Capital Flow Waves:
Surges, Stops, Flight, and Retrenchment

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August 5, 2011

Abstract: This paper analyzes the drivers of international waves in capital flows. We build on the literature on "sudden stops" and "bonanzas" to develop a new methodology for identifying episodes of extreme capital flow movements using quarterly data on gross inflows and gross outflows, differentiating activity by foreigners and domestics. We identify episodes of "surge", "stop", "flight", and "retrenchment" and show how our approach yields fundamentally different results than the previous literature that used measures of net flows. Global factors, especially global risk, are the most important determinants of these episodes. Contagion, especially through trade and the bilateral exposure of banking systems, is important in determining stop and retrenchment episodes. Domestic macroeconomic characteristics are generally less important, although changes in domestic economic growth influence episodes caused by foreigners. We find little role for capital controls in reducing capital flow waves. The results help provide insights for different theoretical approaches explaining crises and capital flow volatility.

Email addresses for the authors are kjforbes@mit.edu and warnockf@darden.virginia.edu. We thank for helpful comments and conversations Alain Chaboud, Marcos Chamon, José de Gregorio, Charles Engel, Jeffrey Frankel, Marcel Fratzscher, Pierre-Olivier Gourinchas, Patrick McGuire, Gian Maria Milesi-Ferretti, Bent Sorenson, Charles Thomas, and participants at the meetings of the NBER/Sloan Global Financial Crisis project and AEA annual conference and in seminars at Bangko Sentral ng Pilipinas, Bank of England, BIS Asia, European Central Bank, Federal Reserve Bank of San Francisco, MIT, Monetary Authority of Singapore, Reserve Bank of Australia, Reserve Bank of New Zealand, UC Berkeley, and UVA-Darden. Vahid Gholampour provided research assistance. Warnock thanks the Darden School Foundation, Asian Institute of Management, and the BIS Asia office for generous support.

1. Introduction

Many countries experienced waves of international capital flows in the 1980s and 1990s. In the past decade capital flow volatility increased even more. Capital flows dried up in late 2001, surged throughout the mid-2000s, contracted sharply during the Global Financial Crisis (GFC) of 2008-2009, and then rebounded quickly in 2010. Capital flow volatility can have widespread economic consequences, such as amplifying economic cycles, increasing financial system vulnerabilities, and aggravating overall macroeconomic instability. Capital flows, however, can also be benign and even provide substantial benefits. For example, even as global liquidity contracted during the GFC, several countries received beneficial capital inflows driven by a "retrenchment" of domestic investors who liquidated foreign investments.

Waves in capital flows have generated an extensive academic literature. Several papers have examined "sudden stops" (when foreign capital inflows suddenly slow), "surges" or "bonanzas" (when foreign capital inflows increase rapidly), or capital "flight" (when domestic investors send large amounts of capital abroad). Other papers have focused on explaining contagion in capital flows, current account reversals and crises, or capital flows more broadly. In addition, the GFC has spurred a resurgence of theoretical papers on capital flows. This paper synthesizes these different literatures—reviewed in detail in Sections 2 and 3—in an effort to better understand what causes the major ebbs and flows of international capital. It does not attempt to explain small fluctuations in capital flows, but instead focuses on extreme movements or "waves". In contrast to previous work that focused on a single type of capital flow episode in isolation (such as a stop, surge, or flight), this paper considers these three types of episodes, as well as periods of "retrenchment", in order to understand the full cycle of international capital flows.

Our analysis focuses on *gross* capital inflows and outflows, differentiating between capital movements viewed as being initiated by foreigners and by domestic investors. In contrast, almost all previous work on capital flow episodes relied on proxies for *net* capital flows, which cannot differentiate between changes in foreign and domestic behavior. Figure 1 highlights the distinction between gross and net flows by depicting net capital flows into Chile and its two components: foreign inflows into Chilean assets (gross inflows) and Chilean flows into non-Chilean assets (gross outflows).[1] The literature's

[1] Following standard balance-of-payments accounting, an outflow is expressed as a negative value. The terminology can be confusing. "Gross inflows" and "gross outflows" are actually "net" items; gross inflows is the net of foreign purchases of domestic securities and foreign sales of domestic securities, while gross outflows is the net of domestic residents' purchases

earlier focus on net flows is understandable; in the early and mid-1990s net capital inflows roughly mirrored gross inflows, so the capital outflows of domestic investors could often (but not always) be ignored and changes in net inflows could be interpreted as being driven by changes in foreign flows. More recently, however, as the size and volatility of gross flows have increased while net capital flows have been more stable, the differentiation between gross inflows and gross outflows has become more important. Foreign and domestic investors can be motivated by different factors and respond differently to various policies and shocks. Policymakers might also react differently based on whether episodes of extreme capital flow movements are instigated by domestic or foreign sources. Analysis based solely on net flows, while appropriate a few decades ago, would miss the dramatic changes in gross flows that have occurred over the past decade and ignore important information contained in the these flows. As domestic investors' flows have become increasingly important, changes in net flows can no longer be interpreted as being driven solely by foreigners.

This paper builds a database of episodes when domestic or foreign investors substantially increase or decrease capital flows into or out of a country, what we call "surge", "stop", "flight", and "retrenchment" episodes. The underlying quarterly data on gross inflows and gross outflows covers the period from 1980 (at the earliest) through 2009 and include over 50 emerging and developed economies. Using this database, we document the incidence of each type of episode of extreme capital flow movements over time, by income level and region. We show that the recent crisis saw an unprecedented incidence of stops and retrenchment, as investors around the world liquidated foreign investment positions and brought money home.

Next, the paper shifts to its main goal: understanding what causes these episodes of extreme capital movements. We briefly review the theoretical literature, which describes capital flow episodes as being driven by specific global factors, contagion, and/or domestic factors. Our analysis indicates that global factors are the most important drivers of waves of capital flows. Global risk, in particular, is the only variable consistently significant as a driver of all types of capital flow waves. An increase in global risk (driven by changes in economic uncertainty or risk appetite) is associated with more stops and retrenchments and fewer surges and flight. Other global factors can be important in explaining specific types of episodes. Strong global growth increases the probability that countries will experience surges and stops, but has no effect on the probability that countries will experience flight or retrenchments;

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of foreign securities and domestic residents' sales of foreign securities. We follow the literature and use the standard terminology of gross inflows, gross outflows, and the net of the two (net inflows).

faster growth in the global money supply increases the probability that middle-income countries will experience a surge of inflows, but does not affect the probability of other types of episodes (or even of surges in high-income countries); and higher global interest rates increase the probability that countries experience stops and retrenchment, but have no significant effect on the incidence of surges or flight.

Certain types of capital flow episodes also appear to spread through contagion. A country is more likely to experience a stop or retrenchment if a country with which it has strong financial or trade linkages has recently experienced a similar episode. Contagion simply through regional proximity is less important after controlling for trade and financial linkages, but still plays a role in the transmission of stops. Contagion through any channel, however, does not affect the probability of surges or flight.

In contrast to the important role for global factors and contagion, domestic factors are generally insignificant in explaining capital flow waves. Only a country's domestic growth is consistently important in affecting capital flow episodes driven by foreigners; stronger growth is correlated with a higher probability of surges and lower probability of stops. The lack of significance of capital controls is particularly noteworthy; there is no significant effect of capital controls on a country's likelihood of experiencing any type of extreme capital flow movement—including no effect on its likelihood of experiencing a surge or stop of capital inflows from abroad.

The results in this paper, and especially the prominent role of global risk aversion and economic uncertainty in explaining capital flow waves, provide insights for theory. Much of the theoretical literature on sudden stops, capital flow volatility, and crises emphasizes the role of domestic conditions such as current account deficits or financial system vulnerabilities. Other papers have highlighted the role of contagion or global factors (such as global interest rates, demand, or risk aversion). A more recent series of theoretical models has attempted to explain the GFC by focusing on global shocks—whether changes in risk, wealth, or liquidity/credit—with little role for domestic factors. Our finding that the primary factor driving capital flow episodes is changes in global risk supports this recent theoretical focus on global factors, especially risk. The results, however, do not support the widespread presumption that interest rates in a major economy, such as the United States, are an important factor driving surges in capital flows (independent of any effect on global risk and growth). Also, the emphasis of many theoretical models on productivity shocks as key determinants of capital flows (such as the real business cycle literature) might be relevant in explaining gross capital inflows, but is less applicable in explaining the volatility in domestic residents' international investment; a country's economic growth determines surges and stops driven by foreigners but not episodes driven by domestics.

The analysis in this paper also informs empirical research. Our more disaggregated focus on gross flows by the type of investor allows a finer delineation of different types of capital flow episodes, and this delineation is necessary to understand the underlying causes of capital flow waves. By differentiating gross inflows from gross outflows, our analysis shows that many episodes previously identified as "surges" of foreign investment are actually driven by the retrenchment of domestic residents. Similarly, the earlier methodology missed periods of sudden stops in foreign capital inflows when these stops occurred simultaneously with an increase in global risk and retrenchment by domestic investors. More generally, previous empirical research on international capital flows that focused on more aggregate data was unable to capture the complete dynamics and causes of capital flow waves.

Finally, our results on the importance of global, contagion, and domestic effects in causing extreme movements in capital flows have important implications for economic policy. Capital flow volatility can have substantial economic costs, especially in emerging economies. For example, past work finds that surges are correlated with real estate booms, banking crises, debt defaults, inflation, and currency crises, and that sudden stops are correlated with currency depreciations, slower growth, and higher interest rates. For policymakers hoping to reduce these vulnerabilities and mitigate negative outcomes, a clear identification of episodes and an understanding of their causes are vital. Our results suggest that many domestic factors only have a limited effect on capital flow volatility. We find no evidence that capital controls can insulate an economy against capital flow waves. As a result, governments concerned about the effects of capital flow volatility should prioritize strengthening their country's ability to withstand this volatility rather than trying to reduce it. Finally, the results indicate a significant role for global factors and contagion in driving episodes, suggesting an important role for global institutions and cross-country cooperation in reducing capital flow volatility.

The remainder of the paper is as follows. Section 2 focuses on measures of extreme capital flow episodes. It reviews the sudden stops and bonanzas literature, discusses traditional definitions of episodes, develops our new methodology based on gross capital flows, and analyzes patterns in the data. Section 3 uses these episodes to analyze the drivers of capital flow waves. It reviews the capital flows literature and discusses the global, contagion, and domestic factors we use to explain the incidence of surges, stops, flight, and retrenchment. It explains the estimation strategy and reports results on the drivers of capital flow waves, including an extensive series of sensitivity tests. These results are then used to provide insights for different theoretical models. Section 4 concludes.

2. Measuring Extreme Capital Flow Episodes

This section reviews the existing literature on stops, bonanzas and flight and presents a detailed description of traditional measures of sudden stops. It then develops our new measures and discusses the insights from using data on gross instead of net flows when analyzing capital flow waves.

2.1 The Literature on Stops, Bonanzas, and Flight

The literature on extreme capital flow episodes originated with Calvo (1998) in his analysis of "sudden stops", defined as sharp slowdowns in net capital inflows. Recent papers broadened this original definition by adding criteria such as (1) the requirement that the stop occurred at the same time as an output contraction in order to exclude positive terms of trade shocks (Calvo, Izquierdo, and Mejía 2004), or (2) that the stop had to occur in conjunction with a sharp rise in interest rate spreads in order to capture a global component and qualify as a "systemic sudden stop" (Calvo, Izquierdo, and Mejía 2008).[2] The mirror image of the traditional sudden stop measure is a capital flow "bonanza" or "surge" (Reinhart and Reinhart (2009), defined as a sharp increase in net capital inflows.[3]

While not focusing specifically on extreme capital flows, two recent papers shifted attention to the importance of considering gross capital flows instead of simply net flows. Milesi-Ferretti and Tille (2010) examine capital flows during the recent crisis, while Broner, Didier, Erçe, and Schmukler (2010) analyze how capital flows relate to business cycles and crises.[4] Combining this new focus on gross flows with an older literature on capital flight—such as Khan and Ul Haque (1985), Lessard and Williamson (1987), and Dooley (1988)—are recent papers that recognize that traditionally defined sudden stops may contain an element of capital flight as domestic residents send money abroad (Faucette, Rothenberg, and Warnock 2005, and Cowan and De Gregorio 2007). Building on this, Cowan, De Gregorio, Micco, and Neilson (2008) and Rothenberg and Warnock (2011) point out that measures of "sudden stops" constructed from proxies for net inflows are not able to differentiate between stops that are due to the actions of foreigners and those due to locals fleeing the domestic

[2] Closely related to a sudden stop is a current account reversal. See Milesi-Ferretti and Razin (2000), Chinn and Prasad (2003), Edwards (2005), Freund (2005), Adalet and Eichengreen (2007), and Freund and Warnock (2007).

[3] Additional papers on bonanzas or surges include Aizenman and Jinjarak (2009), Cardarelli, Elekdag, and Kose (2009), and Caballero (2010). Related to the surge literature is a series of papers focusing on domestic credit booms and credit cycles, such as Gourinchas, Valdés, and Landerretche (2001) and Mendoza and Terrones (2008); these differ from the traditional stop literature by defining episodes as increases in credit relative to a stochastic trend.

[4] Similar in spirit to studies of gross flows is another related literature on the cross-country allocation of investment. This literature essentially studies changes in gross positions. See, for example, Bertaut and Kole (2004), Edison and Warnock (2004), Faruqee, Li, and Yan (2004), Aggarwal, Klapper, and Wysocki (2005), Lane and Milesi-Ferretti (2008), Leuz, Lins, and Warnock (2009), Burger, Warnock, and Warnock (2010), and Forbes (2010) .

market; both use the standard approach to define sudden stops, and then break these down into "true sudden stops" (when gross capital inflows decrease more than gross capital outflows increase) and "sudden flight" (when gross capital outflows increase more than gross capital inflows decrease).[5]

2.2 Earlier Methodology Using Proxies for Net Inflows

A "sudden stop" episode has traditionally been identified using the following approach, as in Calvo et al. (2004). First, construct a proxy for monthly net private capital inflows, P_t, by subtracting monthly changes in international reserves from the quarterly current account balance. Then define C_t to be a 12-month moving sum of lagged values and compute annual year-over-year changes in C_t:

$$C_t = \sum_{i=0}^{11} P_{t-i} \qquad t = 1, 2, \ldots, N \ . \tag{1}$$

$$\Delta C_t = C_t - C_{t-12} \qquad t = 13, 14, \ldots, N \ . \tag{2}$$

Sudden stop episodes were traditionally defined as periods of marked slowdowns in this proxy for net capital inflows. Anyone working in this literature must make several ad hoc decisions to operationalize "marked slowdown". For example, a slowdown relative to what? And how sharp must the slowdown be? For "relative to what", Calvo et al. (2004) compare ΔC_t (the amount of net private inflows in the last 12 months compared to the amount in the preceding 12 months) to its historical mean, with the mean computed using all available historical data up to month *t* (and requiring at least 24 months of ΔC_t). For "how sharp", Calvo et al. (2004) mark the beginning of an episode at the month *t* when ΔC_t falls one standard deviation below its rolling historical mean, providing that at some point within the episode ΔC_t falls at least two standard deviations below its mean. The episode ends once ΔC_t again exceeds one standard deviation below its mean. Capital flow bonanzas (see Reinhart and Reinhart 2009), or surges, have been defined analogously, also with net inflow proxies.

[5] Rothenberg and Warnock (2011) find that many traditionally defined sudden stops are actually sudden flight, while Cowan et al. (2008) point out that some countries tend to simultaneously experience retrenchment and stops.

2.3 Our Methodology Using Gross Flows

There are several methodologies that can be used to identify capital flow episodes; each has advantages and disadvantages. Our methodology builds on the traditional measures of sudden stops and capital flow bonanzas, which allows us to better highlight the difference made by focusing on gross instead of net capital flows. Specifically, we make three fundamental changes to the traditional approach. First, we use data on actual flows instead of current-account-based proxies for flows. Second, we use data on gross flows from the outset to identify episodes, rather than relying on proxies for net flows.[6] Finally, we analyze both large increases and large decreases of both inflows and outflows, instead of just focusing on increases or decreases, in order to improve our understanding of all types of capital flow episodes. This approach, and especially our ability to capture distinctions in the behavior of domestic and foreign investors by using gross instead of net flows, will allow a more nuanced understanding of extreme capital flow episodes.

More specifically, we use quarterly gross flows data in a sample of 58 countries over the period from 1980 through 2009 to identify four types of episodes:[7]

- "Surges": a sharp increase in gross capital inflows;
- "Stops": a sharp decrease in gross capital inflows;
- "Flight":[8] a sharp increase in gross capital outflows; and
- "Retrenchment": a sharp decrease in gross capital outflows.

The first two types of episodes—surges and stops—are driven by foreigners while the last two—flight and retrenchment—are driven by domestic investors.

We calculate year-over-year changes in four-quarter gross capital inflows and outflows and define episodes using three criteria: (1) current year-over-year changes in four-quarter gross capital inflows or outflows is more than two standard deviations above or below the historic average during at least one quarter of the episode; (2) the episode lasts for all consecutive quarters for which the year-over-year

[6] Gross capital inflows are net purchases of domestic assets by foreign investors and gross outflows are net purchases of foreign assets by domestic investors. The use of tax havens, or any low-tax areas, can confound residency-based capital flows data. For example, if a U.S.-based investor books a U.S. equity purchase through the Cayman Islands, this will look like a foreign inflow into U.S. equities. To our knowledge, no residency-based system can get around this issue.

[7] We start with as broad a sample as possible and only exclude countries that do not have detailed quarterly gross flows data. Due to the availability of explanatory variables, our baseline regression sample includes 54 countries.

[8] "Flight" has also been referred to as "starts", as in Cowan et al. (2008), or "sudden diversification".

change in annual gross capital flows is more than one standard deviation above or below the historical average; and (3) the length of the episode is greater than one quarter.[9]

To provide a more concrete example of our methodology, consider the calculation of surge and stop episodes. Let C_t be the 4-quarter moving sum of gross capital inflows (GINFLOW) and compute annual year-over-year changes in C_t:

$$C_t = \sum_{i=0}^{3} GINFLOW_{t-i} \ , \qquad \text{with} \quad t = 1, 2, \ldots, N \quad \text{and} \tag{3}$$

$$\Delta C_t = C_t - C_{t-4} \ , \qquad \text{with } t = 5, 6, \ldots, N \ . \tag{4}$$

Next, compute rolling means and standard deviations of ΔC_t over the last 5 years. A "surge" episode is defined as starting the first month t that ΔC_t increases more than one standard deviation above its rolling mean. The episode ends once ΔC_t falls below one standard deviation above its mean. In addition, in order for the entire period to qualify as a surge episode, there must be at least one quarter t when ΔC_t increases at least two standard deviations above its mean.

A stop episode, defined using a symmetric approach, is a period when gross inflows fall one standard deviation below its mean, provided it reaches two standard deviations below at some point. The episode ends when gross inflows are no longer at least one standard deviation below its mean.

Episodes of flight and retrenchment are defined similarly, but using gross private outflows rather than gross inflows, and taking into account that in BOP accounting terms outflows by domestic residents are reported with a negative value. In other words, when domestic investors acquire foreign securities, in BOP accounting terms gross outflows are negative. A sudden flight episode therefore occurs when gross outflows (in BOP accounting terms) fall one standard deviation below its mean, provided it reaches two standard deviations at some point, and end when gross outflows come back above one standard deviation below its mean. A sudden retrenchment episode occurs when gross outflows increase one standard deviation above its mean, providing it reaches two standard deviations above at some point, and ends when gross outflows come back below one standard deviation above its mean.

[9] Summing capital flows over four quarters is analogous to the traditional literature's focus on one year of flows and also eliminates the impact of seasonal fluctuations. The historical average and standard deviation are calculated over the last five years (20 quarters), which means that episodes are always defined relative to the recent past. We require that countries have at least 4 years worth of data to calculate a "historic" average.

Our primary source of flow data is the International Monetary Fund's International Financial Statistics (IFS, accessed through Haver Analytics in March 2011) on quarterly gross capital inflows and outflows. There are a number of modifications necessary, however, to transform the IFS flow data into a usable dataset; some are straightforward, whereas others involve detailed inspection of country data and the filling of gaps using source-country information. The creation of the underlying flows dataset is described in more detail in Appendix A.

The resulting sample consists of 58 countries listed in Appendix Table 1.[10] The table also lists the start date for which quarterly capital flow data is available for each country. All countries have data through the end of the sample, but start dates differ: 30 countries provide data in 1980, 37 countries in 1990, 52 countries in 1995 and the full sample of 58 countries by 2000. In our baseline measure, we define gross capital inflows as the sum of inflows of direct investment, portfolio inflows, and other inflows; gross private capital outflows are defined analogously as the sum of direct investment outflows, portfolio outflows, and other outflows, with reserve accumulation omitted. We also conduct a series of sensitivity tests using alternative measures, but initially focus on these measures of gross capital outflows and gross private capital inflows.[11] In 2007, our sample includes $10.9 trillion of gross capital inflows, capturing 97% of global capital inflows recorded by the IMF.[12]

Figure 2 shows our identification of surges and stops for one country (Brazil) from 1990 through 2009. The solid line is the change in annual gross capital inflows as defined in equation (4). The dashed lines are the bands for mean capital inflows plus or minus one standard deviation, and the dotted lines are the comparable two-standard-deviation bands. We classify an episode as a sudden stop if the change in annual capital inflows falls below the lowest line (the two standard deviation line) for at least one quarter, with the episode starting when it initially crosses the one-standard deviation line and ending when it crosses back over the same line. Similarly, we classify an episode as a sudden surge if annual capital flows rise above the highest line (the two standard deviation line), with the episode starting when flows initially cross the one-standard deviation line and ending when they cross back over the same line.

According to these criteria, four periods qualify as sudden stops since 1990: 1993Q1 to 1993Q3 (a period of hyperinflation in Brazil), 1995Q1 to 1995Q2 (the Mexican peso crisis), 1999Q1 to 1999Q2

[10] China is not in our sample, as it only recently began to publish quarterly capital flow data.
[11] There are a number of reasonable alternative measures of gross flows—such as excluding currency swap arrangements by the Federal Reserve Board during the recent crisis or including changes in reserves in capital outflows in order to capture total outflows rather than private outflows. Sensitivity analysis shows these alternate definitions have no significant effect on the key results, although including reserves in capital outflows can affect episode dates for some countries.
[12] Estimates based on worldwide financial account liabilities (inflows) of $11.2 trillion in 2007 as reported by the IMF.

(a devaluation in Brazil), and 2008Q2 to 2009Q3 (the GFC). Four other periods qualify as sudden surges: 1990Q2 to 1991Q1 (after Brazil's first democratic election in decades amid hopes inflation would fall), 1994Q1 to 1994Q3 (before the Mexican peso crisis), 1995Q4 to 1996Q2 (before the Asian crisis), and 2006Q3 to 2007Q4 (just before the GFC).

2.4 The Episodes: Surges, Stops, Flight, and Retrenchment

Using the quarterly gross flows data and the criteria discussed above, from 1980 through 2009 we identify 170 surge, 220 stop, 198 flight, and 212 retrenchment episodes; see Appendix Table 2 for a list of episodes by country. Table 1 aggregates these results and reports summary statistics on the incidence of episodes for the full sample and on the average length of each episode for the full sample and by income group and region.[13] Stops are slightly more prevalent than surges, but surges last longer; for the full sample, the average length of each type of episode is roughly one year, with surges lasting the longest with an average length of 4.5 quarters and retrenchments the shortest with an average length of 3.9 quarters. The breakdown by income group indicates that lower income countries experience shorter episodes than the high income countries over the full sample period on average, even for episodes such as stops and flight.

Given how we identify episodes (using a two standard-deviation cutoff), a country's gross flows will be in an episode about one-third of the time. As Appendix Table 2 suggests, however, there is considerable cross-country variation in the incidence of different types of episodes. For example, focusing on the gross inflows measures, Argentina has experienced much fewer surges than stops, being in a surge episode only 12 percent of the time from 1985 through 2009, but in a stop episode in 1 out of every 4 quarters. In contrast, other countries (such as India) were almost twice as likely to be in a surge as in a stop. This variation across countries is what this paper seeks to explain.

2.5. A Comparison of Episodes based on Gross and Net Flows

Our episodes of surges, stops, flight, and retrenchment, defined using gross capital flows, are substantially different from those in previous work that used proxies for net capital flows and did not

[13] We use income classifications in the year 2000 based on GNI per capita as reported by the World Bank, with "lower income" referring to countries classified as "Low income" and "Middle/lower income" by the World Bank, "Middle income" referring to countries classified as "Middle/higher income". "Higher income" refers to countries classified as "High income". We combine lower and middle/lower income into the group "lower income" because there are only four countries in our sample that qualify as lower income based on the World Bank classification. We focus on six regions: North America, Western Europe, Asia, Eastern Europe, Latin America, and Other. The "Other" region is South Africa and Israel.

differentiate between the behavior of domestic and foreign investors. To better understand the differences, we use the two techniques to identify episodes during the height of the GFC—the two quarters from 2008 Q4 to 2009 Q1. Table 2 lists the countries defined as having a surge or stop episode using net capital inflows (similar to the measures used in previous work) and gross flows (as used in this paper). For each column we use the methodology discussed in Section 2.2, except the net flows measures of surges and stops are defined as periods when net capital inflows are above or below the threshold, respectively, while the episodes defined using gross flows are periods when gross inflows are above or below the threshold.

During the height of the GFC, net flows data identify more surge episodes and fewer stop episodes. The left half of Table 2 shows that measures based on net flows identify thirteen surges from 2008 Q4 to 2009 Q1, while gross flows data identify only one surge (Bolivia, for whom a surge that began in 2007 was ending in 2008 Q4). For stops (the right half of the table), net flows identify less than half as many episodes as gross flows (22 stop episodes based on net flows versus 48 based on gross flows). The reason for the disparity is that during the GFC many countries' residents retrenched from foreign markets, bringing money home. In fact, each country defined as having a surge episode based on the net flows data—but not using the gross data—had a retrenchment episode. The sudden inflow of capital as domestic investors sold their foreign holdings and brought the money home is classified as "retrenchment" in our definitions based on gross flows. If the retrenchment outweighs actions by foreign investors, however, it can show up as a "surge" using the older methodology based on net flows. Similarly, most of the countries identified as having a stop episode based on the gross data, but not the net data, also had a large retrenchment in capital flows. Foreigners did pull back from these countries—gross inflows slowed—but in many cases the retrenchment by domestic investors counteracted the sudden stop of investment. Even though foreign capital inflows suddenly stopped, retrenchment meant that net capital flows did not fall enough to qualify as a "sudden stop" episode based on the older methodology.

To clarify these differences, consider the example of Chile. Table 2 shows that during the GFC Chile had a surge episode based on net capital flows (but not gross flows) and a stop based on gross (but not net) capital flows. Figure 1 clarifies why these differences occurred. The figure shows that during the GFC, Chile's gross inflows suddenly dropped while gross outflows also fell sharply, reflecting a retrenchment as domestic investors brought money home (or ceased to send money abroad). The retrenchment by domestic investors outweighed the stop in capital inflows by foreign investors.

Episodes identified using net capital flow data—which comingles different types of flows—would describe this as a "surge", while gross capital flow data would instead define this period as a "stop" in foreign capital inflows combined with a "retrenchment" by domestic investors.

2.6 Descriptive Analysis

Figure 3 shows the evolution of the incidence of each type of episode from 1980 through 2009, broken down by income group. Most episodes are in high income countries, especially in the earlier years of the sample, which is not surprising as high income countries tend to have more complete historical data. More importantly, these graphs show waves in the incidence of capital flow episodes, with large swings in the percent of the sample experiencing an episode. For example, in some years no countries experience a stop or a retrenchment, while at other times a majority of the sample experiences these episodes. These cycles suggest an important role for global factors in driving episodes of extreme capital flow movements.

One aspect of the GFC stands out: an unprecedented number of countries experienced stops and retrenchment. Retrenchment occurred during other periods, although not in so many countries at the same time. With many countries retrenching during the GFC, it is not surprising that there was a spike in the incidence of sudden stops to 78% of the sample in the 4th quarter of 2008; if most countries are retrenching, gross inflows by foreigners will fall in most countries. This strong correlation between stops and retrenchment, however, does not exist during *all* crises. For example, in 1998q4, just following the collapse of LTCM, the incidences of stop and retrenchment episodes were elevated (at 35% and 19%, respectively). As economic risk abated, by the 3rd quarter of 1999 the number of retrenchment episodes declined rapidly to less than 1%, while the number of stop episodes fell more slowly to 15%.

Figure 4 divides the sample by region instead of income group. Many of the capital flow cycles appear to be dominated by trends in Western Europe, which is not surprising as this region encompasses a large number of countries with more complete data coverage. This graph also shows preliminary evidence of regional patterns, possibly indicating the role of common regional characteristics or other forms of contagion in explaining these episodes. For example, about half of Eastern Europe experienced surges in the first quarter of 2003.

Figures 3 and 4 suggest that global and possibly regional/contagion factors are important in causing episodes. A finer look at the episodes by country, however, suggests that domestic fundamentals may also play some role. For example, even though a majority of the sample experienced a retrenchment

episode during the GFC, there are important differences across countries and some countries' residents did not unwind foreign positions and bring money home. More specifically, during late 2008 and early 2009, there was substantial concern about the outlook for Eastern Europe; Poland, however, experienced a retrenchment episode as Polish citizens brought a substantial amount of money home, while Russian citizens sent their money abroad. Other countries that did not have a retrenchment episode during this period include Argentina, Australia, Brazil, Greece, India, Indonesia, New Zealand, Norway, Portugal, Romania, the Slovak Republic, South Africa, and Turkey. Why did this diverse group of countries not have retrenchment episodes as occurred in most of the rest of the sample? Different patterns across countries—even countries in the same region—suggest that even in the presence of substantial global shocks and possibly regional contagion, domestic characteristics can also be important in determining whether a country experiences a surge, stop, flight, or retrenchment episode.

3. What Explains the Episodes? Global, Contagion, and Domestic Factors

This section reviews the literature on capital flows to motivate a parsimonious list of global, contagion, and domestic variables that could explain surge, stop, flight, and retrenchment episodes. We then develop the empirical framework and test for the role of these variables. Next we compare empirical results to those when episodes are based on net flows and take a closer look at key results related to the role of risk and capital controls. We conclude with an extensive series of sensitivity tests and a summary of key results that are consistent across these tests.

3.1 The Literature on Capital Flows

To inform our selection of variables that might explain surge, stop, flight, and retrenchment episodes, we draw from the literature on sudden stops and bonanzas (described in Section 2.1) as well as on capital flows in general, including work on the cross-country allocation of investment, contagion through capital flows, capital flow cycles, and the causes of financial crises. Each of these literatures is extensive and only briefly summarized below.

A major theme that runs through much of this research is whether the forces driving capital flows are "push" factors that are external to the country (including global or contagion effects) or domestic "pull" factors. The seminal papers in this literature—Calvo, Leiderman, and Reinhart (1993, 1996), Fernandez-Arias (1996), and Chuhan, Claessens, and Mamingi (1998)—find that push factors are more important than domestic fundamentals in driving capital flows. There is also some role for domestic

factors; Calvo, Leiderman, and Reinhart (1996) argue that the surge of capital inflows into emerging markets in the early 1990s was initially attributed to domestic developments (such as better policies and economic performance), although global factors were more important, especially cyclical movements in global interest rates. Griffin, Nardari, and Stulz (2004) focus on domestic and global equity market performance to measure pull and push factors and argue that both are important in understanding cross-border equity flows.

Another set of push factors outside a country's control is contagion, generally defined as resulting from circumstances in another country or group of countries (but not the entire world). The literature on contagion has identified a variety of reasons why events in one country can spread to other countries; summaries of these models and explanations for contagion are Claessens, Dornbusch, and Park (2001) and Claessens and Forbes (2001). The various transmission mechanisms for contagion can be broadly broken into contagion through trade channels (which include direct trade, competition in third markets, and changes in import prices), financial channels (including through bank lending or portfolio flows), and "country similarities" (such as a shared regional location or similar economic characteristics). Glick and Rose (1999), Forbes (2002), and Abeysinghe and Forbes (2005) focus on contagion through trade, while Peek and Rosengreen (1997), Kaminsky, Lyons, and Schmukler (2001), and Broner, Gelos, and Reinhart (2006) focus on the role of financial linkages. Van Rijckeghem and Weder (2001), Forbes (2004), and Blanchard, Das, and Faruquee (2010) assess the relative importance of each of these mechanisms in explaining why a crisis spreads from one country to another, with different papers highlighting the roles of different transmission channels. Some papers consider contagion in the context of push and pull factors. Chinn and Forbes (2004) find a role for global as well as contagion effects. Dungey, Fry, González-Hermosillo and Martin (2011) simultaneously consider the role of domestic, contagion, and global factors in explaining crises and finds a role for all three channels, although global market factors often outweigh contagion effects.

The GFC has recently spawned a surge in *theoretical* research on crises and capital flows. Much of this focuses on "push" factors driving capital flows, and especially on the role of risk (Bacchetta and van Wincoop, 2010 and Gourio, Siemer, and Verdelhan, 2010), wealth (Dedola and Lombardo, 2010 and Devereux and Yetman, 2010), or liquidity/credit (Giannetti, 2007, Brunnermeier, 2009, Calvo, 2009, and Kalemli-Ozcan, Papaioannou, and Perri, 2010,).[14] Others focus more on pull factors. For

[14] Any model of international capital flows must assume, at least implicitly, some heterogeneity across agents. If everyone were identical, there would be no need to trade upon the realization of a shock. Asset prices would adjust, as might portfolio

example, the recent theoretical work of Caballero et al. (2008), Mendoza et al. (2009), Bacchetta and Benhima (2010), and Ju and Wei (2011) highlights the size, depth, and fragility of a country's financial system in either attracting capital flows from abroad (for developed financial markets) or driving capital flows out of the country (for less developed financial markets); for empirical support of these models, see Mendoza and Terrones (2008) and Forbes (2010).

Two other factors figure prominently in recent research on capital flows. One is growth—both global and domestic. A focus of several theoretical papers is the role of changes in global growth, often caused by global productivity shocks (see Albuquerque, Loayza, and Serven, 2005). Business cycle models highlight how domestic productivity or terms-of-trade shocks affect growth and in turn generate lending booms and busts and corresponding shifts in capital flows; see Aguiar and Gopinath (2007) for a theoretical model and Broner et al. (2010) for an empirical assessment. The other important factor prominent in recent research is the extent of financial market liberalization and integration with global financial markets; see Aghion, Bacchetta, and Banerjee (2004), Calvo et al. (2008), Edison and Warnock (2008), and Milesi-Ferretti and Tille (2010).

In summary, the theoretical and empirical research reviewed here and in Section 2.1 suggests that a parsimonious list of the possible determinants of capital flow waves would include global factors such as global risk, liquidity, interest rates, and growth; contagion through trade linkages, financial linkages, and geographic location; and domestic factors such as a country's financial market development, integration with global financial markets, fiscal position, and growth shocks. We focus on these variables in our initial estimation.

3.2 Estimation Strategy and Variables

To assess the role of these global, contagion, and domestic variables in determining the conditional probability of having a surge, stop, flight, or retrenchment episode in a given quarter, we estimate the model:

$$Prob(e_{it} = 1) = F\left(\mathbf{\Phi}_{t-1}^{\text{Global}}\mathbf{B}_{\text{G}} + \mathbf{\Phi}_{i,t-1}^{\text{Contagion}}\mathbf{B}_{\text{C}} + \mathbf{\Phi}_{i,t-1}^{\text{Domestic}}\mathbf{B}_{\text{D}}\right) \quad (5)$$

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weights, but international capital flows need not occur. But everyone is not identical. In the theoretical literature explaining international capital flows, the necessary heterogeneity can emerge from many sources, such as information asymmetries, risk, and financial sector development. Models that explicitly exploit heterogeneity are in Brennan and Cao (1997), Caballero, Farhi, and Gourinchas (2008), Mendoza, Quadrini, and Rios-Rull (2009), Gourio et al. (2010), Dumas, Lewis, and Osambela (2010), and Tille and van Wincoop (2011).

where e_{it} is an episode dummy variable that takes the value of 1 if country *i* is experiencing an episode (surge, stop, flight, or retrenchment) in quarter *t*; $\mathbf{\Phi}_{t-1}^{\text{Global}}$ is a vector of global factors lagged by one quarter; $\mathbf{\Phi}_{i,t-1}^{\text{Contagion}}$ is a vector of contagion variables; and $\mathbf{\Phi}_{i,t-1}^{\text{Domestic}}$ is a vector of domestic variables. The appropriate methodology to estimate equation (5) is determined by the distribution of the cumulative distribution function, $F(\cdot)$. Because episodes occur irregularly (83 percent of the sample is zeros), $F(\cdot)$ is asymmetric. Therefore we estimate equation (5) using the complementary logarithmic (or cloglog) framework, which assumes that $F(\cdot)$ is the cumulative distribution function (cdf) of the extreme value distribution.[15] In other words, this estimation strategy assumes that:

$$F(z) = 1 - exp[-exp(z)] \quad . \tag{6}$$

While we estimate each type of episode separately, we use a seemingly unrelated estimation technique that allows for cross-episode correlation in the error terms. This captures the fact that the covariance matrix across episodes is not zero, without assuming a structural model specifying a relationship between episodes. We also cluster the standard errors by country.

While our review of the theoretical and empirical research suggested a parsimonious list of global, contagion and domestic factors, there are a number of variables that could be used to represent each. We focus on measures that are available over the full sample period from 1985 to 2009 for most countries in the sample.[16] The variables are discussed in detail below.

3.2.1 Global Variables

For our initial analysis, we measure global risk as the Volatility Index (VXO) calculated by the Chicago Board Options Exchange. This measures implied volatility using prices for a range of options on the S&P 100 index and captures overall "economic uncertainty" or "risk", including both the riskiness of financial assets as well as investor risk aversion. To simplify the discussion, we refer to periods of global "calm" as periods when the VXO is low, and periods of global "volatility" when the

[15] Caballero (2010) also uses this approach. Earlier work generally uses a logit or probit model which assumes that the distribution of $F(\cdot)$ is logistic or normal, respectively, and therefore symmetric around zero.

[16] Most of the variables are available quarterly. For market statistics that are available at a higher frequency, we use quarterly averages. Economic statistics that are only available on an annual basis are calculated by approximating quarterly values based on the annual frequencies. Also, as specified in equation (5) each variable is lagged by one quarter unless noted.

index is high.[17] To measure global liquidity we use the year-over-year growth in the global money supply, with the global money supply calculated as the sum of M2 in the United States, Euro-zone, and Japan and M4 in the United Kingdom, all converted into US dollars. Global interest rates are measured using the average rate on long-term government bonds in the United States, core euro area, and Japan. Global growth is measured by quarterly global growth in real economic activity. The last three variables are based on data from the IMF's *International Financial Statistics* (IFS) database.

3.2.2 Contagion Variables

We use three measures to capture contagion effects. The first is a measure of geographic proximity, with a dummy variable equal to one if a country in the same region has an episode in the previous quarter. The regions are described in Section 2.4. We also measure contagion through trade linkages (TL) and financial linkages (FL) as:

$$TL_{xt} = \sum_{i=1}^{n} \left(\frac{Exports_{x,i,t-1}}{GDP_{x,t-1}} * Episode_{i,t-1} \right) \tag{7}$$

$$FL_{xt} = \sum_{i=1}^{n} \left(\frac{Bank_{x,i,t-1}}{GDP_{x,t-1}} * Episode_{i,t-1} \right) , \tag{8}$$

where $Exports_{x,i,\,t-1}$ is exports from country x to country i in the previous quarter (t-1) from the IMF's Direction of Trade Statistics, $Bank_{xi,\,t-1}$ is banking claims between countries x and i in the previous quarter, [18] $GDP_{x,\,t-1}$ is GDP for country x in the previous quarter (used to capture the relative importance of exports and banking in the economy), and $Episode_{i,\,t-1}$ =1 if country i had an episode in the last quarter. Both measures are calculated for each country x for each type of episode (surge, stop, flight, and retrenchment).

[17] The VXO, as the old VIX is now known, is similar to the VIX. The VIX is calculated using a broader set of prices, but is only available starting in 1990. Table 5a shows that the correlation between the two measures is 99%, so we focus on the VXO for our baseline analysis to maximize sample size. Section 3.5 discusses alternative measures of risk.

[18] The underlying banking data was provided by the Bank of International Settlements and is based on the algorithm underlying the analysis in McGuire and Tarashev (2006, 2007). While no measure of financial linkages is perfect, we focus on banking data because it is the only cross-country financial data that is of reasonable quality and widely available across countries and time periods. Specifically, $BANK_{x,i}$ is total bank claims between country x and BIS reporting country i. Some i countries (US, UK, Netherlands, and Japan) are reported individually, but for confidentiality reasons other countries are reported to us only by group. The groupings are: AT CY GR IE PT; BE LU; FR DE IT ES; FI DK NO SE; HK MO SG BH, BS BM KY AN PA; GG IM JE; BR CL MX; TR ZA; TW IN MY KR; and CH AU CA. When an i country is only recorded in a group, $BANK_{xi}$ is scaled by the share of the country's GDP in the group.

3.2.3 Country Variables

To capture the domestic factors we use five variables. We measure the depth of the financial system as the sum of each country's stock market capitalization divided by GDP from Beck and Demirgüç-Kunt (2009); in robustness tests other measures only available for smaller samples. We measure capital controls/financial market integration with a broad measure of the country's capital controls as calculated in Chinn and Ito (2008).[19] This statistic is one of the few measures of capital controls available back to 1985 for a broad sample of countries and we explore the impact of a range of other measures in Section 3.5. Real GDP growth is from the IFS, and we measure the growth shock as the deviation between actual growth and the country's trend growth. We measure country indebtedness as public debt to GDP from the new database described in Abbas, Belhocine, ElGanainy, and Horton (2010). We also include a control for GDP per capita.[20]

3.3 Baseline Results

To test for the role of global, contagion, and domestic factors in explaining surge, stop, flight, and retrenchment episodes, we estimate equation 5 using a complimentary logarithmic framework that includes adjustments for covariances across episodes and robust standard errors clustered by country. Results are in Table 3.[21] The variable that is most consistently significant in predicting all types of extreme capital flow episodes is global risk. Higher levels of global risk are negatively correlated with surges and flight and positively correlated with stops and retrenchment.[22] An extensive set of sensitivity tests described in Sections 3.5 and 3.6 shows that this result holds for a range of risk measures, episode definitions, estimation frameworks, and the inclusion of other explanatory variables. Other global

[19] We focus on the KAOPEN measure of capital controls in Chinn and Ito (2008), updated in April 2011. KAOPEN is based on the principal components from four binary variables reported by the IMF: (1) capital account openness; (2) current account openness; (3) the stringency of requirements for the repatriation and/or surrender of export proceeds; and (4) the existence of multiple exchange rates for capital account transactions. In order to be consistent with other measures of capital controls in the additional tests in Section 3.5, we reverse the sign so that a positive value indicates greater controls.

[20] All country-level variables, except for the index of capital controls and GDP per capita, are winsorized at the 1% level to reduce the impact of extreme outliers.

[21] In the sensitivity analysis we show that the key results are robust to the inclusion of fixed effects. Country dummy variables should not be needed if we capture all of the country-specific factors determining whether a country has an episode. These dummy variables are usually jointly significant, however, indicating that we are (not surprisingly) unable to capture all country effects. Including these fixed effects, however, could cause a downward bias on coefficient estimates for country-specific variables that have a significant effect on the probability of an episode but are fairly constant over the sample period.

[22] The estimates, when exponentiated, suggest that a one standard deviation (9 point) increase in the VXO reduces the probability of a surge episode by about 30% and increases the probability of a stop episode by about 20%. To put this in context, the VXO increased from an average of about 10 in the fourth quarter of 2006 to about 60 in the fourth quarter of 2008. According to the coefficient estimates in Table 3 and holding everything else constant, this increase in global risk would triple the probability of a stop and decrease the probability of a surge by almost 90%.

factors are not significant in predicting the probability of all types of episodes of extreme capital flows, but can be important in explaining certain types of episodes. More specifically, global growth is highly significant in explaining the two episodes driven by foreigners—higher global growth is positively correlated with surges and negatively correlated with stops—but has no significant effect on whether domestic investors send money abroad or bring money home. Global interest rates are positively correlated with retrenchment and stop episodes (although the later result is only marginally significant), but are not significantly correlated with surges and flight. Global liquidity has a marginally significant positive effect on surge episodes, but not on other types of episodes.[23]

Contagion of any type (regional, trade, or financial) does not impact the probability of surges or flight, but can have a significant effect on the probability of stops and retrenchment. A country is more likely to have a stop or retrenchment episode when financial partners are experiencing a similar episode. Contagion through trade flows is also important in explaining retrenchments, although is only moderately significant in explaining stops. Even after controlling for trade and financial linkages, geographic location can also explain stops (although again with moderate significance). These results suggest that contagion, especially through financial linkages, is an important factor causing investors to stop investing abroad and return money home, but less important in causing domestic or foreign investors to send money abroad.

In contrast to these significant results for the global and contagion factors, few domestic factors have a consistently significant effect on the probability of any type of extreme capital flow episode. When the domestic economy is growing strongly, stops are less likely and surges are more likely. The other domestic variables that are significant in Table 3, however, are not robust across the sensitivity tests described below. This suggests that extreme capital flow episodes appear to be driven primarily by global factors (especially risk) and through contagion rather than by domestic factors.

Just as noteworthy as the significant variables in Table 3 are those that are usually insignificant. There is no evidence that capital controls reduce a country's likelihood of having a surge or stop episode, and therefore controls do not seem to reduce the extreme volatility of foreign capital flows. Capital controls may increase the probability of domestic investors sending money abroad (flight), but this result is only significant at the 10% level and has fluctuating significance in the sensitivity tests below. The size of a country's financial system does not significantly affect the probability of having a

[23] Splitting the sample by income group (not shown), as defined in Section 2.4, indicates that the relationship between global liquidity and surges is driven by a significant positive relationship for middle income countries. There is no significant relationship between global liquidity and surges in high or low income countries.

surge episode, providing little support for recent theoretical work suggesting that financial system development supports large capital inflows from abroad. Debt ratios generally have no significant effect on extreme capital flow movements—although there may be nonlinear effects not captured in this simple empirical framework. Also noteworthy is that although global liquidity may increase the probability of surges of capital inflows, it does not affect the probability of stops or other types of episodes. Also, global interest rates have no effect on surge episodes (after controlling for risk, growth, and liquidity).

3.4 Regression Results: Gross versus Net Flows

As discussed in detail in Section 2, previous work analyzing sudden surges/bonanzas and stops in capital flows focused on sudden increases or decreases in net capital flows, rather than disaggregating flows into gross flows by domestic or foreign investors. Table 4 uses our definition of extreme capital flow movements, but instead of focusing on gross flows uses the traditional measures based on net capital flows. The table shows the starkly different results when capital flows are not disaggregated by the type of investor. Global risk, which was highly significant in explaining episodes based on gross flows, is insignificant in explaining measures of surges and stops based on net flows. Global interest rates are no longer significant in explaining either type of episode, and both global and domestic growth are no longer significant in predicting surges. Contagion in any form no longer appears to be significant in explaining stops. In fact, some of the coefficient estimates now appear to be counterintuitive. For example, in the regression predicting stops, the positive and significant coefficient on capital controls suggests that countries with greater capital controls are more likely to experience stops and the negative coefficient on the debt ratio suggests that countries with higher debt to GDP ratios are less likely to experience stops.

These results support the key point raised throughout this paper that focusing on net capital flows instead of gross capital flows may miss important dynamics in capital flow movements. Although net capital flows may be the variable of interest for certain analyses, disaggregating capital flows by type of investor is important to better understand the nature and composition of the flows. For example, global risk does <u>not</u> have a significant effect on surges or stops when measured based on net capital flows in Table 4, but does have a large and highly significant effect on the probability of these episodes when measured based on gross flows in Table 3. This difference occurs because actions by foreign and domestic investors can counteract each other. Lower global risk will increase both capital inflows from

foreigners and capital outflows by domestic residents— and these large shifts in both flows may counteract each other so that changes in the aggregated net capital flows are small. Focusing on gross capital flows instead of net flows permits this more nuanced understanding of the drivers of extreme capital flow movements.

3.5 A Closer Look at Global Risk and Capital Controls

Two key results from our baseline analysis are the significance of global risk and insignificance of capital controls in explaining large movements in capital inflows and outflows by both domestic and foreign investors. This section looks more closely at these results.

The finding that global risk is the most consistently significant factor driving capital flow episodes (measured based on gross flows) has important implications not only for understanding capital flow movements, but also for differentiating between theoretical approaches explaining these movements. To better understand this role of risk, we use four different measures of risk (in addition to our baseline measure of the VXO): the VIX, the Quality Spread (the difference between Moody's Baa and Aaa corporate bond yields), the CSFB Risk Appetite Index (RAI), and the Variance Risk Premium (VRP).[24] The most common measures of risk—such as the VXO, the VIX, and the Quality Spread—capture both economic uncertainty as well as risk aversion. The RAI is constructed with the aim of capturing only risk aversion (or risk appetite) while controlling for overall risk and uncertainty. Misina (2003) shows, however, that it may not control for changes in overall risk unless a strict set of theoretical conditions are met.[25] In contrast, the VRP index is based on a less rigid set of assumptions and therefore is a more accurate measure of risk aversion independent of expectations of future volatility (i.e., future risk). A minor disadvantage of the VRP (as well as the VIX) is that it is only available starting in 1990.

[24] See section 3.2.1 for details on the VXO and VIX. The RAI is the beta coefficient of a cross-sectional regression of a series of risk-adjusted asset price returns in several countries on the past variance of these assets. This calculation is based on 64 global assets, including equities and bonds for all developed countries and the major emerging markets. If the beta is positive, it means that the price of riskier assets is rising relative to the price of safer assets, so risk appetite among investors is higher. For more information, see "Global Risk Appetite Index" a Market Focus Report by Credit Suisse First Boston (February 20, 2004). To simplify comparisons with the other risk measures, we reverse the sign of the RAI. The VRP is the difference between the risk-neutral and objective expectation of realized variance, where the risk-neutral expectation of variance is measured as the end-of-month observation of VIX-squared and de-annualized and the realized variance is the sum of squared 5-minute log returns of the S&P 500 index over the month; see Zhou (2010).

[25] Misina (2003) shows that the risk appetite index will measure risk aversion only in the presence of a rank effect in which the key condition is the linear independence of asset returns used to construct the index. This assumption is unlikely to hold.

Table 5a shows the correlations between these different risk measures and Table 6a reports the estimated coefficients on the risk variable if the base regression reported in Table 3 is repeated with these alternative measures of risk. Throughout Table 6a the coefficient on the risk variable is usually highly significant. Broad measures of risk that capture both changes in economic uncertainty as well as changes in risk aversion are positively correlated with stop and retrenchment episodes and negatively correlated with surges. The measure that most accurately isolates changes in risk aversion (the VRP) is positively and significantly related to stops (and negatively related to surges—but only at the 10% significance level). This suggests that risk aversion (and not just increased economic uncertainty) is an important factor determining stop episodes. The one column in which the coefficient on the risk variable is usually insignificant is for regressions predicting flight episodes; as will be discussed in more detail below, flight episodes are more difficult to predict than other types of episodes.

A second key result from the baseline regressions in Table 3 is that a country's capital controls are not significantly related to any type of extreme capital flow episode. This does not support the recent interest in capital controls as a means of reducing surges of capital flows and overall capital flow volatility. To further explore this result, we utilize several different measures of capital controls and integration with global financial markets. First, instead of a direct *de jure* measure of capital controls, we use a broad *de facto* measure of financial integration—the sum of foreign assets and liabilities divided by GDP.[26] Second, we consider a broad measure of capital account restrictions from Schindler (2009) that is only available from 1995 to 2005. Third, we use measures of capital account restrictions from the same source and time period, but that focus specifically on controls on just inflows or outflows.[27] Finally, we also use two new indices of capital controls from Ostry, Ghosh, Chamon, and Qureshi (2011) that measure capital controls in the financial sector and regulations on foreign exchange.[28]

Table 5b shows that the correlations between the different measures of capital controls are low, in part because they measure different aspects of controls. Table 6b shows the coefficient estimates on

[26] The financial integration data is from an updated and extended version of the dataset constructed by Lane and Milesi-Ferretti (2007), available at: http://www.philiplane.org/EWN.html.

[27] For regressions predicting surges and stops we use the index of controls on local purchases and sales, respectively, by nonresidents. For regressions predicting flight and retrenchments we use the index of controls on purchases or sales abroad, respectively, by residents.

[28] The measure of capital controls in the financial sector includes: (i) restrictions on borrowing abroad; (ii) restrictions on maintenance of accounts abroad; and (iii) differential treatment of accounts held by nonresidents. The index of foreign exchange regulations includes: (i) restrictions on lending locally in foreign currency; (ii) purchases of locally issued securities denominated in foreign currency; (iii) differential treatment of accounts held by nonresidents; and (iv) limits on open foreign exchange positions.

each of these capital control measures when we repeat the base regression from Table 3 but use the alternative measure of controls (or financial integration). For surges and stops, the two types of episodes of most concern to policymakers, the coefficients on capital controls continue to be insignificant, even for the more detailed measures. The only exception when the coefficient on capital controls is significant at the 5% level is in the regression predicting stops when financial integration is measured by international exposure through the country's foreign assets and liabilities—more of an openness measure than a direct measure of capital controls. The negative coefficient on financial integration in this case suggests that countries that are more integrated with global financial markets are less likely to experience stop episodes. The only other coefficient on capital controls that is occasionally significant is in regressions predicting retrenchment, with results indicating that countries that are more financially integrated (or which have fewer capital controls) are less likely to experience retrenchments.

3.6 Sensitivity Tests

We conduct an extensive series of sensitivity tests, focusing on different time dimensions and estimation strategies, including additional control variables, using different measures for the control variables, and calculating the episodes using different techniques.

We begin by testing if the estimates are driven by the extreme volatility during the recent crisis (as shown in Figures 3 and 4) by dropping the crisis period from 2008Q3 through 2009Q2 from the sample. We also estimate each of the equations using fixed effects. This strategy controls for each country's fixed characteristics over the sample period and therefore estimates how changes in each domestic variable from its mean for each country affects the probability of each country having a surge, stop, flight or retrenchment in each quarter. This is a different question than for the base estimates that do not include fixed effects and which instead estimate the effect of the level of each domestic characteristic (rather than the change from the country mean) on the probability of the country having an episode in each quarter. We also estimate the main model using a standard probit or logit estimation (instead of the cloglog) and estimate each equation in isolation instead of as part of system estimation.

In another set of sensitivity tests, we include additional control variables in the base regression to test if other factors could affect the probability of having a capital flow episode. First, a number of models (Domeij and Flodén, 2006; and Krueger and Ludwig, 2007) focus on the role of demographics in driving capital flows, usually in an OLG framework. We follow Chinn and Prasad (2003) and include two controls for demographic trends—the "youth dependency ratio" and "old dependency ratio" defined

as the population aged under 15 or over 65 respectively, both divided by the population aged 15 to 65.[29] Second we include a dummy variable equal to one if the country has a pegged exchange rate, based on the exchange rate classification in Shambaugh (2004).[30] Third, we include a measure of the country's credit rating to capture country risk that may not be captured in its debt ratio and other measures. We use the country's Moody's or S&P rating, with a numerical value assigned to each rating and a lower value indicating a higher ranking.[31] Fourth, we add a control for the country's terms-of-trade as measured by the World Bank's "Net Barter Terms of Trade Index". Finally, we control for a country's level of reserves to GDP.[32]

Then we use a number of different measures for the control variables (in addition to the different measures of risk and capital controls in Section 3.5). First, to measure global interest rates, instead of using the average rate on long-term government bonds in the United States, euro area, and Japan, we simply use the rate for the United States. Second, to measure global liquidity, we use private credit growth by deposit money banks and other financial institutions from Beck and Demirgüç -Kunt (2009). Third, to measure the size of the financial system, instead of using just the country's stock market capitalization to GDP, we use the sum of the country's stock market capitalization and private and public bond market capitalization to GDP (which limits the sample size). Fourth, to measure the strength of a country's financial system instead of its size, we use the return on equity for the banking system (also from Beck and Demirgüç-Kunt, 2009). Fifth, instead of measuring domestic productivity shocks as the country's GDP growth versus a historic trend, we measure the shock versus growth as forecast in the spring WEO. Finally, we also exclude the control for GDP per capita.

As a final series of sensitivity tests, we implement different techniques for identifying the episodes of surges, stops, flight, and retrenchment. First, instead of using a historic moving average to calculate the episodes, we use an HP filter with episodes defined by 30% deviations from the stochastic trend. Second, instead of the traditional two-standard deviation cutoff we use a three-standard deviation cutoff for changes in capital flows to qualify as an episode, which greatly decreases the number of

[29] We do not include a demographic variable in the main analysis as the theoretical and empirical work indicates that demographics affects capital flows over the medium and long term, but not necessarily over the shorter periods which are the focus of this paper.
[30] Updated classification data were kindly provided by the author. A country is classified as having a pegged exchange rate if it (a) has no fluctuation at all; (b) moves within 2% bands; or (3) has a one-time devaluation with 0% change after 11 months.
[31] For example, for Moody's an "aaa" rating is scored as a 1, a "aa1" rating is scored as a 2, etc. In each case a 1 is the lowest rating. Cantor and Packer (1996) show "that sovereign ratings effectively summarize and supplement the information contained in macroeconomic indicators."
[32] Data from 2000 to 2010 are the sum of monthly reserve data as reported by the IMF. Pre-2000 data are quarterized versions of the annual Lane and Milesi-Ferretti (2007) dataset.

episodes. Third, we exclude transactions by the monetary authorities from the 3rd quarter of 2008 through the end of the sample in order to remove any effect of the currency swap arrangements by the Federal Reserve Board.[33] This has a minimal effect on the definitions of episodes. Fourth, we include reserves in our definition of outflows by domestic residents, thereby focusing on movements in both official and private capital flows instead of just private flows. This can affect the definition of flight and retrenchment episodes. Finally, we include errors and omissions in the underlying gross flows data, as specified in Appendix A, as a check on data quality issues.

The results of a sample of these sensitivity tests are reported in Appendix Tables 3a – 3d and confirm the results discussed above. Most consistent across episode types are the global variables, especially the global risk variable, which is significant in predicting surge, stop, and retrenchment episodes across robustness tests.[34] This supports the focus of much of the recent theoretical literature that models how changes in global risk can be a key factor driving crises. This is also in line with Fratzscher (2011), which finds that global factors, and especially risk, account for a large share of global capital flow patterns immediately before and during the recent crisis.

Other global factors are often significant in predicting some, but not all, types of episodes. Global growth is often (but not always) significant in predicting waves in capital flows driven by foreigners, with higher global growth correlated positively with surges and negatively with stops. Higher global interest rates usually increase the probability of having a stop or retrenchment episode, but the significance depends on the specification. Greater global liquidity has a positive effect on the probability of surges, although significance varies based on the specification, and global liquidity has no consistent effect on the probability of other types of episodes. Financial contagion and (often) trade contagion continue to be highly significant in predicting stops and retrenchment. As in the baseline regressions, domestic variables show less consistent patterns and are more often insignificant, although domestic growth shocks continue to be negatively correlated with the probability of stop episodes and positively correlated with surge episodes.

Just as noteworthy are the coefficient estimates that are generally insignificant. No variables are consistently significant in predicting flight episodes across countries. The most consistent results for flight episodes are the coefficients on capital controls and debt ratios—with greater controls and lower debt often correlated with a higher chance of flight (although with fluctuating significance). Capital

[33] See McGuire and von Peter (2009) for analysis of the swap arrangements.
[34] The only exception is that the coefficient on risk can become insignificant for surge episodes when episodes are defined using the three-standard deviation cutoff (which substantially reduces the number of episodes).

controls and debt ratios do not significantly affect the probability of having surge, stop, or retrenchment episodes. There is no evidence that reduced integration with global financial markets, including through the use of capital controls, reduces a country's vulnerability to surges and stops. If anything, there is evidence that greater integration reduces country vulnerability to stop episodes. A country's financial system (whether measured by size or efficiency) does not have any significant relationship with surge, flight, or retrenchment episodes, although it sometimes has a positive relationship with stop episodes. This does not support a recent focus of the theoretical literature on global imbalances on the role of the financial system in driving capital inflows from abroad and outflows by domestic investors. Global interest rates (whether measured as just U.S. rates or an average of major economies) have no significant relationship with surges or flight after controlling for other factors.

4. Conclusions

This paper has developed a new methodology to analyze extreme movements in capital flows using data on both inflows and outflows by domestic and foreign investors. Compared to previous work that focused only on net capital flows, this new methodology yields substantially different definitions of periods of "surges" and "stops" when foreign investors substantially increase or decrease capital flows to a country. We also identify periods of "flight" and "retrenchment" when domestic investors substantially increase or decrease their capital flows abroad. This more detailed disaggregation of capital flows is critically important to understand what drives capital flow waves.

The analysis finds a primary role for global factors, and especially global risk, in explaining periods of extreme capital flows by domestic and foreign investors. The impact of global risk on capital flows appears to work primarily through changes in economic uncertainty, although changes in risk aversion are also important in explaining stops in foreign capital inflows. Global growth is also important in driving capital flows by foreigners, although it has less impact on capital flows by domestic investors. Contagion through financial linkages and trade flows is important in explaining episodes when investors reduce investment abroad and return more money home (i.e., stops and retrenchment). The results indicate a less important role for domestic factors in explaining episodes, although domestic growth shocks affect the behavior of foreign investors. Flight episodes, when domestic investors send more money abroad, appear to be more idiosyncratic and harder to explain than other types of extreme capital flow movements.

Our results provide insights to on the relevance of different theoretical approaches to modeling sharp movements in capital flows. The significance of global risk in driving most capital flow episodes (although less so for flight) supports the recent focus in several theoretical papers on global factors, and especially global risk, as a primary cause of crises. Our results are less supportive of theoretical models that focus mainly on changes in interest rates or liquidity in a major economy, such as the United States, as the major factor driving capital flows. Higher global interest rates can be a factor driving stop and retrenchment episodes, and increased global liquidity can be a factor driving surges in middle income countries, but none of these variables is as consistently significant as global risk in driving all types of capital flow episodes.[35] Finally, the results show that domestic growth shocks affect foreign but not domestic investors, thereby providing mixed support for theoretical work focusing on domestic productivity shocks as key determinants of capital flows (such as the real business cycle literature).

The results also have important implications for policymakers concerned about capital flow volatility. Waves of capital flows can present substantial macroeconomic challenges, whether it is the waves of capital inflows that cause currency appreciation and/or asset bubbles or the "undertows" as capital outflows cause a collapse in exchange rates and asset prices. One country characteristic that has recently received substantial support in order to reduce this volatility—capital controls—does not significantly reduce the occurrence of surges, stops, or other capital flow episodes. Most of the significant drivers of capital flow volatility—such as changes in global risk, global growth, and contagion—appear to be outside the control of policymakers in most countries. This suggests that governments may wish to focus more on strengthening their country's ability to withstand capital flow volatility rather than to attempt to directly reduce this volatility. This also suggests an important role for global institutions and cross-country cooperation for policymakers that hope to reduce the sharp volatility of global capital flows.

[35] Bekaert, Hoerova, and Duca (2010) find that a lax monetary policy decreases risk aversion after about five months, so it is possible that the risk measure may be capturing a lagged effect of monetary policy.

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Table 1
Summary Statistics for Episodes (1980-2009)

		Surge	Stop	Flight	Retrenchment
		% of sample with			
Full sample		16%	18%	17%	17%
		Average length of time for each (in quarters)			
Full sample		4.5	4.0	4.1	3.9
By Income Group	High income	4.5	4.1	4.1	4.1
	Med income	4.6	3.9	4.3	3.4
	Lower income	4.3	3.7	3.9	3.6
By Region	North America	3.8	3.9	3.8	3.8
	Western Europe	4.5	4.2	4.2	4.2
	Asia	4.5	3.8	4.1	4.0
	Eastern Europe	4.8	3.8	4.3	3.7
	Latin America	4.3	3.9	3.7	3.2
	Other	4.3	3.7	4.4	3.6

Notes: Income groups are based on World Bank definitions, with "Lower income" including both low income and middle/low income countries according to World Bank classification; "Middle income" is middle/high income; "Higher income" is high income.

Table 2
Episodes During the GFC Based on Net and Gross Capital Flows

Surges		Stops		
Net Flows	**Gross Flows**	**Net Flows**	**Gross Flows**	
Belgium/Lux	Bolivia	Argentina	Argentina	Austria
Canada		Brazil	Brazil	Belgium/Lux
Chile		Estonia	Estonia	Canada
Finland		Guatemala	Guatemala	Chile
France		India	India	Colombia
Iceland		Ireland	Ireland	Czech Rep
Israel		Korea	Korea	Denmark
Netherlands		Latvia	Latvia	France
Singapore		Lithuania	Lithuania	Germany
Sweden		Malaysia	Malaysia	Hong Kong
Taiwan		New Zealand	New Zealand	Iceland
UK		Norway	Norway	Indonesia
Venezuela		Peru	Peru	Israel
		Philippines	Philippines	Italy
		Poland	Poland	Japan
		Romania	Romania	Mexico
		Russia	Russia	Netherlands
		South Africa	South Africa	Nicaragua
		Spain	Spain	Panama
		Turkey	Turkey	Portugal
		Croatia		Singapore
		Greece		Slovenia
				Sweden
				Switzerland
				Taiwan
				Thailand
				UK
				US

Notes: The "Net Flows" columns show episodes based on the net flows data, as used in the traditional sudden stops and bonanzas literature. The "Gross Flows" columns show episodes based on gross flows data, as used in this paper. The difference between the two is that episodes based on net flows include the actions of domestic investors, who retrenched in many countries during the crisis. The crisis is defined as the two quarters 2008Q4 and 2009Q1.

Table 3
Regression Results: Explaining Episodes of Extreme Capital Flows

Global Factors	**Surge**	**Stop**	**Flight**	**Retrenchment**
Global risk	-0.043**	0.022**	-0.033*	0.013**
	(0.017)	(0.005)	(0.019)	(0.006)
Global liquidity	1.790*	-1.330	-0.715	0.082
	(1.035)	(1.076)	(1.103)	(0.997)
Global interest rates	0.011	0.063*	-0.033	0.104**
	(0.056)	(0.036)	(0.068)	(0.041)
Global growth	24.168**	-6.438**	3.270	-4.675
	(9.399)	(2.655)	(6.441)	(2.852)
Contagion Factors				
Regional contagion	0.405	0.270*	0.281	-0.188
	(0.257)	(0.144)	(0.194)	(0.160)
Trade contagion	4.462	4.390*	1.537	7.052**
	(4.534)	(2.240)	(6.587)	(2.461)
Financial contagion	-1.054	4.014**	1.595	4.425**
	(1.379)	(0.842)	(2.438)	(0.931)
Domestic Factors				
Financial system	-0.011	0.306**	-0.019	0.113
	(0.193)	(0.143)	(0.236)	(0.169)
Capital controls	0.004	0.037	0.125*	0.076
	(0.072)	(0.057)	(0.067)	(0.055)
Debt to GDP	-0.005	-0.002	-0.005**	-0.003
	(0.004)	(0.003)	(0.002)	(0.003)
Growth shock	1.205*	-2.706**	0.004	-0.130
	(0.631)	(1.041)	(0.759)	(0.960)
GDP per capita	-0.003	-0.002	0.001	0.013**
	(0.008)	(0.006)	(0.010)	(0.005)
# Observations	***3,479***	***3,479***	***3,479***	***3,479***

Notes: The dependent variable is a 0-1 variable indicating if there is an episode (either surge, stop, flight or retrenchment). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic (or cloglog) framework which assumes that $F(\cdot)$ is the cumulative distribution function (cdf) of the extreme value distribution. To capture the covariance across episodes, the set of four episodes is estimated using seemingly unrelated estimation with robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level.

Table 4
Regression Results: Episodes Based on Net Capital Flows

Global Factors	**Surge**	**Stop**
Global risk	-0.013	0.007
	(0.008)	(0.006)
Global liquidity	2.571**	-0.845
	(1.075)	(0.964)
Global interest rates	-0.002	0.004
	(0.052)	(0.034)
Global growth	2.154	-10.430**
	(4.598)	(3.777)
Contagion Factors		
Regional contagion	-0.171	0.584
	(0.262)	(0.468)
Trade contagion	4.307**	-0.663
	(2.017)	(2.370)
Financial contagion	0.330	0.529
	(0.650)	(1.181)
Domestic Factors		
Financial system	0.432**	0.018
	(0.192)	(0.225)
Capital controls	-0.030	0.131**
	(0.072)	(0.065)
Debt to GDP	-0.005	-0.008**
	(0.003)	(0.004)
Growth shock	1.316	-2.331**
	(0.856)	(0.851)
GDP per capita	-0.003	-0.001
	(0.009)	(0.010)
# Observations	***3,558***	***3,558***

Notes: Capital flow episodes are defined using the traditional methodology based on net capital flows instead of the methodology using gross capital flows developed in this paper. The dependent variable is a 0-1 variable indicating if there is an episode (either surge or stop). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic (or cloglog) framework which assumes that $F(\cdot)$ is the cumulative distribution function (cdf) of the extreme value distribution. To capture the covariance across episodes, the regressions are estimated using seemingly unrelated estimation with robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level.

Table 5a
Correlations between Risk Measures

	VXO	VIX	Quality Spread	CSFB RAI
VXO	1.000			
VIX	0.992	1.000		
Quality Spread	0.695	0.731	1.000	
CSFB Risk Appetite Index (RAI)	0.550	0.535	0.358	1.000
Variance Risk Premium (VRP)	0.692	0.712	0.443	0.428

Table 5b
Correlations between Capital Control Measures

	Capital controls	Fin Integ.	Overall Restrict.	Purch locally	Sales locally	Purch abroad	Sales abroad	Fin controls
Capital controls Chinn-Ito (2008), updated 2011	1.000							
Financial integration Lane-Milesi-Ferretti (2007)	-0.330	1.000						
Overall capital act restrictions Schindler (2009)	0.690	-0.257	1.000					
Restrictions on purchases locally by nonresidents, Schindler (2009)	0.284	-0.205	0.594	1.000				
Restrictions on sale or issue locally by nonresidents , Schindler (2009)	0.512	-0.210	0.624	0.332	1.000			
Restrictions on purchases abroad by residents, Schindler (2009)	0.498	-0.159	0.782	0.328	0.375	1.000		
Restrictions on sale or issue abroad by residents , Schindler (2009)	0.503	-0.198	0.758	0.482	0.558	0.579	1.000	
Financial controls Ostry et al. (2011)	0.486	-0.409	0.636	0.471	0.365	0.475	0.411	1.000
Forex regulations Ostry et al. (2011)	0.542	-0.459	0.602	0.457	0.426	0.381	0.275	0.618

Notes: All measures of capital controls have higher values if the country has greater capital controls, except the Lane-Milesi-Ferretti (2007) measure of financial integration which takes on a higher value if the country is more financially integrated (which usually implies fewer capital controls).

Table 6a: Coefficient on Global Risk Variable with Alternate Measures of Risk

Risk Variable Measured by:	Surge	Stop	Flight	Retrench	# Obs
VXO	-0.043**	0.022**	-0.033*	0.013**	3,479
	(0.017)	(0.005)	(0.019)	(0.006)	
VIX	-0.057**	0.029**	-0.035	0.013**	3,323
	(0.024)	(0.005)	(0.028)	(0.007)	
Quality Spread	-0.750**	0.571**	-0.420	0.364**	3,507
	(0.348)	(0.126)	(0.325)	(0.143)	
CSFB Risk Appetite Index	-0.049	0.105**	-0.028	0.100**	3,507
(RAI)	(0.033)	(0.023)	(0.037)	(0.022)	
Volatility Risk Premium	-0.020*	0.010**	-0.011	0.001	3,323
(VRP)	(0.011)	(0.002)	(0.010)	(0.003)	

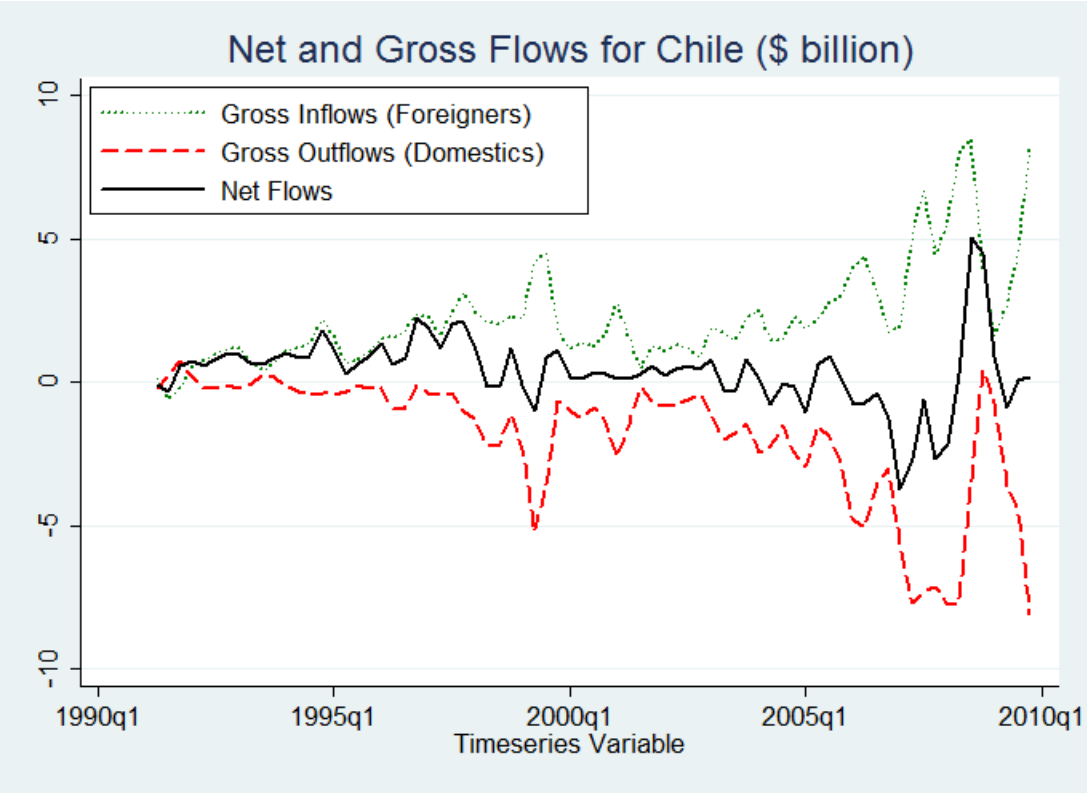
Table 6b: Coefficient on Capital Control Variable with Alternate Measures of Capital Controls

Capital Control Variable Measured by:	Surge	Stop	Flight	Retrench	# Obs
Capital controls	0.004	0.037	0.125*	0.076	3,479
Chinn-Ito (2008)	(0.072)	(0.057)	(0.067)	(0.055)	
Financial integration[1]	-0.044	-0.229**	-0.211	-0.147**	3,479
Lane-Milesi-Ferretti (2007)	(0.140)	(0.072)	(0.153)	(0.059)	
Overall capital acct restrictions	0.403	0.099	0.629	0.673*	1,795
Schindler (2009)	(0.456)	(0.474)	(0.464)	(0.378)	
Specific capital acct restrictions	0.175	0.150	-0.107	0.542*	1,795
Schindler (2009)	(0.276)	(0.265)	(0.290)	(0.287)	
Financial controls	-0.081	-0.123	-0.249	0.695	1,222
Ostry et al. (2011)	(0.557)	(0.377)	(0.412)	(0.480)	
Forex regulations	-1.007	0.163	0.327	0.254	1,252
Ostry et al. (2011)	(0.639)	(0.519)	(0.554)	(0.510)	

Notes: Tables above report the coefficients on either *Global Risk* or *Capital Controls* when the base regressions reported in Table 3 are estimated except the corresponding variable is replaced with one of the alternative measures listed in the table. See Table 3 for additional information on estimation technique and additional variables included in the regressions. ** is significant at the 5% level and * at the 10% level.

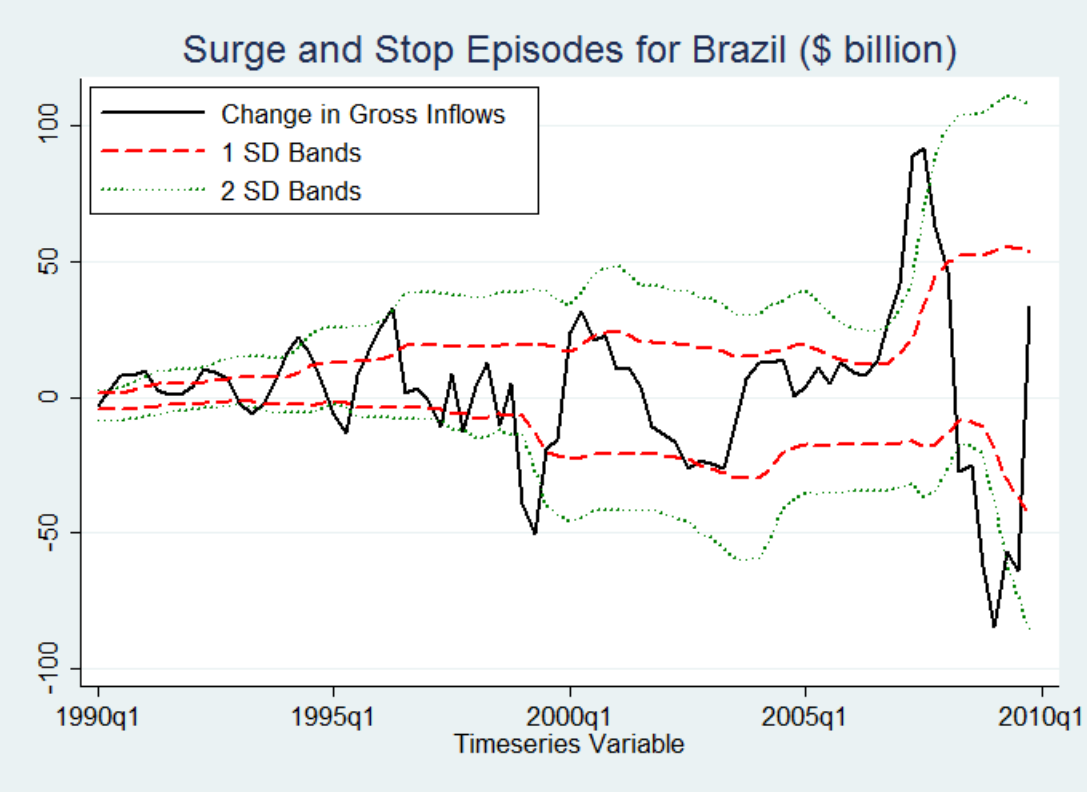
(1) All measures of capital controls have higher values if the country has greater capital controls, except the Lane-Milesi-Ferretti (2007) measure of financial integration which takes on a higher value if the country is more financially integrated.

Figure 1
Net and Gross Capital Flows for Chile



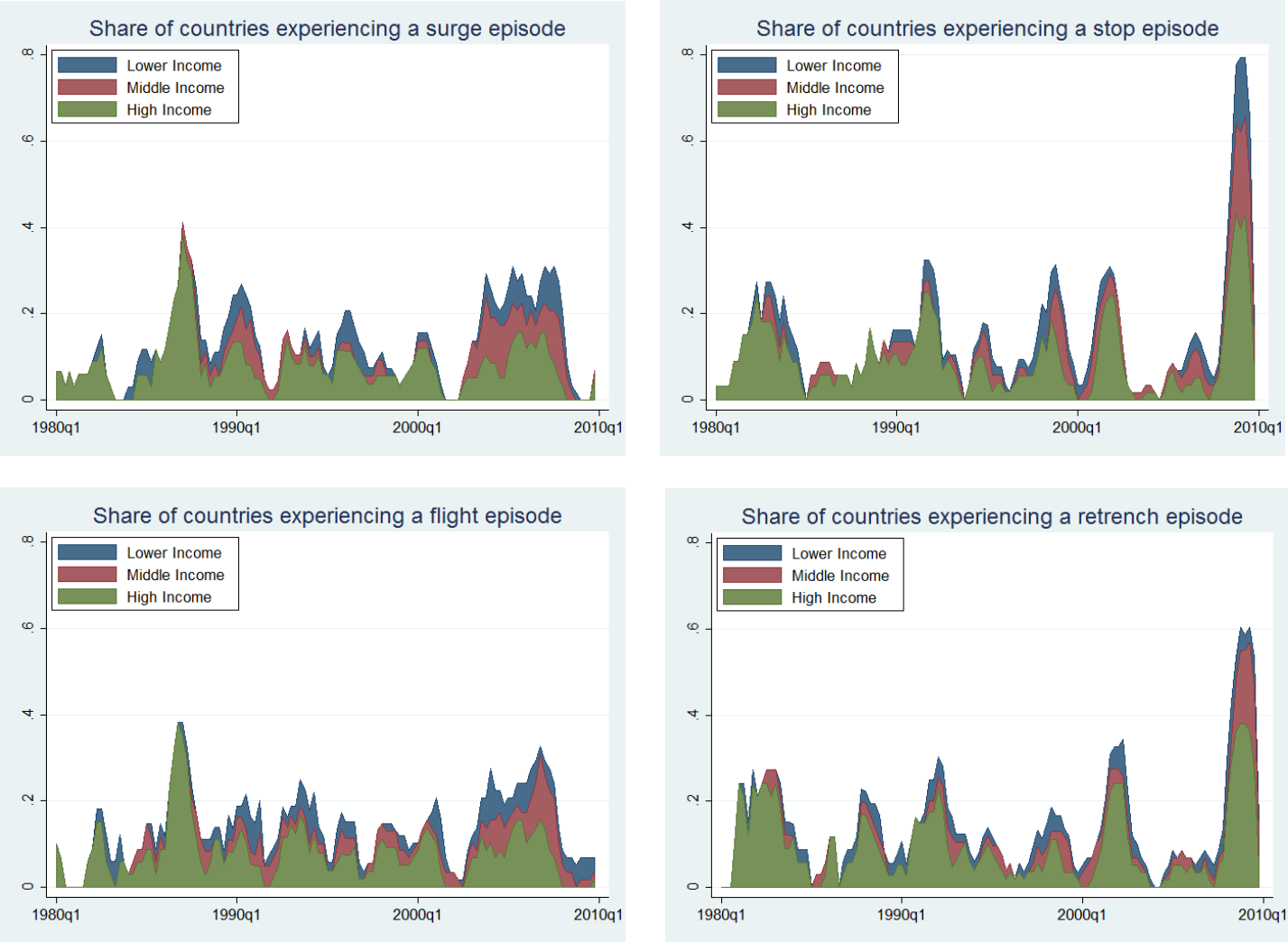
Notes: This graph shows net capital flows and gross inflows and gross outflows for Chile from 1990 through 2009. Each flow is calculated as the 2-quarter moving average. Gross outflows are reported using standard BOP definitions, so that a negative number indicates a gross outflow.

Figure 2
Construction of the Surge and Stop Episodes



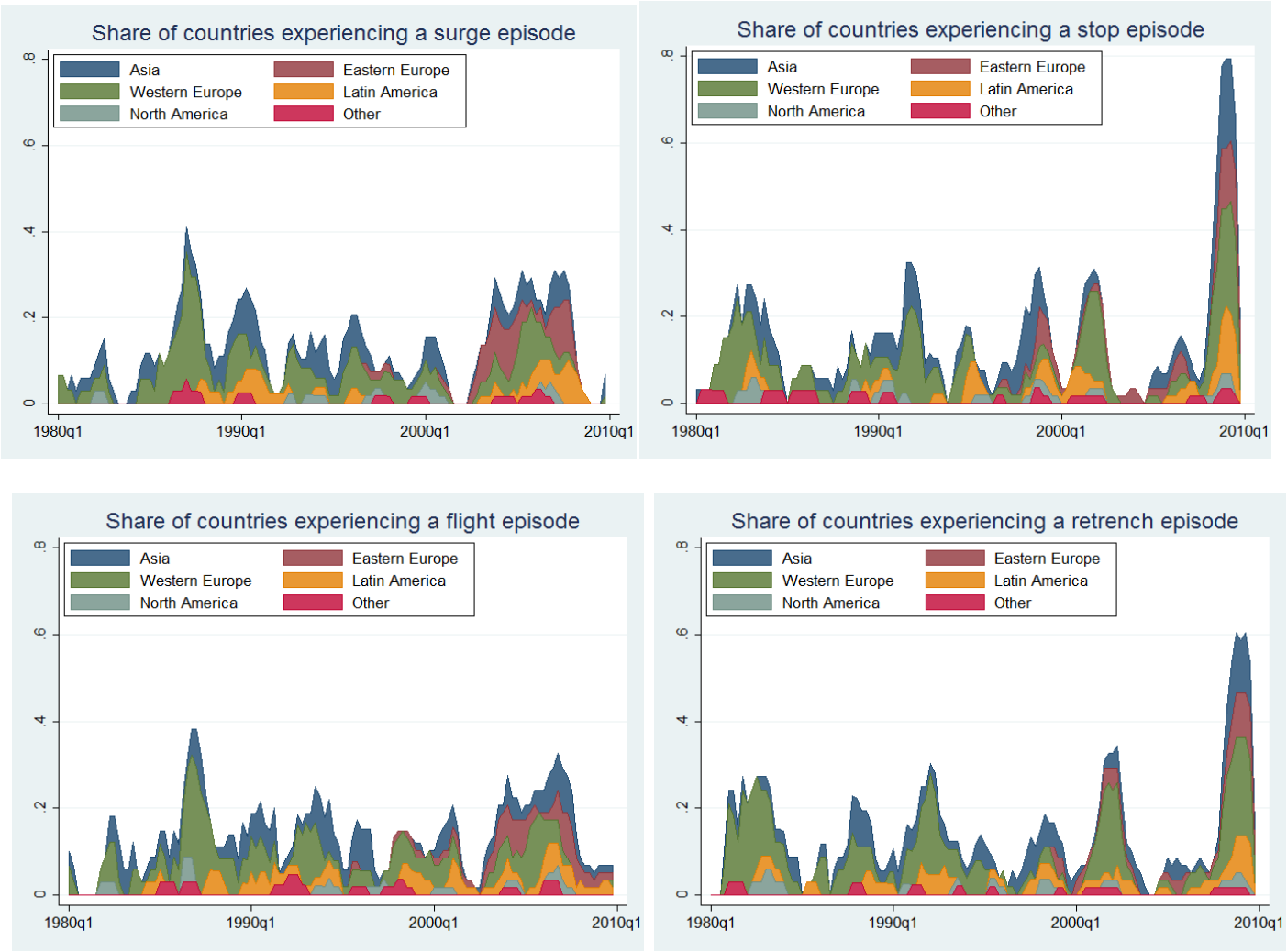
Notes: The figure shows the construction of our measures of surges and stops for Brazil. A surge episode begins when gross inflows (the solid line) exceed one standard deviation above the rolling mean, provided they eventually exceed two standard deviations above the mean. The surge episode ends when gross inflows again cross the one standard deviation line. Stops are defined analogously; a stop episode begins when gross inflows fall one standard deviation below the rolling mean, provided they eventually fall two standard deviations below the mean, and ends when gross inflows again cross the one standard deviation line.

Figure 3
Percent of Countries with Each Type of Episode: By Income Group



Notes: Income classifications are based on groupings from the World Bank in the year 2000 based on GNI per capita. "Lower income" in the graphs above refer to countries classified as "Low income" and "Middle/lower income" by the World Bank, "Middle income" referring to countries classified as "Middle/higher income". "Higher income" refers to countries classified as "High income". We combine lower and middle/lower income into the group "lower income" because there are only four countries in our sample that qualify as lower income based on the World Bank classification.

Figure 4
Percent of Countries with Each Type of Episode: By Region



Note: The "Other" region is South Africa and Israel.

Appendix A: Data Set on Flows

Our primary source of flow data is quarterly gross capital inflows and outflows from the International Monetary Fund's *International Financial Statistics* (accessed through Haver Analytics in March 2011). There are a number of modifications necessary to transform the IFS flows data into a usable dataset:

- Many countries' flows are reported in millions of U.S. dollars, but some are in billions. Because our episodes are defined within the context of a single country's flows, this would not impact our empirical work, but we convert all to billions of U.S. dollars.
- Some countries (Taiwan and Singapore, for example, as well as 2001 data for the Slovak Republic) are not in the quarterly IFS flows data, but quarterly flows data are readily accessible from national sources. Using the quarterly data from national sources, we add Taiwan and Singapore to the dataset and fill in 2001 data for the Slovak Republic.[36]
- Some countries (such as Norway for 1992 and 1993) have no quarterly BOP data in the IFS for a gap in the series, but annual BOP data exist for that period; we fill that gap by (equally) dividing the annual numbers into the quarters.[37]
- For some countries, IFS flow data exist for certain time periods, but upon inspection it becomes obvious that the data are all zeros and/or have many gaps; in those cases we drop all data prior to certain dates (Greece pre-1999, Bolivia pre-1988, Peru pre-1991).
- Upon inspection it is not clear that the IFS properly differentiates between true zeros and NAs (not availables). We cannot settle this issue, but have a two-fold strategy to deal with it. First, if there is a string of NAs surrounded by strings of zeros, we replace those interior NAs with zeros.[38] Second, if these interior NAs or any reported zeros are actually due to the variable not being reported, there is a natural fix in the BOP presentation: errors and omissions (E&O). That is, if outward portfolio investment is not collected but is reported as zero, it should appear in the BOP accounts as a negative

[36] Sources for non-IFS data are as follows: Slovak Rep. (01q1-01q4) http://www.nbs.sk/en/statistics/balance-of-payments-statistics/en-platobna-bilancia; Taiwan http://www.cbc.gov.tw/ct.asp?xItem=2070&ctNode=512&mp=2; and Singapore's BOP dataset.

[37] Other 'annual to quarterly' fixes include Poland 1995-1999 and India's outward FDI 1991-1996.

[38] Interior NAs that we fill with zeros include the following: Taiwan (1990q4, portfolio investment liabilities), Slovenia (1994, portfolio investment liabilities); India (1991-1996 and 1999, portfolio investment assets); Indonesia (1995Q2-Q4, portfolio investment assets and other investment assets; 2003Q3-2003Q4, portfolio investment assets and direct investment assets); Thailand (1991-1992, portfolio investment assets); Bangladesh (2001Q3-Q4, direct investment assets); Mexico (1994-1995, direct investment assets); and Guatamala (1995-2000, direct investment assets). Note that while some of these are likely true zeros (and so our fix is appropriate), those that are not should be alleviated by our E&O fix, described below.

E&O. Our fix is, in robustness checks, to assign any positive E&O to inflows and any negative E&O to outflows.[39]

- Finally, we compared annualized data from our final flows dataset to the annual IMF BOP dataset. For some countries (such as Switzerland) annual BOP data pre-date quarterly data. We do not use the annual data to backfill data for those countries, as annual data are decidedly different from quarterly when examining extreme flow episodes. Other than earlier start dates for some countries in the annual dataset, the two datasets are nearly identical, with the lone discrepancy being for Belgium-Luxembourg (a construct that, because of limited availability of some explanatory variables, does not appear in our regressions).

After making all of the adjustments described above, we include all countries for which quarterly data for balance of payments flows are available for at least ten years. While data are available for 2010 for many countries, capital flows data are prone to substantial revisions for a year, so we end our dataset in Q42009.

[39] We thank Gian Maria Milesi-Ferretti for advising us on this particular fix. Note that a blanket fix, such as assigning all E&O to unreported inflows or all to unreported outflows, might work for a particular country but not across a broad set of countries (as some are more likely to have holes in different aspects of the BOP accounts). Thus, a data-driven fix is more appropriate: If E&O is negative, assign it to outflows; when E&O is positive, assign it to inflows.

Appendix Table 1: Country and Time Period Representation

Country	Start year	Country	Start year
Argentina	1980	Latvia	1993
Australia	1980	Lithuania	1993
Austria	1980	Malaysia	1999
Bangladesh	1980	Mexico	1980
BelLux	1980	Netherlands	1980
Bolivia	1988	New Zealand	1980
Brazil	1980	Nicaragua	1992
Canada	1980	Norway	1980
Chile	1991	Panama	1998
Colombia	1996	Peru	1991
Croatia	1993	Philippines	1980
Czech Republic	1993	Poland	1995
Denmark	1981	Portugal	1980
Estonia	1992	Romania	1991
Finland	1980	Russia	1994
France	1980	Singapore	1995
Germany	1980	Slovak Rep.	1993
Greece	1999	Slovenia	1992
Guatemala	1980	South Africa	1980
Hong Kong	1999	Spain	1980
Hungary	1989	Sri Lanka	1980
Iceland	1980	Sweden	1980
India	1980	Switzerland	1999
Indonesia	1981	Taiwan	1987
Ireland	1981	Thailand	1980
Israel	1980	Turkey	1984
Italy	1980	UK	1980
Japan	1980	US	1980
Korea	1980	Venezuela	1994

Notes. The table shows the 58 countries in our sample, as well as the dates for which quarterly gross capital flows data begin in our dataset. All data series end in 2009 and are from the IFS unless noted in Appendix A.

Appendix Table 2: Surge, Stop, Flight, and Retrenchment Episodes by Country (1980 to 2009)

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Argentina	1990q4	1992q3	1982q4	1983q1	1989q3	1990q1	1982q3	1982q4
	2003q1	2003q4	1989q2	1990q3	1991q2	1992q3	1988q3	1989q1
			1994q4	1995q1	2002q4	2003q1	1992q4	1993q2
			1998q4	1999q3	2006q3	2007q3	1998q3	1999q2
			2000q4	2002q2	2008q1	2008q3	2009q2	2009q4
			2008q2	2009q3				
Australia	1980q4	1983q1	1983q2	1984q1	1980q1	1980q2	1980q4	1981q2
	1993q4	1994q3	1989q3	1991q3	1984q2	1985q1	1989q2	1991q1
	1995q3	1996q3	1997q3	1998q1	1995q4	1996q3	1994q4	1995q2
	2002q3	2002q4	1998q3	1998q4	2004q1	2004q3	2003q1	2003q3
	2003q4	2004q3	2005q1	2005q4	2006q2	2007q1	2005q1	2005q4
	2006q2	2007q1						
Austria	1980q3	1980q4	1981q3	1982q3	1992q2	1993q1	1981q4	1982q3
	1992q2	1993q1	1996q4	1997q1	1997q2	1998q1	1986q1	1986q2
	1999q2	2000q1	2001q1	2002q1	1999q2	2000q1	1993q3	1993q4
	2005q1	2005q4	2006q1	2006q4	2005q1	2005q4	1998q2	1998q3
			2008q3	2009q3			2001q2	2002q1
							2006q1	2006q4
							2008q4	2009q4
Bangladesh	1989q1	1989q4	1982q4	1983q3	1987q1	1987q3	1992q2	1993q1
	1998q1	1998q3	1991q3	1992q1	1988q2	1989q3	2001q1	2001q4
	2003q4	2004q1	2006q1	2006q2	1995q3	1997q1	2009q3	2009q4
	2005q1	2005q2			2005q4	2006q3		
					2008q2	2008q4		
Belgium -	1987q1	1987q4	1981q1	1982q2	1987q1	1987q4	1981q1	1982q2
Luxembourg	1999q3	2000q3	1988q2	1989q1	1999q3	2000q3	1988q2	1989q1
			1994q1	1995q1	2005q2	2006q1	1994q1	1995q1
			2001q4	2002q3			2001q4	2002q3
			2008q2	2009q3			2008q2	2009q3
Bolivia	1996q1	1996q3	1995q1	1995q2	1994q1	1994q4	2004q3	2005q1
	2007q3	2008q4	1999q2	2001q2	2001q1	2001q2	2006q2	2006q3
			2006q3	2007q2	2003q3	2004q1		
					2008q4	2009q3		
Brazil	1988q1	1988q4	1982q4	1983q4	1984q2	1985q1	1982q4	1983q4
	1990q2	1991q1	1993q1	1993q3	1987q4	1988q3	1985q2	1985q4
	1994q1	1994q3	1995q1	1995q2	1994q2	1994q4	1992q1	1992q4
	1995q4	1996q2	1999q1	1999q2	1998q3	1999q2	1995q2	1996q1
	2006q3	2007q4	2008q2	2009q3	2006q4	2007q3	1997q4	1998q2
							2008q2	2008q3

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Canada	1996q4	1997q3	1982q2	1983q2	1986q2	1986q4	1982q2	1983q2
	2000q1	2001q1	1991q2	1991q3	1994q2	1994q4	1993q2	1993q3
	2006q2	2007q1	1995q2	1996q1	1996q3	1997q2	1995q2	1996q1
			1999q1	1999q4	2000q1	2001q1	1998q1	1998q3
			2008q4	2009q2	2006q2	2007q1	2008q4	2009q3
Chile	2005q4	2006q3	2000q2	2001q1	1998q2	1999q4	1997q2	1997q3
	2007q4	2008q3	2007q1	2007q2	2006q1	2006q4	2000q2	2000q4
			2009q1	2009q3	2007q2	2008q1	2008q3	2009q3
Colombia	2005q4	2006q3	2008q2	2009q1	2006q2	2006q3	2002q2	2003q1
							2007q2	2007q3
Croatia	2002q4	2004q1	1998q4	1999q2	2000q1	2000q4	2001q3	2002q1
			2004q4	2005q3	2002q4	2003q4	2004q4	2005q4
					2006q4	2007q3		
Czech	2002q3	2003q1	2003q2	2004q1	2003q3	2005q1	2000q1	2000q4
Republic			2006q2	2006q4			2002q1	2002q3
			2008q4	2009q3			2008q4	2009q4
Denmark	1993q3	1994q2	1986q4	1987q2	1993q3	1994q2	1986q4	1987q2
	1995q3	1996q2	1989q2	1989q4	1999q4	2001q1	1992q2	1993q2
	2005q1	2005q4	1991q4	1993q2	2005q2	2005q4	1994q3	1995q1
			1994q3	1995q1			2001q2	2002q2
			1998q3	1999q1			2008q3	2009q4
			2001q2	2002q1				
			2008q4	2009q4				
Estonia	1997q4	1998q1	1998q3	1999q3	1997q4	1998q1	1998q4	1999q1
	2003q1	2005q1	2008q2	2009q4	2001q1	2001q2	2000q1	2000q2
					2004q2	2005q3	2008q2	2009q3
Finland	1984q3	1985q1	1985q4	1986q2	1985q1	1985q2	1983q3	1984q2
	1987q1	1987q4	1991q1	1992q2	1986q3	1987q1	1985q4	1986q2
	1996q3	1997q3	2001q1	2001q4	1988q3	1989q1	1987q3	1987q4
	1998q4	1999q1	2009q2	2009q3	1993q1	1993q3	1990q3	1990q4
	2004q3	2004q4			1998q4	1999q1	1992q1	1992q3
	2006q2	2007q1			2004q3	2005q1	2001q1	2001q4
					2006q2	2006q4	2009q1	2009q3
France	1986q3	1987q4	1981q3	1982q2	1986q4	1987q4	1981q1	1983q2
	1997q4	1998q3	1991q1	1992q1	1992q3	1992q4	1991q2	1992q1
	2001q1	2001q2	2001q4	2002q3	1997q4	1998q3	2001q4	2002q3
			2008q1	2009q3	2001q1	2001q2	2008q1	2009q3

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Germany	1980q1	1980q2	1981q4	1982q4	1984q3	1985q2	1981q4	1982q1
	1986q1	1986q4	1987q4	1988q3	1985q4	1986q4	1982q3	1983q2
	1989q2	1990q1	1994q1	1994q4	1993q1	1993q4	1987q3	1988q2
	1992q3	1993q2	2001q1	2002q2	2004q3	2005q4	1990q4	1992q2
	2005q1	2005q4	2008q3	2009q3			1994q2	1994q4
	2007q2	2008q1					2000q4	2002q2
							2008q2	2009q3
Greece	2005q1	2005q4	2006q1	2006q4	2005q1	2005q3	2006q1	2006q4
			2009q2	2009q4				
Guatemala	1987q4	1988q1	1994q4	1995q3	1990q3	1991q2	1988q3	1988q4
	2006q1	2006q4	2008q4	2009q3	1998q2	1998q3	1989q2	1990q1
					1999q1	1999q4	1991q3	1992q1
					2001q1	2001q3	2002q2	2002q3
					2004q1	2004q4	2008q4	2009q3
Hong Kong			2008q3	2009q3			2008q3	2009q3
Hungary	2003q1	2003q4	1996q4	1997q1	1995q3	1995q4	2009q3	2009q4
	2004q2	2005q3	2002q2	2002q3	2001q2	2002q1		
	2007q2	2008q1	2009q3	2009q4	2006q1	2008q1		
Iceland	1987q1	1987q4	1982q4	1983q4	1983q3	1983q4	1981q4	1982q3
	1995q4	1996q4	1989q2	1990q1	1986q3	1987q2	1992q1	1992q3
	2003q3	2006q1	2001q2	2002q1	1993q2	1993q3	2001q3	2002q2
			2008q2	2009q3	1997q3	1998q2	2006q4	2007q1
					1999q1	1999q4	2008q1	2009q2
					2003q1	2006q1		
India	1982q2	1982q3	1989q4	1990q4	1982q2	1982q4	1981q2	1981q4
	1984q1	1985q2	1991q3	1992q1	1990q3	1991q2	1983q2	1984q1
	1993q4	1994q4	1998q2	1998q3	1995q4	1996q4	1992q1	1992q4
	1996q2	1997q1	2008q3	2009q3	2000q4	2001q3	1999q2	2000q2
	2003q3	2004q2			2004q1	2004q3	2002q1	2002q4
	2004q4	2005q3					2007q4	2008q2
	2006q4	2008q1						
Indonesia	1990q3	1991q2	1993q2	1993q3	1993q3	1994q3	1997q2	1998q3
	1995q2	1996q3	1997q4	1998q3	2002q3	2003q2	2003q3	2003q4
	2005q4	2006q1	2006q4	2007q1	2004q1	2005q1	2006q3	2007q1
			2009q1	2009q3	2005q3	2006q2		

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Ireland	1986q4	1987q3	1991q3	1992q2	1987q2	1988q1	1991q4	1992q2
	1989q3	1990q2	2001q2	2001q3	1989q3	1990q1	2000q4	2001q3
	1992q4	1993q4	2008q2	2009q3	1992q3	1993q1	2008q2	2009q3
	1995q3	1996q3			1995q4	1996q3		
	1997q4	1999q1			1997q4	1998q4		
	2003q3	2004q2			2003q3	2004q2		
	2006q3	2007q3			2006q3	2007q2		
Israel	1986q2	1987q1	1980q2	1981q3	1986q2	1987q1	1981q1	1981q4
	1989q4	1990q3	1983q4	1984q4	1992q1	1992q3	1991q1	1991q3
	1999q2	2000q1	1988q3	1989q2	1998q1	1998q4	1993q3	1993q4
	2006q1	2006q4	1996q3	1996q4	2006q1	2006q4	1995q2	1995q3
			1998q3	1998q4			2001q2	2002q2
			2001q2	2002q2			2007q3	2009q2
			2007q3	2007q4				
			2008q4	2009q2				
Italy	1987q1	1987q3	1982q2	1983q1	1987q1	1987q3	1982q2	1983q1
	1996q1	1997q1	1991q4	1992q2	2003q1	2003q4	1986q1	1986q2
	2003q1	2003q4	1992q4	1993q3	2005q1	2005q4	1993q1	1993q3
	2005q2	2006q1	1999q1	1999q2			2000q3	2002q3
			2000q4	2002q3			2007q3	2008q4
			2007q3	2008q4				
Japan	1986q2	1987q3	1982q4	1983q1	1986q1	1987q2	1982q4	1983q1
	1993q4	1995q1	1990q4	1991q4	1993q4	1994q4	1987q4	1988q3
	2000q2	2001q1	1992q2	1993q1	2000q2	2001q1	1990q3	1991q3
			1998q1	1999q1			1996q3	1996q4
			2005q2	2005q3			1998q2	1999q4
			2006q3	2007q1			2008q3	2009q3
			2008q3	2009q3				
Korea	1988q2	1989q1	1986q3	1987q4	1982q2	1983q1	1984q3	1984q4
	1990q2	1991q2	1997q2	1998q3	1985q2	1985q4	1987q4	1988q1
	1994q3	1995q4	2008q1	2009q2	1988q4	1989q1	1997q3	1999q1
	2009q4	2009q4			1990q2	1990q3	2005q1	2005q3
					1994q2	1995q4	2008q3	2009q3
					2002q4	2003q3		
Latvia	2003q3	2005q1	1998q4	1999q2	2006q3	2007q4	1998q4	1999q2
	2006q2	2007q4	2005q3	2005q4			2005q3	2006q1
			2008q3	2009q3			2008q3	2009q2
Lithuania	2004q2	2004q3	2000q4	2001q2	2004q1	2004q4	2001q2	2001q3
	2005q4	2006q2	2008q3	2009q4			2008q3	2009q3
	2006q4	2008q1						

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Malaysia	2009q4		2005q4	2006q3	2006q2	2007q4	2008q3	2009q2
			2008q3	2009q2				
Mexico	1989q2	1991q2	1994q4	1995q4	1987q3	1988q2	1991q3	1991q4
	2004q4	2005q2	2008q4	2009q3	1990q1	1990q4	1992q2	1993q1
	2007q3	2008q2			1993q2	1994q1	1997q3	1997q4
					2001q3	2002q2	2008q4	2009q3
Netherlands	1985q3	1987q1	1981q1	1982q3	1980q1		1980q4	1981q1
	1995q3	1996q2	1990q4	1991q4	1986q2	1987q1	1981q4	1983q2
	1997q4	1998q4	2001q2	2001q3	1997q4	1998q4	1990q4	1992q1
	2005q2	2006q2	2002q1	2002q4	2005q2	2006q2	2001q2	2001q3
			2008q1	2009q3			2002q1	2002q4
							2008q1	2009q3
New Zealand	1986q3	1987q2	1987q4	1988q3	1986q4	1987q2	1986q1	1986q2
	2000q2	2001q1	1996q4	1997q2	1989q2	1990q2	1988q1	1989q1
	2006q3	2007q3	1998q3	1999q2	1993q3	1994q2	2002q4	2003q3
			2008q2	2009q3	2000q2	2001q1	2005q3	2006q1
					2006q3	2007q3		
Nicaragua			2000q3	2001q3	2000q4	2001q2	1998q1	1998q4
			2009q1	2009q4			2002q4	2003q2
Norway	1982q3	1982q4	1988q3	1989q2	1986q3	1987q3	1981q1	1981q2
	1984q3	1985q3	1991q3	1992q2	1994q3	1995q3	1987q4	1988q4
	1992q4	1993q2	1997q4	1998q1	2000q2	2001q2	1992q2	1994q1
	2000q3	2000q4	2001q3	2002q1	2005q4	2007q1	1999q2	1999q3
	2002q4	2003q2	2007q4	2008q4			2001q4	2002q3
	2005q4	2007q1	2009q2	2009q4			2007q4	2008q3
							2009q2	2009q4
Panama			2008q4	2009q3			2008q4	2009q3
Peru	2006q4	2008q2	1998q1	1998q2	2001q1	2001q2	2007q1	2007q2
			1998q4	1999q3	2003q2	2004q1	2007q4	2008q3
			2008q4	2009q3	2009q2	2009q4		
	2006q4	2008q2	1998q1	1998q2	2001q1	2001q2	2007q1	2007q2
Philippines	1984q4	1985q2	1983q2	1984q2	1991q4	1994q2	1997q3	1998q2
	1994q2	1994q3	1992q1	1992q2	1999q1	1999q2	2008q1	2008q4
	1996q1	1997q1	1997q3	1998q4	2007q1	2007q2		
	2005q2	2005q4	2008q1	2009q1				
	2007q1	2007q3						
Poland	2003q4	2004q4	2001q4	2002q3	2004q2	2005q1	2002q3	2003q2
	2007q1	2008q2	2008q4	2009q3			2008q3	2009q3

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Portugal	1981q2	1982q3	1983q4	1984q3	1982q2	1982q3	1980q4	1982q1
	1987q3	1988q2	1992q3	1993q2	1983q3	1984q1	1987q4	1988q1
	1988q4	1990q2	1996q2	1996q3	1990q2	1991q2	1989q4	1990q1
	1994q3	1995q3	1999q3	1999q4	1993q1	1993q4	1992q1	1992q2
	2000q1	2000q4	2002q4	2003q1	2003q3	2004q1	1996q1	1996q3
	2003q4	2004q2	2004q4	2005q2	2009q4		2002q4	2003q1
	2006q1	2006q2	2008q3	2009q2			2004q3	2005q2
Romania	1996q4	1997q3	1999q4	2000q1	2003q4	2004q1	2007q4	2008q2
	2000q4	2001q2	2008q3	2009q4	2004q4	2005q3		
	2004q1	2005q3			2006q4	2007q2		
	2006q4	2007q4						
Russia	2003q2	2004q1	2006q2	2006q3	2003q2	2004q2	2001q3	2002q2
	2007q1	2008q1	2008q4	2009q3	2007q2	2009q1	2009q3	2009q4
Singapore	2006q4	2008q1	2008q2	2009q2	2006q2	2007q4	2008q2	2009q2
Slovak	2004q3	2005q2	1998q4	1999q4	2008q2	2008q3	1999q1	1999q2
Republic			2006q1	2006q4	2009q1	2009q4	2007q2	2007q3
Slovenia	2002q3	2003q3	1997q4	1998q4	1998q3	1999q2	2008q1	2009q3
	2007q1	2007q4	2003q4	2004q2	2002q4	2003q3		
			2008q3	2009q3	2007q1	2007q4		
South	1987q1	1987q4	1985q2	1986q3	1985q1	1985q4	1987q4	1988q2
Africa	1997q2	1998q1	1990q2	1990q4	1991q2	1993q1	1999q1	1999q2
	2003q4	2004q4	1998q3	1999q2	1995q3	1996q2	2000q3	2001q1
	2005q2	2006q2	2000q3	2001q1	1997q2	1998q2		
			2007q1	2007q2	2003q4	2004q3		
			2008q3	2009q3	2006q1	2006q4		
Spain	1987q1	1988q2	1982q1	1983q2	1982q1	1982q4	1981q1	1981q2
	1990q4	1991q3	1985q2	1986q2	1988q2	1989q1	1983q2	1984q1
			1992q1	1992q2	1990q1	1991q2	1987q1	1987q3
			1994q2	1995q1	1992q3	1993q4	1991q4	1992q1
			2001q3	2002q2			1994q2	1995q1
			2008q1	2009q4			2001q3	2002q2
							2007q3	2009q3
Sri	1989q4	1990q3	1983q4	1984q4	1982q4	1983q3	1990q1	1990q2
Lanka	2000q1	2000q4	1994q2	1994q3	1990q3	1991q2	1993q2	1994q3
			1995q4	1996q1	1995q1	1995q3	1998q4	1999q1
			1998q3	1999q1	2007q3	2008q1	2001q4	2002q3
			2001q2	2002q1	2009q1	2009q3		
			2008q1	2008q2				

	Surges		Stops		Flight		Retrenchment	
	Start	**End**	**Start**	**End**	**Start**	**End**	**Start**	**End**
Sweden	1985q3	1987q3	1983q4	1984q3	1981q4	1982q3	1984q1	1984q4
	1989q2	1990q4	1991q2	1992q2	1986q2	1988q1	1991q1	1992q1
	2004q4	2005q3	1997q1	1997q3	1988q4	1990q3	1997q1	1997q3
			2008q4	2009q3			2008q1	2009q3
	1985q3	1987q3	1983q4	1984q3	1981q4	1982q3	1984q1	1984q4
Switzerland	2005q3	2006q2	2008q1	2009q1	2005q3	2006q1	2008q1	2009q1
Taiwan	1999q2	2000q2	1995q3	1995q4	1996q1	1996q3	1997q1	1997q4
	2003q3	2004q2	1997q4	1998q3	2000q1	2000q4	2002q2	2002q3
	2009q4		2001q1	2001q2	2003q3	2004q1	2008q2	2009q2
			2005q1	2005q2				
			2008q4	2009q2				
Thailand	1987q4	1990q3	1982q1	1982q2	1983q2	1983q3	1984q2	1984q4
	1995q2	1996q1	1992q1	1992q4	1985q2	1986q1	1986q4	1988q4
	2004q3	2006q1	1996q3	1998q2	1989q3	1990q2	1991q2	1991q4
			2007q1	2007q4	1993q2	1994q2	1994q4	1995q1
			2008q3	2009q3	2005q1	2006q1	1996q3	1997q2
					2009q4		2008q1	2009q3
Turkey	1990q1	1990q4	1991q3	1991q4	1991q1	1991q2	1994q3	1995q3
	1992q3	1993q4	1994q2	1995q1	1995q4	1996q3	2007q4	2008q2
	2000q1	2000q3	2001q1	2001q4	2006q4	2007q3	2009q2	2009q4
			2007q4	2008q2				
			2008q4	1980q1				
UK	1980q1	1980q2	1990q1	1990q3	1980q1	1980q2	1982q2	1983q1
	1985q3	1987q2	1991q3	1992q1	1985q4	1987q2	1991q3	1992q2
	1992q3	1993q4	1994q2	1994q4	1992q4	1993q2	1998q1	1998q4
			1998q1	1998q4	2000q3	2000q4	2001q3	2002q2
			2001q3	2002q2			2008q2	2009q2
			2008q2	2009q2				
US	1982q1	1982q3	1983q1	1983q3	1981q4	1982q3	1983q1	1984q1
	1992q3	1992q4	1988q3	1988q4	1986q2	1986q4	1990q3	1990q4
	1993q3	1994q3	1989q4	1990q4	1993q3	1994q2	1998q1	1998q4
	1999q4	2000q3	1998q1	1999q1	2004q1	2004q4	2001q3	2002q2
	2006q4	2007q2	2001q3	2002q2	2006q4	2007q3	2008q1	2009q1
			2008q1	2009q2				
Venezuela	2003q4	2004q1	2006q2	2006q4	2005q2	2006q2	2001q1	2001q4
	2005q2	2005q4					2006q4	2007q1
	2007q2	2008q1					2008q4	2009q3

Appendix Table 3a: Sensitivity Tests—Explaining Surge Episodes

Global Factors	Drop Crisis[1]	Fixed Effects	Add ER Regime[2]	Add Moodys[2]	Global Credit[3]	Financial System[3]	Growth Shock[4]	Inc. Official Flows[5]	HP Filter[5]
Global risk	-0.042**	-0.044**	-0.043**	-0.056**	-0.045**	-0.073**	-0.044**	-0.043**	-0.022**
	(0.017)	(0.021)	(0.017)	(0.021)	(0.018)	(0.023)	(0.020)	(0.016)	(0.004)
Global liquidity	2.161**	1.943*	1.768*	3.674**	1.408*	0.969	2.859*	1.790*	0.222
	(1.094)	(1.137)	(1.029)	(1.482)	(0.774)	(1.781)	(1.546)	(0.986)	(0.570)
Global interest rates	0.003	0.052	0.008	-0.028	0.017	-0.071	0.019	0.011	-0.008
	(0.056)	(0.082)	(0.056)	(0.076)	(0.060)	(0.083)	(0.065)	(0.055)	(0.022)
Global growth	21.622**	24.496**	23.900**	18.978*	21.130**	10.766	14.015	24.168**	7.859**
	(9.157)	(10.986)	(9.594)	(10.813)	(9.845)	(8.899)	(9.081)	(9.020)	(3.870)
Contagion Factors									
Regional	0.353	0.532	0.426	0.325	0.490*	0.206	0.387	0.405	0.538
	(0.252)	(0.341)	(0.261)	(0.309)	(0.275)	(0.265)	(0.286)	(0.283)	(0.354)
Trade	4.367	4.294	4.132	4.640	5.377	-1.513	5.217	4.462	1.452*
	(4.346)	(5.217)	(4.518)	(5.090)	(4.633)	(5.077)	(5.136)	(4.690)	(0.873)
Financial	-1.314	-0.686	-0.625	-0.555	-1.444	2.132	-0.454	-1.054	0.245
	(1.291)	(2.407)	(1.484)	(1.691)	(1.489)	(2.228)	(1.800)	(1.850)	(0.288)
Domestic Factors									
Financial system	0.012	0.293	-0.043	-0.154	0.017	-0.111	-0.002	-0.011	0.156*
	(0.195)	(0.410)	(0.195)	(0.216)	(0.188)	(0.145)	(0.204)	(0.194)	(0.083)
Capital controls	0.003	-0.090	-0.010	0.072	0.012	0.057	0.013	0.004	0.077**
	(0.072)	(0.113)	(0.072)	(0.082)	(0.078)	(0.107)	(0.082)	(0.070)	(0.023)
Debt to GDP	-0.005	-0.009	-0.005	-0.003	-0.004	0.002	-0.004	-0.005	0.003**
	(0.004)	(0.007)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.001)
Growth shock	1.379**	0.323	1.248**	1.523**	1.405**	2.144**	19.035**	1.205*	0.389
	(0.672)	(0.533)	(0.631)	(0.698)	(0.595)	(0.790)	(7.168)	(0.620)	(0.667)
GDP per capita	-0.001	-0.015	-0.002	-0.027*	-0.005	0.000	-0.002	-0.003	0.003
	(0.008)	(0.025)	(0.008)	(0.016)	(0.008)	(0.012)	(0.008)	(0.008)	(0.004)
			-0.261	-0.069*					
			(0.170)	(0.040)					
Sample Size	***3,275***	***3,479***	***3,479***	***2,971***	***3,324***	***2,344***	***3,323***	***3,479***	***3,245***

Notes: The dependent variable is a 0-1 variable indicating if there is an episode (either surge, stop, flight or retrenchment). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic framework with seemingly unrelated estimation across the four episodes and robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level. (1) Drops the recent crisis from 2008Q2 through 2009Q2 from the sample. (2) Additional control variables are included in the regression; for ER regime the control is a dummy equal to 1 if the country has a pegged exchange rate as defined in Shambaugh (2004); for Moodys the control is a numerical value for Moody's index, with a higher value indicating lower credit. (3) Global liquidity is measured as the growth in private credit by deposit money banks and other institutions to GDP. Financial system measures the soundness of the financial system as bank return on equity. Both variables are from Beck and Demirgüç-Kunt (2009). (4) Growth shock is measured as the deviation between actual growth and forecasted growth, as forecast in the IMF's WEO in the previous spring. (5) Episodes are constructed by either including reserves in order to capture private and official flows instead of just private flows or by using an HP filter with a 30% boundary.

Appendix Table 3b: Sensitivity Tests—Explaining Stop Episodes

Global Factors	Drop Crisis[1]	Fixed Effects	Add ER Regime[2]	Add Moodys[2]	Global Credit[3]	Financial System[3]	Growth Shock[4]	Inc. Official Flows[5]	HP Filter[5]
Global risk	0.021**	0.020**	0.022**	0.024**	0.023**	0.026**	0.021**	0.022**	0.026**
	(0.008)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.004)
Global liquidity	-3.928**	-2.216*	-1.319	-1.617	1.887**	-0.429	-1.283	-1.330	-0.670
	(1.207)	(1.246)	(1.077)	(1.039)	(0.753)	(1.213)	(1.008)	(1.038)	(0.496)
Global interest rates	0.101**	0.085*	0.063*	0.115**	0.075**	0.169**	0.061*	0.063*	0.053**
	(0.040)	(0.049)	(0.035)	(0.048)	(0.037)	(0.050)	(0.035)	(0.037)	(0.019)
Global growth	-6.810**	-1.740	-6.383**	-4.577	-7.856**	-4.741	-6.458**	-6.438**	-8.553**
	(2.747)	(3.309)	(2.649)	(3.143)	(2.661)	(3.321)	(2.674)	(2.826)	(1.585)
Contagion Factors									
Regional	0.237*	0.297**	0.274*	0.235	0.288**	0.410**	0.292**	0.270*	0.208
	(0.136)	(0.144)	(0.144)	(0.161)	(0.145)	(0.144)	(0.141)	(0.142)	(0.142)
Trade	1.718	6.235**	4.313*	5.989**	3.784*	7.003**	3.817*	4.390**	1.131*
	(2.555)	(2.934)	(2.273)	(2.347)	(2.229)	(2.368)	(2.215)	(1.952)	(0.656)
Financial	3.970**	4.831**	4.094**	3.801**	3.781**	3.320**	3.458**	4.014**	0.518**
	(0.892)	(1.065)	(0.876)	(0.868)	(0.909)	(0.797)	(0.824)	(0.976)	(0.191)
Domestic Factors									
Financial system	0.177	0.658**	0.294**	0.405**	0.287**	0.313**	0.355**	0.306**	-0.125
	(0.146)	(0.334)	(0.142)	(0.144)	(0.137)	(0.119)	(0.153)	(0.148)	(0.077)
Capital controls	0.028	0.059	0.032	0.019	0.024	0.097	0.040	0.037	-0.023
	(0.054)	(0.128)	(0.059)	(0.064)	(0.064)	(0.068)	(0.052)	(0.059)	(0.021)
Debt to GDP	-0.002	-0.015**	-0.002	-0.000	-0.002	0.003	0.000	-0.002	-0.002
	(0.003)	(0.006)	(0.003)	(0.003)	(0.003)	(0.003)	(0.002)	(0.003)	(0.002)
Growth shock	-2.116*	-2.327**	-2.704**	-2.821**	-2.746**	-3.999**	-32.987**	-2.706**	-0.446
	(1.174)	(1.007)	(1.046)	(1.019)	(1.043)	(1.381)	(4.785)	(1.040)	(0.591)
GDP per capita	-0.000	0.014	-0.001	0.010	-0.005	-0.008	-0.000	-0.002	-0.006*
	(0.006)	(0.017)	(0.006)	(0.010)	(0.006)	(0.007)	(0.006)	(0.006)	(0.003)
			-0.070	0.045					
			(0.147)	(0.028)					
Sample Size	***3,275***	***3,479***	***3,479***	***2,971***	***3,324***	***2,344***	***3,323***	***3,479***	***3,245***

Notes: The dependent variable is a 0-1 variable indicating if there is an episode (either surge, stop, flight or retrenchment). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic framework with seemingly unrelated estimation across the four episodes and robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level. (1) Drops the recent crisis from 2008Q2 through 2009Q2 from the sample. (2) Additional control variables are included in the regression; for ER regime the control is a dummy equal to 1 if the country has a pegged exchange rate as defined in Shambaugh (2004); for Moodys the control is a numerical value for Moody's index, with a higher value indicating lower credit. (3) Global liquidity is measured as the growth in private credit by deposit money banks and other institutions to GDP. Financial system measures the soundness of the financial system as bank return on equity. Both variables are from Beck and Demirgüç-Kunt (2009). (4) Growth shock is measured as the deviation between actual growth and forecasted growth, as forecast in the IMF's WEO in the previous spring. (5) Episodes are constructed by either including reserves in order to capture private and official flows instead of just private flows or by using an HP filter with a 30% boundary.

Appendix Table 3c: Sensitivity Tests—Explaining Flight Episodes

Global Factors	Drop Crisis[1]	Fixed Effects	Add ER Regime[2]	Add Moodys[2]	Global Credit[3]	Financial System[3]	Growth Shock[4]	Inc. Official Flows[5]	HP Filter[5]
Global risk	-0.037**	-0.036	-0.034*	-0.035	-0.035*	-0.046*	-0.033	-0.046*	-0.014**
	(0.019)	(0.026)	(0.020)	(0.022)	(0.020)	(0.025)	(0.024)	(0.025)	(0.007)
Global liquidity	-0.372	-0.454	-0.733	0.300	1.083	-0.564	0.390	-0.694	0.347
	(1.214)	(1.333)	(1.121)	(1.307)	(0.818)	(1.531)	(1.384)	(1.444)	(0.597)
Global interest rates	-0.033	-0.036	-0.034	-0.062	-0.021	-0.045	-0.008	-0.085	-0.022
	(0.066)	(0.115)	(0.068)	(0.089)	(0.069)	(0.105)	(0.086)	(0.071)	(0.029)
Global growth	4.392	1.286	3.005	4.792	1.631	7.755	2.441	13.904*	4.722
	(5.997)	(7.391)	(6.543)	(7.893)	(6.440)	(9.522)	(7.492)	(8.179)	(3.676)
Contagion Factors									
Regional	0.302	0.567**	0.288	0.216	0.183	0.184	0.193	-0.164	0.524
	(0.210)	(0.232)	(0.193)	(0.208)	(0.189)	(0.261)	(0.186)	(0.262)	(0.320)
Trade	1.508	-2.042	1.106	2.155	2.554	-0.753	2.619	5.949	1.597
	(5.888)	(9.172)	(6.635)	(6.958)	(6.789)	(7.537)	(7.896)	(8.575)	(1.087)
Financial	0.988	3.632	2.104	1.704	1.459	3.904	2.640	0.763	0.406
	(2.019)	(4.062)	(2.764)	(2.812)	(2.473)	(4.238)	(3.623)	(3.085)	(0.324)
Domestic Factors									
Financial system	0.053	-0.456	-0.055	-0.251	-0.030	-0.063	-0.067	-0.525**	0.056
	(0.243)	(0.441)	(0.241)	(0.241)	(0.219)	(0.185)	(0.223)	(0.247)	(0.086)
Capital controls	0.117*	0.177	0.106	0.141*	0.152**	0.221*	0.140*	0.144**	0.066**
	(0.069)	(0.124)	(0.067)	(0.077)	(0.073)	(0.118)	(0.076)	(0.064)	(0.026)
Debt to GDP	-0.005**	-0.007	-0.005**	-0.005*	-0.004*	-0.002	-0.005*	-0.001	0.001
	(0.002)	(0.007)	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.003)	(0.001)
Growth shock	0.139	-0.139	0.016	0.476	0.024	-0.476	-2.709	2.053**	0.503
	(0.782)	(0.746)	(0.753)	(0.763)	(0.769)	(1.144)	(6.865)	(0.765)	(0.533)
GDP per capita	0.002	0.015	0.002	-0.006	0.001	0.001	-0.002	0.017	0.002
	(0.011)	(0.028)	(0.010)	(0.013)	(0.011)	(0.017)	(0.012)	(0.011)	(0.004)
			-0.278	-0.027					
			(0.175)	(0.029)					
Sample Size	***3,275***	***3,479***	***3,479***	***2,971***	***3,324***	***2,344***	***3,323***	***3,479***	***3,245***

Notes: The dependent variable is a 0-1 variable indicating if there is an episode (either surge, stop, flight or retrenchment). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic framework with seemingly unrelated estimation across the four episodes and robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level. (1) Drops the recent crisis from 2008Q2 through 2009Q2 from the sample. (2) Additional control variables are included in the regression; for ER regime the control is a dummy equal to 1 if the country has a pegged exchange rate as defined in Shambaugh (2004); for Moodys the control is a numerical value for Moody's index, with a higher value indicating lower credit. (3) Global liquidity is measured as the growth in private credit by deposit money banks and other institutions to GDP. Financial system measures the soundness of the financial system as bank return on equity. Both variables are from Beck and Demirgüç-Kunt (2009). (4) Growth shock is measured as the deviation between actual growth and forecasted growth, as forecast in the IMF's WEO in the previous spring. (5) Episodes are constructed by either including reserves in order to capture private and official flows instead of just private flows or by using an HP filter with a 30% boundary.

Appendix Table 3d: Sensitivity Tests—Explaining Retrenchment Episodes

Global Factors	Drop Crisis[1]	Fixed Effects	Add ER Regime[2]	Add Moodys[2]	Global Credit[3]	Financial System[3]	Growth Shock[4]	Inc. Official Flows[5]	HP Filter[5]
Global risk	0.020*	0.013**	0.013**	0.013**	0.015**	0.015**	0.011*	0.027**	0.017**
	(0.010)	(0.006)	(0.006)	(0.006)	(0.006)	(0.007)	(0.006)	(0.005)	(0.004)
Global liquidity	-1.389	-0.462	0.088	-0.124	1.464**	-0.416	0.035	0.108	-0.876
	(1.186)	(1.089)	(0.994)	(0.994)	(0.740)	(1.098)	(0.984)	(1.154)	(0.547)
Global interest rates	0.127**	0.143**	0.104**	0.131**	0.097**	0.116**	0.092**	0.067	0.089**
	(0.046)	(0.055)	(0.041)	(0.048)	(0.042)	(0.048)	(0.042)	(0.041)	(0.020)
Global growth	-6.130**	-2.378	-4.643	-2.905	-4.879	-2.654	-5.055*	-2.075	-6.030**
	(3.044)	(3.341)	(2.863)	(3.056)	(3.122)	(3.535)	(2.975)	(2.823)	(1.210)
Contagion Factors									
Regional	-0.125	-0.236	-0.186	-0.069	-0.281*	0.089	-0.138	0.618**	0.057
	(0.156)	(0.195)	(0.159)	(0.163)	(0.157)	(0.169)	(0.158)	(0.128)	(0.171)
Trade	5.460**	7.633**	7.032**	5.917**	7.046**	6.043**	6.564**	6.428**	2.025**
	(2.530)	(2.799)	(2.471)	(2.827)	(2.470)	(3.027)	(2.619)	(1.974)	(0.508)
Financial	3.619**	5.252**	4.467**	4.977**	4.256**	4.767**	4.121**	2.842**	0.424**
	(0.987)	(1.102)	(0.983)	(0.997)	(1.003)	(1.024)	(0.980)	(0.878)	(0.191)
Domestic Factors									
Financial system	0.027	0.452	0.107	0.273	0.126	0.012	0.150	0.277*	-0.011
	(0.184)	(0.339)	(0.174)	(0.173)	(0.181)	(0.141)	(0.180)	(0.166)	(0.087)
Capital controls	0.072	0.006	0.074	0.064	0.084	0.124*	0.078	0.046	0.004
	(0.054)	(0.113)	(0.057)	(0.068)	(0.063)	(0.065)	(0.059)	(0.058)	(0.020)
Debt to GDP	-0.002	-0.014**	-0.003	-0.004	-0.002	-0.003	-0.002	-0.003	-0.000
	(0.003)	(0.005)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.001)
Growth shock	0.356	0.396	-0.124	-0.666	0.004	-1.021	-14.621**	-1.586**	-0.238
	(1.037)	(1.025)	(0.967)	(1.073)	(0.912)	(1.185)	(4.552)	(0.722)	(0.555)
GDP per capita	0.011	0.021	0.013**	0.026**	0.011*	0.011	0.013**	0.001	-0.003
	(0.007)	(0.017)	(0.006)	(0.010)	(0.006)	(0.008)	(0.005)	(0.007)	(0.003)
			-0.036	0.058**					
			(0.145)	(0.028)					
Sample Size	***3,275***	***3,479***	***3,479***	***2,971***	***3,324***	***2,344***	***3,323***	***3,479***	***3,245***

Notes: The dependent variable is a 0-1 variable indicating if there is an episode (either surge, stop, flight or retrenchment). Variables are defined in Section 3.2. Estimates are obtained using the complementary logarithmic framework with seemingly unrelated estimation across the four episodes and robust standard errors clustered by country. ** is significant at the 5% level and * at the 10% level. (1) Drops the recent crisis from 2008Q2 through 2009Q2 from the sample. (2) Additional control variables are included in the regression; for ER regime the control is a dummy equal to 1 if the country has a pegged exchange rate as defined in Shambaugh (2004); for Moodys the control is a numerical value for Moody's index, with a higher value indicating lower credit. (3) Global liquidity is measured as the growth in private credit by deposit money banks and other institutions to GDP. Financial system measures the soundness of the financial system as bank return on equity. Both variables are from Beck and Demirgüç-Kunt (2009). (4) Growth shock is measured as the deviation between actual growth and forecasted growth, as forecast in the IMF's WEO in the previous spring. (5) Episodes are constructed by either including reserves in order to capture private and official flows instead of just private flows or by using an HP filter with a 30% boundary