populations should experience greater investment demand due to a growing labor force, and thus attract capital inflows, whereas countries with older workforces should save more, and accumulate foreign assets in the face of slower expected growth (Higgins 1998; Lane and Milesi-Ferreti 2002). This highlights that the impact of demographic change not only on net capital flows, but also on gross inflows and outflows, depends on the degree of openness, since saving and investment can only diverge to the extent that capital is able to flow into and out of the country.

There are even fewer studies that provide medium to long term projections of gross capital flows. Speller, Thwaites, and Wright (2011) project gross inflows and outflows through 2050, based solely on scenarios of growth convergence and demographic change. Over the shorter run, Mody, Taylor and Kim (2001) provide two-year forecasts of gross capital inflows to 32 developing countries using a vector error correction framework based on the Fernandez-Arias and Montiel (1996) model, and the Institute of International Finance (2013) builds 2-year projections through 2014, with a focus on the aftermath of the 2007-09 global financial crisis and the ongoing euro area debt crisis.

Due to a lack of full-fledged and well accepted theories of the drivers of gross capital flows, in this paper we settle for a less structured approach to identify the medium to long term determinants of gross capital flows based on the existing relevant theoretical and empirical literature discussed above, incorporating both a broad set of push (country-level) and pull (global) factors. This paper is supportive of previous research in that it finds that greater capital inflows are associated with indicators of financial development and globalization (domestic credit to the private sector as a percentage of GDP and an index of de jure capital account openness), as well as with higher GDP growth, a lower dependency ratio, human capital accumulation, and global liquidity and risk measures.

\(^3\) A growing body of literature supports the idea that informational asymmetries are important in explaining international capital flows; also see, for example, Kang and Stulz (1997), Ahearne, Griever and Warnock (2004), and Leuz, Lins and Warnock (2009).

\(^4\) Another formal model of how greater integration of financial markets can drive an expansion of capital flows is developed by Evans and Hnatkovska (2005); the model implies a relationship between integration and changes in the composition and volatility of capital flows as well.
III. The Data on Capital Flows

To analyze and project patterns of global gross capital flows over the next two decades, we begin by compiling a comprehensive historical dataset on gross flows, both aggregate and by component, and potential determinant variables including country specific macroeconomic and structural variables and a set of global factors. The dataset is constructed on an annual basis for 1980 through 2010.5

The capital flows data are drawn from the IMF Balance of Payments Statistics (BOPS) database, and encompass FDI, portfolio investment, and other investments (primarily bank loans), from both the liabilities (inflows) and assets (outflows) sides of the financial account of the Balance of Payments (BOP), and also official reserve accumulation on the outflows side.6 Gross capital inflows (GKFI) to a country are defined as non-residents’ purchases of domestic assets net of non-residents’ sales of domestic assets, or the sum of all liability flows under the financial account of the BOP; gross capital outflows (GKFO) from a country are domestic residents’ purchases of foreign assets net of residents’ sales of foreign assets, or the additive inverse of the sum of all asset flows under the financial account of the BOP.7 A country’s net capital flow (NKF) is then defined as gross capital inflows minus gross capital outflows, as shown by the following identity:

\[ NKF = GKFI - GKFO \]

Figure 1 documents global gross capital flows from 1980 to 2010, disaggregated by destination into advanced and developing country groups.8 Two trends are notable. First is the striking, long-term expansion in gross capital flows. From 1990 to a peak in 2007, the sum of high income countries’ gross capital inflows and outflows grew tenfold, compared to a less than fourfold increase in trade flows (imports plus exports) and a less than two-and-a-half-fold increase in nominal GDP over that period. This long term expansion was followed by a dramatic collapse during the global financial crisis of 2007-2009. At the peak in 2007, total gross capital flows amounted to $11 trillion—an amount equivalent to 19 percent of world GDP—up from $0.4 trillion in 1980 and approximately $3.7 trillion in 2000. At the nadir in 2009, gross flows had dropped to $1.8 trillion.

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5 For certain countries, data are not available for the whole sample period. Countries with missing data are in general closed economies or small economies that do not use a standard balance-of-payments statistical system. This missing data problem is minor.

6 There are also derivative flows under the BOP financial account, but these are excluded from our analysis, since data on derivative flows are available for only a small number of countries. These flows are typically small in any case (by the available data, $40 billion globally in 2011, about 1% of global gross capital flows), particularly for developing countries.

7 In the Balance of Payments, sources of foreign exchange such as capital inflows and exports are denoted as credits, with a positive sign, whereas uses of foreign exchange, such as capital outflows and imports, are denoted as debits, with a negative sign (International Monetary Fund 2009).

8 Globally, total inflows should equal total outflows. In practice, there is some discrepancy in the data. Here, total global flows are approximated by summing inflow rather than outflow data.
The second pattern clearly visible in Figure 1 is that, while historically the expansion in gross capital flows was driven mainly by flows between advanced countries, recently developing countries have begun to play a greater role. By 2007, 11 percent of gross capital inflows went to developing countries, up from 4 percent in 2000 (and about 2 percent in the 1980s). Capital flows to and from developing countries were much less affected during the crisis than flows in and out of advanced countries, and briefly, during the most acute phase of the crisis, inflows to developing countries comprised the majority of the global total. But the growing importance of developing countries in international finance is not a story of a transitory shock; even as high income countries’ flows have begun to recover in the immediate post-crisis years, developing countries’ collective share of global flows is significantly greater than a decade ago, although still not commensurate with their share of global output, growth, and trade.

The current acceleration of gross capital flows into and out of developing countries has a precedent in the experience of high-income economies. From 1990 to 2007, high income countries’ gross capital inflows and outflows expanded far more rapidly than their trade flows or output. The more recent expansion in inflows and outflows for developing countries suggests a similar reduction in frictions and improved attractiveness to foreign investors, corresponding to broad improvements in governance and transparency, and steadily increasing regional and global integration of developing countries’ financial markets.

Developing countries typically receive mainly equity inflows, while their outflows tend to go to relatively safe securities, so that a disproportionate amount of risk is borne abroad (compensated for by higher returns on foreign liabilities than on foreign assets). Thus, improved access to foreign capital means that investment projects can go ahead despite residents’ relatively low tolerance for risk, and without the country necessarily borrowing on net. Large gross flows can be destabilizing, though; cross-border banking flows, in particular, are volatile and highly procyclical, potentially magnifying risk instead of spreading it (Committee on International Economic Policy and Reform 2012).

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9 Didier, Hevia, and Schmukler (2011) show more broadly, however, that the crisis impacted economic conditions in high income and developing countries similarly when differences in pre-crisis growth rates are accounted for, and also that there was wide variation among developing countries, with Eastern European countries among the most affected, and low income countries relatively isolated from the global crisis.
IV. Econometric analysis of the determinants of global gross capital inflows

An econometric model is specified with gross capital inflows (as a share of GDP) as the dependent variable. The working age share of the population is included as one of the key variables of interest. Capital account openness is also included, and in one specification the working age share of the population is interacted with capital account openness. Other key country-specific variables included in the model are measures of financial market development, growth, and education. It is intuitive that financial market development potentially reduces frictions to capital movements. Likewise, it is intuitive that growth matters for expected returns to investment, and it is commonly included in empirical models of the determinants of net capital flows or international positions (for example, Devereux 2007). Similarly, improvements in educational attainment of the work force can be expected to raise the marginal product of capital and returns to investment (Lucas 1990). In addition to these country level factors, the model includes a set of global factors.

All factors are explicitly specified in the model:

\[ Y_{it} = \alpha_i + \beta_1 \text{Demog}_{it} + \beta_2 \text{Econ}_{it} + \beta_3 \text{Struct}_{it} + \gamma \text{Global}_t + e_{it}. \]

The dependent variable, \( Y_{it} \), is the volume of gross capital inflows (FDI, portfolio flows, and bank lending) as a share of GDP of country \( i \) at time \( t \). The categories of independent variables are constructed as follows:

- \( \text{Demog}_{it} \) denotes a vector of demographic variables representing country \( i \) at time \( t \), including:
  - Share of working-age population (ages 20–64), to directly capture the impact of the age structure of a country’s population on capital inflows;
  - Tertiary school enrollment (% gross), as a proxy for quality of the labor force, which has been suggested in the literature to be an important determinant of productivity.

- \( \text{Econ}_{it} \) denotes a vector of economic variables representing country \( i \) at time \( t \), including:
  - Real GDP growth (%), which affects investors’ expectations of medium to long-run rates of returns to investment in the country;
  - International trade (% of GDP), measured as the sum of exports and imports as a percentage of GDP, and included in some specifications because it is one measure of a country’s integration with the rest of the world.

- \( \text{Struct}_{it} \) denotes a vector of structural variables that facilitate capital flows or influence the efficiency of capital allocation in country \( i \) at time \( t \), including:
  - Domestic credit extended to private sector (% of GDP), a measure of the level of domestic financial sector development;
  - Chinn-Ito index score, a measure of de jure capital account openness (Chinn and Ito 2006);
ICRG, averaged indices of political risk from domestic corruption and lack of law and order (the higher the measure, the lower the risk).

Global, denotes a vector of global factors at time t, including:

- G7 GDP-weighted average growth rate, a measure of the global business cycle;
- U.S. federal funds rate, a measure of the cost of capital;
- Difference between 10-year U.S. Treasury bond and 3-month U.S. Treasury bill yields, a proxy of the market perception of risk in advanced economies.

A set of country group dummy control variables is included in the model, as follows:

- Euro, which equals one, for all years, for countries in the euro area as of January 2013;
- LIC, LMC, and UMC, which equal one if a country is low income, lower middle income, or upper middle income, respectively, based on current World Bank country income level classifications, and zero otherwise.

Data used in the regressions is drawn from the World Bank’s World Development Indicators and Global Economic Monitor databases, the UN Department of Economic and Social Affairs Population Division, the IMF Balance of Payments Statistics database, Chinn and Ito (2006), and the U.S. Federal Reserve. For each country, capital inflows are measured as the sum of the flows under financial account liabilities in the balance of payments.\(^\text{10}\)

The econometric work underlying our forecast of capital flows finds that greater capital inflows are associated with faster growth, financial development, the level of a country’s de jure capital account openness, a greater working-age share of the population, greater tertiary school enrollment, lower perceived risk in advanced economies, and easy U.S. monetary conditions.

Table 1 reports selected results of ordinary least squares (OLS) estimates of the model with independent variables expressed in levels, allowing for year fixed effects and country fixed effects (indicated over a random effects specification by a Hausman test; Hausman 1978), with errors corrected for serial autocorrelation and heteroskedasticity across countries. Specification 1 uses annual data, and specifications 2 through 4 measure all variables in five-year moving averages to smooth short term fluctuations in gross inflows. This is especially important for small developing countries, in which a single large deal can generate a spike in inflows in the particular year in which it occurred. Since our key variables of interest are thought to be medium to long run factors, smoothing the data seems appropriate.

It is well recognized (see, for example, Reinhart 1999) that capital inflows to a country are likely to depend on domestic economic activities and domestic growth, and at the same time, that economic performance and financial development may be affected by capital inflows. To partially address this endogeneity problem, in the annual specification all country-level variables are lagged one year. In the smoothed specifications, three-year lags are used, so that the 5-year periods over which the left hand side variable and lagged right hand side variables are measured overlap for only two out of five years.

\(^{10}\) For certain countries, data are not available for the whole sample period. Countries with missing data are in general closed economies or small economies that do not use a standard balance-of-payments statistical system. This missing data problem is minor.
Perhaps not surprisingly, higher real GDP growth is unequivocally positively associated with capital inflows as a percentage of GDP, *ceteris paribus*, with a significant coefficient across all specifications of the model. Trade as a percentage of GDP, however, is not statistically significant in any specification, nor is the measure of political risk; in the interest of increasing coverage of the sample, trade and political risk are dropped from the final specification selected for constructing the projections.

Level of domestic financial development, represented by domestic credit to the private sector as a percentage of GDP, is positively associated with capital inflows and statistically significant in most specifications. Capital account openness is, in most cases, associated with greater capital inflows as well.

There is some stability across specifications in the sign and magnitude of the correlation between age structure of a country and the level of gross capital inflows as a share of GDP, and in the specifications with greater country coverage the coefficient is significant at the 10% level. For each percentage-point increase in the proportion of a country’s 20–64-year-old population during the years 1980–2010, the amount of foreign capital inflows the country received during a given year increased by three-quarters of a percent of GDP, *ceteris paribus*. This result is in line with the idea that a growing labor force and low dependency ratio attract capital. Tertiary school enrollment (investing in the effectiveness of the future working population) is also positively correlated with capital inflows, with high statistical significance.

Global factors also appear to be associated with variations in gross flows to some extent. A greater yield spread, indicating market perceptions of default risk, has the expected negative sign and is statistically significant, but the magnitude of the coefficient shows some instability across specifications. The U.S. federal funds rate, typically considered a leading indicator of the U.S. business cycle, has a positive and statistically significant coefficient in the specification used for the projections, but the sign changes when the political risk measure is included; one possibility is that it is correlated highly enough with some global shocks controlled for by year fixed effects that the coefficient is overly sensitive to changes in the sample. The global business cycle, represented by the variable G7 GDP-weighted average growth rate, is not found to be statistically significant at conventional levels in most specifications.

As mentioned above, it has been suggested in the literature that demographics may have an interactive effect with openness. Intuitively, the sensitivity of gross capital inflows to any of the variables of interest might be reduced by capital account restrictions. A set of specifications of the model allow the capital account openness measure to interact with each of the other four country-level variables of interest: growth, credit, working-age share of the population, and school enrollment. Results of this second set of estimations are shown in table 3A.2.

When openness is interacted with the working-age share of the population, the interaction term has a positive and statistically significant coefficient, which can be interpreted to mean that demography has a greater influence on capital inflows when a country is more open to capital flows, or that openness has a greater influence on capital flows when a country has a “demographic dividend” to exploit. Both ways of reading the result are intuitively plausible. The result suggests that policymakers considering relaxing capital account restrictions may wish to consider that the effects of openness and demographics can be interdependent. However, controlling for this interaction term, the coefficient on openness itself turns negative and significant; this does not lend itself to an intuitive story and may indicate nonlinearity in one or both of these variables, or a nonlinear interactive effect, the possibility of which merits further investigation.
V. Projecting gross capital flows over the next 20 years

A parsimonious version of the model (Table 1 column 4) is selected for the projections. This specification incorporates all significant determinants—apart from the age-openness interaction term which may be problematic as discussed above—and the elimination of all consistently insignificant variables which do not have full country coverage improves sample size and country coverage within each country group.\textsuperscript{11} Thus, the trade and political risk variables are dropped.

The specification includes country fixed effects, but not time fixed effects, since the unobservable global factors captured by time fixed effects cannot be projected meaningfully.\textsuperscript{12} Moreover, a comparison with the other specifications in Table 1, which do include time fixed effects, shows that eliminating the time fixed effects does not significantly change the estimation coefficients of country specific variables (nor do country fixed effects change much). The high overall R-squared, relative to within-country R-squared, of the estimated model used for the projections indicates that the country fixed effects explain a significant amount of the total variation in capital flows. The estimated country fixed effects are included in the projections, held constant over time. These should capture any factors which impact capital inflows that vary by country but not significantly over time, for example natural resource endowments.\textsuperscript{13}

Gross capital inflows, as a percentage of GDP, are projected country by country, applying the estimated coefficients to the projected paths of the key determinants for 158 countries that are covered by the sample on which the econometric estimates are based. The country level projections are then grouped into 17 country groups corresponding to those used by Bussolo, Lim and Maliszewska (2013) in the \textsc{linkage} CGE model, consisting of 9 major developing and advanced countries and 8 groups for the rest of the world’s countries based on income levels and regions. This work provides the basis for the two scenarios of projected gross inflows to 2030, corresponding to the gradual and rapid convergence scenarios presented in the World Bank report \textit{Capital for the Future}.

Projections of country groups’ (CGE groups and developing vs. advanced) aggregate gross capital inflows are real GDP weighted averages of all countries in the respective groups covered by the estimates of the parsimonious model, assuming the out of sample countries have the average rates of their country group.

The federal funds rate and the U.S. yield spread are assumed to hold constant at their 2008-11 average levels. Schooling is also assumed to hold constant across countries, given the lack of clear recent trends that hold across countries, and, more broadly, no coherent methodology for projecting changes in educational attainment; an assumption on schooling could be the basis for a third scenario, but this is left for future research. The other determinants are projected as follows:

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\textsuperscript{11} Good coverage within each region is important for projections of regional, income group, and global aggregates, since these are inferred from real GDP weighted averages of in-sample countries. Thus, if the numbers of in-sample countries are too small, the representativeness of the in-sample countries for their groups will be reduced and aggregate projections will be less accurate.

\textsuperscript{12} In practice, including time fixed effects in the econometrics, but then setting these to zero in the projections, would tend to enlarge the projection errors somewhat, since this is equivalent to eliminating a control variable but using coefficients on the retained variables which were estimated with the control variable included, degrading the fit of the projection model.

\textsuperscript{13} Observable measures of natural resource endowments, such as proven reserves or rates of depletion, may vary significantly over time and also may be more relevant for foreign investment than unobservable underlying endowments, but including these explicitly in the model could introduce serious endogeneity problems since exploration and extraction may be significantly impacted by foreign investment.
5.1 Projected demographics:

Demographic forces will be a fundamental driver of international capital flows in the future. The projected path of each country’s population between the ages of 20 and 64, as a percentage of its total population, is from the UN Department of Economic and Social Affairs Population Division, and this path is not allowed to differ across the scenarios considered in this paper. According to these projections, the working age share of the population will increase in low income and lower middle income countries on average, and tend to fall in upper middle income countries but much more slowly than in advanced countries (Figure 2). Differences in the timing and speed of demographic shifts between developing and high income countries in the coming decades will affect long run growth and returns to investment. As discussed above, a young, growing labor force should raise returns to capital and stimulate investment demand, whereas countries with older workers approaching retirement should save more and accumulate assets overseas in the face of slower expected growth (Higgins 1998; Lane and Milesi-Ferretti 2002). This implies that developing countries should attract more capital in the future.

Figure 2: Average share of working age population (age 20-65) of total, by income group (in percentage)

Source: Authors’ calculations based on UN Population Division data.

5.2 Real GDP growth and financial market development in the two scenarios:

For the purpose of the capital flow scenarios, domestic financial sector development and economic growth follow paths generated by Bussolo, Lim and Maliszewska (2013) using the LINKAGE CGE model. The effects of developing countries catching up, in terms of income level and financial market development, on gross capital flows will be much stronger in the next two decades, especially for upper middle income countries, due to their greater share of global growth and output, and the higher starting value of their gross capital flows compared to levels a decade ago.

5.3 Financial integration in the two scenarios:

The gradual and rapid convergence scenarios used to project gross capital flows each consider three possible paths of integration for each developing country: its historical trend, its income group’s average

14 The country-level projected growth rates from the LINKAGE model are also used to construct the path of the G7 growth rate.
historical trend, and a convergence path in which, by 2030, an upper middle income country converges to
the average of high-income countries in 2010, a lower middle income country converges to that of upper-
middle-income countries, and a low income country converges to that of lower middle income countries.
In the gradual convergence scenario, each developing country is assumed to follow the minimum of those
three possibilities for that particular country, while in the rapid convergence scenario each one follows the
maximum of the three (Figure 3). Each high income country is expected to continue integrating as well,
following the maximum of its historical trend or that of the group in the gradual convergence scenario,
and converging to 5 (a hypothesized maximum of the index) in the rapid convergence scenario.

Figure 3: Assumed convergence path of a proxy for economic globalization

<table>
<thead>
<tr>
<th>Gradual convergence scenario</th>
<th>Rapid convergence scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>Low income countries</td>
<td>5</td>
</tr>
<tr>
<td>Lower middle income countries</td>
<td>4</td>
</tr>
<tr>
<td>Upper middle income countries</td>
<td>3</td>
</tr>
<tr>
<td>High income countries</td>
<td>2</td>
</tr>
</tbody>
</table>

Source: Authors’ estimates based on the Chinn-Ito index (Chinn and Ito 2006).
Note: Income group aggregates are simple unweighted averages.

Strictly speaking, this relatively aggressive assumption for high income countries is an unrealistic
path for the Chinn-Ito index, since it is a *de jure* measure of openness and advanced countries already
tend to have fairly open capital accounts. The liberty taken here is intended to capture a spillover effect
from the rapid integration of developing countries, and rapid increase in their volumes of gross capital
outflows, to the *de facto* level of integration of advanced economies’ financial markets, since such a
spillover is not explicitly accounted for in the model. It should also be noted that these scenarios are not
intended to encompass the full range of paths that the pattern of global financial integration might
plausibly follow, as they correspond to two specific scenarios, both of which envision a significantly
greater role of developing countries in the global economy, so that the world of international finance—
and thus the scope for global integration—is effectively larger. Indeed, McKinsey Global Institute (2013)
describes a scenario that is different from these, in which the global financial system is “balakanized” and
international portfolio diversification remains anemic over the medium term, never fully recovering from
the shock of the 2007-09 global financial crisis, possibly constraining investment and contributing to
weak global growth.

5.4 Projection error adjustment

Like any model based projection, the scenarios of gross capital inflows as percentage of GDP for
countries and country groups based on the estimated coefficients and projected paths of determinants is
imperfect. The magnitude of the projection errors can be expected to differ from country to country,
especially since the projections are based on panel analysis and the same estimated coefficients are
applied across countries. For the country group projections, there are additional errors since not all
countries in the group are typically included in the model. Left uncorrected, the errors would tend to
accumulate, growing larger over the time span of the projection. Thus, a consistent adjustment to the projection errors is needed.

In-sample prediction errors are estimated, country by country, by comparing the average gross inflows predicted by the model for 2010-11 to the actual 2010-11 average, and multiplying the 2011 projection either by the ratio of the historical two-year average to the predicted two-year average, or by two in cases when the ratio exceeds two.\textsuperscript{15} It is assumed that there will be the same projection error into the future, so the projected paths through 2030 are shifted, additively, by the adjustment to the in-sample 2011 projections.

5.5 Projected gross capital outflows

Scenarios for gross capital outflows are derived from gross capital inflows, and current account balances inferred from the difference between projected saving and investment from Bussolo, Lim and Maliszewska (2013). The focus of the scenario exercise is on gross capital inflows, and the results for outflows are admittedly more \textit{ad hoc} since they are calculated as a residual rather than being explicitly modeled. The factors that drive residents’ capital outflows from a country are not taken into account, and these may differ significantly from the factors that drive foreigners’ capital flows into the country and the determinants of current accounts. Exploration of the determinants of gross capital outflows would be left for future research.

\textsuperscript{15} In the special case in which the historical 2010-11 average is positive but the predicted 2010-11 average is negative, the absolute value of the ratio is used, this having the desired effect of splicing the projection to the historical series.
5.6 Projected nominal volumes of gross capital flows

Volumes of global gross capital flows to and from country groups (CGE groups and developing vs. advanced) are calculated by multiplying the projected group gross capital inflows as percentage of GDP and projected nominal GDP of the country group, including the countries not in the sample, assuming the out of sample countries have the average rates of the country group. Nominal GDP numbers are projected based on CGE projected real growth for country groups and assumed 3.5% average global annual inflation rates.16

5.7 Projection results

Under the gradual convergence scenario, global gross capital flows will reach approximately $13 trillion in 2030, 47 percent of which will be destined for developing countries ($6.2 trillion, or 6 percent of GDP), equating to a 9.9 percent average annual growth rate in the volume of inflows to developing countries between 2012-2030 (Figures 4 and 5). Under the rapid convergence scenario, the greater efficiency of capital allocation from deepening and integration of developing countries’ financial markets will drive a significantly greater expansion in gross capital flows. In this scenario, Global gross capital flows will reach nearly $22.6 trillion in 2030. Of this amount, inflows to developing countries are projected to be $13.5 trillion (11 percent of GDP), implying a 14.6 percent average annual growth rate. Developing countries’ share will surpass that of advanced countries in about 2025, and reach 60 percent of global gross inflows by 2030.

Figure 4: Projection of gross capital inflows to developing countries, as percentage of GDP

Source: Authors’ calculations from the IMF International Financial Statistics (IFS) and authors’ projections.

16 The assumption of a constant 3.5 percent world inflation rate is based on the 2003-07 five-year average from the World Bank’s Global Economic Prospects.
Figure 5: Projection of gross capital inflows, nominal volumes

Under both scenarios explored above, a much larger share of global gross capital flows will originate in, as well as be destined for, developing countries in 2030. Disaggregating this result by country shows that China will be an important part of the story, but it is by no means a China story alone, nor is it a BRICs story alone (Figure 6). Under the rapid convergence scenario, financial development will be significantly faster across the developing world except in cases where our metric for financial market development, domestic credit, is already quite high (notably, China and South Africa). Under this scenario, developing countries other than the BRICs will collectively account for 17 percent of global gross inflows in 2030, and 15 percent of outflows. In this multipolar world, no single country will attract such a great share of global inflows as the US or the euro area do today, not even China; small and medium sized developing countries will collectively matter much more in the global economy than they do today, particularly in terms of their role in global financial markets.

On the other hand, by 2030 China may be as important a source of capital flows as the US and Europe are today. Under both the gradual and rapid convergence scenarios, China is expected to account for 40 percent of global outflows in 2030. This is driven mainly by robust growth, greater integration with global financial markets, and significant current account surpluses stemming from its currently very high investment rate falling somewhat faster than its saving rate as wages rise (further discussed in Capital for the Future).

Source: Authors’ projections; historical data calculated from the IMF IFS database.
Note: Inflows are depicted in nominal U.S. dollars, assuming a constant 3.5 percent world inflation rate based on the 2010 price level.

17 The scenarios for outflows are calculated as a residual of the gross inflow and current account projections, rather than being explicitly modeled (as in online Annex 3.4), and thus are admittedly less theoretically grounded. Some factors that drive residents’ capital outflows from a country are not taken into account, and these may differ significantly from the factors that drive foreigners’ capital flows into the country and the determinants of current accounts. To the extent that income growth and the development and global integration of financial markets are likely drivers of gross outflows, however, these effects are accounted for by the modeling strategy via their intermediary impact on gross inflows.
VI. Conclusion

The two scenarios of global gross capital flows presented here were developed for the World Bank’s Capital for the Future report, a broader look at scenarios of saving, investment, and both net and gross capital flows through 2030. The central conclusion of the scenario analysis presented here, that developing countries will become substantially more important as sources and destinations of global capital flows, fits into the broader message of the report: that developing countries are moving to the center of the world economic stage.

One might ask why we should expect, with any certainty, to see such a transformation in the next two decades, given that despite the last one or two decades of improved economic growth, and underlying institutional improvements, in developing countries, they account today for a much smaller share of global capital flows than their shares of world output and trade in goods and services. Part of the answer is the role of changing relative country size. While the exact projected paths of capital flows admittedly depend on somewhat arbitrary assumptions regarding the paths of the main determinants, the overall story that emerges does not depend crucially on these assumptions. Even in the gradual convergence scenario, in which the path of developing countries’ gross capital inflows as a share of output is significantly more moderate than a simple linear extrapolation of the historical trend, and in which by 2030 it only reaches two-thirds of its previous historical peak, nearly half of global capital flows will be destined for developing countries, compared to less than a quarter in 2010. This will be due in large part to a continued expansion in the relative economic size of the developing world. That is, while financial market development and integration and advantageous demographics will be potentially important drivers of expanding gross capital flows into and out of developing countries, a large part of their expanding global share is essentially baked into the cake regardless of the impact of these factors on developing countries’ capital inflows relative to their respective output levels.
Of course, developing countries’ global share of gross inflows also depends on the evolution of inflows to high income countries. We have made the reasonable assumptions that aging will be associated with a slowdown in growth in the advanced world, and that there is less scope for further financial development there than in developing countries; this is partly offset, however, by allowing for a spillover effect from the developing to the advanced world, in the form of an acceleration in advanced countries’ globalization measure as their financial markets integrate on a new, larger global scale.

Moreover, a large increase in developing countries’ global share of capital inflows and outflows is not at all implausible upon a close examination of the recent historical evidence. While developing countries’ current share of capital flows may appear small, it is in fact much greater than it was two decades ago, and this is not a spurious result from the impact of the recent global financial crisis on flows to advanced countries. Between 1990 and 2007, gross capital inflows to developing countries grew by 32 percent per year on average, increasing cumulatively over that time by a factor of 29.\textsuperscript{18} The scenarios explored in this paper are relatively conservative in terms of growth rates, with developing countries’ nominal gross inflows growing at an average rate of less than 10 percent between 2012 and 2030 under the gradual convergence scenario, and under 15 percent under the rapid convergence scenario. Yet, the end result of this growth is fairly dramatic, due to a significantly greater starting value. In short, these scenarios do not show developing countries’ gross flows accelerating relative to past trends, but in fact moderating; yet, under these scenarios, by 2030 they will account for roughly half, or more, of the world’s capital inflows and outflows.

While access to capital and an expanded role in the global financial system should not be taken for granted in the case of any individual country, policymakers should indeed prepare for a world in which developing countries, of all sizes and across regions, will tend to be much more important in international finance than they are today. As financial markets continue to become more interconnected, policy coordination will be key for maintaining stability of the system. But considering that the first best level of international coordination has never appeared to be politically feasible, and may become even more difficult with a greater number of players, policymaking at the national level will be important as well. What is needed, in the long run, is careful reform of regulatory institutions to be more forward-looking and adaptable to changes in financial markets, particularly to a sustained expansion in gross capital inflows and credit.

\textsuperscript{18} Estimates of the historical growth of capital flows are based on the IMF International Financial Statistics.
### Table 1: Regression results for capital inflows as share of GDP

<table>
<thead>
<tr>
<th></th>
<th>Model 1</th>
<th>Model 2</th>
<th>Model 3</th>
<th>Model 4</th>
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<tr>
<td></td>
<td>Annual</td>
<td>Smoothed</td>
<td>Smoothed</td>
<td>Model for</td>
</tr>
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<td></td>
<td></td>
<td>(5-yr moving</td>
<td>(5-yr moving</td>
<td>projection</td>
</tr>
<tr>
<td></td>
<td></td>
<td>average)</td>
<td>average,</td>
<td>(parsimonious,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>ICRG dropped</td>
<td>5-yr MA)</td>
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<tr>
<td>GDP growth (annual %)(lagged)</td>
<td>0.567</td>
<td>0.944</td>
<td>0.675</td>
<td>0.687</td>
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<tr>
<td></td>
<td>(0.016)**</td>
<td>(0.045)**</td>
<td>(0.023)**</td>
<td>(0.027)**</td>
</tr>
<tr>
<td>Domestic credit to private sector (% of GDP)(lagged)</td>
<td>0.200</td>
<td>0.065</td>
<td>0.079</td>
<td>0.080</td>
</tr>
<tr>
<td></td>
<td>(0.022)**</td>
<td>(0.143)</td>
<td>(0.070)*</td>
<td>(0.068)*</td>
</tr>
<tr>
<td>Capital account openness (Chinn-Ito index)(lagged)</td>
<td>2.102</td>
<td>1.265</td>
<td>1.420</td>
<td>1.429</td>
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<tr>
<td></td>
<td>(0.015)**</td>
<td>(0.143)</td>
<td>(0.092)*</td>
<td>(0.091)*</td>
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<tr>
<td>Population age 20-64, % of total (lagged)</td>
<td>1.086</td>
<td>0.912</td>
<td>0.768</td>
<td>0.769</td>
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<td>(0.125)</td>
<td>(0.113)</td>
<td>(0.097)*</td>
<td>(0.099)*</td>
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<tr>
<td>School enrollment, tertiary (% gross)(lagged)</td>
<td>0.111</td>
<td>0.215</td>
<td>0.166</td>
<td>0.168</td>
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<tr>
<td></td>
<td>(0.198)</td>
<td>(0.002)**</td>
<td>(0.018)**</td>
<td>(0.017)**</td>
</tr>
<tr>
<td>Total trade as % of GDP (lagged)</td>
<td>0.017</td>
<td>-0.092</td>
<td>0.007</td>
<td></td>
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<tr>
<td></td>
<td>(0.734)</td>
<td>(0.263)</td>
<td>(0.846)</td>
<td></td>
</tr>
<tr>
<td>Corruption, Law &amp; Order (ICRG)(lagged)</td>
<td>0.067</td>
<td>0.987</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.959)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>G7 GDP weighted average growth</td>
<td>0.224</td>
<td>4.355</td>
<td>1.160</td>
<td>1.163</td>
</tr>
<tr>
<td></td>
<td>(0.651)</td>
<td>(0.018)**</td>
<td>(0.288)</td>
<td>(0.250)</td>
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<tr>
<td>10y-3m US interest rates</td>
<td>-1.623</td>
<td>-12.392</td>
<td>-3.684</td>
<td>-3.633</td>
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<tr>
<td></td>
<td>(0.095)*</td>
<td>(0.000)***</td>
<td>(0.056)*</td>
<td>(0.051)*</td>
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<tr>
<td>Fed funds rate</td>
<td>2.327</td>
<td>-2.592</td>
<td>1.052</td>
<td>1.066</td>
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<tr>
<td></td>
<td>(0.035)**</td>
<td>(0.001)***</td>
<td>(0.010)***</td>
<td>(0.010)***</td>
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<tr>
<td>Observations</td>
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<td>1867</td>
<td>2589</td>
<td>2616</td>
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<td>Number of countries</td>
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<td>125</td>
<td>156</td>
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<td>within R-Sq</td>
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<td>0.15</td>
<td>0.15</td>
<td>0.15</td>
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<td>overall R-Sq</td>
<td>0.31</td>
<td>0.49</td>
<td>0.44</td>
<td>0.44</td>
</tr>
</tbody>
</table>

**Notes:**

1. P-values are reported in parentheses.
2. * indicates significance at 10 percent level; ** indicates significance at 5 percent level; *** indicates significance at 1 percent level.
Table 2: Regression results for capital inflows as share of GDP with interactions

<table>
<thead>
<tr>
<th></th>
<th>Model I1</th>
<th>Model I2</th>
<th>Model I3</th>
<th>Model I4</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Growth interacted with openness</strong></td>
<td>0.681</td>
<td>0.694</td>
<td>0.669</td>
<td>0.690</td>
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<tr>
<td>(0.038)**</td>
<td>(0.027)**</td>
<td>(0.029)**</td>
<td>(0.027)**</td>
<td></td>
</tr>
<tr>
<td><strong>Domestic credit to private sector (% of GDP)(lagged)</strong></td>
<td>0.083</td>
<td>0.057</td>
<td>0.074</td>
<td>0.077</td>
</tr>
<tr>
<td>(0.058)*</td>
<td>(0.290)</td>
<td>(0.070)*</td>
<td>(0.090)*</td>
<td></td>
</tr>
<tr>
<td><strong>Capital account openness (Chinn-Ito index)(lagged)</strong></td>
<td>-0.046</td>
<td>0.690</td>
<td>-11.114</td>
<td>0.506</td>
</tr>
<tr>
<td>(0.969)</td>
<td>(0.417)</td>
<td>(0.039)**</td>
<td>(0.677)</td>
<td></td>
</tr>
<tr>
<td><strong>Population age 20-64, % of total (lagged)</strong></td>
<td>0.635</td>
<td>0.849</td>
<td>0.845</td>
<td>0.923</td>
</tr>
<tr>
<td>(0.116)</td>
<td>(0.090)*</td>
<td>(0.075)*</td>
<td>(0.121)</td>
<td></td>
</tr>
<tr>
<td><strong>School enrollment, tertiary (% gross)(lagged)</strong></td>
<td>0.159</td>
<td>0.152</td>
<td>0.063</td>
<td>0.087</td>
</tr>
<tr>
<td>(0.021)**</td>
<td>(0.022)**</td>
<td>(0.402)</td>
<td>(0.398)</td>
<td></td>
</tr>
<tr>
<td><strong>Capital account openness × Growth</strong></td>
<td>0.421</td>
<td></td>
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<tr>
<td>(0.138)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Capital account openness × Domestic credit</strong></td>
<td>0.017</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.346)</td>
<td></td>
<td></td>
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<tr>
<td><strong>Capital account openness × Population age 20-64</strong></td>
<td></td>
<td></td>
<td>0.247</td>
<td></td>
</tr>
<tr>
<td>(0.026)**</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Capital account openness × School enrollment</strong></td>
<td></td>
<td></td>
<td></td>
<td>0.043</td>
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<tr>
<td>(0.433)</td>
<td></td>
<td></td>
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<tr>
<td><strong>G7 GDP weighted average growth</strong></td>
<td></td>
<td>1.200</td>
<td>0.987</td>
<td>1.183</td>
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<tr>
<td>(0.397)</td>
<td>(0.238)</td>
<td>(0.319)</td>
<td>(0.242)</td>
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<tr>
<td><strong>10y-3m US interest rates</strong></td>
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<td>-3.615</td>
<td>-3.654</td>
<td>-3.564</td>
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<tr>
<td>(0.045)**</td>
<td>(0.054)*</td>
<td>(0.051)*</td>
<td>(0.054)*</td>
<td></td>
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<tr>
<td><strong>Fed funds rate</strong></td>
<td>1.001</td>
<td>1.098</td>
<td>1.028</td>
<td>1.088</td>
</tr>
<tr>
<td>(0.011)**</td>
<td>(0.011)**</td>
<td>(0.009)**</td>
<td>(0.011)**</td>
<td></td>
</tr>
</tbody>
</table>

Observations 2616 2616 2616 2616
Number of countries 158 158 158 158
within R-Sq 0.16 0.15 0.16 0.15
overall R-Sq 0.45 0.44 0.45 0.45

Robust p values in parentheses
* significant at 10%; ** significant at 5%; *** significant at 1%

Notes:
1. P-values are reported in parentheses.
2. * indicates significance at 10 percent level; ** indicates significance at 5 percent level; *** indicates significance at 1 percent level.
References


