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Surges

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ABSTRACT

This paper examines when and why capital sometimes surges to emerging market economies (EMEs). Using data on net capital flows for 56 EMEs over 1980—2011, we find that global factors, including US interest rates and investor risk aversion act as "gatekeepers" that determine when surges of capital to EMEs will occur. Whether a particular EME receives a surge, and the magnitude of that surge, however, depends largely on domestic factors such as its external financing need, capital account openness, and exchange rate regime. Differentiating between surges driven by exceptional behavior of asset flows (repatriation of foreign assets by domestic residents) from those driven by exceptional behavior of liability flows (nonresident investments into the country), shows the latter to be relatively more sensitive to global factors and contagion.

1. Introduction

After collapsing during the 2008 global financial crisis, capital flows to emerging market economies (EMEs) surged in late 2009 and 2010, only to recede rapidly in the second half of 2011. A fresh wave of inflows in 2012 then ended in sharp outflows in mid-2013, leaving EMEs grappling with depreciating currencies in their wake.[1] While historically capital flows to EMEs have often been episodic (Fig. 1), the magnitude and volatility of recent flows have posed particular macroeconomic policy challenges, and raised financial-stability concerns. A first step in dealing with such large flows is to understand their characteristics and determinants, which is the purpose of this paper.

The literature on cross-border capital flows has a long tradition of trying to identify global "push" and domestic "pull" factors that influence flows to recipient countries.[2] Yet, in equilibrium, capital flows must reflect the confluence of supply and demand, so there must be both push (supply-side) and pull (demand-side) factors, and it is hard to attribute the observed flows to one side or the other. It may therefore be more meaningful (and, from a policy perspective, more important) to consider the determinants of inflows that are abnormally large, which may occur when push factors are different than normal, or when pull factors are particularly strong (or some combination of the two). This is the tack taken here, where we define surges as exceptionally large net capital inflows (positive flows on a net basis) to the country—specifically, flows that are in the top 30th percentile of both the country-specific and of the full sample's distribution of net capital flows, expressed in percent of GDP—and examine the correlates of their occurrence and magnitude.[3]

It is common to think of inflow surges as being the result of foreigners pouring money into the country (thereby increasing the country's stock of foreign liabilities), but they could equally result from the asset side—residents selling their assets abroad and repatriating the proceeds, or simply not purchasing as many foreign assets as before. Since we define surges as instances of exceptionally large net capital inflows, they must be associated with some exceptional behavior of liability flows or of asset flows (or of both). We therefore classify our surge observations into those that are predominantly *liability-flow* driven (and likely reflect the investment decisions of nonresidents) and those that are *asset-flow* driven (and reflect the investment decisions of residents), and also examine their determinants.[4] The distinction is worth making because the properties of these two types of

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[1] For example, in the two months following the US sovereign debt rating downgrade in August 2011, the currencies of Brazil, Korea, India, and Russia depreciated by about 8–12% in nominal terms, which largely offset earlier gains that had cumulated between end-2009 and mid-2011. More recently, after the US Fed announcement in June 2013 of tapering its quantitative easing program, currencies of these EMEs fell by 6–7% relative to the beginning of the year.

[2] See, e.g., Chuhan et al. (1993), Fernandez-Arias (1996), Taylor and Sarno (1997), and Fratzscher (2011).

[3] Reinhart and Reinhart (2008), Cardarelli et al. (2009), and Forbes and Warnock (2012) also examine the characteristics of large capital flows. Our work, as discussed below, differs from theirs in several respects.

[4] Some recent papers (e.g., Milesi-Ferretti and Tille, 2011; Forbes and Warnock, 2012) stress the need to distinguish between gross asset and gross liability flows. This distinction is, however, more relevant for advanced economies where gross flows far exceed net capital flows.

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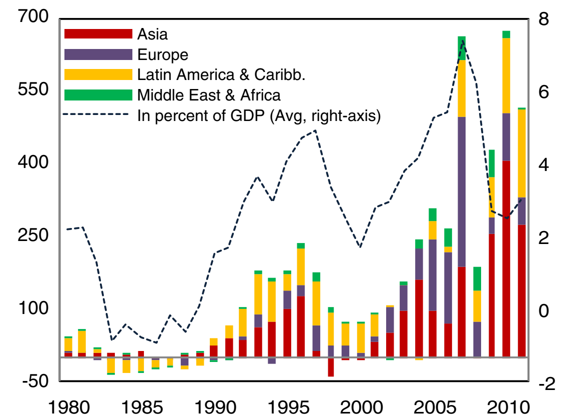


Source: IMF's IFS database.
Note: Net financial flows excludes reserves and other investment liabilities of the general government.

Fig. 1. Net capital flows to EMEs, 1980–2011 (in USD billions).

surges may be quite different—for instance, domestic investors may be more responsive to changes in local conditions because of informational advantages, while foreign investors may be more sensitive to global factors—thereby calling for different policy responses.

To conduct our empirical analysis, we use annual data for 56 EMEs over 1980–2011. Before looking at surges, however, we first establish (through quantile regressions) that large net flows are indeed distinct phenomena that behave differently from more normal flows, thus justifying our focus on surges. We then apply our definition of surges, which yields 326 surge observations (around one-fourth of the panel)—roughly synchronized in the early 1980s (prior to the onset of the Latin American debt crisis); the early 1990s (as these countries emerged from crisis); and the mid-2000s, as capital flows to EMEs recovered from the Asian crisis and the Russian default, and accelerated in the run-up to the global financial crisis. Next, using conventional probit models, we identify the correlates of the occurrence of surges, and also examine the factors associated with the magnitude of the flow during the surge. Finally, we further classify our 326 net inflow surge observations into those associated with the exceptional behavior of liability flows and those with the exceptional behavior of asset flows, and examine the similarities and differences of both types of surges using regression techniques as well as binary recursive tree analysis to flesh out interactions and threshold effects.

The very synchronicity of surge episodes across countries over the decades suggests that global factors might be at play. Indeed, we find that global factors, including US interest rates, and global risk (as captured by the volatility of the S&P 500 index returns)—are key factors associated with large net capital flows to EMEs. At the same time, whether a particular EME experiences a surge also depends on its own attractiveness as an investment destination. Thus, country fundamentals, including external financing need, financial openness and interconnectedness, real economic growth, and institutional quality, are also associated with the likelihood of experiencing an inflow surge. Conditional on the surge occurring, moreover, domestic pull factors, including the country's external financing need, financial openness, and exchange rate regime are strongly related to its magnitude. Broadly speaking, therefore, global push factors act as "gatekeepers," controlling whether capital will surge toward EMEs at all, but domestic pull factors determine where—and in what magnitude—they will end up. This explains why inflow surges tend to be synchronized, but also why not all countries experience a surge when, in aggregate, capital flows toward EMEs.

Our analysis also shows that most (two-thirds) of the surges in EMEs are associated with the exceptional behavior of liability rather than of asset flows. The correlates of the two types of surges turn out to be quite similar: global factors matter for both, with lower US interest rates and greater global risk appetite encouraging both foreigners to invest more in EMEs, and domestic residents to invest less abroad. Yet some differences are discernible. Foreign investors are equally attuned to local conditions as domestic investors, but tend to be more sensitive to changes in global conditions, and are also more subject to regional contagion than residents. These conclusions are reaffirmed by the binary recursive tree analysis, which shows that global factors are relatively more important for liability-flow surges than for asset-flow surges.

These findings—which are robust to different surge definitions, estimation methodologies and specifications, as well as to the potential endogeneity of domestic macroeconomic factors to the inflow surge—hold important policy implications. First, inasmuch as surges reflect exogenous supply-side factors that could reverse abruptly, or are driven by contagion rather than by fundamentals, the case for imposing capital controls on inflow surges that may cause economic or financial disruption is correspondingly stronger. Second, to the extent that advanced economy interest rates are a key determinant of capital flow surges to EMEs, there may be a need for multilateral surveillance to ensure that spillovers are taken into account. And third, if the aggregate volume of capital flows to EMEs is largely determined by supply-side factors, but the allocation of flows across countries depends on local factors (including capital account openness), there may also be a need for coordination among recipient countries to ensure that they do not pursue beggar-thy-neighbor policies in an effort to deflect unwanted surges to each other.

Our findings complement those of previous studies. Earlier work on large capital flows by Reinhart and Reinhart (2008) and Cardarelli et al. (2009) mainly catalogs stylized facts surrounding capital inflow "bonanzas" but does not undertake formal analysis of their determinants. A recent paper by Forbes and Warnock (2012) is the closest to our study, but there are some important differences in focus, methodology, findings, and policy implications. Forbes and Warnock identify surges on the basis of *gross* flows of assets or liabilities, rather than on the basis of *net* flows.[5] Many of their identified surges in EMEs, therefore, do not necessarily correspond to periods of exceptionally large net flows.[6] While gross flows matter for some purposes, it is the net surge that matters for competitiveness, macroeconomic management, and the economy's aggregate foreign currency exposure that are of key concern to EMEs. Forbes and Warnock also pool advanced economies and EMEs in their analysis, yet capital flow dynamics for the two groups may be quite different (e.g., unlike advanced economies, EMEs typically borrow in foreign currency and are much more susceptible to sudden stops). This may account for their result (in contrast to ours) that advanced economy interest rates are not important for determining surges to EMEs, with the corresponding policy implication that advanced economy monetary policy has no spillovers.[7] Finally, Forbes and Warnock only study the occurrence of a surge, whereas we also look at why the magnitude of the flow varies across surges, and find that global factors act as "gatekeepers" but local factors determine where, and in what magnitude, flows end up.

Our contribution to the existing literature is thus three-fold. First, we focus on surges of net capital flows, and establish that they behave differently from more normal levels of net flows. Second, we examine the determinants of both the occurrence of surges, and their magnitude. To this end, we systematically account for the plausible drivers of

5 Their surges in gross asset flows (residents repatriating foreign assets) and gross liability flows (nonresidents acquiring domestic assets) are not the same as our asset- and liability-flow surges. Our surges represent large *net* capital flows, which are then classified based on whether they are driven by changes in the behavior of asset flows or of liability flows.

6 For example, 49% of their inflow "surge" observations also correspond to their "capital flight" (residents buying foreign assets) observations, so the net inflow should be small; likewise, 58% of their "retrenchment" observations are also "sudden stop" (nonresidents selling or no longer buying domestic assets) observations, again implying small net inflows.

7 Higher advanced economy interest rates would have two offsetting effects in their sample: decreasing the surge likelihood to EMEs, while increasing it in advanced economies, leading to a small or no average effect.

surges—including a range of global push and domestic pull factors—and exploit a unique database of IMF desk projections to obtain instruments for potentially endogenous domestic determinants of capital inflows (such as real GDP growth). Third, we classify our net flow surges according to whether they are predominantly driven by the exceptional behavior of asset flows or of liability flows, and examine the association of both types of surges with global and local factors using regression techniques as well as binary recursive tree analysis.

The rest of the paper is organized as follows. Section 2 establishes that large capital inflows behave qualitatively differently from more normal flows, thus meriting distinct treatment. Section 3 turns to identifying large capital inflow—surge—observations, documents their key features, and presents the main empirical results on the determinants of their occurrence and magnitude, along with an extensive sensitivity analysis of the results. Section 4 describes how surges may be classified as asset-flow and liability-flow driven, and explores the similarities and differences of the two types of surges. Section 5 concludes.

2. Are large inflows different?

We begin by establishing that large capital inflows to EMEs are not just scaled-up normal flows, but rather behave qualitatively differently from more normal inflows. While existing studies take this as given (e.g., Reinhart and Reinhart, 2008; Forbes and Warnock, 2012), we estimate quantile regressions to formally examine whether the responsiveness of capital flows to various determinants varies across the distribution, as follows:

$$K_{jt} = x_t'\beta_1^q + z_{jt}'\gamma_1^q + c_{jt}'\delta_1^q + \varepsilon_{jt}; \qquad q = 25, 30, 50, 70, 75, 90 \tag{1}$$

where K_{jt} denotes net capital flows (positive values indicating inflows on a net basis), expressed in percent of GDP, to country j at time t; x, z, and c are global push, domestic pull, and contagion factors (discussed below), respectively; q indicates the different quantiles of net capital flows (to GDP) for which the model is estimated; and ε is the random error term. To address potential endogeneity concerns of the domestic pull factors in (1), we substitute current values of these variables with lagged values. Since many of the domestic pull factors change only slowly, and because we are interested in the effect of global factors that are common across recipient countries, we do not include country- or time-fixed effects, but control for region-specific effects and a range of country characteristics.[8]

We compute net capital flows from the IMF's *Balance of Payment Statistics* as total net financial flows excluding "other investment liabilities of the general government" (which are typically official loans rather than private inflows) and exceptional financing items (change in reserve assets and use of IMF credit).[9] Why do we focus on net (and not gross) flows? There are pros and cons of looking at net or gross flows. Although some risks may depend on the country's gross external liabilities, most macroeconomic consequences of capital flows (such as exchange rate appreciation or macroeconomic overheating) are related to net, not gross, capital flows. Indeed, even many financial-stability risks are mainly related to net flows, and some of the most common prudential measures in EMEs, for example, limits on banks' open foreign exchange positions, are always defined in terms of net, not gross, exposures. A problem with examining gross inflows is that they may not constitute periods of net inflows, let alone exceptionally large net inflows.

To identify variables that constitute x, z, and c in (1), we draw on existing literature. While early empirical studies paid particular attention to the role of interest rate differentials (e.g., Branson, 1968; Kouri and Porter, 1974; Kriecher, 1981), later studies have identified a range of global push and domestic pull factors as possible determinants of capital flows to EMEs (see, e.g., Calvo et al., 1993; Chuhan et al., 1993; Fernandez-Arias, 1996; Fernandez-Arias and Montiel, 1996; Taylor and Sarno, 1997; Forbes and Warnock, 2012).

2.1. Global push factors

Global push factors reflect external conditions (or supply-side factors), largely beyond the control of EMEs, which underpin the supply of global liquidity and induce investors to increase exposure to EMEs. Based on the neoclassical theory, which predicts that capital should respond to interest rate differentials between countries—flowing from countries with low return (capital-abundant advanced economies) to those with high return (capital-scarce EMEs)—one such factor is the interest rate in advanced economies. To capture that, we include the US real interest rate (3-month US Treasury bill rate deflated by US inflation), where capital flows to EMEs are expected to increase with lower US interest rates, and vice versa.[10] In addition, we include global market uncertainty—proxied by the volatility of the Standard & Poor (S&P) 500 index returns—and world commodity prices (measured as the log difference between the actual and trend commodity price index to capture the effect of large movements in commodity prices) as other global push factors.[11] Greater volatility of the S&P 500 index returns is likely to be associated with lower flows to EMEs since advanced economies are traditionally considered to be safe havens in times of increased uncertainty. Higher commodity prices, however, are likely to be positively correlated with inflows inasmuch as they indicate a boom in demand for EME exports, and perhaps the recycling of income earned by commodity exporters.

2.2. Domestic pull factors

Pull factors are recipient country characteristics (or demand-side factors) that affect risks and returns to investors, and depend on local macroeconomic fundamentals, official policies, and market imperfections (Fernandez-Arias and Montiel, 1996). If capital flows respond to interest rate differentials, then they will be larger if expected returns in EMEs are higher. We thus include the domestic real interest (money market or treasury bill rate, according to data availability, deflated by domestic inflation), and the expected real exchange rate depreciation of the domestic currency (proxied by the log difference between the actual real effective exchange rate (REER) and its long-term trend) as domestic pull factors. Higher domestic interest rates and greater currency appreciation prospects (implied by REER undervaluation) are likely to be associated with larger inflows to EMEs.

Another important pull factor is the country's external financing need. Early studies of private capital flows to developing countries often included the country's current account deficit as a measure of its financing need (Kouri and Porter, 1974). But with the increasing importance of private (as opposed to official) flows to EMEs, this becomes almost tautological: abstracting from changes in reserves, the current account deficit must be (largely) financed by private capital flows, and the observed flows must correspond to the current account deficit. To

[8] Including country-fixed effects in (1) does not change the main results documented below. In estimating (1), bootstrapped standard errors are computed.

[9] Specifically, net capital flows are computed as the difference between IFS series "…4995W.9" (financial account balance excluding group E) and "…4753ZB9" (other investment liabilities of the general government excluding group E) based on Balance of Payments Manual 5 (BPM5) presentation. We scale net flows by GDP to control for economic size—large inflows in absolute terms may not be of concern if the economy has a large absorptive capacity. See Table A1 for a description of variables and data sources.

[10] We compute real interest rates by using expected (i.e., one-period ahead) inflation rate, but the results presented below remain similar if current inflation rate is used instead.

[11] We use the volatility of S&P 500 index returns instead of the commonly used VIX because the latter is only available from 1990 onwards. As a robustness check, however, we also use: (i) the Credit Suisse Global Risk Appetite Index (RAI)—available from 1984 onwards—which measures excess return per unit of risk with lower (higher) values indicating periods of financial market strain (ease), and (ii) a normalized measure for VIX supplemented by a normalized measure of the VXO index—the precursor of VIX—for the pre-1990 years. The correlation between our S&P 500 index returns volatility measure and the VIX/normalized VIX is 0.5.

get around this problem, and to see whether capital flows to EMEs respond to "fundamentals," we turn to a consumption-smoothing model of the current account (Ghosh, 1995). In such a model, the current account responds only to temporary, and not to permanent shocks. Since surges are defined as episodes of temporarily large capital inflows, they presumably correspond to temporary shocks to the domestic economy and, as such, the financing need to which they are responding should be well captured by the consumption-smoothing current account deficit (to GDP).[12] In what follows, we include the consumption-smoothing current account and, as robustness checks, either its individual components or the actual current account balance (to GDP).

Even if the country does have an external financing need, this may not be met if the capital account is closed. To capture this possibility, we include a measure of (de jure) financial openness—taken from Chinn and Ito (2008)—which is based on the IMF's Annual Report on Exchange Arrangements and Exchange Restrictions (AREAR). But despite an open capital account, a country that is in arrears or otherwise in default on its external payments is unlikely to be an attractive destination for investors. We, therefore, also include a dummy variable (based on Reinhart and Reinhart, 2008) for whether the sovereign is in a debt crisis such that it is unable to make its principal or interest payments by the due date.

Fast growing economies are more likely to experience large capital flows, not only because of their potentially large financing needs, but also because investors (especially for equity flows) may be attracted to the potential productivity gains and corresponding returns. Likewise, they may feel more confident investing in countries with better institutional quality (Alfaro et al., 2008). Thus, we include real GDP growth rate as well as a measure of institutional quality among the pull factors. We also include the de facto exchange rate regime (taken from the IMF's AREAER with higher values indicating a less flexible exchange rate regime) to capture the possibility that the implicit guarantee of a fixed exchange rate may encourage greater cross-border borrowing and lending. Countries that are better integrated with global financial markets may be more likely to receive inflows (Ghosh et al., 2012; Hale et al., 2011)—perhaps because of lower informational costs for foreign investors or because of more diversified sources of external financing. Therefore, we also include a measure of the country's financial "connectedness," proxied by the proportion of advanced economies that have banks with cross-border exposure to the recipient country (Minoiu and Reyes, 2011), in our pull factors.

2.3. Contagion

Recent literature finds strong contagion effects on capital flows, particularly in the context of economic and financial crises/sudden stops (Glick and Rose, 1999; Kaminsky et al., 2001). But equally, there are several channels through which "positive" contagion could result in flows to one country resulting in larger flows to regional neighbors, e.g., through financial linkages (financial flows being on-lent from one EME to another), trade between EMEs, or, similar macroeconomic characteristics and investor herding behavior more generally (Forbes and Warnock, 2012). To capture such contagion, we define a regional contagion variable as the average net capital flow (in percent of GDP) to other countries in the region.

2.4. Quantile regressions

To examine whether large inflows to EMEs behave any differently from more normal inflows, we estimate (1) for a sample of 56 EMEs using data over 1980–2011 (Table 1).[13] For comparative purposes, we first present the results for the Ordinary Least Squares (OLS) regression estimated for the full (sample) distribution of net capital flows to GDP (col. [1]). Most estimated coefficients are of the expected sign and are statistically significant. Among global push factors, higher US interest rates and greater volatility of the S&P 500 index returns are associated with lower capital flows into EMEs, while commodity price booms are associated with larger inflows. Regional contagion is positive: larger flows to one country are associated with larger flows to other countries in the region. Among the domestic pull factors, greater financing needs (as captured by the consumption-smoothing current account), a less flexible exchange rate regime, greater financial openness and connectedness, and better institutional quality are all associated with larger inflows. By contrast, above trend REER (implying real exchange rate overvaluation) and default status are associated with smaller inflows, while the estimated coefficient of real GDP growth is statistically insignificant.

Going beyond the OLS results, quantile regressions suggest that the association between net capital flows and several of the push and pull factors depends on the magnitude of the flow (cols. [2]–[7]). For example, the coefficients on the US real interest rate, global risk aversion, and commodity prices are all significantly larger for net flows that are at the upper end of the distribution (cols. [5]–[7]). Among pull factors, the coefficients on the exchange rate regime, capital account openness and institutional quality are also significantly larger. Conversely, the impact of domestic real interest rates is not statistically significant for large flows relative to more normal flows (i.e., those at the median of the distribution).

That the differences between estimated coefficients across the inflow distribution are statistically significant is confirmed by the interquantile regressions (cols. [8]–[10]). Testing for the difference between the 50th percentile and the 75th percentile shows that five (out of a total of 14) coefficients are statistically significantly different. For the largest flows (comparing the 75th to the 90th percentile) the differences are even more striking: seven out of 14 (i.e., half the coefficients of the regression) are statistically significantly different (col. [10]). A visual depiction is afforded by Fig. 2, which plots the estimated coefficients from the quantile regression at different points along the net capital flow distribution, together with the average estimate obtained from OLS. For most coefficients, the quantile and OLS estimates' do not coincide, and the estimates for large inflows lie outside the OLS confidence bands. These findings suggest that there are indeed differences in the responsiveness of net capital flows to the various push and pull factors at different points along the net capital flow distribution. Large flows behave qualitatively differently from normal flows, and as such, merit separate treatment.

3. Identifying surges and their determinants

Our concept of a surge is that it should capture instance of an exceptionally large level of capital flows into the country. Earlier literature has commonly used thresholds to identify such observations—e.g., Reinhart and Reinhart (2008) select a cut-off of 20th percentile for net capital flows (in percent of GDP), and Cardarelli et al. (2009) define a surge when net private capital flows (in percent of GDP) to a country exceed its trend by one standard deviation (or fall in the top quartile of the regional distribution). Forbes and Warnock (2012) use quarterly data on gross capital flows, and define a surge as an annual increase in gross inflows that is more than one standard deviation above the (five-year rolling) average, and at least two standard deviations above the average in at least one quarter.[14]

Following the existing literature, we adopt a "threshold" approach and define an observation to be a surge if it lies both in the top 30th

[12] The consumption-smoothing current account can be shown to equal the present discounted value of expected changes in "national cash flow"—the difference between GDP, investment, and government consumption (see Ghosh (1995) for details).

[13] The EMEs included in the sample (listed in Table A2) are mainly those covered by the IMF's Early Warning Exercise (IMF, 2010).

[14] These definitions are somewhat analogous to those used for identifying current account reversals and sudden stops (see Reinhart and Reinhart (2008) for a review).

Table 1
Quantile regression estimates for net capital flows to GDP, 1980–2011.

Estimation	OLS	Quantile regressions (percentiles)						Interquantile regressions		
		25th	30th	50th	70th	75th	90th	25th vs. 50th	50th vs. 75th	75th vs. 90th
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Real US interest rate	−0.416***	−0.264***	−0.291***	−0.263***	−0.390***	−0.396***	−0.664***	0.001	−0.133*	−0.268**
	(0.122)	(0.079)	(0.071)	(0.067)	(0.085)	(0.095)	(0.170)	(0.066)	(0.073)	(0.136)
S&P 500 index volatility	−0.001***	−0.001	−0.000	−0.000	−0.001**	−0.001***	−0.002***	0.000	−0.001*	−0.001*
	(0.001)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.001)
Commodity price index	0.035*	0.019	0.024**	0.021**	0.029**	0.031***	0.068***	0.003	0.009	0.037*
	(0.020)	(0.012)	(0.011)	(0.009)	(0.011)	(0.011)	(0.023)	(0.010)	(0.011)	(0.020)
Regional contagion	0.022*	0.024***	0.018**	0.022***	0.022***	0.019**	0.002	−0.002	−0.003	−0.017
	(0.013)	(0.009)	(0.008)	(0.008)	(0.008)	(0.010)	(0.015)	(0.008)	(0.009)	(0.013)
Real domestic interest rate	0.121**	0.100***	0.097***	0.062***	0.051**	0.058*	0.027	−0.038*	−0.004	−0.030
	(0.046)	(0.027)	(0.027)	(0.023)	(0.024)	(0.030)	(0.059)	(0.022)	(0.027)	(0.049)
REER deviation from trend	−0.060**	0.017	0.003	−0.017	−0.029	−0.040*	−0.108***	−0.034*	−0.023	−0.067**
	(0.026)	(0.023)	(0.022)	(0.020)	(0.019)	(0.024)	(0.034)	(0.019)	(0.018)	(0.028)
Optimal current account/GDP	−0.455***	−0.284***	−0.282***	−0.314***	−0.337***	−0.348***	−0.454***	−0.030	−0.034	−0.106*
	(0.096)	(0.066)	(0.062)	(0.051)	(0.049)	(0.053)	(0.069)	(0.054)	(0.050)	(0.063)
Real GDP growth	0.126	0.200***	0.219***	0.196***	0.209***	0.163***	0.094	−0.004	−0.033	−0.069
	(0.099)	(0.059)	(0.054)	(0.036)	(0.042)	(0.056)	(0.084)	(0.043)	(0.039)	(0.073)
Exchange rate regime	0.012**	−0.001	0.001	0.004*	0.011***	0.012***	0.024***	0.005**	0.008***	0.012**
	(0.005)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)	(0.006)	(0.002)	(0.002)	(0.005)
Capital account openness	0.006***	0.004***	0.004***	0.004***	0.006***	0.007***	0.008***	0.000	0.003***	0.000
	(0.002)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)	(0.001)	(0.001)	(0.002)
Financial interconnectedness	0.003***	0.003***	0.003***	0.001***	0.002***	0.002***	0.001	−0.002***	0.001	−0.001
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Institutional quality index	0.067*	0.050**	0.063***	0.069***	0.097***	0.104***	0.143***	0.019	0.036**	0.038*
	(0.038)	(0.020)	(0.019)	(0.013)	(0.017)	(0.017)	(0.027)	(0.016)	(0.016)	(0.023)
Default onset	−0.025***	−0.025**	−0.027***	−0.022**	−0.016**	−0.019*	−0.020	0.004	0.003	−0.001
	(0.006)	(0.011)	(0.010)	(0.009)	(0.008)	(0.010)	(0.014)	(0.009)	(0.009)	(0.013)
Real GDP per capita (log)	−0.010	−0.013***	−0.013***	−0.009***	−0.010***	−0.010***	−0.015***	0.004*	−0.001	−0.005
	(0.007)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.005)	(0.002)	(0.002)	(0.004)
Observations	1199	1199	1199	1199	1199	1199	1199	1199	1199	1199
R-squared[a]	0.246	0.146	0.146	0.166	0.197	0.209	0.239			

Notes: Dependent variable is net capital flow to GDP. Real domestic interest rate, REER deviation from trend, current account balance/GDP, capital account openness, exchange rate regime, reserves to imports, institutional quality index, and (log) of real GDP per capita are lagged one period. Constant and region-specific effects are included in all specifications. The interquantile regressions (reported in cols. [8]–[10]) estimates regressions of the difference in quantiles (e.g., col. [8] indicates the difference between the estimates obtained for the 25th and 50th percentiles, and whether that difference is statistically significant). Clustered and bootstrapped standard errors (with 100 replications) reported in parentheses for OLS and quantile regressions, respectively. ***, ** and * indicate significance at 1, 5, and 10% levels, respectively.

[a] Pseudo-R^2 reported for quantile regressions.

percentile of the country's own distribution of net capital flows (expressed in percent of GDP) *and* also in the top 30th percentile of the entire sample's distribution of net capital flows (in percent of GDP):

$$S_{jt} = \begin{cases} 1 & \text{if } K_{jt} \in \left\{ top\,30^{th}\, percentile \left(K_{js}\right)_{s=1}^{T} \right\} \cap \left\{ top\,30^{th}\, percentile \left(K_{is}\right)_{i=1,s=1}^{N,T} \right\} \\ 0 & otherwise \end{cases} \tag{2}$$

where S_{jt} is an indicator of whether there is a surge in country j at time t, K_{jt} is the net capital flow (measured in percent of GDP) to country j in time t, and N and T indicate the total number of countries and years in the sample, respectively. The reason for identifying surges based on the country-specific distribution of net capital flows as well as the sample-wide criterion is to ensure that surges are not only "large" by the country's own experience but also by cross-country standards. This prevents countries experiencing capital outflows or very small inflows (on a net basis) through most of the sample period to be identified as having surges (recall, from the quantile regression above, that it is large net capital flows in percent of GDP that are shown to behave differently from more normal flows).[15]

With our definition, if two (or more) consecutive years meet the criteria specified in (2), then each year is coded as a surge observation. While the particular choice of algorithm to identify surges inevitably involves trade-offs, our threshold approach has the advantage of ensuring uniform treatment across countries while still allowing significant cross-country variation in the absolute threshold of a surge.[16] As with other empirical studies, however, dating the start and the end of a surge is not always straightforward since the strict application of any algorithm to identify surges runs the risk of omitting at least some observations of relatively large net capital flows. We therefore also construct a one-year window around the identified surge observations, including the immediate pre- and post-surge years (provided the net capital flow is positive in these years), and check the robustness of our estimation results to these additional surge observations.[17]

[15] For example, through most of our sample period (1980–2011), Venezuela experiences capital outflows and only small inflows (on a net basis). The top 30th percentile of its net capital flows distribution thus also includes negative observations, and values less than 1 percent of GDP—which does not accord well with our criterion of "exceptionally large" inflows.

[16] In our approach, the country-specific cut-off for identifying surges remains constant over the sample period, ensuring that exceptionally large capital inflows (in percent of GDP) are always coded as surges. This is in contrast to methods that use deviations from rolling averages, which may take better account of drifts in capital flow volatility, but may not code large inflow observations as a surge if such flows have persisted for a few years. Conversely, rolling methods may identify a capital inflow as a "surge" even though it is small in absolute terms (and hence of little macroeconomic consequence), if flows have been low for a while but then there is a small jump in the series.

[17] The obtained surges could be categorized into those driven by foreign direct, portfolio, or other types of investment flows. Doing so, however, would result in too few observations under each category for a meaningful empirical analysis. (The problem may be mitigated by using quarterly data, but that is unavailable for earlier years for most EMEs.)

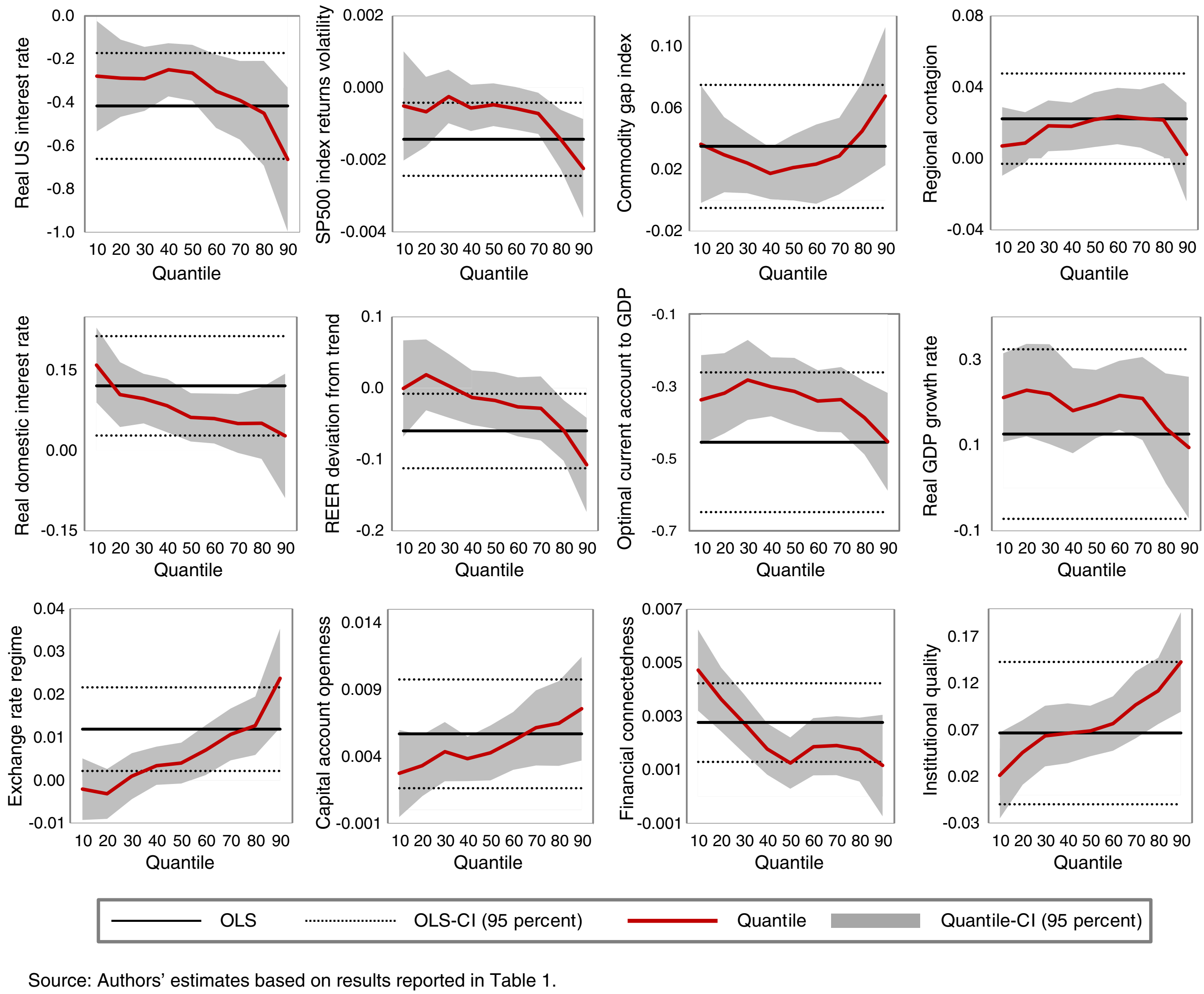


Fig. 2. Regression coefficient estimates for net capital flows to GDP, 1980–2011.

3.1. Stylized facts

Applying the above definition to our panel of 56 EMEs yields 326 surge observations.[18] Surges tend to last, on average, for about 2 years, while the average net capital flow during the episode is around 10% of GDP. As a proportion of GDP, the largest surges are in the Middle East and African EMEs (around 13% of GDP, perhaps because of large resource extraction investment projects), followed by emerging Europe. Surges have become more frequent in recent years with the share of surge observations rising from 10% of the sample in the 1980s to more than 20% in the 1990s, and to almost 30% in the last decade (Fig. 3).

An initial snapshot of the occurrence and magnitude of surges suggests three noteworthy points. First, surges tend to be synchronized internationally, generally corresponding to "well-established" periods of high global capital mobility—the early 1980s (just before the Latin American debt crisis), the mid-1990s (before the East Asian financial crisis and Russian default), and the mid-2000s in the run-up to the recent global financial crisis—suggesting that common factors are at

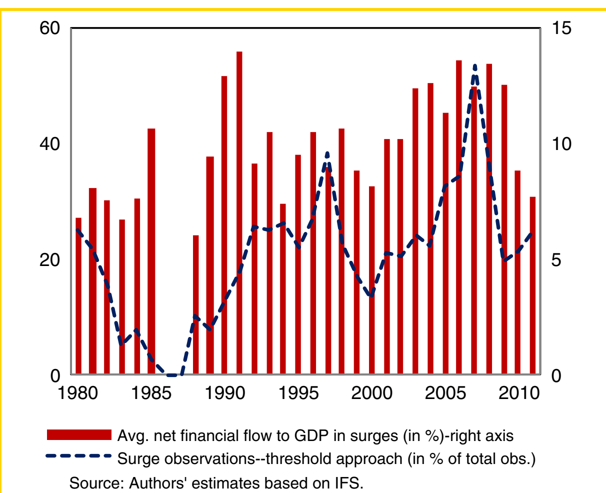


Fig. 3. Surges of net capital flows to EMEs, 1980–2011.

[18] See Table A2 for the list of identified surges. A comparison of our surge observations with those of Reinhart and Reinhart (2008) and Cardarelli et al. (2009)—who also look at large net flows (to GDP)—suggests broad overlap, particularly for "well-known" surges. Specifically, the correlation between our surges and theirs is about 0.3–0.4 (while the correlation between the surges series in the two studies is also similar).

play. Second, even in times of such global surges, not all EMEs are affected. In fact, the proportion of EMEs experiencing an inflow surge in any given year never exceeds one-half of the sample, with some countries experiencing them repeatedly. As such, conditions in the recipient countries must also be relevant. Third, there is considerable time-series and cross-sectional variation in the magnitude of flows during surges. For example, Asian countries experienced the largest surges (in percent of GDP) during the 1990s wave of capital flows, whereas emerging Europe experienced the largest surges in the mid-2000s.[19] Thus, both global and domestic factors appear to be relevant in determining surges—perhaps global factors driving the overall volume of flows to EMEs, and domestic factors influencing their allocation.

What are these factors? A simple tabulation of explanatory variables for surge and nonsurge (normal and outflow) episodes suggests that several global push and domestic pull factors may be relevant (Table 2). During surges, the US real interest rate and global market uncertainty (S&P 500 index returns volatility) are significantly lower than at other times, while recipient countries tend to have larger external financing needs, faster output growth, more open capital accounts, less flexible exchange rate regimes, and stronger institutions. These statistics are, however, unconditional averages; in what follows, we examine the factors associated with the occurrence and magnitude of surges more formally, and conduct various robustness checks on our results.

3.2. Occurrence of surges

To examine the factors associated with the occurrence of surges, we estimate a probit model of the following form:

$$\Pr\left(S_{jt}=1\right)=F\left(x_t'\beta_2+z_{jt}'\gamma_2+c_{jt}'\delta_2\right) \tag{3}$$

where S_{jt} is an indicator variable of whether a net inflow surge occurs in country j in period t; x and z are the various global push and domestic pull factors, respectively; and c denotes contagion (now defined as the proportion of other countries in the region experiencing a surge). As before, we use lagged values of the domestic factors to mitigate potential endogeneity concerns, and include region-specific effects while estimating (3). In addition, we cluster standard errors at the country level to address the possibility of correlation in the error term.[20]

The results reported in Table 3 (cols. [1]–[5]) indicate that inflow surges to EMEs are statistically significantly related to the behavior of global push factors. Against an unconditional surge probability of 22%, a 100 basis points (bps) rise in the US real interest rate is associated with a 3 percentage point lower likelihood of a surge (evaluated at mean values of other regressors). Likewise, times of greater global market uncertainty (volatility of the S&P 500 index returns) are associated with significantly lower probability of surges to EMEs, presumably because—at least traditionally—these countries have not been viewed as safe havens. Conversely, commodity price booms, which likely signal higher global demand for EME exports, are positively correlated with inflow surges, as is regional contagion (though the estimated coefficient for the latter becomes statistically insignificant after controlling for the full set of domestic pull factors). Although individual coefficients are highly statistically significant, these global factors have limited explanatory power: the Pseudo-R^2 (which compares the log likelihood of the full model with that of a constant only model) is 6%, and the probit sensitivity (proportion of surges correctly called) is about 4%.

Turning to domestic pull factors, the external financing need implied by the consumption-smoothing current account is highly statistically significant, as is real GDP growth.[21] Higher real interest rates in the recipient country are positively related with surges—such that a 100 bps rise in the domestic real rate is associated with one half of a percentage point higher surge likelihood—albeit the estimated coefficient is statistically significant at the 10% level. The implied real exchange rate overvaluation (measured by the REER deviation from trend) lowers the likelihood of a surge, but the estimated coefficient loses statistical significance when other domestic factors are added. Countries with more open capital accounts, that are better financially connected (with more sources of cross-border bank flows), or that have stronger institutions, are also significantly more likely to experience inflow surges, as are countries with less flexible exchange rate regimes.[22] Countries that are in default are less likely to experience an inflow surge, though the variable is not statistically significant. Adding these pull factors more than doubles the pseudo-R^2 to 19% and raises the sensitivity to 26%; overall, the probit calls 80% of the observations correctly.

Fig. 4 plots the implied probability of a surge (evaluated around mean values) based on the estimates of the full model reported in Table 3, col. [5]. A one standard deviation shock to the volatility of the S&P 500 index returns lowers the predicted surge probability by about 3 percentage points, while the corresponding shock to the commodity price index raises the surge probability by about 7 percentage points. Among the domestic macroeconomic factors, a one percentage point increase in the country's real GDP growth rate, or a one percent of GDP increase in its external financing need, raises the predicted likelihood of a surge by about 1 and 3 percentage points, respectively. On capital account openness and institutional quality, moving from the sample median to the 75th percentile raises the predicted probability of a surge by some 3–4 percentage points.

3.3. Magnitude of flows during surges

The probit model estimated above gives the likelihood of experiencing an inflow surge, but the magnitude of the surge also varies considerably across countries (ranging from about 4 to 54% of GDP; Table 2). Is it possible to say anything about the size of the surge conditional on its occurrence? To this end, we estimate a regression over the sample of surge observations, of the following form:

$$K_{jt|S_{jt}=1}=x_t'\beta_3+z_{jt}'\gamma_3+c_{jt}'\delta_3+\eta_{jt} \tag{4}$$

where $K_{jt|S_{jt}=1}$ is the net capital flow (to GDP) to country j in time t, conditional on the occurrence of a surge; x, z and c are the global push, (lagged) domestic pull, and contagion factors, respectively; and η is the random error term. We estimate (4) using OLS, and, as before, include region-specific effects, and cluster the standard errors at the country level.[23]

The estimation results, reported in Table 3 (cols. [6]–[10]), suggest a more limited role for global factors in determining the magnitude of the surge. A 100 bps decline in the US real interest rate is associated with about 0.4% of GDP larger capital flows, and a one standard deviation decrease in S&P 500 index returns volatility increases the magnitude of the surge by 1% of GDP—though both

[19] See Figure A1 for the occurrence (and magnitude) of surges by region.

[20] The results remain essentially similar if country-fixed effects are included in the estimation (as reported in the sensitivity analysis below), or if the standard errors are clustered by year, or bootstrapped.

[21] The significance of the external financing need is robust to the use of (lagged) current account balance to GDP ratio as an alternate proxy. Moreover, when the individual components of the optimal current account (output, investment, and government consumption measured as deviations from trend) are included, investment is the dominant variable, with higher investment ratio significantly raising the surge likelihood (see Table A3).

[22] Since the impact of capital account openness may be conditional on global factors—i.e., more open countries may be more likely to experience a surge when foreign interest rates or global market uncertainty is low—we also estimate regressions including interaction terms between the openness variable and the various global factors. The estimated coefficients of these interaction terms are, however, not robustly significant.

[23] The contagion variable in the magnitude regression (4) is (correspondingly) defined as the average net flow (in percent of GDP) received by other countries in the region experiencing a surge.

Table 2
Summary statistics of selected variables.

	Observations	Mean	Min	Max	Std dev.
Surge					
Net capital flow s to GDP (in %)	271	10.60***	4.57	54.62	7.13
Real US interest rate (in %)	271	1.25***	−2.93	5.20	2.03
S&P 500 index returns volatility	271	8.26***	2.94	22.59	4.39
Real domestic interest rate (in %)	270	2.23	−18.73	41.65	5.91
REER deviation from trend (in %)	271	0.70**	−16.65	19.98	4.65
Optimal current account (in %)	271	−2.60***	−23.68	9.41	4.06
Real GDP growth rate	271	5.13***	−12.40	12.55	3.39
Trade openness (in %)	271	84.69***	15.98	191.83	36.86
Reserves to GDP (in %)	271	16.81***	1.43	85.45	10.93
Real GDP per capita (log)	271	7.89**	5.87	10.00	0.73
De facto exchange rate regime	271	2.11*	1.00	3.00	0.68
Capital account openness index	271	0.57***	−1.86	2.46	1.48
Financial interconnectedness	271	8.16***	1.00	15.00	3.21
Institutional quality index	271	0.66***	0.34	0.89	0.09
Nonsurge					
Net capital flow s to GDP (in %)	928	0.84	−39.82	24.44	4.72
Real US interest rate (in %)	928	0.83	−2.93	5.20	2.19
S&P 500 index returns volatility	928	9.45	2.94	22.59	4.27
Real domestic interest rate (in %)	922	1.82	−34.22	30.31	6.26
REER deviation from trend (in %)	928	−0.40	−45.41	69.02	7.33
Optimal current account (in %)	928	0.60	−11.19	19.38	3.39
Real GDP growth (in %)	928	3.62	−15.06	25.65	4.15
Trade openness (in %)	928	68.60	13.22	220.41	37.74
Reserves to GDP (in %)	926	13.06	0.43	108.25	12.28
Real GDP per capita (log)	928	7.76	5.47	10.04	0.90
De facto exchange rate regime	928	2.03	1.00	3.00	0.66
Capital account openness index	928	−0.08	−1.86	2.46	1.42
Financial interconnectedness	928	6.59	0.00	15.00	2.92
Institutional quality index	928	0.61	0.29	0.86	0.11

Notes: Observations restricted to the estimated sample as in Table 3. Real domestic interest rate and real GDP growth rate have been re-scaled using the formula $x/(1+x)$ if $x > 0$, and $x/(1-x)$ if $x < 0$ to transform the outliers. ***, ** and * indicate significant difference between the surge and nonsurge observations at the 1, 5, and 10% levels, respectively.

effects are statistically significant at the 10% level only—while the estimated coefficient of commodity price booms is statistically insignificant. These results, together with the findings of the probit model above, suggest that global factors may act largely as "gatekeepers"—capital surges toward EMEs only when these global conditions permit, but once this hurdle is passed, the volume of capital that flows is largely independent of it.

Since countries that experience a surge already have the macroeconomic and structural characteristics identified above, several of the domestic pull factors are statistically insignificant in the magnitude regression conditional on surge occurrence. Nevertheless, the nominal exchange rate regime, implied real exchange rate overvaluation, and external financing needs of the country are all highly statistically significant. A one-percent of GDP increase in the estimated external financing need is associated with one-third of one percent of GDP higher capital inflows, while 10% real exchange rate overvaluation is associated with lower net capital flows of about 2% of GDP. Other factors equal, a country with a pegged exchange rate would experience 3% of GDP larger capital flows during a surge than if it had a more flexible exchange rate regime.[24] Finally, countries with more open capital accounts appear to experience larger surges: moving from the 25th to the 75th percentile of the sample's capital account openness index is associated with 1% of GDP higher net inflows during a surge.

An interesting observation is that of a negative, but statistically insignificant, estimated coefficient of the regional contagion variable in the magnitude regression. This finding, along with the positive estimated coefficient for the contagion variable in the surge likelihood regressions, suggests that there is positive contagion whereby investors "discover" a region. But then because funds are allocated regionally by investors, the magnitude of the resulting flow in a country is a decreasing function of flows to other countries (such that the more is allocated to one recipient country, the less may be received by other countries in the region).

Overall, these findings are consistent with, but go beyond, the results of previous studies, and help to explain the stylized facts noted earlier. The finding that the likelihood of surge occurrence is influenced strongly by global factors—notably, the US interest rates, as argued by Calvo et al. (1993) and Reinhart and Reinhart (2008), global risk, and commodity price booms—explains the synchronicity of surges across regions, and highlights that sudden changes in these factors could trigger large swings in capital flows. Certain macroeconomic (in particular, growth and external financing need), and structural (notably, financial openness and institutional quality) characteristics are also important covariates with surge occurrence, which explains why not all countries experience a surge even when, in aggregate, capital is flowing toward EMEs. Further, among the countries that experience a surge, the magnitude of the flow appears to be strongly associated with the external financing need, the exchange rate regime, and financial openness—with countries that have less flexible regimes, or those that are more financially open, experiencing larger surges.

3.4. Sensitivity analysis

To check the robustness of our estimates reported above, we conduct a range of sensitivity tests regarding the dating and coverage of surge observations, the method of identifying surges, model specification, and the potential endogeneity of the regressors.

[24] Considering that the association between REER overvaluation and surge likelihood/magnitude may be conditional on the exchange rate regime in place, such that in countries with a fixed exchange rate regime, an undervalued exchange rate may imply a higher surge likelihood/magnitude (by providing foreign investors with incentives to speculate on a currency appreciation), we also include in our specification an interaction term between the exchange rate regime and our measure of REER overvaluation (lagged one period). The estimated coefficient of the interaction term is negative, but statistically significant in the surge magnitude regression only (indicating that conditional on surge occurrence, countries with fixed exchange rate regimes and overvalued real exchange rates experience smaller surges than those with more flexible regimes).

Table 3
Occurrence and magnitude of surge, 1980–2011.

	Occurrence					Magnitude				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Real US interest rate	−6.467**	−12.260***	−9.903***	−10.534***	−10.418***	−0.475**	−0.480*	−0.387*	−0.405*	−0.410*
	(2.849)	(2.297)	(2.148)	(2.095)	(2.238)	(0.233)	(0.242)	(0.220)	(0.223)	(0.223)
S&P500 index volatility	−0.032***	−0.051***	−0.038***	−0.037***	−0.029***	−0.002*	−0.002*	−0.002*	−0.002*	−0.002*
	(0.010)	(0.011)	(0.012)	(0.012)	(0.011)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Commodity price index	0.894**	1.010**	0.956**	0.787*	1.092***	0.033	0.010	0.012	0.029	0.028
	(0.397)	(0.423)	(0.420)	(0.420)	(0.414)	(0.032)	(0.028)	(0.030)	(0.028)	(0.032)
Regional contagion	0.820***	0.666***	0.410*	0.230	0.087	−0.040	−0.048	−0.031	−0.026	−0.023
	(0.257)	(0.242)	(0.247)	(0.240)	(0.227)	(0.069)	(0.070)	(0.068)	(0.071)	(0.070)
Real domestic interest rate		1.453	1.704*	2.080*	1.934*		−0.091	−0.114	−0.035	−0.036
		(1.021)	(1.025)	(1.120)	(1.051)		(0.080)	(0.083)	(0.066)	(0.071)
REER deviation from trend		−1.058**	−0.986	−0.957	−1.098		−0.146*	−0.136*	−0.160**	−0.162**
		(0.538)	(0.632)	(0.726)	(0.744)		(0.077)	(0.079)	(0.076)	(0.077)
Optimal current account/GDP		−12.365**	−11.761**	−11.854**	−11.810***		−0.245*	−0.201	−0.247**	−0.249**
		(1.793)	(1.722)	(1.830)	(1.788)		(0.138)	(0.122)	(0.122)	(0.124)
Real GDP growth			5.712**	4.541***	4.406***			−0.116	−0.152	−0.150
			(1.442)	(1.360)	(1.388)			(0.230)	(0.220)	(0.226)
Capital account openness			0.077*	0.077*	0.085*			0.010***	0.008**	0.007*
			(0.043)	(0.045)	(0.047)			(0.003)	(0.003)	(0.003)
Financial interconnectedness				0.074***	0.074***				−0.001	−0.002
				(0.015)	(0.015)				(0.002)	(0.002)
Exchange rate regime				0.198***	0.174**				0.031***	0.031***
				(0.074)	(0.074)				(0.010)	(0.010)
Institutional quality index					2.276***					0.019
					(0.673)					(0.090)
Default onset					−0.330					−0.002
					(0.372)					(0.020)
Real GDP per capita (log)					−0.298***					0.008
					(0.101)					(0.019)
Observations	1199	1199	1199	1199	1199	271	271	271	271	271
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared[a]	0.059	0.131	0.152	0.176	0.194	0.155	0.187	0.222	0.288	0.293
Percent correctly predicted	78.07	78.65	79.57	79.73	79.98					
Sensitivity	4.428	16.61	21.40	25.46	26.20					
Specificity	99.57	96.77	96.55	95.58	95.69					

Notes: Dependent variable is a binary variable equal to 1 if a surge occurs and 0 otherwise in cols. [1]–[5], and net capital flow to GDP conditional on surge occurrence in cols. [6]–[10]. Cols. [1]–[5] are estimated using a probit model, and cols [6]–[10] are estimated using OLS. Statistics reported in parentheses are clustered standard errors (at the country level). Constant and region-specific effects are included in all specifications. ***, ** and * indicate significance at 1, 5, and 10% levels, respectively. Sensitivity (specificity) gives the fraction of surge (nonsurge) observations that are correctly specified. All variables except for global factors (real US interest rate, S&P 500 index returns volatility, and commodity price index), regional contagion, and financial interconnectedness are lagged one period.

[a] Refers to Pseudo R^2 in cols. [1]–[5].

3.4.1. Extended surges

For countries receiving large net capital flows (in percent of GDP) for several years, pinning down the exact timing (start and end) of surge episodes may not always be straightforward. In general, strict application of any algorithm to identify surges runs the risk of omitting at least some observations of relatively large net capital flows, that in reality are probably part of the same episode, but that do not quite meet the identification criteria by a small margin.

We therefore construct a one-year window around our identified surge observations, including the nonsurge years immediately before and after the surge years (provided the net capital flow in those years is positive), and re-estimate all specifications using the extended surge variable.[25] Tables 4 and 5 (col. [1]) present the estimation results for this exercise, which largely support the findings reported in Table 3. For surge likelihood, the estimated coefficients of US real interest rate and global market uncertainty are statistically significant—while domestic factors such as the external financing need, real GDP growth rate, capital account openness, exchange rate regime, financial interconnectedness, and institutional quality are also strongly significant. The main difference with the previous results is that the estimated coefficients of implied real exchange rate overvaluation and the sovereign default dummy are now also statistically significant. For surge magnitude, as before, the external financing need, a less flexible exchange rate regime, and the implied real exchange rate overvaluation are statistically significant, along with the US real interest rate, and the S&P 500 index returns volatility measure.

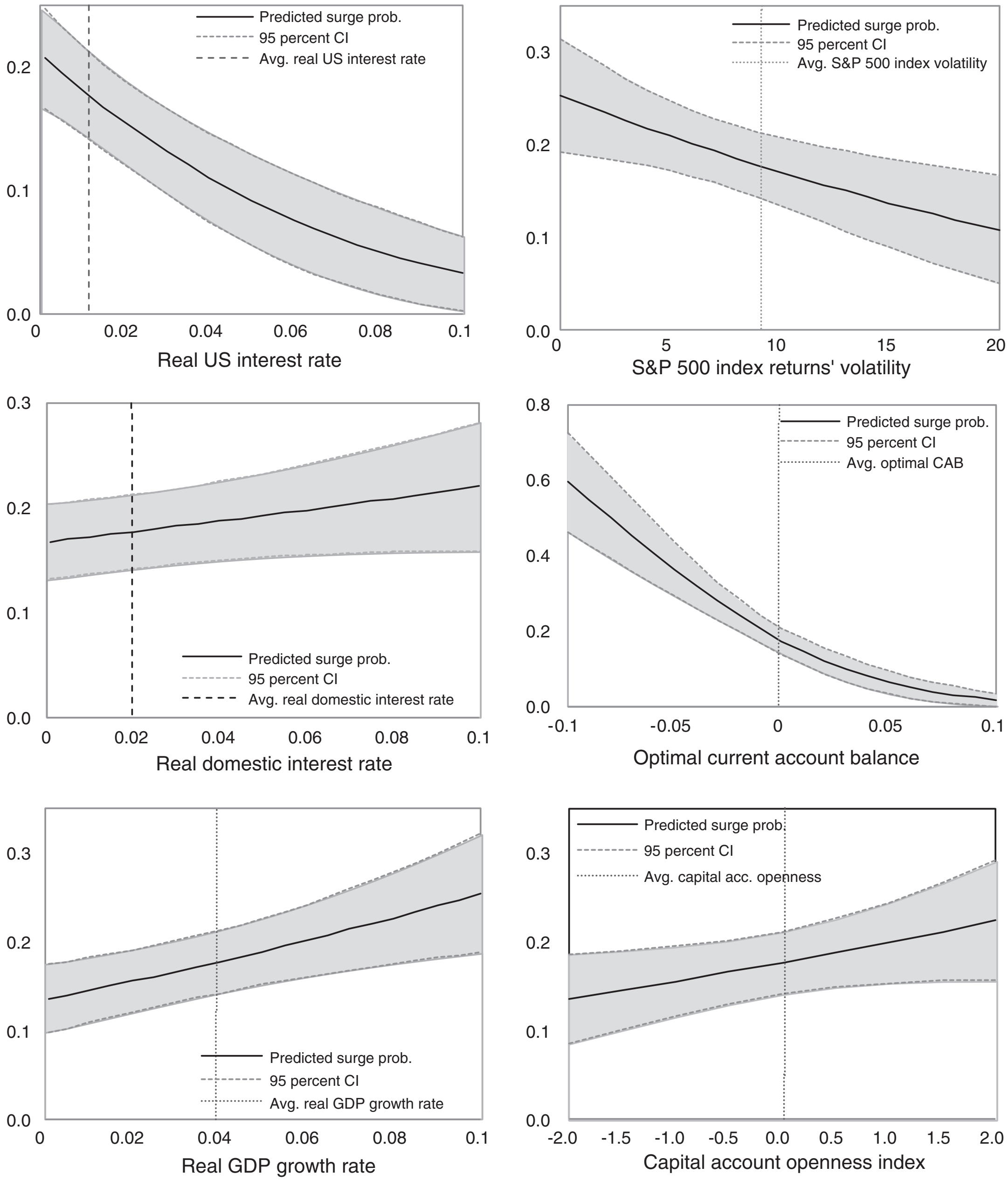
3.4.2. Alternative surge definitions

To check whether our results are sensitive to the definition of surges, we employ two alternative approaches. First, we adopt a more novel, "clustering" approach, which avoids imposing ad hoc thresholds to identify surges. Specifically, we apply the *k-means* clustering technique on each country's (standardized) net flow to GDP observations, and group them into three clusters (surges; normal flows; and outflows), such that the within-cluster sum of squared differences from the mean is minimized (while the between-cluster difference in means is maximized). As a result, each observation belongs to the cluster with the nearest mean, and clusters comprise observations that are statistically similar. Second, we modify our existing threshold definition to identify surges based on the country-specific criterion only (i.e., observations in the top 30th percentile of the country's own net capital flow to GDP distribution, but not necessarily in the full sample's top 30th percentile distribution).

With the cluster and country-specific threshold approaches, we obtain 372 and 476 surge observations, respectively.[26] Analysis of these

[25] The total number of surge observations increases to 496 in the extended version of the variable.

[26] The threshold approach yields fewer surge observations than these alternate approaches because of the sample-wide criterion, whereby net capital flow (to GDP) observations that are not only large by the country's own experience but also by cross-country standards are identified as surges.



Source: Authors' estimates.
Notes: Estimates based on the results reported in Table 3 (col. 5) holding all other variables fixed at mean values.

Fig. 4. Predicted probabilities of surge occurrence.

surge observations yields a broadly similar picture to that obtained above (Tables 4 and 5, col. [2]–[3]). The impact of both global and domestic factors is generally comparable to earlier estimates in terms of statistical significance and magnitude—with the exception of the capital account openness variable, which loses its statistical significance in Table 4. The weakening of the estimated impact of capital account openness, however, may simply reflect the fact that such openness matters more for extreme net flows as identified by our threshold approach (a country with a relatively closed capital account may, at times, experience larger inflows compared to its own historical standard, but is unlikely to be the recipient of surges that are large by cross-country standards). For the surge magnitude regressions with alternate surge variables, the notable difference from the results presented in Table 3 is that now the estimated coefficient of the regional contagion variable turns statistically significant.

3.4.3. Alternative specifications

While the estimations reported in Table 3 include a range of push and pull factors, other proxies and additional variables could also be added. To check the sensitivity of our results to alternative variable definitions of global factors, we use the 10-year US government bond yield (instead of the 3-month US Treasury bill rate); and replace our S&P 500 index returns volatility measure with the Credit Suisse Risk Appetite Index (higher values indicating times of financial ease and greater investor risk appetite), and a normalized measure of VIX supplemented with a normalized measure of the VXO index for the pre-1990 years (higher values indicating higher volatility in international markets, and lower risk appetite). The revised estimation results reported in Table 4 (cols. [4]–[6]) show that using these alternate proxies does not have much impact on the results—both lower US interest rates and greater risk appetite (as measured by the VIX index) are associated with greater likelihood of a surge occurrence, while the results of all other variables remain the same as before.[27]

Columns [7]–[12] (in Tables 4 and 5) include additional pull variables in our general specification to capture the effect of other potentially important domestic characteristics (for example, a country's trade openness, and financial development may increase its attractiveness as an investment destination, and boost the likelihood and magnitude of surges), while column [13] includes country-fixed effects. The results show that trade openness is indeed associated with significantly higher surge likelihood, but the proxies for financial sector development and financial soundness (such as stock market capitalization, private sector credit to GDP, and banks' return on equity) are statistically insignificant. We also do not find a strong impact of contagion through trade relationships—defined as in Forbes and Warnock (2012)—on surge likelihood/magnitude. The inclusion of these variables does not, however, affect much the estimated magnitude and significance of the other pull factors in the regressions.[28]

Although, as shown in Fig. 1, a surge in international capital flows to the EMEs occurred in the early 1980s (as a continuation of the surge in late 1970s), surges in later years—particularly post-Latin American debt crisis—have been larger (in both absolute and relative to GDP terms), and have also involved more countries.[29] To examine whether the role of global and local factors in later years has been any different, we re-estimate our regressions for the 1990–2011 sample. The results summarized in column [14] (of Tables 4 and 5) show a largely unchanged impact of global and local factors, with the exception of the financial openness index, which is statistically insignificant for the latter period (presumably because of less sample variation in this period as most EMEs had opened up their capital accounts).

Finally, the surge occurrence probit has a large number of zero observations in the dependent variable (about 80% of the observations in the estimated sample are zero). By construction, the probit model specifies that the distribution of $F(.)$ in (3) is normal, and symmetric around zero. If however the distribution of the dependent variable is skewed, applying the complementary log–log model—which is asymmetric around zero—may be preferable (Forbes and Warnock, 2012). Table 4 (col. [15]) presents the estimation results with the complementary log–log method (with clustered standard errors at the country level); reassuringly, the obtained results remain very similar to those reported in Table 3.

3.4.4. Endogeneity

In the analysis presented above, following earlier studies (e.g., Forbes and Warnock, 2012), we use one-year lagged values for domestic pull variables to mitigate potential endogeneity concerns. While using one-period lags as instruments is common, both because they are readily available and because persistence in most macro time series means that one-period lags tend to be highly correlated with the regressor, the validity of doing so rests on the assumption of a serially uncorrelated error term. If, however, the error term exhibits serial correlation (e.g., AR(1)), then one-period lags will not be valid instruments.

An obvious solution would be to use two-period lags. But that may not work very well because macro series typically do not exhibit sufficient persistence for the t-2 lag to be a good (i.e., strongly correlated with the regressor) instrument. To get around this issue, we draw on a unique database of IMF country-team projections, and construct instruments for macroeconomic variables such as real GDP growth and real exchange rate overvaluation—for which endogeneity concerns are likely to be the most pertinent—using *projections* made in year t-2 or earlier for year t.[30] Empirically, these projections are more strongly correlated with the regressors than the actual t-2 value (in other words, the IMF projections incorporate more information than is available in the t-2 lag of the variable), and are less likely to be correlated with the error term in the occurrence/magnitude regressions.[31] While endogeneity is of less concern using these instruments, there is of course no guarantee that endogeneity problems have been fully addressed, and the reported results need to be treated with appropriate caution.

Unfortunately, these projections are only available from 1990 onward, so our sample size for these instrumental variable (IV) regressions is smaller (Table 6). For comparison, however, we also include in cols. [1] and [3] the results for surge likelihood and magnitude regressions obtained from simple probit and OLS approaches (that is, without instrumenting), respectively, for the shorter sample. The results obtained from the IV probit model (col. [2]) echo the findings in col. [1]; for example, the estimated effect of real GDP growth rate on surge likelihood remains significantly positive, while that of implied REER overvaluation is statistically insignificant.[32] For the IV regressions of surge magnitude, reported in col. [4], we do not find a strong association between implied REER overvaluation and net flows, while the association between real GDP growth and net flows in a surge is also not statistically significant. The estimated coefficients (and significance) of other variables in the regression remain largely unaffected in the IV estimations—overall, therefore, our results appear to be robust to the potential endogeneity of the regressors.

4. Asset-flow vs. liability-flow surges

The analysis above treats all surges as the same, but a net inflow surge may be the result of exceptional behavior of liability flows (foreigners investing in the home country) or exceptional behavior of asset flows (residents repatriating foreign assets, or just not investing abroad as much as usual) or possibly both. To the extent that asset-flow surges reflect the investment decisions of residents, while liability-flow surges reflect the investment decisions of nonresidents, the behavior of these two types of surges, and their response to global push and domestic pull factors, may be quite different. In what follows, we examine if this holds true in the data by first classifying surges as asset-flow or liability-flow driven, and then estimating the occurrence and magnitude regressions for both types of surges.

4.1. Classifying surges

A simple way of classifying our 326 (net inflow) surge observations would be according to whether it is the asset- or the liability-flow

[27] In addition, we also conduct robustness checks using nominal (instead of real) US and domestic interest rates, and compute both the US and domestic real interest rates with contemporaneous inflation (instead of expected inflation), but the results remain very similar.

[28] We also include fiscal balance and public debt to GDP ratios, and a proxy for the political regime in place, but find these variables to be statistically insignificant.

[29] Several studies (e.g., Chuhan et al., 1993; Taylor and Sarno, 1997) note that the composition of flows in the surge of 1990s and later years has also been different with a pronounced increase in portfolio flows.

[30] The IMF projections offer several advantages. First, because of its near-universal membership, IMF's projections reflect the knowledge of individual economies, but also capture the interlinkages between them. Second, because these forecasts are produced simultaneously for all member countries, they satisfy the binding general equilibrium constraints (e.g., on current accounts and exchange rates) for the global economy. Third, these projections are available from 1990 onward, giving consistent time series estimates for a large number of countries that can be readily employed in the empirical analysis. Most studies of the accuracy of these projections suggest that biases are numerically small, if extant at all (Takagi and Kucur, 2006). Berg et al. (1999) use IMF country-team projections as instruments in a study of economic growth in transition economies.

[31] E.g., correlation between actual real GDP growth rate and the projected growth rate in t-2 is almost twice than that between actual growth rate and its two-year lagged value. The IMF does not project REER overvaluation but only expected movements in the exchange rate. But if the currency is expected to be overvalued (undervalued) in the future, the real exchange rate would be projected to appreciate (depreciate).

[32] Projections are not available for structural variables (such as the exchange rate regime and capital account openness), but since these are slow-moving variables, we use their two-year lagged values as instruments and find the estimated coefficients for these variables to be very similar to those obtained before.

Table 4
Likelihood of surge: sensitivity analysis.

	Surge definitions			Alternate regressors			Additional regressors							Sample Estimation	
	Extended	Cluster	Country-specific	Real US 10 yr. yield	RAI	VIX	Trade openness	Reserves to GDP	Stock market cap.	ROE	Pvt. sector credit/GDP	Trade links	Fixed effects	1999-2009	Comp. log–log
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)
Real US interest rate	−10.701***	−12.260***	−11.878***	−6.342**	−5.747**	−8.725***	−9.418***	−9.316***	−13.783***	−11.758***	−12.211***	−10.354***	−16.225***	−9.255***	−14.837***
	(2.825)	(2.816)	(2.524)	(2.678)	(2.888)	(2.682)	(2.177)	(2.253)	(3.075)	(3.871)	(2.536)	(2.222)	(3.260)	(3.344)	(3.550)
S&P 500 index/RAI/VIX	−0.023**	−0.016	−0.006	−0.015	0.140	−0.092*	−0.027**	−0.029***	−0.045***	−0.034**	−0.033***	−0.029***	−0.028**	−0.029**	−0.050***
	(0.011)	(0.012)	(0.010)	(0.011)	(0.091)	(0.052)	(0.012)	(0.011)	(0.015)	(0.014)	(0.012)	(0.011)	(0.012)	(0.014)	(0.017)
Commodity price index	0.706	1.335***	1.031***	0.851**	1.102**	0.957**	1.135***	1.044**	1.188**	1.318**	1.385***	1.088***	1.504***	0.889**	1.117*
	(0.457)	(0.400)	(0.372)	(0.411)	(0.428)	(0.430)	(0.414)	(0.416)	(0.560)	(0.523)	(0.452)	(0.416)	(0.469)	(0.431)	(0.577)
Regional contagion	0.503*	0.744***	0.791***	0.180	0.219	0.281	0.056	0.088	−0.247	−0.371	−0.089	0.068	0.238	−0.107	0.045
	(0.290)	(0.257)	(0.282)	(0.232)	(0.256)	(0.255)	(0.224)	(0.225)	(0.341)	(0.360)	(0.298)	(0.236)	(0.268)	(0.262)	(0.333)
Real domestic interest rate	2.847***	2.942***	1.548**	1.620	1.926	2.003	2.148**	2.012*	1.131	2.044	1.789*	1.947*	1.406	1.406	2.856*
	(1.079)	(1.030)	(0.783)	(1.028)	(1.216)	(1.222)	(1.034)	(1.048)	(1.328)	(1.347)	(1.053)	(1.064)	(1.139)	(1.347)	(1.522)
REER deviation from trend	−1.158**	−1.268*	−0.777	−1.048	−1.210	−1.259*	−0.703	−1.034	−1.831**	−1.692*	−1.184	−1.094	−1.189	−1.914**	−1.405
	(0.471)	(0.766)	(0.652)	(0.751)	(0.779)	(0.712)	(0.721)	(0.754)	(0.780)	(0.903)	(0.720)	(0.741)	(0.786)	(0.893)	(1.126)
Optimal current account/GDP	−13.040***	−10.254***	−9.622***	−11.367***	−12.232***	−12.029***	−11.609***	−11.884***	−12.417***	−12.313***	−11.886***	−11.821***	−12.496***	−13.100**	−16.322***
	(2.340)	(2.338)	(1.886)	(1.813)	(1.883)	(1.823)	(1.740)	(1.797)	(2.376)	(2.057)	(1.951)	(1.783)	(2.006)	(2.012)	(2.515)
Real GDP growth	4.929***	4.225***	3.243**	4.456***	4.879***	5.025***	4.062***	4.465***	3.746**	4.678**	3.943**	4.394***	4.376**	4.267***	6.630***
	(1.524)	(1.390)	(1.445)	(1.385)	(1.431)	(1.434)	(1.434)	(1.387)	(1.826)	(1.829)	(1.683)	(1.387)	(1.710)	(1.529)	(1.949)
Capital account openness	0.102*	0.021	0.031	0.088*	0.053	0.070	0.064	0.079*	0.062	0.041	0.098**	0.084*	0.004	0.037	0.111*
	(0.057)	(0.037)	(0.035)	(0.048)	(0.047)	(0.046)	(0.048)	(0.047)	(0.053)	(0.045)	(0.046)	(0.047)	(0.075)	(0.047)	(0.064)
Financial interconnectedness	0.063***	0.103***	0.106***	0.074***	0.078***	0.078***	0.089***	0.075***	0.092***	0.097***	0.071***	0.074***	0.131***	0.087***	0.114***
	(0.015)	(0.015)	(0.016)	(0.015)	(0.015)	(0.015)	(0.016)	(0.015)	(0.016)	(0.016)	(0.015)	(0.015)	(0.021)	(0.016)	(0.023)
Exchange rate regime	0.181**	0.155*	0.085	0.163**	0.207***	0.216***	0.127	0.162**	0.251***	0.243***	0.163**	0.172**	0.218*	0.249***	0.211**
	(0.089)	(0.082)	(0.073)	(0.074)	(0.074)	(0.074)	(0.081)	(0.074)	(0.085)	(0.079)	(0.077)	(0.075)	(0.128)	(0.076)	(0.105)
Institutional quality index	2.521***	1.375**	1.630***	1.943***	2.055***	2.259***	1.681**	2.144***	2.284***	1.971**	2.441***	2.267***	2.731***	1.835**	3.741***
	(0.774)	(0.663)	(0.531)	(0.707)	(0.756)	(0.765)	(0.735)	(0.677)	(0.834)	(0.870)	(0.711)	(0.687)	(1.008)	(0.786)	(1.097)
Default onset	−0.660**	−0.975**	−0.540*	−0.366	−0.470	−0.458	−0.355	−0.313		−0.354	−0.313	−0.332	−0.247	−0.445	−0.832
	(0.326)	(0.443)	(0.292)	(0.386)	(0.524)	(0.513)	(0.369)	(0.373)		(0.572)	(0.378)	(0.372)	(0.361)	(0.555)	(0.688)
Real GDP per capita (log)	−0.279**	−0.204**	−0.259***	−0.262***	−0.325***	−0.345***	−0.319***	−0.319***	−0.261**	−0.343***	−0.292***	−0.298***	−0.951**	−0.316***	−0.489***
	(0.127)	(0.087)	(0.064)	(0.100)	(0.106)	(0.108)	(0.093)	(0.100)	(0.124)	(0.104)	(0.111)	(0.101)	(0.388)	(0.103)	(0.151)
Observations	1199	1199	1199	1199	1121	1067	1199	1199	879	840	1181	1199	1181	956	1199
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.217	0.203	0.174	0.188	0.199	0.194	0.202	0.195	0.212	0.199	0.191	0.194	0.277	0.188	

Notes: Dependent variable is a binary variable (=1 if a surge occurs; 0 otherwise). All regressions (except for complementary log–log regression) are estimated using probit estimation method. Clustered standard errors (at the country level) are reported in parentheses. All variables except for real US interest rate, S&P 500 index returns volatility, commodity price index, regional contagion, and financial interconnectedness are lagged one period. Constant and region specific effects are included in all specifications. ***, ** and * indicate significance at 1, 5, and 10% levels, respectively. Extended = Surges identified using a one-year window (i.e., including the year before and after the surge if the net capital flow is positive); Cluster = Surges identified using the cluster approach; Country-specific = Surges identified as the top 30th percentile of the country-specific distribution of net capital flows; Real US 10 yr. yield = Includes the real US 10 yr. government bond yield instead of the real US 3-month T-bill rate; RAI = Includes the (log of) Credit Suisse global risk appetite index (RAI) instead of the S&P 500 index volatility measure; VIX = Includes the (normalized) VIX extended backward up to 1986 with the (normalized) VXO index; Trade openness = Includes trade to GDP ratio in the specification; Reserves to GDP = Includes the stock of foreign reserves to GDP ratio in the specification.
Stock market cap. = Includes stock market capitalization in the specification; ROE = Includes banks' return on equity in the specification; Pvt. sector credit/GDP = Includes private sector credit to GDP ratio in the specification; Trade links = Includes trade links to measure contagion effects in the specification; Fixed effects = Includes country fixed effects in the specification; Comp. log–log = Estimates the complementary log–log model.

Table 5
Magnitude of surge: sensitivity analysis.

	Surge definitions			Alternate regressors			Additional regressors							Sample
	Extended	Cluster	Country specific	Real US 10 yr. yield	RAI	VIX	Trade openness	Reserves to GDP	Stock market cap.	ROE credit/GDP	Pvt. sector	Trade links	Fixed effects	1990–2009
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
Real US interest rate	−0.439**	−0.314	−0.371*	−0.242	−0.144	−0.207	−0.154	−0.009	−0.922***	−0.556*	−0.661***	−0.331	−0.202	−0.243
	(0.171)	(0.219)	(0.185)	(0.224)	(0.269)	(0.245)	(0.176)	(0.234)	(0.335)	(0.327)	(0.234)	(0.217)	(0.267)	(0.321)
S&P 500 index/RAI/VIX	−0.002**	−0.002**	−0.002**	−0.001*	0.001	−0.005	−0.001	−0.002*	−0.003***	−0.002*	−0.002*	−0.001	−0.002**	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.009)	(0.005)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Commodity price index	0.030	0.021	0.019	0.017	0.030	0.028	0.044	0.007	0.060	0.052	0.055*	0.021	0.082***	0.020
	(0.021)	(0.027)	(0.025)	(0.032)	(0.039)	(0.039)	(0.030)	(0.032)	(0.045)	(0.041)	(0.031)	(0.030)	(0.027)	(0.038)
Regional contagion	−0.102	−0.208**	−0.075	−0.014	−0.024	−0.042	0.022	0.019	−0.228***	−0.069	−0.063	−0.021	0.046	−0.066
	(0.063)	(0.101)	(0.067)	(0.072)	(0.077)	(0.082)	(0.064)	(0.065)	(0.076)	(0.100)	(0.061)	(0.070)	(0.047)	(0.090)
Real domestic interest rate	−0.007	−0.047	0.020	−0.054	−0.058	−0.052	0.033	0.005	−0.131	−0.043	−0.001	−0.024	0.015	−0.070
	(0.063)	(0.062)	(0.068)	(0.072)	(0.073)	(0.075)	(0.073)	(0.067)	(0.082)	(0.083)	(0.062)	(0.070)	(0.059)	(0.076)
REER deviation from trend	−0.120**	−0.235***	−0.164**	−0.158**	−0.167*	−0.177*	−0.076	−0.124	−0.200*	−0.162**	−0.178**	−0.155**	−0.175**	−0.171*
	(0.054)	(0.084)	(0.063)	(0.078)	(0.091)	(0.091)	(0.076)	(0.082)	(0.108)	(0.078)	(0.079)	(0.075)	(0.086)	(0.087)
Optimal current account/GDP	−0.294***	−0.302***	−0.353***	−0.248**	−0.240*	−0.260**	−0.164	−0.246*	−0.298	−0.257*	−0.303	−0.253**	−0.216	−0.268**
	(0.091)	(0.110)	(0.107)	(0.123)	(0.126)	(0.128)	(0.116)	(0.125)	(0.190)	(0.149)	(0.182)	(0.121)	(0.130)	(0.126)
Real GDP growth	−0.048	−0.038	0.049	−0.140	−0.114	−0.127	−0.166	−0.108	−0.244	−0.170	−0.243	−0.166	−0.294	−0.183
	(0.130)	(0.235)	(0.168)	(0.223)	(0.221)	(0.226)	(0.228)	(0.244)	(0.246)	(0.266)	(0.251)	(0.227)	(0.265)	(0.244)
Capital account openness	0.006**	0.006*	0.006**	0.007*	0.007*	0.007*	0.003	0.004	0.005	0.006	0.005	0.006*	0.005	0.006*
	(0.002)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)	(0.004)
Financial interconnectedness	0.000	−0.003	−0.002	−0.002	−0.002	−0.002	0.000	−0.002	−0.001	−0.001	−0.002	−0.002	−0.000	−0.002
	(0.001)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Exchange rate regime	0.025***	0.024**	0.025***	0.031***	0.031***	0.031***	0.023***	0.025***	0.034**	0.033***	0.032***	0.029***	0.016**	0.030***
	(0.008)	(0.010)	(0.009)	(0.010)	(0.010)	(0.010)	(0.008)	(0.007)	(0.013)	(0.011)	(0.011)	(0.010)	(0.007)	(0.010)
Institutional quality index	0.013	0.079	0.075	0.000	0.016	0.019	−0.055	−0.039	−0.016	0.040	0.031	0.020	−0.073	−0.011
	(0.072)	(0.088)	(0.076)	(0.094)	(0.107)	(0.106)	(0.092)	(0.093)	(0.113)	(0.134)	(0.093)	(0.090)	(0.071)	(0.115)
Default onset	0.003	−0.002	−0.000	−0.006	0.006	−0.000	−0.030	0.000		0.004	−0.013	−0.008	−0.038*	0.001
	(0.017)	(0.018)	(0.018)	(0.020)	(0.022)	(0.026)	(0.023)	(0.021)		(0.022)	(0.023)	(0.019)	(0.021)	(0.022)
Real GDP per capita (log)	0.002	−0.001	0.003	0.009	0.008	0.008	0.003	0.001	0.020	0.006	0.003	0.008	0.012	0.011
	(0.015)	(0.016)	(0.014)	(0.020)	(0.021)	(0.021)	(0.017)	(0.014)	(0.023)	(0.024)	(0.020)	(0.019)	(0.019)	(0.021)
Observations	439	316	390	271	260	256	271	271	216	223	253	271	271	252
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.234	0.295	0.267	0.287	0.288	0.299	0.358	0.375	0.353	0.315	0.32	0.303	0.728	0.303

Notes: Dependent variable is net capital flow to GDP conditional on surge occurrence. All regressions are estimated using OLS, with clustered standard errors (at the country level) reported in parentheses. All variables except for real US interest rate, S&P500 index returns volatility, commodity price index, regional contagion, and financial interconnectedness are lagged one period. Constant and region specific effects are included in all specifications. ***, ** and * indicate significance at 1, 5, and 10% levels, respectively. Extended = Surges identified using a one-year window (i.e., including the year before and after the surge if the net capital flow is positive); Cluster = Surges identified using the cluster approach; Real US 10 yr. yield = Includes the real US 10 yr. government bond yield instead of the real US 3-month T-bill rate; RAI = Includes the (log of) Credit Suisse global risk appetite index (RAI) instead of the S&P 500 index volatility measure; VIX = Includes the (normalized) VIX index extended backward up to 1986 with the (normalized) VXO index; Trade openness = Includes trade to GDP ratio in the specification; Reserves to GDP = Includes stock of foreign reserves to GDP ratio in the specification; Stock market cap. = Includes stock market capitalization in the specification; ROE = Includes banks' return on equity in the specification; Pvt. sector credit/GDP = Includes private sector credit to GDP ratio in the specification; Trade links = Includes trade links to measure contagion effects in the specification; Fixed effects = Includes country fixed effects in the specification.

Table 6
Surge likelihood and magnitude: sensitivity analysis for endogeneity.

Estimation	Surge likelihood a/		Surge magnitude b/	
	Probit	IV-probit	OLS	IV-2SLS
	(1)	(2)	(3)	(4)
Real US interest rate	−12.185***	−12.974***	−0.294	−0.370
	(3.754)	(4.323)	(0.315)	(0.307)
S&P 500 index	−0.029*	−0.028	−0.001	−0.002
	(0.017)	(0.019)	(0.001)	(0.001)
Commodity price index	0.482	0.241	0.003	−0.006
	(0.442)	(0.515)	(0.034)	(0.071)
Regional contagion	−0.310	−0.385	0.010	−0.023
	(0.356)	(0.408)	(0.108)	(0.112)
Real domestic interest rate	3.050***	3.017*	−0.005	−0.055
	(0.997)	(1.540)	(0.086)	(0.102)
REER deviation from trend	−0.395	5.047	0.003	0.377
	(0.870)	(9.775)	(0.062)	(0.726)
Optimal current account/GDP	−20.327***	−18.875***	−0.301***	−0.267*
	(3.147)	(3.222)	(0.109)	(0.140)
Real GDP growth	7.597***	12.105*	0.277*	0.126
	(2.530)	(7.281)	(0.150)	(1.402)
Capital account openness	0.061	0.062	0.008*	0.009*
	(0.058)	(0.045)	(0.005)	(0.005)
Financial interconnectedness	0.058***	0.042	−0.002	−0.002
	(0.020)	(0.028)	(0.002)	(0.003)
Exchange rate regime	0.173**	0.159*	0.025***	0.028**
	(0.078)	(0.089)	(0.009)	(0.012)
Institutional quality index	2.346**	2.040*	0.028	0.002
	(0.973)	(1.050)	(0.130)	(0.128)
Real GDP per capita (log)	−0.297**	−0.255**	−0.035***	−0.307
	(0.129)	(0.116)	(0.012)	(0.220)
Observations	758	758	209	209
Regional dummies	Yes	Yes	Yes	Yes
Variables instrumented	No	Yes	No	Yes

a/Dependent variable is a binary variable equal to 1 if a surge occurs and 0 otherwise. Constant and region specific effects included in all specifications. Instrumental variables (IV) regressions estimated with two-step probit model. Real GDP growth rate and REER deviation from trend instrumented with real GDP growth rate and real exchange rate change projected in time periods t-2 or earlier. ***, ** and * indicate significance at 1, 5, and 10% levels, respectively.
b/Dependent variable is net capital flow to GDP conditional on surge occurrence. Clustered standard errors reported in parentheses. Constant and region specific effects included in all specifications. Instrumental variables (IV) regressions estimated with 2SLS approach. Real GDP growth rate and REER deviation from trend instrumented with real GDP growth rate and real exchange rate change projected in time periods t-2 or earlier. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

component of net flows that is larger. For example, suppose in year t, a country receives net capital flows of 7% of GDP—which happens to qualify as a surge based on our definition—of which 4% of GDP are in liability flows and 3% of GDP are in asset flows. Then this surge could be classified as a (predominantly) liability-flow driven surge since the liability-flow component of net flows is larger than the asset-flow component. Such an approach, however, runs into two key problems. First, because liability flows to EMEs are nearly always larger than asset flows, almost all surges would be classified as liability-flow surges. Second, and more importantly, this approach does not always correctly capture *why* the observation is a surge. That is, to continue the example, suppose there is no surge in year t-1: net capital flows are 5% of GDP (too low to qualify as a surge observation), consisting of 4% of GDP of liability flows and 1% of GDP of asset flows. In period t, net flows rise to 7% of GDP (which is high enough to qualify as a surge) but liability flows remain unchanged (at 4% of GDP), while asset flows increase by 2% of GDP. If the relative *level* of asset versus liability flows is used for classification, then this surge would be classified as a liability-flow surge (since the 4% of GDP of liability flows still exceed the 3% of GDP of asset flows). But clearly it should be considered as an asset-flow surge because it is only the exceptional behavior of asset flows that results in the observation at time t qualifying as a net inflow surge (whereas liability flows remain unchanged from the previous (nonsurge) year).

To classify each of our surge observations as an asset-flow or liability-flow surge, we therefore consider whether the *change* in asset flows is greater or smaller than the change in liability flows such that[33]:

$$AS_{jt} = \begin{cases} 1 \ \text{if} \ \left\{S_{jt} = 1\right\} \cap \left\{\Delta assetflow_{jt} > \Delta liabilityflow_{jt}\right\} \\ 0 \ \text{otherwise} \end{cases} \tag{5}$$

$$LS_{jt} = \begin{cases} 1 \ \text{if} \ \left\{S_{jt} = 1\right\} \cap \left\{\Delta liabilityflow_{jt} > \Delta assetflow_{jt}\right\} \\ 0 \ \text{otherwise} \end{cases} \tag{6}$$

where AS_{jt} and LS_{jt} indicate whether the surge in country j at time t is driven by asset flows or liability flows, respectively; $assetflow_{jt}$ is the (negative of) the change in the (stock of) foreign assets of country j's residents at time t, expressed in percent of GDP; $liabilityflow_{jt}$ is the change in the (stock of) foreign liabilities of country j at time t, expressed in percent of GDP; and Δ denotes the first difference operator.[34]

The obtained classification shows that the majority (more than two-thirds) of identified surges correspond to an increase in liability-flows rather than to an increase in asset-flows into the country. Asset-flow driven surges outnumber liability-flow driven surges in only two out of the 30 years of our sample—1982 and 2008, both of which are crisis years (Fig. 5[a]).[35] On average, liability-flow driven surges are also somewhat larger than asset-driven surges, though the difference is not statistically significant (Fig. 5[b]).

4.2. What drives asset- and liability-flow surges?

Considering the difference in occurrence of asset-flow and liability-flow driven surges, are their determinants different? Cols. [1]–[5] in Table 7 report the estimation results of a probit model for asset-flow surges (as defined in (5) above, and where liability-flow surges are excluded from the sample), while cols. [6]–[10] report the corresponding results obtained from estimating a probit model for liability-flow surges (as defined in (6) above, with asset-flow surges excluded from the sample).[36]

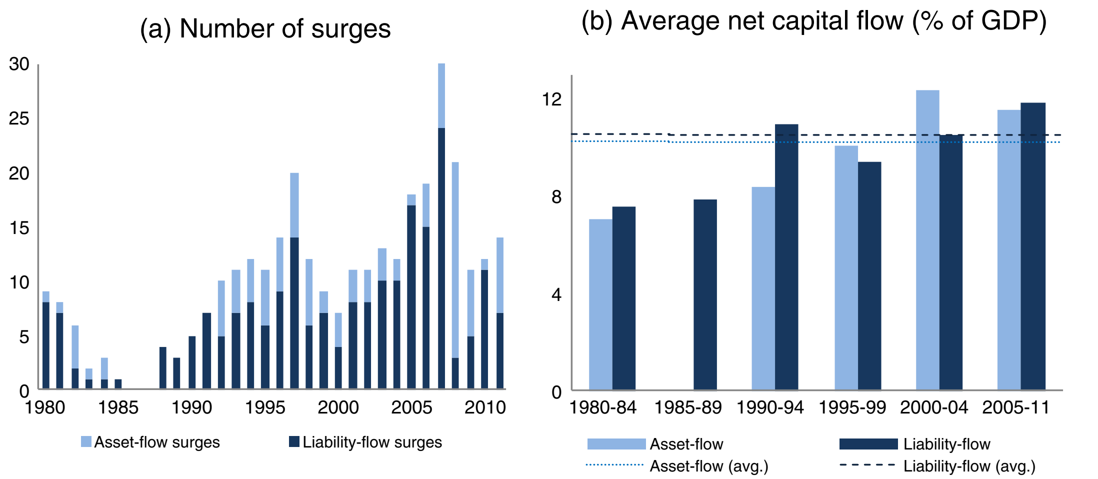
US real interest rates matter significantly for both asset-flow and liability-flow surges, though the impact is greater for the latter—a 100 bps increase in the US real rate (evaluated at mean values) lowers the predicted probability of a liability-flow surge by about 2 percentage points but that of an asset-flow surge by 1 percentage point. Global market uncertainty is strongly related to both types of surges, such that in times of increased global market uncertainty, foreign as well as domestic investors exit EMEs (and presumably prefer to invest in safe haven

[33] For surges in consecutive years, each surge observation is classified in the same manner, namely whether the change from the previous year in asset-flows is larger or smaller than the change in liability-flows. An alternative would be to classify according to whether the change from the previous *nonsurge* observation (in t-1) in asset-flows is smaller or larger than the corresponding change in liability-flows. The latter method yields somewhat fewer asset-flow surges, but similar—indeed, somewhat sharper—results about the differences in the determinants of asset-flow and liability-flow surges.

[34] The classification criteria may appear to give a "knife-edge" quality to the classification, whereby a slightly larger increase in asset- or liability-flows can tip the classification from one category to the other. While this is true in principle (and indeed is the property of any threshold-based classification), in practice, it is usually clear whether increase in asset or liability flows dominates. Thus, in more than 95% of our surge observations, the difference between the increase in asset flows and the increase in liability flows exceeds 0.5% of GDP. Further, dropping the 5% of surge observations, where the difference is less than 0.5% of GDP, makes virtually no difference to the results presented below.

[35] This observation is in line with the well-established drawdown on residents' foreign assets during crises (Milesi-Ferretti and Tille, 2011).

[36] We estimate asset- and liability-driven surges as separate samples because a direct comparison of their regression coefficients would involve adding several interactive terms (between the explanatory variables and a dummy variable indicating whether the surge is asset/liability-driven) in the general specification, with limited degrees of freedom (and the potential to create multicollinearity). However, estimating a single regression including the interactive terms one-by-one presents a similar picture to that obtained below in terms of the relative importance of the push and pull factors for the two types of surges.



Source: Authors' estimates based on IFS.

Fig. 5. Types of surges, 1980—2011.

countries). Nevertheless, foreign investors appear to be more sensitive to global market uncertainty: a one standard deviation shock to the S&P 500 index returns volatility reduces the estimated likelihood of a liability-flow surge by 3 percentage points compared to about 1 percentage point for asset-flow surges. Asset-flow surges, but not liability-flow surges, are more likely when commodity prices are booming. Conversely, liability-flow surges are more subject to regional contagion than asset-flow surges.

Among the domestic pull factors, external financing need, real GDP growth, and institutional quality are correlated with both types of surges. Asset-flow surges, however, appear to react more strongly to changes in the domestic real interest rate, while liability-flow surges are somewhat more sensitive to the recipient country's external financing need: a 1% of GDP increase raises the estimated likelihood of a liability-flow surge by about 1 percentage point more than it raises the likelihood of an asset-flow surge (Fig. 6). Liability-flow surges also

Table 7
Likelihood of surge: by surge type, 1980–2011.

	Asset-flow surge					Liability-flow surge				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Real US interest rate	−5.158	−12.078**	−8.572**	−8.824**	−7.861**	−6.568**	−11.189***	−9.575***	−10.436***	−10.692***
	(3.396)	(3.162)	(3.414)	(3.462)	(3.716)	(2.797)	(2.403)	(2.248)	(2.336)	(2.411)
S&P 500 index volatility	−0.021*	−0.042***	−0.029**	−0.028**	−0.018	−0.033***	−0.051***	−0.040***	−0.038***	−0.032**
	(0.011)	(0.013)	(0.014)	(0.014)	(0.014)	(0.012)	(0.013)	(0.014)	(0.013)	(0.013)
Commodity price index	1.652***	1.849***	1.705***	1.671***	1.902***	0.566	0.524	0.514	0.210	0.512
	(0.428)	(0.496)	(0.483)	(0.491)	(0.528)	(0.470)	(0.452)	(0.457)	(0.462)	(0.437)
Regional contagion	0.581**	0.401	0.082	0.061	−0.048	0.864***	0.762***	0.553*	0.308	0.141
	(0.280)	(0.284)	(0.309)	(0.306)	(0.311)	(0.309)	(0.292)	(0.294)	(0.264)	(0.256)
Real domestic interest rate	1.119	1.999**	2.187**	2.267**	2.022**	0.508	1.057	1.370	1.912	1.834
	(0.946)	(0.969)	(1.003)	(1.024)	(0.958)	(1.069)	(1.074)	(1.077)	(1.234)	(1.186)
REER deviation from trend	1.866***	1.046*	1.497*	1.523*	1.455**	−0.982	−2.187***	−2.269***	−2.476***	−2.618***
	(0.619)	(0.611)	(0.774)	(0.802)	(0.715)	(0.599)	(0.617)	(0.674)	(0.755)	(0.836)
Optimal current account/GDP		−13.462***	−12.794***	−12.735***	−12.735***		−10.934***	−10.514***	−10.904***	−10.872***
		(2.416)	(2.386)	(2.397)	(2.377)		(1.653)	(1.637)	(1.867)	(1.817)
Real GDP grow th			5.966***	5.834***	5.527***			5.122***	3.354**	3.366**
			(1.878)	(1.864)	(1.777)			(1.488)	(1.429)	(1.489)
Capital account openness			0.127**	0.125**	0.134**			0.049	0.049	0.059
			(0.054)	(0.054)	(0.055)			(0.042)	(0.047)	(0.047)
Financial interconnectedness				0.013	0.012				0.103***	0.104***
				(0.021)	(0.023)				(0.019)	(0.018)
Exchange rate regime				0.059	0.027				0.261***	0.240***
				(0.086)	(0.086)				(0.085)	(0.082)
Institutional quality index					2.569***					1.950***
					(0.866)					(0.656)
Default onset					−0.346					−0.523
					(0.389)					(0.474)
Real GDP per capita (log)					−0.237**					−0.317***
					(0.113)					(0.110)
Observations	1017	1017	1017	1017	1017	1111	1111	1111	1111	1111
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Pseudo-R^2	0.0617	0.147	0.179	0.180	0.200	0.0632	0.121	0.137	0.180	0.197

Notes: Dependent variable is a binary variable (=1 if a surge occurs; 0 otherwise). Asset- (liability-) flow surge is defined as the surge when change in residents' asset flows (liability flows) is larger than the change in their liability flows (asset flows). Regressions are estimated using probit model, with clustered standard errors (at the country level) reported in parentheses. All variables except for real US interest rate, S&P 500 index returns volatility, commodity price index, regional contagion and financial interconnectedness are lagged one period. Constant and region-specific effects are included in all specifications. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

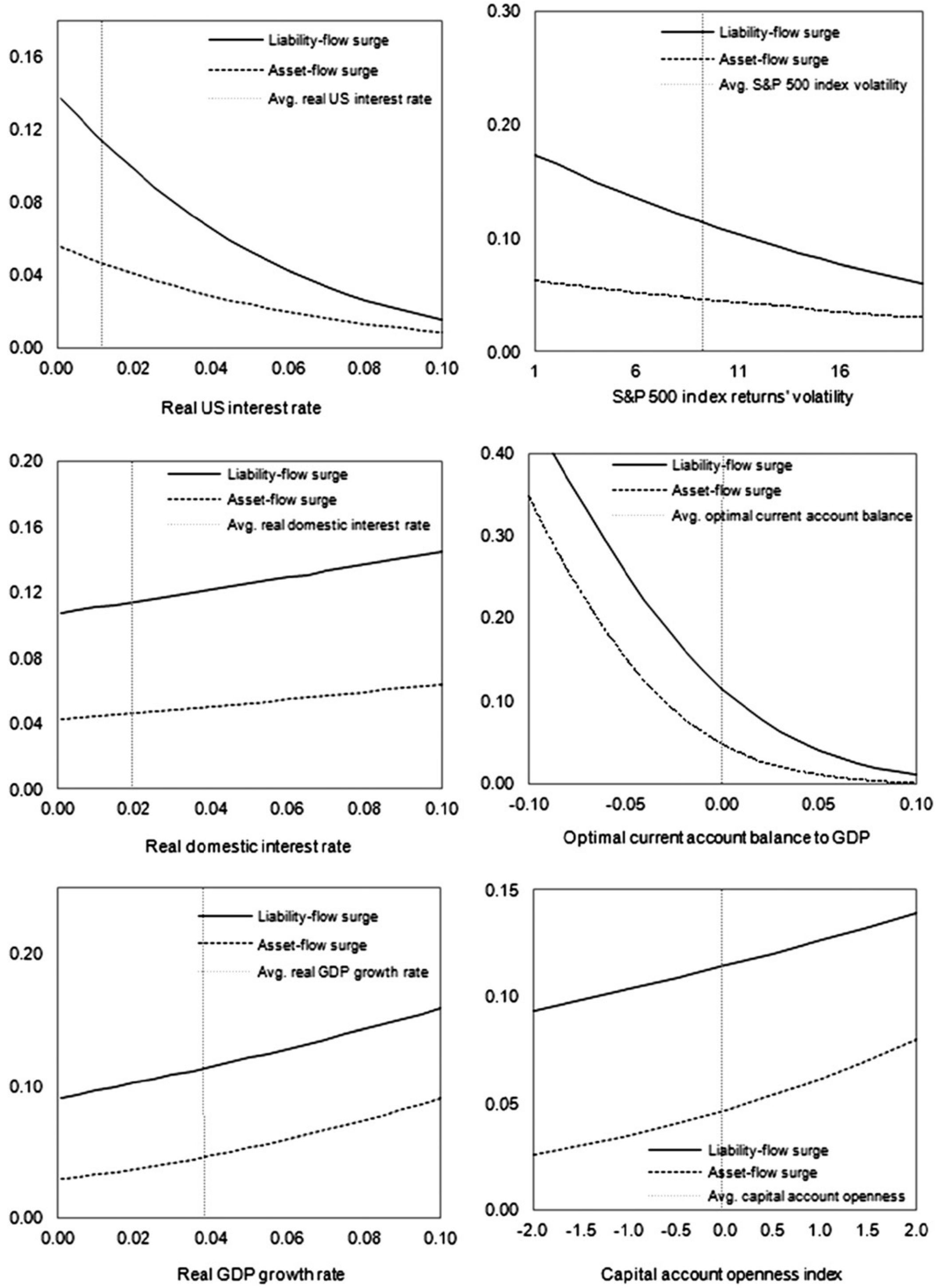


Fig. 6. Predicted probabilities of asset- and liability-driven surge occurrence.

appear to be more sensitive to financial interconnectedness, real exchange rate overvaluation, and the exchange rate regime (such that countries with greater interconnectedness, less flexible exchange rate regimes, or less overvaluation are more likely to experience a liability-flow surge). Capital account openness is strongly associated with asset-flow surges—moving from the 25th to the 75th percentile of the capital account openness index raises the estimated asset-flow surge probability by about 3 percentage points. This is intuitive because countries normally liberalize inflows before outflows, and it is only when outflows have been liberalized and residents have invested abroad that there can be repatriation that results in as asset-flow surge.

In terms of the magnitude of flows during surges, as before, several domestic macroeconomic and structural characteristics are statistically insignificant because by definition countries are sufficiently similar to have experienced a surge (Table 8). Nevertheless, the results show that global factors are only weakly associated with the magnitude of either asset- or liability-flow surges. Domestic factors, by contrast, do matter. The regression predicts that the size of inflows received will be larger if the nominal exchange rate regime is less flexible and the capital account is (more) open. Thus, a country with a fixed exchange rate experiences about 3 and 4% of GDP larger capital flows during asset- and liability-flow surges, respectively, than if it had a more

Table 8
Magnitude of surge: by surge type, 1980–2011.

	Asset-flow surge					Liability-flow surge				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Real US interest rate	−0.220	−0.264	−0.237	−0.326	−0.322	−0.521*	−0.566*	−0.452	−0.396	−0.403
	(0.379)	(0.387)	(0.341)	(0.312)	(0.334)	(0.285)	(0.307)	(0.294)	(0.298)	(0.308)
S&P500 index volatility	0.000	−0.000	−0.001	−0.001	−0.001	−0.002*	−0.003*	−0.002	−0.002	−0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.001)	(0.001)
Commodity price index	0.082*	0.082*	0.073*	0.094**	0.096*	0.005	−0.011	0.001	0.012	0.015
	(0.045)	(0.044)	(0.040)	(0.044)	(0.049)	(0.042)	(0.045)	(0.044)	(0.040)	(0.047)
Regional contagion	−0.018	−0.009	−0.020	−0.065	−0.066	−0.077	−0.089	−0.057	−0.023	−0.010
	(0.075)	(0.082)	(0.096)	(0.102)	(0.127)	(0.106)	(0.106)	(0.102)	(0.105)	(0.104)
Real domestic interest rate	0.011	0.016	−0.005	0.071	0.073	−0.150	−0.131	−0.150	−0.047	−0.051
	(0.144)	(0.143)	(0.135)	(0.133)	(0.144)	(0.092)	(0.093)	(0.091)	(0.073)	(0.082)
REER deviation from trend	−0.149**	−0.146**	−0.135*	−0.140**	−0.136	−0.122	−0.158	−0.142	−0.194	−0.195
	(0.074)	(0.071)	(0.072)	(0.064)	(0.087)	(0.115)	(0.118)	(0.123)	(0.124)	(0.130)
Optimal current account/GDP		−0.124	−0.066	−0.029	−0.030		−0.287*	−0.236	−0.349**	−0.353**
		(0.174)	(0.155)	(0.160)	(0.165)		(0.167)	(0.156)	(0.157)	(0.161)
Real GDP growth			−0.193	−0.153	−0.172			−0.064	−0.180	−0.183
			(0.173)	(0.172)	(0.183)			(0.347)	(0.324)	(0.318)
Capital account openness			0.012*	0.011*	0.011*			0.009**	0.007*	0.005
			(0.006)	(0.006)	(0.006)			(0.004)	(0.004)	(0.004)
Financial interconnectedness				−0.001	−0.001				−0.001	−0.002
				(0.002)	(0.002)				(0.002)	(0.002)
Exchange rate regime				0.025**	0.025*				0.037***	0.037***
				(0.012)	(0.015)				(0.013)	(0.013)
Institutional quality index					0.013					0.039
					(0.108)					(0.105)
Default onset					−0.010					−0.001
					(0.038)					(0.028)
Real GDP per capita (log)					−0.001					0.008
					(0.027)					(0.019)
Observations	88	88	88	88	88	182	182	182	182	182
Regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
R-squared	0.302	0.306	0.358	0.406	0.406	0.141	0.162	0.191	0.272	0.278

Notes: Dependent variable is net capital flow to GDP if a surge occurs. Asset- (liability-) flow driven surge is the surge when change in residents' asset flows (liability flows) is larger than the change in residents' liability flows (asset flows). All variables except for real US interest rate, S&P500 index returns volatility, commodity price index, regional contagion and financial interconnectedness are lagged one period. Constant, and region-specific effects are included. All regressions are estimated using OLS. Clustered standard errors (at the country level) reported in parentheses. ***,** and * indicate significance at 1, 5, and 10% levels, respectively.

flexible regime. Likewise, moving from the 25th to the 75th percentile of the capital account openness index is associated with 1–2% of GDP larger asset- or liability-flow surges. The external financing need, however, is more strongly associated with the magnitude of liability-flow surges as compared to asset-flow surges.

These results suggest that while asset- and liability-flow surges have many common factors, they also have some important differences. Liability-flow surges seem to be more sensitive to global factors and to contagion, but are also more responsive to the external financing needs of the country and dependent on its financial interconnectedness. Inasmuch as liability-flow surges reflect the investment decisions of foreigners, who are likely to face greater informational barriers than residents in identifying local investment opportunities (and must therefore rely more on global factors), these findings make intuitive sense.

4.3. Asset- and liability-flow surges: some further exploration

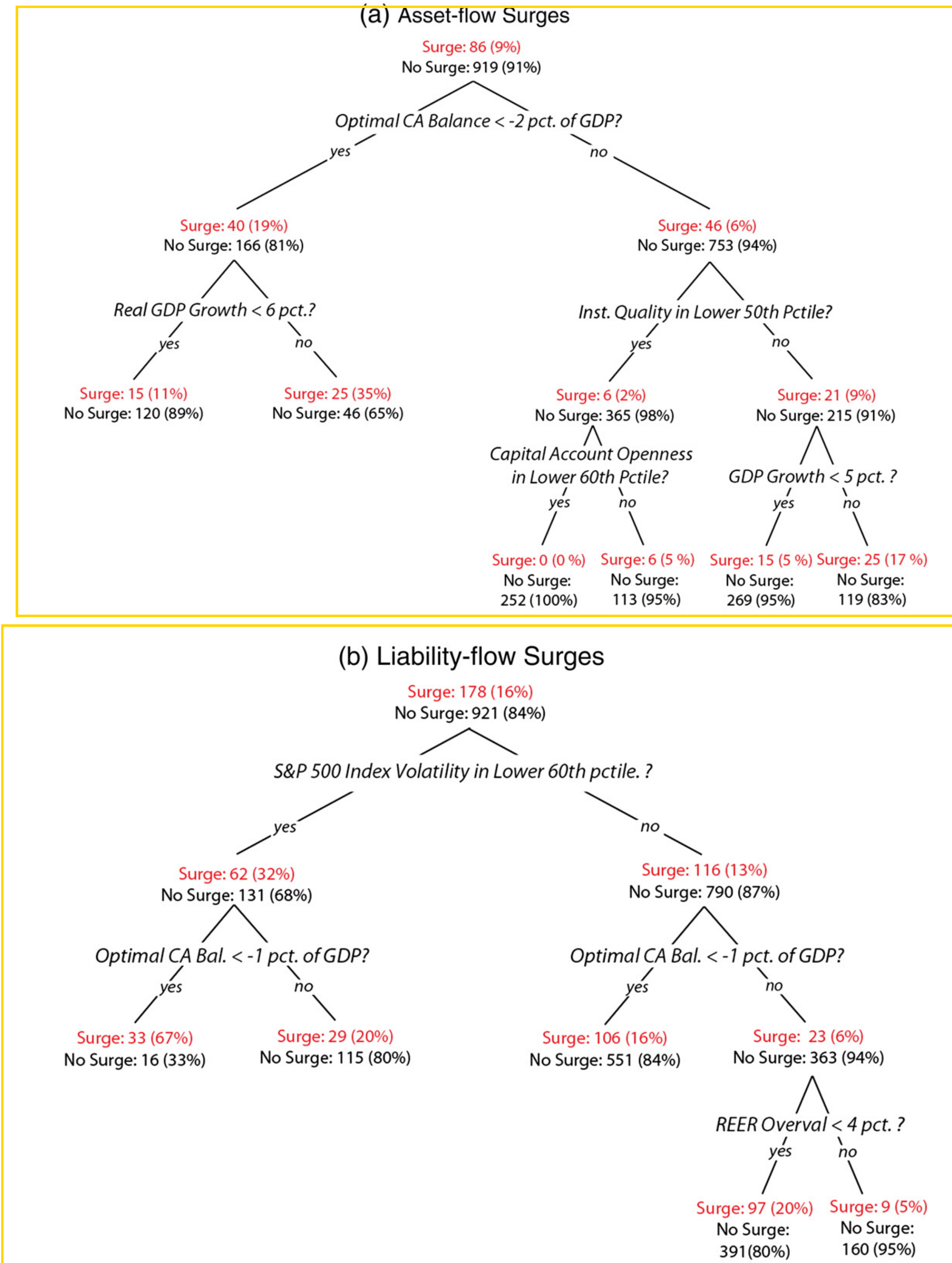
While the empirical analysis conducted thus far identifies the key factors that contribute to net capital flow surges in EMEs, it also highlights the possibility that both global and domestic factors may interact with each other to produce the cross-sectional and time-series pattern of surges that we observe in the data. A country may thus be more receptive to capital inflows because of structural characteristics or large external financing needs, but only experience a surge when global conditions permit. In principle, the probit model estimated above—which gives the marginal effect on the probability of a surge for each of the explanatory variables (holding the other variables at their mean values)—could be modified to include such interactions; in practice, this becomes extremely difficult when several explanatory variables are involved, and possible threshold effects are unknown.

To further explore the differences between asset-flow and liability-flow surges, we therefore complement the probit analysis with a decision-theoretic classification technique—known as a binary recursive tree—that readily allows for arbitrary interactions between the various explanatory variables, fleshing out any context-dependence and threshold effects in the data.[37] Formally, a binary recursive tree is a sequence of rules for predicting a binary variable, y, (i.e., surge vs. nonsurge) on the basis of a vector of explanatory variables, x_j, where $j = 1 \ldots J$, such that at each level, the sample is split into two sub-branches according to some threshold value of one of the explanatory variables, $\hat{x}_j$. The threshold value $\hat{x}_j$ is chosen as the value that best discriminates between surge and nonsurge observations based on a specific criterion.[38] The splitting is repeated along the various sub-branches until a terminal node is reached. This technique thus establishes a hierarchy among variables such that an explanatory variable that appears toward the top of the tree may be considered more important in distinguishing between the surge and nonsurge cases than one appearing on a lower sub-branch.

Based on the probit model above, we include the global factors as well as the important statistically significant domestic factors (external

[37] Previously, binary recursive analysis has been employed by several studies investigating the determinants of currency crises (see, e.g., Ghosh and Ghosh, 2003).

[38] While several algorithms are available to search for the best split (e.g., minimizing the sum of type I and type II errors) we employ the Chi-squared Automatic Interaction Detector (CHAID), which uses a chi-squared test to determine the best split (see Kass (1980) for details). Implementation of CHAID is undertaken using the SIPINA classification tree software.



Source: Authors' estimates
Notes: Binary recursive trees are constructed using the Improved CHAID algorithm in SAPINA software (with minimum size of nodes to split and leaves specified as 20 and 10 observations respectively, and the p-level for merging and splitting nodes specified as 0.05 and 0.001, respectively). Outlier observations for (lagged) optimal current account (i.e., in the top and bottom 0.5th percentile) have been excluded.

Fig. 7. Binary recursive trees for surge occurrence.

financing need; real GDP growth rate; real exchange rate overvaluation; capital account openness; exchange rate regime, and institutional quality) to construct the binary tree. Fig. 7[a] presents the resulting binary recursive tree for asset-flow surges, with the conditional probabilities of a surge indicated at each node.[39] The first variable used for splitting the sample turns out to be the optimal current account balance (to GDP) at the threshold value of about 2% of GDP. The conditional probability of an asset-flow surge in countries with external financing needs larger than this threshold value (the left hand branch of the tree) is 19%, whereas the probability for countries with financing needs below this threshold is only 6%. Continuing along the left hand branch of the tree, the second node depends on the real GDP growth rate such that countries with a growth rate in excess of 6% of GDP are thrice more likely to have an asset-flow surge than otherwise.

Moving on to the right hand branch of the tree (i.e., countries with optimal current account deficits smaller than 2% of GDP), we see that it is institutional quality that matters—countries with smaller financing needs, but in the top 50th percentile of the institutional quality index, have a much higher likelihood of an asset-flow surge than those with lower institutional quality. For countries with above-median institutional quality, the next important variable is real GDP growth rate, with a threshold value of 5% (and a conditional surge probability of about 17% for countries that exceed this growth threshold compared to 5% for countries that do not). But for countries with below-median institutional quality, it is capital account openness that matters, with countries in the top 60th percentile of the capital account openness index more likely to experience a surge. Note that nothing prevents the algorithm from further splitting the tree (using any of the regressors); however, given the stopping rule for the algorithm, the improvement in the fit is not sufficient to justify the additional complexity of the tree.

Fig. 7[b] presents the corresponding tree for liability-flow surges. When global market volatility is low (in the bottom 16th percentile of the S&P 500 index returns volatility), the conditional probability of a liability-flow surge is 32% (versus 13% when global market volatility is high). Conditional on low global market volatility (the left hand side of the tree), countries with large external financing needs are more than thrice (67% versus 20%) as likely to experience a surge. Along the right hand side of the tree (when global market volatility is high), again external financing need is what matters—countries with financing needs above 1% of GDP are four times as likely to experience a surge than those with smaller needs. However, among the latter, countries with less overvalued real exchange rates are much more likely to attract foreign inflows.

These results echo the findings from the probit analysis. But what is striking about the binary trees is that global factors do not feature in the tree for asset-flow surges. By contrast, for liability-flow surges, global market volatility is the most important variable for discriminating between surge and nonsurge observations. This accords with the intuition above that nonresidents will tend to be more sensitive to global factors, whereas residents will respond more directly to domestic factors when making their investment decisions.

5. Conclusion

This paper examines the drivers of exceptionally large net capital flows—surges—to EMEs, distinguishing between their occurrence and magnitude, and differentiating between those that reflect exceptional behavior of asset flows from those that reflect exceptional behavior of liability flows. We use a simple algorithm—based on a threshold approach—to identify surges, which correspond to most "well-known" episodes of large capital flows to EMEs: prior to the 1980s debt crisis, the post-debt crisis recovery and run-up to the Asian crisis, and the post-Asian crisis recovery and run-up to the global financial crisis.

Our descriptive analysis based on a sample of 56 EMEs over 1980–2011 indicates that surges are synchronized internationally, and have become more frequent in recent years. Nevertheless, even when surges occur globally, they are relatively concentrated: no more than one-half of the EMEs in the sample experience a surge at the same time, with some countries experiencing them repeatedly. The amount of capital received in a surge also varies considerably across countries. Further, classifying surges based on whether they are driven by asset flows or liability flows, we find that most (over two-thirds) of the net flow surges to EMEs are driven by the latter.

The picture that emerges from our regression analysis is one in which global push factors, notably, the US real interest rate and global market uncertainty, determine whether there will be a surge of capital flows towards EMEs generally—which explains why surges are synchronized internationally and why they recur. Even during such episodes, however, a country that has no need for capital or that is an unattractive destination for investors is unlikely to experience an inflow surge. Hence pull factors, including external financing needs, growth performance, the exchange rate regime, financial openness, and institutional quality help determine which countries experience an inflow surge. Conditional on a surge occurring, moreover, it is mainly the domestic pull factors that determine its magnitude.

Our results also indicate that domestic and foreign investors respond to both global and local factors such that lower US interest rates encourage capital to flow to EMEs, while increased global market uncertainty drives capital towards traditional safe havens. Foreign investors, however, appear to be more sensitive to global conditions than their domestic counterparts, with a change in the US interest rate and global uncertainty raising the predicted likelihood of liability-flow surges by more than the likelihood of asset-flow surges. A binary recursive tree analysis echoes these results with global factors being most important in explaining liability-flow surges but domestic pull factors dominating in asset-flow surges.

Overall, our findings provide a better understanding of large upward swings in capital flows to EMEs. From the policy perspective, they suggest that inasmuch as surges reflect exogenous supply-side factors that could reverse abruptly, the case for EMEs to take preventive measures, including macroprudential measures or capital controls, is correspondingly stronger. To the extent that advanced economy monetary policies are key drivers of inflow surges to EMEs, there may be a need for multilateral surveillance over such policies to ensure that spillovers are taken into account (Ostry et al., 2012). Further, since local factors (including capital account openness) also play a role in determining where the capital ends up, there may be a need for greater coordination between EMEs to ensure that they do not inadvertently pursue beggar-thy-neighbor policies. While the drivers of asset- and liability-flow surges tend to be largely similar, policy responses may need to be tailored to the type of surge—for example, prudential measures might be more important for dealing with financial-stability risks caused by asset-flow surges, but capital controls on inflows may be a viable option for liability-flow surges.

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[39] We also estimate a binary tree for the full sample (i.e., our 326 surge observations, without differentiating between asset-flow and liability-flow surges). That tree (not presented here) turns out to be quite simple, and shows that large external financing need is often the proximate cause for receiving large net flows. However, global risk features prominently as well, and countries with large external financing needs are about 2½ times more likely to experience a surge when global risk aversion is low. The tree correctly classifies about 80% of the sample; 18% of the surge observations and 97% of the nonsurge observations.

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Appendix A. Supplementary data and results

Supplementary data to this article can be found online at http://dx.doi.org/10.1016/j.jinteco.2013.12.007.

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