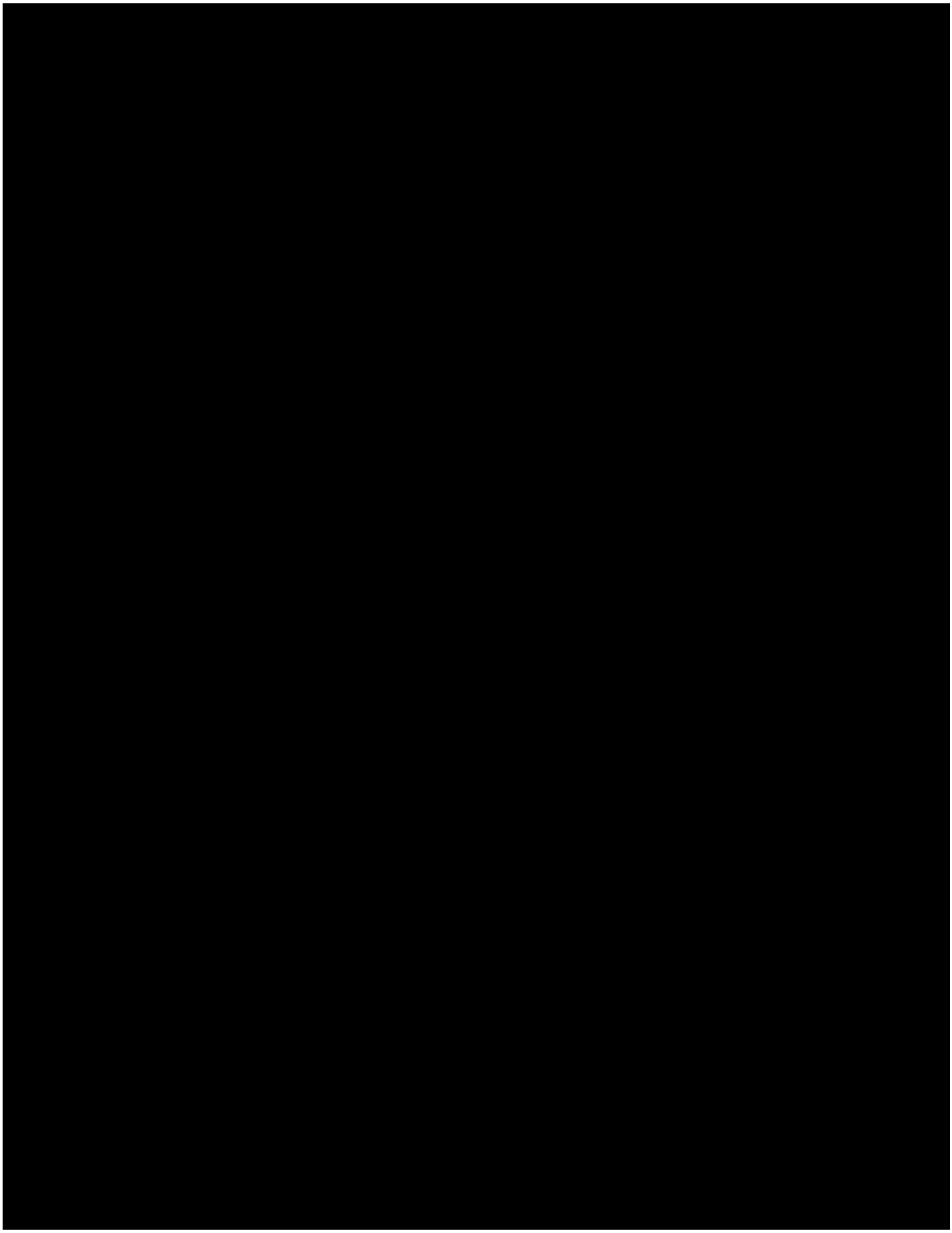

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Finance Department

Changing Times for Frontier Markets: A Perspective from Portfolio Investment Flows and Financial Integration[1/]

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Authorized for distribution by Donal McGettigan and Olaf Unteroberdoerster

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Abstract

This paper investigates to what extent low-income developing countries (LIDCs) characterized as frontier markets (FMs) have begun to be subject to capital flows dynamics typically associated with emerging markets (EMs). Using a sample of developing countries covering the period 2000–14, we show that: (i) average annual portfolio flows to FMs as a share of GDP outstripped those to EMs by about 0.6 percentage points of GDP; (ii) during years of heightened stress in global financial markets, portfolio flows to FMs dried up like those to EMs; and that (iii) FMs have become more integrated into international financial markets. Our findings confirm that, in terms of portfolio flows, FMs have become more similar to EMs than to the rest of LIDCs and are therefore more vulnerable to swings in global financial markets conditions. Accordingly, it is important to have in place frameworks to strengthen FMs' resilience to adverse capital flows shocks.

JEL Classification Numbers: E44, F3, G0, and O57

Keywords: Frontier Markets, Portfolio flows, Financial Integration, Balance of Payments Needs.

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CONTENTS

I. INTRODUCTION

A key lesson from the emerging markets (EMs) crises of the 1990s and early 2000s is that sharp swings in capital flows can have dire macroeconomic consequences. In emerging markets and developing countries (EMDCs), capital inflows can supplement domestic savings and help boost both physical investment and economic growth. However, reaping the benefits of financial openness and large capital flows without incurring considerable risks is a challenge for policymakers in many countries. In EMs, surges in inflows are often associated with procyclical macroeconomic policies and precede financial crises (Kaminsky et al., 2004). In economies with intermediate levels of financial development, financial openness may, as Aghion et al. (2004) note, induce chronic phases of strong economic growth with capital inflows followed by collapses with capital flow reversals. The likelihood of reversals and the severity of the ensuing economic downturn depends in part on the composition of capital flows. Foreign direct investment (FDI) is found to be more stable and less prone to reversals than private loans and portfolio flows (Sula and Willett, 2009; Chuhan et al., 1998).

Against this backdrop, the surge of portfolio flows to some frontier markets among low-income developing countries (LIDCs) since the mid-2000s has fueled debates about those countries' growing vulnerability to similar adverse capital account shocks.[1] Traditionally, LIDCs had to rely on official resources to cover their balance of payments (BoP) needs (IMF, 2014a), and most of them continue to do so. However, since the mid-2000s and especially in the aftermath of the 2008 global financial crisis (GFC), relatively strong macroeconomic performance in a subset of frontier markets (FMs), together with low interest rates in advanced economies (AEs), heightened foreign investors' interest in portfolio assets from those markets. Based on the experience of EMs' crises, larger inflows into FMs have raised a number of questions from researchers and policymakers regarding not only short-term but also medium-term macroeconomic management challenges and external vulnerability.[2]

In this paper, we investigate whether, in light of low-income FMs' experience with capital flows in recent years, they actually resemble EMs and are thereby vulnerable to capital flow reversals or they remain as the rest of LIDCs. Our analysis focuses on similarities in portfolio flow dynamics facing FMs, the rest of the LIDCs, and EMs, and not on the underlying factors. Insights from a number of recent studies offer a storyline that buttresses the motivation of this paper. By 2015, surges in gross non-FDI private flows (as percent of GDP) to LIDCs were comparable to those of EMs (Araujo et al. 2015). Most of these flows have gone to FMs. This is in line with the fact that investing in FMs, more broadly defined, has been considered as a good diversification strategy because returns on FMs' assets have generally been less correlated with global market returns owing to their limited integration with global economic and financial markets (Berger, Pukthuanthong and Yang, 2011; Oey, 2014). While the limited integration of

[1] There is not a single definition of FMs. For the purpose of our analysis, we rely on the taxonomy of LIDCs the IMF proposes in a 2014 policy paper in which FMs are LIDCs that meet well-defined criteria related mainly to the depth and openness of their financial markets and access to international sovereign bond markets. From the perspective of investment banks and rating agencies, FMs represent a relatively diverse group of countries, including also medium and high-income countries that fall outside the markets generally included in global equity or bond indices and are characterized by their less-developed capital markets, structural weaknesses, and their tendency to have higher idiosyncratic risks.

[2] Berger et al., 2011; Jorge A. Chan-Lau, 2014; Marshall et al., 2015, IMF, 2014.

low-income FMs in global financial markets explains their resilience to the GFC, large cross-border portfolio flows to FMs in the aftermath of the crisis are seen as exposing FMs more than in the past to global markets volatility as they tend to face wider bond spreads when global financing conditions tighten (Guscina, Pedras, and Presciuttini, 2014; IMF, 2014b; IMF, 2016). However, this important issue has not been econometrically investigated much.

Our empirical investigation of whether FMs resemble EMs in terms of their exposure to private capital flows and their volatility relies on a two-pronged econometric analysis and makes important contributions to the literature. First, using a difference-in-differences (DiD) estimation on annual data covering a panel of 76 countries during 2000–14, the paper assesses the order of magnitude of net portfolio investment to FMs relative to other developing countries subgroups—EMs and the rest of LIDCs, referred to as the non-FM LIDCs—controlling for standard determinants of capital flows. The use of a DiD estimation is, to the best of our knowledge, a novelty to the capital flows literature. Second, using an international capital asset pricing model (ICAPM) model including monthly sovereign bond returns for FMs over 2000–14, the paper investigates whether there have been significant changes in the linkage between FMs and international capital markets since the GFC and discusses what the changes, if any, entail for risks facing FMs relative to EMs.

Three main results emerge from our analysis and support the view that FMs resemble EMs in terms of vulnerability to capital flow reversals. First, based on the DiD approach, we find that, after the GFC, average annual net portfolio investment to FMs outstripped those to EMs by about 0.6 percentage point of GDP while, unsurprisingly, portfolio flows to non-FMs LIDCs (NFM-LIDCs, henceforth) did not exhibit substantial changes. This suggests that, although portfolio flows to FMs remain small in dollar terms compared with those of EMs, their importance relative to the size of recipient countries' economies has increased drastically in the post-GFC period. Second, while having increased in the post-GFC period as a whole, net portfolio flows to FMs dried out in years of heightened global risk aversion, notably during 2008–09 and in 2013, the year of the taper tantrum. Third, from the asset pricing analysis, we find that there has been a noteworthy change in FMs' market betas with respect to global market returns, indicating an increase in financial integration and comovement of returns after 2008. These findings confirm that FMs have become more similar to EMs than the rest of the LIDCs and are therefore more likely to be subject in similar ways to the effects of adverse changes in global financial markets conditions. Our findings withstand various robustness checks.

The paper complements three strands of the empirical literature on the drivers of capital flows and the vulnerability of recipient countries' economies to flow reversals. First, the paper contributes to the growing literature on capital flows to FMs. The finding of increased co-movement of assets returns between FMs and global financial markets is in line with the higher post-crisis correlation found by Chan-Lau (2014) but somewhat in contrast with the finding of no evidence that FMs, more broadly defined, are becoming increasingly integrated over time (Berger, Pukthuanthong and Yang, 2011). Second, the paper belongs to the literature on the determinants of capital flows to developing countries, the so-called pull and push factors, which also encompasses the literature on the spillovers of monetary easing in the United States and other AEs (Byrne and Fiess, 2011; Blanchard et al., 2011, Ghosh et al., 2014; Joyce et al., 2011; Krishnamurthy and Vissing-Jorgensen, 2011; Fratzscher et al. 2013; Forbes and Warnock, 2012;

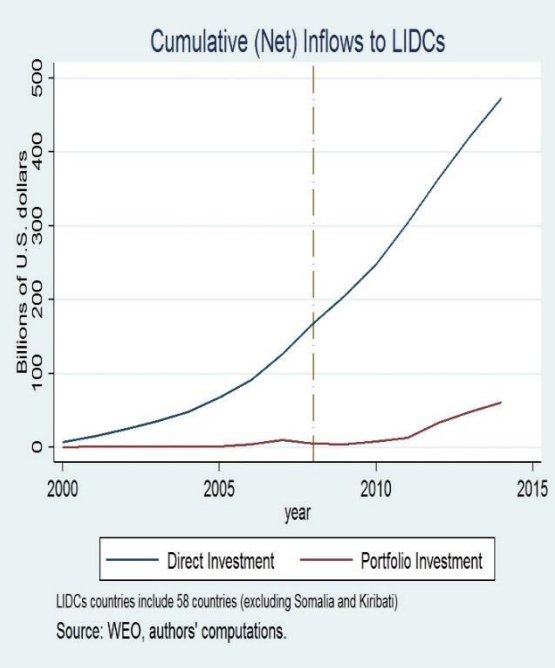
Suchanek and Rai, 2014, Claeys and Darvas, 2015). In line with the existing literature, the paper confirms the importance of push factors in driving capital flows to FMs.

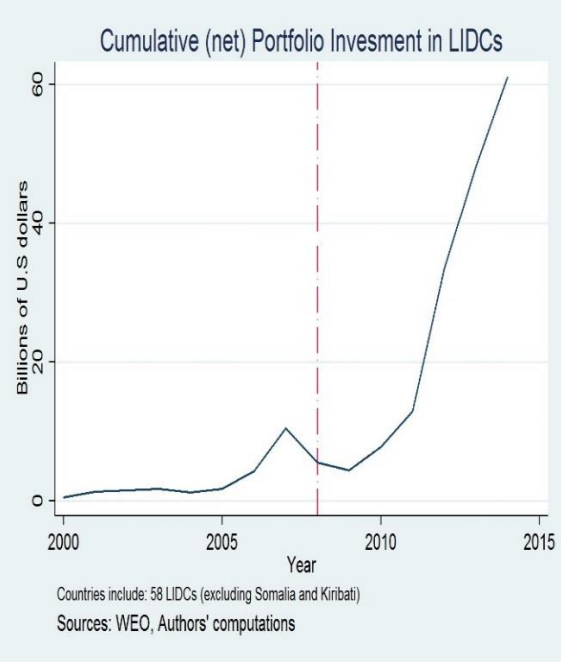
The remainder of the paper is organized as follows. Section 2 presents stylized facts on private capital flows to developing countries. Section 3 discusses the grouping of countries as well as the data. Section 4 presents the empirical analysis and the results. Section 5 concludes.

II. Stylized Facts on Private Capital Flows to Developing Countries

Over the 2000–14 period, LIDCs received large private capital flows, especially FDI.[3] These flows reflect lax global financial conditions combined with high growth and improved economic performance in LIDCs. A noteworthy feature of the cumulative flows is that FDI flows have been much larger in magnitude than cumulative net portfolio flows (Figure 1).[4] Net FDI increased more than six fold during the period, in part reflecting the global commodities supercycle and associated investment in the extractive sector (UNCTAD, 2014).

Figure 1. Capital Flows to LIDCs, 2000–2014



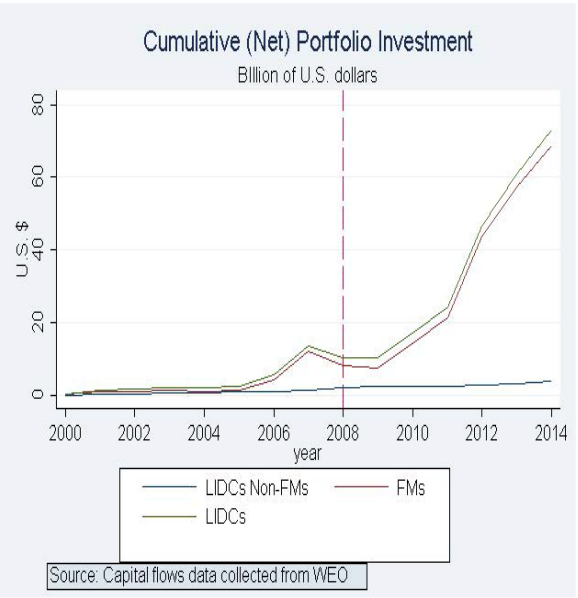


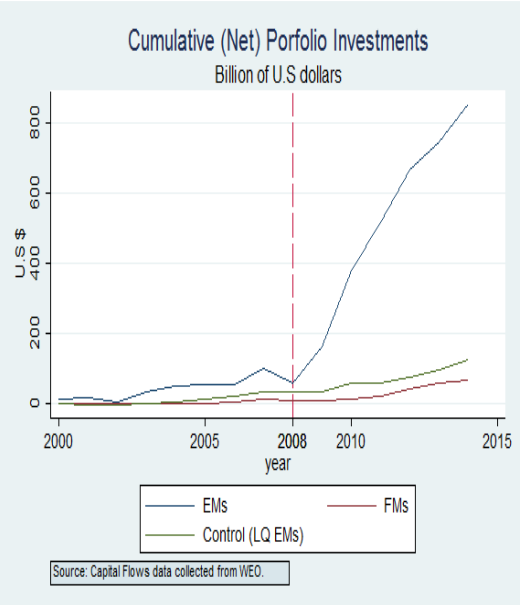
[3] Capital inflows are defined as the aggregate of foreign direct investment (FDI), portfolio, and other liabilities. Category Other includes liability to official creditors, foreign bank loans, and other financial transactions not covered in direct investment, portfolio investment, or reserve assets (IMF, 2014).

[4] This is also true for banking or other investments, which are excluded from the figure.

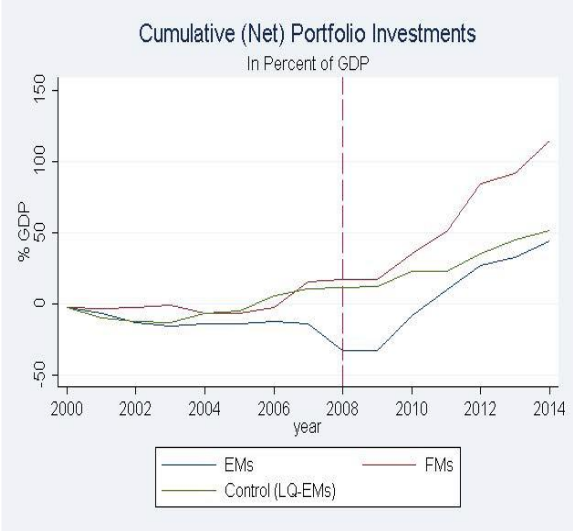
Figure 2. Portfolio Flows to Developing Countries Sub-groups, 2000–2014

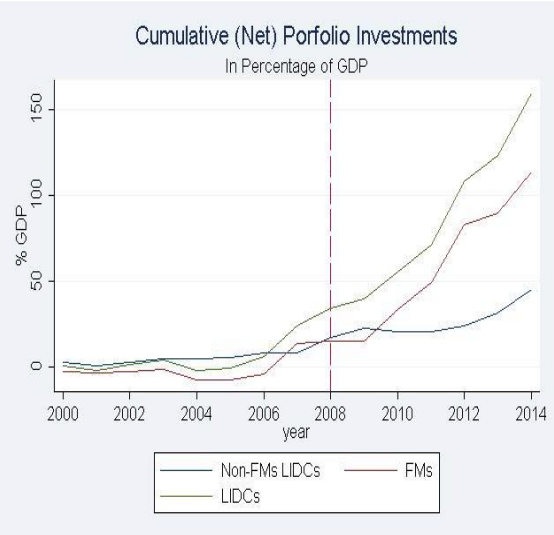
Panel A. (in US$ billions)





Panel B. (in percent of GDP)

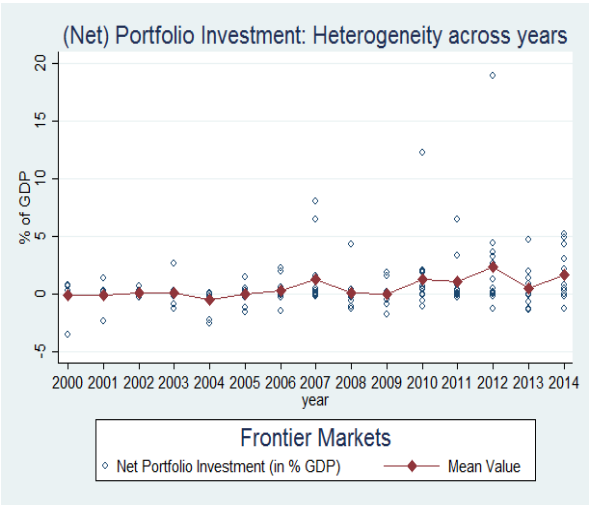


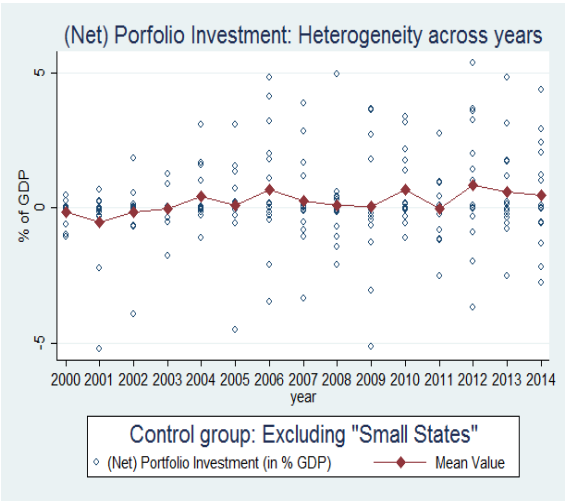


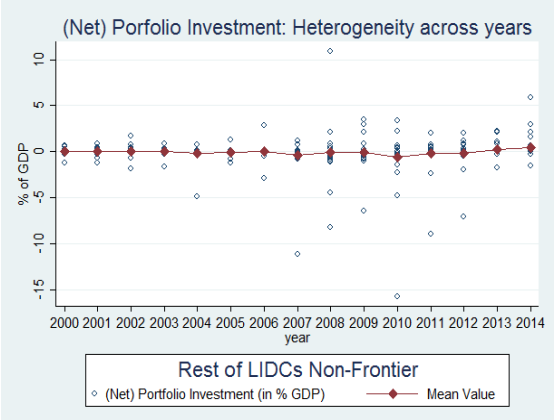
Notes: Figures show cumulative totals over the years per country group. Countries comprising different groups are as presented in Appendices A and B.

Source: IMF WEO

Figure 3. Annual Portfolio Flows to Developing Countries Subgroups
(in percent of GDP)







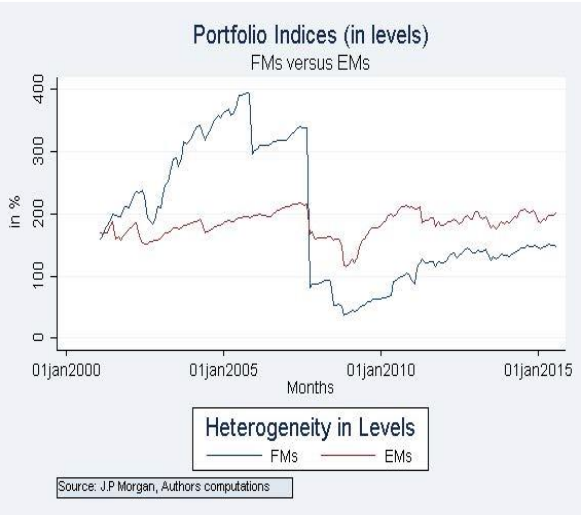
Source: IMF WEO and authors' calculations

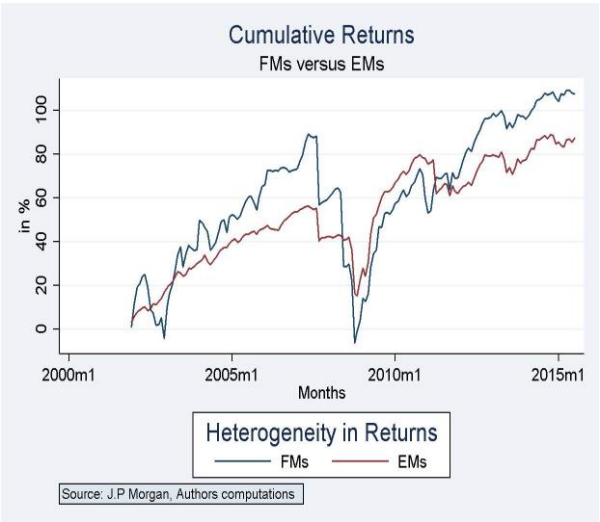
Amidst this surge in capital flows, the dynamics of portfolio flows to developing countries have been heterogeneous across country subgroups across years. While net portfolio flows to the LIDCs' group as a whole increased significantly as mentioned above, the surge benefitted almost exclusively FMs as cumulative flows to the rest of LIDCs (non-frontier) remained virtually flat during 2008–14 (Figure 2). Moreover, though sharp, the increase in flows to FMs was far below that to EMs. Within EMs, most of the flows were directed to more developed EMs as the less advanced EMs countries (i.e., lower quartile of the group) registered a relatively marginal increase that kept the pattern of their cumulative net inflows close to that of FMs. While flows to FMs were, in absolute terms, lower than those to less advanced, they were significantly larger as a share of recipient countries' GDP (Figure 3).

Anecdotal evidence suggests that the significant increase in flows to FMs coincided with some repricing of risk assets (Figure 4). While rates of economic growth and macroeconomic stability in FMs had been improving since the 2000s, financial assets in FMs and EMs remained

differently priced, with the former priced lower (Figure 4). This price difference can be attributed to either high segmentation of FMs from the global markets or to the high risk premia demanded by international investors. The search for yield, coupled with lower risk aversion might have led to a correction of this price difference, thereby eventually fostering greater integration of FMs into global financial markets. Therefore, after 2008 capital flows would be expected to increase significantly towards FMs, catching up or even exceeding the growth rate of capital flows to EMs.

Figure 4. EM and FM Bond Index Levels





III. DATA

A. Country Groupings

We use the IMF's World Economic Outlook (WEO) country classification, consisting of advanced economies (AEs) and the Emerging Markets and Developing countries (EMDCs). The EMDCs group is very heterogeneous. Within the EMDCs, the subgroup of countries whose gross national income (GNI) fall below the World Bank's upper middle-income countries' (UMIC) threshold is relevant for our study as it includes lower quartile emerging markets (LQ-EMs) and low income developing countries (LIDCs). The subgroup of LQ-EMs is made up of 16 countries (listed in Appendix B) with per capita GNI higher than the IDA cutoff.[5] The remaining countries comprise the LIDCs group, and consist of 60 countries listed in Appendix A.[6] In a policy paper

[5] These correspond to the World Bank's cut-off points for lower middle-income (LMIC) and upper middle-income (UMIC) countries for FY2013, respectively.

[6] These countries have economic features that differ markedly from those of higher income countries and are eligible for concessional financing from both the IMF and the World Bank based on relative poverty assessed through income thresholds set by the International Development Association (IDA). The IDA income threshold that guide the determination of eligibility for IMF's concessional lending under the Poverty Reduction and Growth Trust (PRGT) facilities is updated annually. As of end-2014, LIDCs had the following characteristics: (i) PRGT-eligible as per the 2013 PRGT Eligibility Report; (ii) Gross National

issued in September 2014, the IMF classifies 14 LIDCs as FMs based on well-defined criteria.[7] Applying these criteria to the 14 countries since 2000, the beginning of the sample period of our econometric analysis, reveals that these countries met the FMs' qualification criteria at different points in time. The list of FMs with the year in which they first met the FMs' qualification criteria is in the left column of Appendix B.[8] Countries in the LQ-EMs subgroup are closest to FMs in terms of depth and openness of financial markets and access to international sovereign bond markets and also in terms of economic and development indicators such as poverty rates, life expectancy at birth, the share of agricultural employment in total employment, and domestic credit to the private sector relative to GDP. Moreover, the quality of their institutions as rated by the World Bank's Country Policy and Institutional Assessment (CPIA) and their risk of debt distress ratings ("Short Term Vulnerabilities") are similar to the LIDCs' average.[9] Therefore, countries in the LQ-EM subgroup will be used as a control group.

The IMF taxonomy used to identify FMs differs from the developing countries' classification by rating agencies and market analysts in a number of respects but is robust. As noted above, in the IMF's classification, FMs are first and foremost LIDCs, whereas for market analysts.[10] FMs are primarily a subset of EMs though they also include some AEs. A common feature of market analysts' classifications is that they are designed for financial professionals and tend to put more weight on financial accessibility[11] and investment returns while taking into account other macroeconomic fundamentals that have a bearing on investment returns. By contrast, in the IMF's classification, macroeconomic fundamentals and indicators of financial depth and openness have a more prominent role as the FMs' selection or qualification criteria. After an exercise aimed at constructing an FM group that takes into account both the IMF's taxonomy and the classification by market analysts, we end up with an FM's group that confirms the robustness of the IMF's classification (Appendix C provides details on the exercise).

B. The Variables

For our analysis, we compile two different datasets, since there are two different parts to our empirical analyses; private capital flows and financial integration. These are explained below and described in more details in Appendix D.

Income (GNI) per capita less than the ad-hoc PRGT income graduation level for non-small states (twice the IDA cut-off point or US$2,390 for FY2013).

[7] The selection criteria focus on the depth and openness of the financial system and the issuance of sovereign bonds. Each LIDC is benchmarked against EMs as follows: (i) LIDCs that are within one standard deviation below the EM average for the following variables: M2 to GDP; cross border loans/deposits, stock market capitalization, and portfolio inflows; and (ii) LIDCs that have accessed (or have the potential to access: proxied by sovereign ratings similar to those that have issued sovereign bonds) sovereign bond markets, putting them on the radar screen of international fund managers. Details are in Appendix II of IMF, 2014b.

[8] We use this time-varying composition of the FMs group to check the robustness of our empirical results.

[9] The World Bank maintains and updates the CPIA to assess the quality of a country's policies and institutional arrangements along 16 criteria grouped into four equally-weighted clusters: Economic Management, Structural Policies, Policies for Social Inclusion and Equity, and Public Sector Management and Institutions. Countries are rated on a scale of 1 (low) to 6 (high) for all of the sixteen criteria and are assigned an overall score.

[10] Including rating agencies' bond indices—Next Eleven, FTSE, MSCI, Russell, NEXGEM, and EMBI.

[11] Referring to multiple indicators including market depth, liquidity, and openness to foreign investors.

Private Capital Flows

To analyze the private capital flows to LIDCs and FMs, we collect data for two sets of variables. The first set comprises BoP and pull factors, and the data is obtained from WEO. We construct a panel of 76 countries with annual data covering the period 2000–14. The sample includes all LIDCs and countries in the LQ-EMs. Our main data series, net portfolio flows, comes from the WEO Database. The (net) portfolio investment variable is then scaled by GDP. The issue of using net flows versus gross flows has been frequently debated in the literature. Given the questions we are interested in, we report results on net flows, following Shaghil and Zlate (2014). The second set of variables includes global push factors such as the U.S. 10-Year Treasury Bond Yield and VIX index, obtained from FRED (Federal Reserve Economic Data) and Bloomberg. Lastly, we introduce an additional pull factor for the robustness tests: Financial Risk rating variable from the International Country Risk Guide (ICRG). We consider this variable as a proxy for financial governance and use in our robustness checks. This variable is available for only half of the countries in our sample.

Summary statistics in Table 1 confirm insights on portfolio flows to developing countries from the visual analysis and offer additional information on changes in portfolio flows volatility across groups. We report statistics on the evolution of net portfolio flows (scaled by GDP) to the two LIDCs' subgroups and the EM control group before and after 2008, which suggest that on average, net portfolio flows to all groups increased after 2008 (Table 1). The means suggest also that net portfolio to FMs outstripped those to the EM control group. Standard deviations suggest that after 2008, the volatility of net portfolio flows to all but the NFM-LIDC group increased and that the increase was most pronounced for FMs.

Table 1. Summary Statistics

	Net Portfolio Investment (% GDP)			
	Mean	Std.Dev	Min.	Max.
LIDCs				
2000-08	0.693	1.129	0.124	0.329
2008-14	0.354	0.207	0.105	0.67
FMs				
2000-08	0.135	0.446	-0.444	1.277
2008-14	1.007	0.807	-0.108	2.397
NFM-LIDCs				
2000-08	0.046	0.719	-0.054	0.218
2008-14	0.13	0.124	-0.063	0.335
EMs (Control group)				
2000-08	0.077	0.331	-0.507	0.686
2008-14	0.386	0.317	0.005	0.843

The correlation matrix provides preliminary insights into the bivariate relationships between the variables we use in our empirical investigation (Table 2). In particular, there is a negative relationship between portfolio inflows EMDCs receive and the VIX as well as interest rates in major AEs, proxied by the 10-year US Treasury bond yield. Also, the correlations among the variables we use are all very low, suggesting that, in the regressions, there should be no concerns about multicollinearity among regressors.

Table 2: Correlation Matrix

	Portfolio Investment/ GDP	VIX	U.S 10-Y Treasury Bond Yield	Growth	Debt/GDP	Fiscal Balance/ GDP	Current-Account/ GDP	Exports/ GDP
Portfolio Investment/GDP	1							
VIX	-0.0672*	1						
	(0.0302)							
U.S 10-Y Treasury Bond Yield	-0.1303*	0.1124*	1					
	0.0000	*(0.0002)*						
Growth	0.0429	-0.1084*	-0.008	1				
	(0.1674)	*(0.0004)*	*(0.7760)*					
Debt/GDP	-0.0562	0.0261	0.267*	0.1061*	1			
	(0.0784)	*(0.4083)*	*0.0000*	*(0.0008)*				
Fiscal Balance/GDP	-0.0392	-0.0875*	0.089*	-0.0897	-0.102*	1		
	(0.2102)	*(0.0047)*	*(0.0030)*	*(0.0013)*	*(0.0010)*			
Current-Account/GDP	-0.1189*	-0.0324	0.189*	0.0257	-0.086*	0.112*	1	
	(0.0001)	*(0.2919)*	*0.0000*	*(0.4032)*	*(0.0050)*	*(0.0030)*		
Exports/GDP	0.0463	-0.0406	0.0305	0.1114*	-0.066*	0.1053*	0.1668*	1
	(0.1357)	*(0.1857)*	*(0.3200)*	*(0.0003)*	*(0.0350)*	*(0.0006)*	*0.0000*	

*p-values are reported in parantheses and * denotes signicance*

Financial Integration

To test for changes in FMs' financial integration with the global markets, we use bond-index data. These include individual FM country indices and a global bond index. To construct bond returns in FMs in our sample, we use JP Morgan's NEXGEM index. NEXGEM index is a fixed-income benchmark that provides exposure to non-investment grade rated, smaller, less liquid population of EMs economies or FMs. It includes 18 countries representing Sub-Saharan Africa, Central American, the Caribbean, Middle East, Europe, and Asia. We use the bond index for each country to construct bond return and apply our financial integration methodology. In total, we have 12 FMs and 10 EMs with data available (Appendix E for a complete list). To capture the global bond returns, we use JP Morgan Global Aggregate Bond Index (GABI), which consists of the JPM GABI US, a U.S. dollar denominated, investment-grade index spanning asset classes from developed to emerging markets, and the JPM GABI extends the U.S. index to also include multi-currency, investment-grade instruments.

IV. EMPIRICAL ANALYSIS AND RESULTS

A. Hypotheses

The visual analysis and summary statistics highlight the stylized facts on possible shifts in the size and volatility of net portfolio flows within and across EMDCs. However, these stylized facts do not provide much evidence about the nature and significance of the shifts. We build on the insights from the stylized facts to formulate hypotheses that are subsequently tested in econometric analyses. The first hypothesis (H1) is the basis of our tests for the shift in the size of capital flows. Conditional upon H1 being true, the second hypothesis (H2) allows us to test the sensitivity of capital flows to changes in global risk aversion, thereby helping to assess differences in volatility of capital flows between FMs and the control group. The third hypothesis (H3) aims to test for changes in FMs' financial integration with the global markets, i.e., financial spillover risk. H3 is conditional upon H1 being true. Each hypothesis is explained below.

Hypothesis 1 (H1): Catching-up on capital flows

$$\{low\ \boldsymbol{r}\ environment\} + \{\sigma_{LQ-EM} \approx \sigma_{FM}\} + \{E[R_{FM}] \geq E[R_{LQ-EM}]\} \rightarrow \{"Search\ for\ Yield"\}$$
$$\rightarrow \Delta\left[\frac{CF}{Y}\right]_{FM} \geq \Delta\left[\frac{CF}{Y}\right]_{LQ-EM}$$

where *r* is the world interest rate, σ stands for the country risk profile, *E*[.] denotes mathematical expectation, *R* represents the rate of return on private investment, *Y* is the output and *CF* stands for capital flows.

Hypothesis 1 says that in a low interest rate environment, where the underlying macroeconomic risks in EMs and FMs are broadly similar, and where the expected rate of return on FM assets is equal to or higher than that on EMs' assets (as in Figure 4), increases in private capital flows to FMs will be comparable to those to EMs reflecting the investors' search for higher yields. In our analysis, we take the 2008 monetary easing in AEs as an exogenous shock that results in ample liquidity, search for yield, reduction in investors' risk aversion, and increased capital flows to EMDCs. Drawing on the stylized facts, we consider that these increases, measured in percent of recipient countries' GDP, differ across the following three subgroups of EMDCs: (i) NFM-LIDCs with low integration and financial development; (ii) FMs with stronger macroeconomic fundamentals; (iii) EMs with the strongest fundamentals. We expect FMs to attract more or at least equal amount of capital flows compared to EMs unlike NFM-LIDCs.[12]

Hypothesis 2 (H2): Increased sensitivity of FMs to global economic and financial developments

If Hypothesis 1 is true, i.e., if we find evidence of a significant increase in private portfolio flows to FMs that make them resemble more those to EMs, we expect FMs to become more exposed to external financial shocks and changes in investor sentiment. Therefore, in turmoil times the

[12] This is in line with the breakdown of aggregate portfolio flows to LIDCs as illustrated in Figures 2 and 3.

flows would significantly decrease. This is also a reflection of greater integration into global financial markets. Hence, our third hypothesis.

Hypothesis 3 (H3): Greater integration of FMs into global financial markets

If H1 is verified, it means that FMs increasingly resemble EMs and their financial integration increases. Therefore, we expect increased co-movement between FMs' bond returns and global bond returns. In particular, we expect, in an ICAPM regression, FMs' market beta to increase and become significant after 2008.

B. Portfolio Flows: Investigating H1 and H2

Methodology

In the first part of our empirical analyses, the objective is to identify, the average effect of being perceived as a frontier market (FM) on net portfolio flows using a DiD approach. Borrowing from Rubin's (1974) description of causal effects in non-randomized experiments, we are interested in estimating, from a population of developing countries, the typical causal effect of a country being treated as FM versus non-FM on net portfolio flows to the country (i.e., the average impact of treatment on the treated). The GFC and the ensuing search for yields associated with low interest rates offer a useful window for assessing variations in portfolio flows within and across developing countries subgroups. We exploit the pre- and post-crisis pattern of capital flows to compare portfolio flows to countries when they are perceived as FMs to portfolio flows to a control group (LQ-EMs), an estimate of the counterfactual.

In a DiD estimation in general, outcomes are observed for two groups during two time periods and the estimation is used to assess the impact of a particular treatment on the outcome of the treated group. One of the groups is exposed to a treatment in the second period but not in the first period. In panel data, with the same units within a group being observed in each time period, the average gain in the non-treated group (the control group) is subtracted from the average gain in the treatment group to get an estimate of the effect of the treatment. Assuming that Y1 and Y0 are outcomes (net portfolio flows) after and before the crisis, the DiD logic can be better illustrated in a box using, in line with our analysis, FMs and LQ-EMs as treatment group and control group, respectively, to derive the effect of the treatment after the crisis. Appendix F elaborates further on our DiD estimation based on regression specification.

Table 3. Illustration of DiD estimation

	FMs *(treatment group), FM=1*	**LQ-EMs (control group),** *FM=0*
After the crisis, *t=1*	Y_1 / *FM=1*	Y_1 / *FM=0*
Before the crisis, *t=0*	Y_0 / *FM=1*	Y_0 / *FM=0*
In-group difference between post and pre-crisis outcomes	$(\bar{Y}_1$ / *FM=1)-*$(\bar{Y}_0$ / *FM=1)*	$(\bar{Y}_1$ / *FM=0)-*$(\bar{Y}_0$ / *FM=0)*
$DiD = [(\bar{Y}_1$ / *FM=1)-*$(\bar{Y}_0$ / *FM=1)] - [*$(\bar{Y}_1$ / *FM=0)-*$(\bar{Y}_0$ / *FM=0)]*		

An important methodological concern of a DiD estimation that is addressed in our analysis is that the estimate of the difference in outcomes between the treated group and the control group could be affected by other shocks taking place at the same time or by time-invariant country characteristics that have a bearing on portfolio flows, thereby precluding a meaningful causal inference between the treatment and the outcome. This concern is addressed in two ways. First, as indicated earlier, the control group is made of countries that are broadly similar to FMs in terms of developmental characteristics and are exposed to similar shocks. Second, using panel data and fixed-effects (FEs), we control for observed and unobserved time-invariant country-specific characteristics that might be correlated with both a country's characterization as FM, as well as the volume of portfolio flows it attracts.

The use of a DiD approach is a novelty of this paper and an important contribution to the literature on capital flows in terms of assessing shifts in capital flows dynamics. To the best of our knowledge, this is the first paper that uses this type of empirical approach in a macroeconomic setting to understand the dynamics of capital flows. The DiD approach makes it possible to compare the convergence in private capital flows both cross-sectionally and across time. The cross-sectional comparison avoids the problem of omitted trends by comparing two groups over the same time period. The time series comparison avoids the problem of unobserved differences between two different country groups by looking at the same group of countries before and after the change (Roberts and Whited, 2013).

We model private portfolio inflows to FMs, NFM-LIDCs, and LQ-EMs (control group) using annual panel data from about 76 countries during 2000–14 and compare changes in portfolio flows taking into account country and time fixed effects. The country fixed effects control for unobserved, time invariant heterogeneity in countries' risks. The year fixed effects control for shocks common to all countries. The start date 2000 allows us to compare the period prior to the global financial crisis (2000–08) when flows to LIDCs were lower, to the post-2008 period with notable increase in inflows following the monetary easing (shock). Our baseline regression is:

$$\frac{NPI_{i,t}}{Y_{i,t}} = \beta_0 LIDC_{i,t} + \beta_1 Crisis_t + \beta_2 FM_{i,t} + \beta_3 FM_{i,t} Crisis_t + \beta_4 NFM_{i,t} Crisis_t + \gamma * X_{i,t} + \upsilon_i + \xi_t + u_{i,t} \quad (1)$$

where:

- i and t denote country and year, respectively.
- $NPI_{i,t}$ (=Net Portfolio investment in US$)
- $Y_{i,t}$(= GDP in US$)
- $LIDC_{i,t}$ (=1 if country i is LIDC, 0 otherwise)
- $Crisis_t$ (=1 if the observation is after 2008, 0 otherwise)
- $FM_{i,t}$ (=1 if country i is FM, 0 otherwise)
- $NFM_{i,t}$ (=1 if country i is NFM-LIDC, 0 otherwise)
- $X_{i,t}$(=control factors)
- υ_i(=country fixed effects)
- ξ_t(=year fixed effects)

The dependent variable is defined as the ratio of net portfolio investment (NPI) to country *i* during period *t* as a percentage of the country's nominal GDP. In the baseline specification, v_i, and ξ_t are country and year fixed effects, respectively. Our key variables of interest are: the interaction term between $FM_{i,t}$ and the crisis dummy (β_3) and the interaction term between $NFM_{i,t}$ and the crisis dummy(β_4) in Eq. 1. If FMs and NFM-LIDCs are differently affected after 2008, we expect β_3 and β_4 to be statistically significant. If Hypothesis 1 is true, we expect β_3 to be positive and statistically significant.

A common approach in this type of regressions is to control for country-level characteristics as well as global determinants.[13] Therefore, we employ a number of control of variables, i.e., push and pull factors which the existing literature have found to explain changes in capital flows across time and countries. This allows us to get a "clean" measure of difference between portfolio flows to FMs and the control group (EMs or NFM-LIDCs) that can be attributed primarily to the treatment (2008 monetary easing).

Testing for Hypothesis 2 (increasing sensitivity of FMs) requires an analysis of the same flow data using DiD methodology with two different specifications in order to ascertain whether, taking into account the level of global risk aversion, FMs are treated the same as EMs. In the first specification, we introduce a triple interaction term comprising FM, crisis, and VIX. If, after the crisis, FMs are treated as EMs, this interaction term should not be statistically significant. In the second, considering that EMs experience a reduction of capital flows in periods of heightened stress in global financial markets, we run regressions to ascertain, from the yearly pattern of net portfolio flows, whether the experience of FMs is the same as that of EMs. Accordingly, in lieu

[13] Several studies document evidence on the determinants of capital flows, e.g. Byrne and Fies, 2016; IMF, 2011; Ghosh et al., 2014; Fratzscher et al., 2013; Forbes and Warnock, 2012; Shaghil and Andrei, 2014; IMF, 2014.

of including one interaction term of the FM and crisis dummies, the regression includes several interactions terms of the dummy FM with a dummy for each of the years the sample covers. Focusing particularly on the post-crisis period, during which FMs are found to have experienced an increase in portfolio flows exceeding that of EMs, we expect the interaction terms of the FM dummy and year dummies to be positive and significant, except in years of heightened stress in global financial markets. We estimate the following regression model:

$$\frac{NPI_{i,t}}{Y_{i,t}} = \beta_0 LIDC_{i,t} + \sum_{t=2001}^{2014} \beta_t * D_t + \beta_2 FM_{i,t} + \sum_{t=2001}^{2014} \alpha_t * D_t * FM_i + \sum_{t=2001}^{2014} \gamma_t * D_t * NFM_i \quad + \upsilon_i + \xi_t + \epsilon_{i,t} \tag{2}$$

Where *LIDC*, *FM*, and *NFM* are defined as in equation (1); D_t is a dummy variable set equal to 1 if the observation falls during year *t*.

Lastly, as another robustness check we run the regression specified in Eq. 1 for all LIDCs as a group to compare with the control group LQ-EMs to understand if the increases in capital flows have occurred for all LIDCs or only for FMs because of the latter's changing economic nature. We estimate Equation 1 using only LIDC interaction terms. Our variable of interest is the interaction term between LIDC dummy and the crisis dummy. If after the crisis, countries in the LIDCs group as a whole experience a change in portfolio flows that is significantly different from that of the LQ-EMs group, we expect this interaction term to be statistically significant.

Results

Our tests provide evidence on changes in portfolio flows to LQ-EMs, FMs and the rest of the LIDCs (NFM-LIDCs). The results show that during 2000–14 portfolio flows to FMs exceeded those to LQ-EMs by 1.4 percentage points of GDP, while portfolio flows to other LIDCs in comparison to EMs have not changed significantly. In section II of the paper, we documented that visually portfolio flows to both FMs and EMs have been increasing since 2008. Here, we are able to demonstrate that (i) the upward trend was similar for both groups; and (ii) the increase has been higher for FMs as a percentage of GDP.

Overall, the results provide answers to the following question: comparing net portfolio flows to two countries after controlling for standard determinants of capital flows, does the country that happens to be an FM (or NFM- LIDCs) observe a significant increase in portfolio flows after 2008 compared to LQ-EMs? The coefficients of our variables of interest are highly significant and robust (Table 4). This result suggests that while FMs are becoming more similar to LQ-EMs in terms of portfolio flows, there is no evidence of a similar trend for the rest of the LIDC group. Including only the push factors (VIX and US bond yield) does not change the results. When controlling for pull factors, we find that FMs' portfolio flows exceed EMs' by 0.62 percent of GDP, less than our initial finding of 1.4 percent.

Table 4. Hypothesis 1 Results: Catching up on Capital Flows

	NPI/GDP							
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Crisis$_t$*Frontier$_i$	1.417**	1.417**	0.623**	0.623**	0.623**	0.876***	0.845***	0.844***
	(0.6820)	*(0.6820)*	*(0.2690)*	*(0.2560)*	*(0.2560)*	*(0.2160)*	*(0.2230)*	*(0.2360)*
Crisis$_t$*NFM$_i$	0.611	0.611	-0.12	-0.0775	-0.137	-0.129	-0.0902	-0.146
	(0.6140)	*(0.6140)*	*(0.2040)*	*(0.1940)*	*(0.1870)*	*(0.2010)*	*(0.1910)*	*(0.1840)*
VIX $_t$		-0.0363	-0.0219***	-0.0231***	-0.0223***	-0.0210***	-0.0220***	-0.0213***
		(0.0244)	*(0.0067)*	*(0.0068)*	*(0.0068)*	*(0.0068)*	*(0.0070)*	*(0.0069)*
U.S 10-Y TB yield$_t$		0.108	-0.0253	0.00238	-0.0303	-0.0265	-0.000221	-0.0312
		(0.2190)	*(0.0723)*	*(0.0730)*	*(0.0698)*	*(0.0727)*	*(0.0732)*	*(0.0704)*
Growth$_t$			0.00325	0.0027	0.00367	0.00382	0.00326	0.00417
			(0.0051)	*(0.0051)*	*(0.0049)*	*(0.0051)*	*(0.0051)*	*(0.0049)*
Debt-to-GDP$_{t-1}$			-3.84E-08	-4.06E-08	-1.75E-08	-3.77E-08	-3.98E-08	-1.84E-08
			(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*
Fiscal-Balance/GDP$_{t-1}$			9.91E-08	1.17E-08	7.70E-08	8.25E-08	-1.30E-09	6.13E-08
			(0.0000)	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*	*(0.0000)*
Current-Account/GDP$_t$				-0.0151**			-0.0144**	
				(0.0068)			*(0.0068)*	
Export-to-GDP$_t$					-0.0139			-0.0139
					(0.0169)			*(0.0170)*
Observations	1,220	1,220	896	896	896	896	896	896
Country FEs	YES	YES	YES	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES	YES	YES	YES
R-squared	0.557	0.557	0.321	0.326	0.324	0.322	0.327	0.325

Notes: *The dependent variable is the ratio of (net) portfolio investment liabilities to GDP. The main regressors are: (i) interaction term of a frontier market (=1 if country i is FM) and a time dummy variable that indicates the start of the crisis (=1 after 2008). All columns include country and year fixed effects. Country observable characteristics push factors and pull factors are added as control variables. Columns (1)-(5) present the baseline specification where FMs are time-invariant. Columns (6)-(8) present the baseline specification where the composition of the FM group is time varying based on countries' qualification dates shown in the first column of Appendix B. All standard errors are clustered at the country-level. *** p<0.01, ** p<0.05, * p<0.1. Observations are between 2000 and 2014.*

The second part of our analysis, testing Hypothesis 2, enables us to document similarities in capital flows to EMs and FMs taking into account the level of global risk aversion. After showing that Hypothesis 1 holds, we conclude, from the nonsignificant coefficient of the triple interaction term, that after the crisis, FMs' exposure to changes in investor sentiment has become comparable to that of our EM control group (LQ_EMs). The coefficient of the triple interaction term reflects the comparison of portfolio flows to FMs relative to EMs after the crisis both in times of lower or heightened stress in global financial markets (Table 5). Secondly, in the regression including interactions of the FM dummy with each of the years, unsurprisingly the interaction terms involving the pre-crisis years are generally not significant, except for 2007, while for the post-crisis years there are differences (Appendix G, Table 1). In particular, interactions involving years of heightened stress in global financial markets—2008, 2009, and

2013, the year of the taper tantrum— are not significant. The results show that although there is no evidence of a flow reversal, the finding that portfolio flows appear to have dried out in times of financial market stress makes FMs somewhat resemble EMs. These findings support Hypothesis 2, providing statistical evidence for increased sensitivity of FM capital flows to developments in the global economy.

Table 5. FM Sensitivity to Global Risk Aversion

	NPI/Y			
	(1)	(2)	(3)	(4)
$Crisis_t*FM_t*VIX_t$	-0.0425	-0.0425	-0.0462	-0.0490
	(0.0336)	(0.0336)	(0.0344)	(0.0342)
$Crisis_t*FM_t$	1.506*	1.506*	1.630*	1.861**
	(0.825)	(0.825)	(0.858)	(0.860)
VIX_t		-0.00106	-0.00129	-0.00887
		(0.0344)	(0.0355)	(0.0355)
U.S 10-Y TB $yield_t$		-0.0834	-0.0987	-0.0609
		(0.147)	(0.157)	(0.0158)
$Growth_t$			-0.00283	-0.00638
			(0.0289)	(0.0288)
Fiscal Balance/GDP_{t-1}			0.0348	0.0399
			(0.0323)	(0.0322)
Export/GDP_t				-0.0303**
				(0.0138)
Observations	440	440	428	428
Country FEs	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES
R-squared	0.239	0.239	0.232	0.241

Notes: *This table implements a triple interaction DiD estimation using the interaction of risk aversion (proxied by the VIX index), a crisis dummy (=1 in 2008 and after) and a frontier market dummy. All standard errors are clustered at the country level. *** p<0.01, ** p<0.05, * p<0.1. Observations are between 2000 and 2014.*

We run a number of robustness tests. First, we try to see whether the results hold if we use country specific dates for meeting the FM qualification criteria. Even when a non-stationary FM group is used to compare net portfolio flows to FMs relative to LQ-EMs, we still find that FMs received more than LQ-EMs, by roughly 0.85 percentage point of (Table 4, columns 6–8). Secondly, we use an alternative specification that includes a proxy for governance (International Country Risk Guide Indicators for country governance) to see if changes in governance could be driving the main results. These governance indicators are not available for all countries, decreasing the sample size by 50 percent. The regressions follow our baseline setup, including a full set of country and year fixed effects. We find an increase in portfolio flows to FMs of about

0.6 percent of GDP relative to LQ-EMs (Appendix G, Table 2). Our reading of the evidence is that although some results lose significance in some specifications, overall our results are highly robust across different specifications.

We also run regressions in which we compare all LIDCs (FMs and NFM-LIDCs) as a group to LQ-EMs using a DiD test. The results are presented in (Appendix G, Table 3). These tests illustrate that the coefficients of interest are not statistically significant, i.e., when LQ-EMs are compared with the whole LIDC universe, there is no evidence of increased portfolio flows to LIDCs that would suggest convergence towards, or greater similarity with, EMs in terms of these flows. Our initial findings indicating a similar trajectory between FMs and EMs are specific to FMs. After 2008, private capital flows to FMs have been on a different trajectory from those to the rest of the LIDC group.

C. Financial Integration: Investigating the FM's Integration Hypothesis (H3)

Methodology

A different empirical framework is used to test for changes in the financial integration of FMs with global financial markets. We argue that as a result of FMs' larger capital flows after 2008, their financial integration with the global markets also increased. In other words, in a fully integrated world, local assets in an FM country are affected by the same type of world shocks that advanced markets experience. By contrast, when markets are segmented, a local economy may be largely shielded from such external shocks. However, as both the economic and financial integration increase, local assets would be affected more by shocks in advanced markets. As a result, correlations would increase (Bekaert and Harvey, 2000).

We calculate global market betas to test for the changes in FMs' integration with the global markets. To test for these, we use an ICAPM model.[14] CAPM beta has been widely used for gauging the level of market integration (Bekaert and Harvey, 1995; Bodnar et al., 2003; Bruner et al, 2008). In addition to analyzing FMs' market betas, we calculate these also for EMs for comparison. The crisis year 2008, which corresponds to US monetary easing, is used as a break point in the sample period 2000–14. The sample covers 12 FMs and 10 EMs, and all the data is at monthly frequency. Our empirical model provides estimates of FMs' sensitivities to and comovement with global financial markets:

$$R_{i,t} - R_t^f = \alpha_i + \beta * \left(R_t^{Mkt} - R_t^f\right) + \gamma i + \varepsilon_{i,t} \qquad (4)$$

where $R_{i,t}$ represents the bond index return of country i at month t, R^{Mkt} is the market return on Barclays Global Bond Index, R_f is the risk-free rate proxied by 3-month US T-bill rate, γ_i stands for country fixed effects, and $\epsilon_{i,t}$ is the unexplained portion of the variance in the return for country i during day t. All returns are calculated using US$ prices.

[14] For a comprehensive review of CAPM literature, see: Fama and French, 2004; Perold, 2004.

Initially, we run single-factor CAPM tests with the global market index as specified above. Through these regressions, we aim to see if and how the global market beta changed after the monetary easing, which would indicate increase in financial integration if true. We also run a two-factor CAPM, with both local and global indices (Eq. 5 below). These reflect local and global factors, respectively. This results in a partial-integration model, where we assume that investors price both the global and local risk factors, but separately. In the literature, the notion of 'partial market integration' has been widely used for asset pricing in emerging markets. In our case, it is appropriate given the similarities between current FMs and the earlier EM experience.

$$R_{i,t} - R_t^f = \alpha_i + \beta_1 * \left(R_t^{Mkt} - R_t^f\right) + \beta_2 * \left(R_t^{local} - R_t^f\right) + \gamma i + \varepsilon_{i,t} \qquad (5)$$

where the only difference from Eq.4 is the term $\beta_2 * \left(R_t^{local} - R_t^f\right)$. R_t^{local} stands for the return on a narrow or immediate benchmark index that includes FM or EM bonds. For FMs and EMs, "local" indices are proxied by JP NEXGEM index and EMBI, respectively.

Our market integration/segmentation hypothesis (H3) predicts that if FMs are not integrated with the global market, the market beta should be insignificant, i.e., an asset's risk is not measured by its covariance with world returns as it would be in the case of full integration. Instead it would be measured by its own variance, as captured by local market returns. If FMs are integrated, then the market beta should be significant. In this case, if our second hypothesis is true, we should expect to find a significant global market β for FMs after 2008.

Results

Our results indicate enhanced market integration for FMs in the post-2008 period, which also implies more pronounced financial vulnerabilities. To document this, we compare FMs' market betas before and after 2008 as well as comparing with those of EMs. First, we find that before 2008 the correlation between FM bond index returns and global bond market returns is insignificant. After 2008 we find a significant and positive relationship between these returns, and FMs' market beta becomes comparable to that of EMs at around 1.7. The econometric results are illustrated in Table 6; FMs in Panel A and LQ-EMs in Panel B. The results for the periods 2000–08 and 2008–14 are reported separately; labelled as "before" and "after" respectively. Columns 1–4 are populated by the results from single-factor ICAPM regressions; without and with fixed effects. Columns 5 and 6 show the results from two-factor ICAPM regressions. Overall, the findings show that, as portfolio flows to FMs started to become similar to those to EMs after 2008, the comovement between FMs' and global markets' returns has also increased, implying enhanced financial integration and vulnerabilities.

Table 6. ICAPM Estimation Results

Panel A: ICAPM Frontier Markets

Variables	(1) BEFORE	(2) AFTER	(3) BEFORE	(4) AFTER	(5) BEFORE	(6) AFTER
$R^{mkt}{}_t - R^f{}_t$	0.454	1.716***	0.499	1.716***	0.179	1.121***
	(0.312)	(0.391)	(0.322)	(0.402)	(0.282)	(0.323)
$R^{nexgem}{}_t - R^f{}_t$	-	-	-	-	0.339**	0.473***
					(0.159)	(0.127)
Constant	-0.236	-0.079	-1.035	-0.470	-0.944**	-0.178
	(0.267)	(0.291)	(0.648)	(0.425)	(0.426)	(0.284)
Country FE	-	-	YES	YES	YES	YES
Observations	824	839	824	839	824	839
R-squared	0.008	0.081	0.020	0.088	0.140	0.315

Panel B: ICAPM Emerging Markets

Variables	(1) BEFORE	(2) AFTER	(3) BEFORE	(4) AFTER	(5) BEFORE	(6) AFTER
$R^{mkt}{}_t - R^f{}_t$	1.373***	1.669***	1.312***	1.656***	0.541**	0.713**
	(0.332)	(0.439)	(0.331)	(0.450)	(0.219)	(0.327)
$R^{embi}{}_t - R^f{}_t$	-	-	-	-	0.681***	0.744***
					(0.0413)	(0.0509)
Constant	-0.246	-0.317	-6.115***	-1.11	-1.117	-0.962
	(0.288)	(0.359)	(1.763)	(1.799)	(1.178)	(1.282)
Country FE	-	-	YES	YES	YES	YES
Observations	702	730	702	730	702	730
R-squared	0.079	0.059	0.135	0.072	0.641	0.531

***Notes** : The dependent variable is $R_{i,t} - R_t{}^f$, where i and t stands for country and time, respectively. The estimation uses robust standard errors to allow for correlation across error terms. . *** p<0.01, ** p<0.05, * p<0.1. Monthly observations are between 2001 and 2014.*

Initially, we test for changes in financial integration by using a single-factor CAPM model. For FMs, we find that there is a noteworthy difference in the global market beta before and after 2008. The beta becomes positive and significant in the latter, implying that FMs have become more financially integrated after 2008, while they were segmented from the global markets before. On the other hand, for EMs, the global market beta is positive and significant for both periods, with a slight increase after 2008. Another interesting result we obtain is that the post-2008 market betas for FMs and EMs are of comparable size at approximately 1.7, supporting our view on FMs becoming similar to EMs in terms of market integration. The magnitude of the coefficient (market beta) is also economically important, implying that a change in international bond returns of 1 percent translates into a 1.7 percent change in FM bond returns after 2008. In this case, assuming a negative shock in global markets that leads to a 1 percent increase in returns, FM bonds will experience an increase of 1.7 percent in returns. Given the nature of bonds, asset prices will move in the opposite direction, i.e., FM bond prices will decrease. As a result, FMs will experience this global shock more severely than advanced markets. As a result, we interpret our findings as robust evidence in favor of integration of LQ-EMs (over 2000–14) and post-2008 integration of FMs with the global markets.

The results from two-factor ICAPM regressions support the partial-integration argument, where sub-group bond indices are assumed to proxy for local risk factors and the global index is a proxy for global risk factors. For both FMs and EMs, R^2 values are notably higher than those of single-factor regressions, demonstrating that both local and global factors are priced, but separately. In the FM case, while before 2008 only local factors are priced, after 2008 this is true for both local and global factors. R^2 increases from 8.8 percent to 31.5 percent, and large unexplained variance indicate significant other (omitted) risk factors and idiosyncratic risks. For EMs, local and global factors are significant both before and after 2008, indicating their already partially-integrated nature in the 2000s.[15]

All in all, our findings support our financial integration hypothesis H3. Following the monetary easing and increase in capital flows, we find that FMs moved from full-segmentation to greater integration with the global markets. This also shows that they resemble EMs in terms of their vulnerability to global shocks and to external risks. This comes as no surprise given that financial integration is often accompanied or preceded by economic integration.

V. CONCLUSION

Over the past decade, capital flows to FMs increased significantly, reflecting FMs' improved macroeconomic performance and investors' greater interest in these economies. Data shows that this trend was particularly strong after the global financial crisis in 2008, a period of loose monetary policy in major AEs and ample global liquidity. In this paper, based on panel data on EMDCs covering the period 2000–14, we focus on investigating whether FMs resemble EMs in terms of both the trends and patterns portfolio flows, as well as the level of FMs' integration with global financial markets. We use two empirical frameworks for our analysis. First, we use the DiD framework to test for the changing trends in portfolio flows and the patterns of such flows for different EMDCs subgroups. Second, to test for the change in FMs' integration with global markets, we rely on an ICAPM model.

The evidence from our DiD results suggests that, in terms of capital flows, since the 2008 crisis, FMs resemble EMs and that they differ from the rest of LIDCs. FMs' resemblance to EMs after the crisis stems from two findings. First, in terms of the volume of capital flows, portfolios flows to FMs have exceeded those to EMs by about 0.6 percentage points of GDP a year, meaning that FMs have been catching up with EMs. Second, when the level of risk aversion is taken into account, portfolio flows to FMs are not statistically different from those to EMs. The finding suggests that in times of heightened stress in global financial markets FMs are just as vulnerable as EMs to portfolio flows drying up or being reversed. This was actually observed in 2008, 2009, and in 2013, the year of the taper tantrum.

Our findings from the ICAPM analysis complements the results from the DiD in two respects. First, they suggest that FMs were not integrated with global financial markets by the time of the 2008 GFC, confirming why FMs largely escaped the turmoil in global markets and lending support to the finding of a significantly higher increase in portfolio flows relative to those to

[15] The literature documents that EMs moved from full-segmentation to partial-integration in the 1990s (Henry, 2000).

EMs only after the crisis. Second, there has been a shift in FMs' integration with global financial markets after the crisis, reflected by their market beta becoming positive and significant. This sign of greater comovement between FMs' and global markets' returns points to a new risk of increased vulnerability to changes in global market conditions and capital reversals that these economies face.

The results suggest that there has been a change in the landscape of capital flows to developing countries that may have policy implications. The finding of FMs' greater vulnerability to adverse developments in global financial markets points to the importance having in place frameworks for FMs to manage vulnerabilities to capital flow reversals and cope with such reversals that could jeopardize macroeconomic performance.

There are a number of caveats in our paper. First, the study's conclusions are based on changes that have occurred during a relatively short period of unusually lax monetary conditions in major AEs. As such, they may not reflect a permanent shift in the way FMs compare to EMs. Also, identifying FMs in our sample, might entail a certain level of sample bias to the extent that the selection of FMs is not random. However, controlling for other determinants of portfolio flows, as done in our regressions, mitigates this bias. Moreover, the selection does not drive our findings, which are interesting and quite intuitive. Additionally, in our tests of financial market integration, we are not able to include all FMs in our regressions, as the bond return data is not available. A larger sample size would have improved the robustness of our findings. As we do not provide any indication of what the shifts imply for either FMs' financing needs or the framework for strengthening resilience to adverse external financial shocks, there is room for further research on the policy implications of our findings.

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Appendix A. LIDCs

Notes: LIDCs are 60 countries with the following characteristics (IMF, 2014):

PRGT-eligible in the 2013 PRGT eligibility exercise

Level of per capita Gross National Income (GNI) less than the ad-hoc PRGT income graduation level for non-small states (i.e., 2 *IDA-OT or $2,390).

Low-Income Developing Countries (LIDCs)

Afghanistan	Madagascar
Bangladesh	Malawi
Benin	Mali
Bhutan	Mauritania
Bolivia	Moldova
Burkina Faso	Mongolia
Burundi	Mozambique
Cambodia	Myanmar
Cameroon	Nepal
Central African Republic	Nicaragua
Chad	Niger
Comoros	Nigeria
Congo, Democratic Republic of the	Papua New Guinea
Congo, Republic of	Rwanda
Côte d'Ivoire	Senegal
Djibouti	Sierra Leone
Eritrea	Solomon Islands
Ethiopia	Somalia
Gambia, The	South Sudan
Ghana	Sudan
Guinea	São Tomé and Príncipe
Guinea-Bissau	Tajikistan
Haiti	Tanzania
Honduras	Togo
Kenya	Uganda
Kiribati	Uzbekistan
Kyrgyz Republic	Vietnam
Lao P.D.R.	Yemen
Lesotho	Zambia
Liberia	Zimbabwe

Appendix B. Sub-Groups

Notes: For analytical purposes, we have divided the LIDCs group into two subgroups (FMs and the rest of the LIDCs), based on characteristics that are key drivers of economic performance (IMF, 2014). In the table below, the first column shows the list of FMs and, besides each country, the year in which it met the FMs classification criteria (time-varying classification of FMs countries, drawn from De Lira and Nkusu (2015)). The second column shows the EMs in our control group.

FMs	**EMs (Control Group)**
Bangladesh (2010)	Angola
Bolivia (1997)	Armenia
Côte d'Ivoire (2010)	Egypt
Ghana (1997)	El Salvador
Kenya (1996)	Fiji
Mongolia (2008)	Georgia
Mozambique (1999)	Guatemala
Nigeria (1998)	Indonesia
Papua New Guinea (2003)	Kosovo
Senegal (2009)	Morocco
Tanzania (2010)	Paraguay
Uganda (2010)	Sri Lanka
Vietnam (2008)	Swaziland
Zambia (1998)	Syria
(Honduras)	Tunisia
	Ukraine

Appendix C. Deriving a Frontier Market Group Combining IMF and Market Analysts' Classifications

To construct an FM group that takes into account IMF's and market analysts' classification, for each country that does not exceed the income threshold separating LMIC from UMIC, the classification by each of the market analysts or the IMF takes discrete values of -1, 1, and 0, when the country is classified as an EM, an FM, or neither, respectively. As we are more interested in macroeconomic fundamentals, the IMF's classification is assigned the same weight as all the market analysts together while individually, market analysts are assigned equal weights. For a country, if the overall weighted average rating is at least 0.5, it means that either the IMF's characterization of the country as FM is confirmed or that market analysts overwhelmingly classifies the country as an FM even when the IMF considers it to be a NFM-LIDC. Yellow highlights indicate country is not FM while green highlights indicate country is FM after taking into account IMF and market analysts' classifications.

Country	IMF	Next Eleven	FTSE	MSCI	Russell	NEXGEM	EMBI	Weighted average rating (WaR)	Classification, FM=1 if WaR≥0.5
Indonesia	-1	-1	-1	-1	-1		-1	-0.917	0
Egypt	-1	-1	-1	-1	1	1	-1	-0.667	0
Angola	-1	0	0	0	0	1	-1	-0.500	0
El Salvador	-1	0	0	0	0	1	-1	-0.500	0
Fiji	-1	0	0	0	0	0	0	-0.500	0
Guatemala	-1	0	0	0	0	1	-1	-0.500	0
Kosovo	-1	0	0	0	0	0	0	-0.500	0
Paraguay	-1	0	0	0	0	1	-1	-0.500	0
Swaziland	-1	0	0	0	0	0	0	-0.500	0
Syria	-1	0	0	0	0	0	0	-0.500	0
Armenia	-1	0	0	0	0	1	0	-0.417	0
Georgia	-1	0	0	0	0	1	0	-0.417	0
Ukraine	-1	0	0	1	1	0	-1	-0.417	0
Morocco	-1	0	1	1	1	0	-1	-0.333	0
Tunisia	-1	0	1	1	1	0	-1	-0.333	0
Sri Lanka	-1	0	1	1	1	1	-1	-0.250	0
Bolivia	1	0	0	0	0	1	-1	0.500	1
Mongolia	1	0	0	0	0	1	-1	0.500	1
Papua New Guinea	1	0	0	0	0	0	0	0.500	1
Tanzania	1	0	0	0	0	1	-1	0.500	1
Uganda	1	0	0	0	0	0	0	0.500	1
Mozambique	1	0	0	0	0	1	0	0.583	1
Senegal	1	0	0	0	1	1	-1	0.583	1
Zambia	1	0	0	0	1	1	-1	0.583	1
Honduras	0	0	0	0	0	1	0	0.083	0
Bangladesh	1	-1	1	1	1	0	0	0.667	1
Cote d'Ivoire	1	0	1	0	1	1	-1	0.667	1
Nigeria	1	-1	1	1	1	1	-1	0.667	1
Vietnam	1	-1	1	1	1	1	-1	0.667	1
Ghana	1	0	1	1	1	1	-1	0.750	1
Kenya	1	0	1	1	1	1	0	0.833	1

Appendix D. Definition of Variables

Dependent Variable

We model net private capital inflows to FMs, LIDCs Non-FMs and control group from 2000 to 2014. The main dependent variable is the ratio of net portfolio investment to country i during the year t as a fraction of the country's nominal GDP.

$\frac{NPI_{i,t}}{Y_{i,t}}$. Net portfolio investment scaled by GDP, where $NPI_{i,t}$ is the net portfolio investment and $Y_{i,t}$ is country's i nominal GDP. Source: WEO.

Key Explanatory Variables: Push Factors

U.S.10-year Treasury bond yield. Source: Federal Reserve Economic Data – FRED – St. Louis Fed

VIX (risk aversion) is a trademarked ticker symbol for the Chicago Board Options Exchange Market Volatility Index, a popular measure of the implied volatility of S&P 500 index options. Often referred to as the "fear index" or the "fear gauge", it represents one measure of the market's expectation of stock market volatility over the next 30-day period. Source: Bloomberg.

Key Explanatory Variables: Pull Factors

Growth: Output Growth. Source: IMF.

Total Debt-to-GDP Ratio: Sovereign Debt scaled by GDP. Source: WEO.

Fiscal-Balance-to-GDP Ratio: Fiscal Balance scaled by GDP. Source: WEO.

Governance. Country Financial Governance Index. Source: International Country Risk Guide (ICRG).

Others

R^{Mkt} - R^f : Excess Returns
Source: J.P Morgan and Federal Reserve Economic Data – FRED –St. Louis Fed

R^f_t : Risk-free rate. Source: Federal Reserve Economic Data – FRED –St. Louis Fed

$R_{i,t}$: $\Delta lnP_{i,t}$, where $P_{i,t}$ is the bond index of country i in month t. Source: Barclays.

Appendix E. Financial Integration, CAPM, Sub-Groups

Notes: The data is obtained from NEXGEM and EMBIG JP Morgan Indices.

FMs	EMs
Bolivia	Angola
Ghana	Egypt
Côte d'Ivoire	El Salvador
Senegal	Georgia
Tanzania	Indonesia
Vietnam	Morocco
Zambia	Paraguay
Nigeria	Sri Lanka
Kenya	Tunisia
Mongolia	Guatemala
Honduras	Ukraine
Mozambique	

Appendix F. Econometric Framework and Identification Strategy

This section will provide an overview of the underlying assumptions for our empirical strategy. Let us first rewrite a simplified version Eq. 1:

$$\frac{NPI_{i,t}}{Y_{i,t}} = \beta_0 LIDC_{i,t} + \beta_1 Crisis_t + \beta_2 FM_{i,t} + \beta_3 FM_{i,t} * Crisis_t + \beta_4 NFM_{i,t} * Crisis_t + \gamma X_{i,t} + u_{i,t} \quad \text{(E1)}$$

We define the LIDCs eligibility assignment set $\mathcal{E}_t \equiv \{i \in \mathcal{I} : LIDC_{i,t} = 1\}$. The complement of ε_t, $\varepsilon^C{}_t$ is the control assignment set. Let $\bar{F}_t$ be the frontier of some set F_t. Then,
we define the lower bound of EMs B_t as:

$$\mathcal{B}_t \equiv \bar{\mathcal{E}}_t \cap \mathcal{E}_t^C \quad \text{(E2)}$$

We define three groups by their distance to the ad-hoc cutoffs presented in Figure 1.

Let $\mathcal{B}_{h^+,t} \equiv \mathcal{B}_{h,t} \cap \mathcal{E}_t$, $\mathcal{B}_{h^-,t} \equiv \mathcal{B}_{h,t} \cap \mathcal{E}_t^C$, $\mathcal{B}_{h^{--},t} \equiv \mathcal{E}_t \cap \mathcal{B}_{h^-,t}$ be the lower bound of the EMs and the FMs and the LIDC non-FMs countries, respectively.

The idea of the methodology used in this paper is to compare the outcome (i.e., portfolio investments) while controlling for the cross sectional variation between countries and the time series variation. Using the diff-in-diff, our estimators take into account any permanent, i.e., time- invariant, difference between the treatment groups (FMs and NFM-LIDCs) and the control group (lower bound of EMs) by the inclusion the $FM_{i,t}$, $LIDC_{i,t}$ and $NFM_{i,t}$. Further, any common trend affecting both groups is also differentiated away by the inclusion of $Crisis_t$. In sum, treat for endogeneity issues cannot come from either permanent differences between the control and the treatment groups, or shared trends.

Consider each group of countries and denote τ the conditional expectation of equation E1. We have:

- **EMs, $\mathcal{B}_{h^+,t}$: $LIDC_{i,t}$=0, $Frontier_{i,t}$=0, $NFM_{i,t}$=0**

$$\tau^{Before} = E(Y_{i,t} \mid Crisis_t = 0, X_{i,t}) = \gamma X_{i,t} \quad \text{(E3)}$$

$$\tau^{After} = E(Y_{i,t} \mid Crisis_t = 1, X_{i,t}) = \beta_1 + \gamma X_{i,t} \quad \text{(E4)}$$

(E4) - (E3) is the effect of the crisis on the EMs control group = β_1. Adding $X_{i,t}$ allow us to diminish the endogeneity concern that these countries' capital flows would have changed over the period of observation even if the financial crisis had not been here.

- **FMs, $\mathcal{B}_{h^-,t}$: $\mathbf{LIDC}_{i,t}$=1, $\mathbf{Frontier}_{i,t}$=1, $\mathbf{NFM}_{i,t}$=0**

$$\tau^{Before} = E\left(Y_{i,t} \,|\, Crisis_t = 0, X_{i,t}\right) = \beta_0 + \beta_2 + \gamma X_{i,t} \tag{E5}$$

$$\tau^{After} = E\left(Y_{i,t} \,|\, Crisis_t = 1, X_{i,t}\right) = \beta_0 + \beta_1 + \beta_2 + \beta_3 + \gamma X_{i,t} \tag{E6}$$

(E6) - (E5) is the effect of the crisis on the FMs = β_1 ` β_3. Adding $X_{i,t}$ allows us to diminish the endogeneity concern that these countries' capital flows would have changed over the period of observation even if the financial crisis had not been here.

- **LIDCs Non-FMs: $\mathbf{LIDC}_{i,t}$=1, $\mathbf{Frontier}_{i,t}$=0, $\mathbf{NFM}_{i,t}$=1**

$$\tau^{Before} = E\left(Y_{i,t} \,|\, Crisis_t = 0, X_{i,t}\right) = \beta_0 + \gamma X_{i,t} \tag{E7}$$

$$\tau^{After} = E\left(Y_{i,t} \,|\, Crisis_t = 1, X_{i,t}\right) = \beta_0 + \beta_1 + \beta_4 + \gamma X_{i,t} \tag{E8}$$

(E8) - (E7) is the effect of the crisis on the NFM-LIDCs = $\beta_1 + \beta_4$. Adding $X_{i,t}$ allow us to diminish the endogeneity concern that these countries' capital flows would have changed over the period of observation even if the financial crisis had not been here. Further, the vector $X_{i,t}$ improves the efficiency of our estimators (Roberts and Whited, 2012).

Our strategy addresses the secular trends by examining the outcomes (i.e., Portfolio Investments) for similar groups of countries that are less likely to receive the treatment (capital flows) but shared similar influence to the trending variables. Compared to our control group for EMs, one would expect to see a sharp change in capital flows for the FMs following 2008, this approach is called the difference-in differences (DD). In our context, the DD estimator for FMs countries is obtained by differentiating (E6 - E5) and (E4 - E3) which yields β_3.

Appendix G. Additional Regression Tables

Table 1. Investigating Treatment Effects per year

Notes: The regressions in this table replicate the specifications of the main results, with the exception that FM or NFM-LIDC are interacted with time dummies for each year. All columns include country and year fixed effects. The table shows only the interactions of FM with year dummies. All standard errors are clustered at the country level, allowing for autocorrelation across time and within the country. Observations are between 2000 and 2014. *** p<0.01, ** p<0.05, * p<0.1

	NPI/Y			
	(1)	(2)	(3)	(4)
(year==2001)*FM$_{i;t}$	0.304	0.304	0.304	0.263
	(0.532)	(0.532)	(0.571)	(0.567)
(year==2002)*FM$_{i;t}$	0.167	0.167	0.230	0.203
	(0.530)	(0.530)	(0.568)	(0.564)
(year==2003)*FM$_{i;t}$	0.188	0.188	0.273	0.235
	(0.530)	(0.530)	(0.567)	(0.563)
(year==2004)*FM$_{i;t}$	-0.430	-0.430	-0.357	-0.399
	(0.530)	(0.530)	(0.566)	(0.562)
(year==2005)*FM$_{i;t}$	0.101	0.101	0.211	0.198
	(0.530)	(0.530)	(0.565)	(0.561)
(year==2006)*FM$_{i;t}$	0.101	0.101	0.217	0.196
	(0.530)	(0.530)	(0.564)	(0.560)
(year==2007)*FM$_{i;t}$	1.243**	1.243**	1.357**	1.276**
	(0.530)	(0.530)	(0.565)	(0.560)
(year==2008)*FM$_{i;t}$	0.0197	0.0197	0.128	0.122
	(0.530)	(0.530)	(0.565)	(0.560)
(year==2009)*FM$_{i;t}$	0.0151	0.0151	0.128	0.121
	(0.530)	(0.530)	(0.564)	(0.560)
(year==2010)*FM$_{i;t}$	1.169**	1.169**	1.286**	1.237**
	(0.530)	(0.530)	(0.565)	(0.560)
(year==2011)*FM$_{i;t}$	1.115**	1.115**	1.232**	1.166**
	(0.531)	(0.531)	(0.565)	(0.561)
(year==2012)*FM$_{i;t}$	2.045***	2.045***	2.150***	1.981***
	(0.531)	(0.531)	(0.565)	(0.561)
(year==2013)*FM$_{i;t}$	0.303	0.303	0.380	0.270
	(0.531)	(0.531)	(0.565)	(0.561)
(year==2014)*FM$_{i;t}$	1.254**	1.254**	1.358**	1.302**
	(0.531)	(0.531)	(0.566)	(0.561)
Observations	1,040	1,040	1,002	1,002
R-Squared	0.233	0.233	0.232	0.242
F tests on equality of coefficients				
F-stat 2008=2011	2.91	2.91	3.06	2.78
p-val 2011	0.0549	0.0549	0.0474	0.0628
F-stat 2008=2012	9.88	9.88	9.77	8.34
p-val 2012	0.0001	0.0001	0.0001	0.0003
F-stat 2008=2013	0.21	0.21	0.24	0.12
p-val 2013	0.8137	0.8137	0.7861	0.8889

Table 2. Robustness Check: Controlling for Governance

Notes: The regressions in this table serve as a robustness check of the main results presented in Table 2. The specifications are somewhat modified and one regression specifically includes the quality of governance among the regressors. All columns include country and year fixed effects. All standard errors are clustered at the country level, allowing for autocorrelation across time and within the country. Observations are between 2000 and 2014. *** p<0.01, ** p<0.05, * p<0.1

	NPI/Y			NPI/Y		
VARIABLES	(1)	(2)	(3)	(4)	(5)	(6)
$Crisis_t$*$Frontier_t$	0.674*	0.649*	0.632**	0.630**	0.647**	0.638**
	(0.374)	(0.374)	(0.279)	(0.281)	(0.273)	(0.276)
$Crisis_t$*NFM_t	-0.284	-0.235	-0.316	-0.318	-0.322	-0.315
	(0.287)	(0.287)	(0.273)	(0.275)	(0.281)	(0.277)
VIX_t		-0.00936	-0.0126	-0.0299***	-0.0131	-
		(0.00837)	(0.00974)	(0.00811)	(0.00987)	(0.00837)
U.S 10-Y TB $yield_t$		-0.379**	-0.279***	-0.155*	-0.262**	-0.143*
		(0.147)	(0.101)	(0.0794)	(0.104)	(0.0798)
$Growth_t$		0.892	1.122*	1.270**	1.071*	1.259**
		(0.696)	(0.597)	(0.571)	(0.604)	(0.592)
$Debt/GDP_{t-1}$			-1.57e-06***	-1.59e-06***	-1.60e-06***	-1.63e-06***
			(5.16e-07)	(4.78e-07)	(5.57e-07)	(5.08e-07)
$Fiscal\text{-}Balance/GDP_{t-1}$			-5.87e-06	-4.62e-06	-6.82e-06	-5.44e-06
			(5.02e-06)	(5.12e-06)	(7.81e-06)	(7.70e-06)
$Governance_t$					0.00774	0.00146
					(0.0158)	(0.0164)
Country Fixed Effects	YES	YES	YES	YES	YES	YES
Year Fixed Effects	YES	YES	YES	YES	YES	YES
Observations	731	682	580	580	571	571
R-squared	0.164	0.199	0.188	0.221	0.188	0.222

Table 3. Robustness Check: Investigating the Difference of all LIDCs with EMs

Notes: The regressions in this table serve to investigate whether, compared to the LQ-EMs, all LIDCs are affected differently in term portfolio investments. The dependent variable is the ratio of (net) portfolio investment liabilities to GDP. The main regressors are: (i) interaction term of the dummy variable *LIDC* (=1 if country i is part of the LIDC group) and a time dummy variable that indicates the start of the crisis (=1 after 2008). All columns include country and year fixed effects. Country observable characteristics, push and pull factors are added to control for capital flow determinants. All standard errors are one-way clustered at the country level. Observations are between 2000 and 2014. *** p<0.01, ** p<0.05, * p<0.1

	NPI/Y			NPI/Y	
	(1)	(2)	(3)	(4)	(5)
$Crisis_t$*$LIDC_t$	1.569	1.569	0.0118	-0.00923	0.0544
	(1.380)	(1.380)	(0.236)	(0.234)	(0.226)
VIX_t		-0.0549	-0.0196**	-0.203***	-0.0208***
		(0.0404)	(0.00756)	(0.00766)	(0.00769)
U.S 10-Y TB $yield_t$		0.331	-0.0515	-0.0289	-0.0470
		(0.438)	(0.0939)	(0.0935)	(0.0954)
$Growth_t$			0.00313	0.0259	0.00350
			(0.00533)	(0.00529)	(0.00509)
$Debt/GDP_{t-1}$			2.05e-08	1.05e-08	4.61e-08
			(5.62e-08)	(5.27e-08)	(5.02e-08)
Fiscal $Balance/GDP_{t-1}$			9.12e-08	5.44e-09	6.74e-08
			(1.16e-07)	(1.21e-07)	(1.15e-07)
Current $Account/GDP_t$				-0.0155**	
				(0.00695)	
$Export/GDP_t$					-0.0140
					(0.0167)
Observations	1,220	1,220	896	896	896
Country FEs	YES	YES	YES	YES	YES
Year FEs	YES	YES	YES	YES	YES
R-squared	0.561	0.561	0.313	0.318	0.316