

# THE RELATIONSHIPS AMONG CAPITAL FLOW SURGES, REVERSALS AND SUDDEN STOPS

## ABSTRACT

We investigate the behavior of capital flow surges and sudden stops or capital flow reversals. The extent to which surges are related to reversals is the major focus of our paper. We distinguish "true" sudden stops based on the behavior of gross foreign flows from reversals of net capital flows. We find that despite the large differences in the number of surges identified by seven different measures a majority of surges do end in reversals of some type. The percentages tend to be slightly over half for surges in net capital flows but are higher in the case of gross capital flows, especially for sudden stops. On average roughly 70 percent of gross surges end in sudden stops. This highlights the importance of distinguishing between gross and net flows. A surprising finding is that more than half of sudden stops and net capital flow reversals are not preceded by surges.

*JEL Classification:* F3, F32

*Keywords:* capital flows, surges, sudden stops, capital flow reversals, financial crises.

# **THE RELATIONSHIPS AMONG CAPITAL FLOW SURGES, REVERSALS AND SUDDEN STOPS**

## **1. INTRODUCTION AND OVERVIEW**

Large rapid inflows and outflows of capital have become a prominent and often disruptive feature of the international financial landscape. While there is a long tradition of worrying about capital flight where domestic residents flee a country, more recently the major focus has been on the frequency of large capital inflows that then reverse themselves. Since the dramatic episodes of capital surges and subsequent outflows associated with the Mexican and Asian crises in the 1990s, this subject has attracted considerable attention from researchers and policy makers.

While the traditional view was that large capital inflows showed that a country was doing well and its fundamentals were solid, such large inflows have frequently become a source of concern because of the fear that they will soon reverse themselves. Thus policy concerns with the "management" of capital flows now focus as much or more on large capital inflows as on the possibility of domestic capital flight.

Policies to deal with such capital inflows have become a major component in discussions of macro prudential policies and the resurgence of interest in capital controls. Standard international monetary theory demonstrates that there is a strong case for attempting to offset the effects of temporary large capital flows through such measures as sterilized intervention in the foreign exchange market to limit potentially disruptive effects on exchange rates and/or money supplies. Of course a major difficulty in implementing such strategies is the problem of judging whether the inflows are likely to be temporary or not. While there is little prospect of being able to make such judgments with high accuracy, the more we can learn about the nature of such

capital flows the better will be the position of policymakers when they have to make such judgments.

Thus it is not surprising that there has been a great deal of recent research on the statistical properties of these large inflows and outflows. Most of the first phase of this literature on capital flows and reversals used measures that conflate the behavior of domestic and foreign capital by focusing on “net” capital flows and referring to any large drop in these flows as being “sudden stops”.<sup>1</sup>

More recent studies, however, have shown the importance of distinguishing between the behavior of foreign investors and domestic residents. Calderon and Kubota (2013), Rothenberg and Warnock (2011), Forbes and Warnock (2012) and Cavallo et al. (2013) have all found that a number of episodes that have been labeled sudden stops based on the behavior of net flows have been dominated by capital flight by domestic residents.<sup>2</sup>

Our study is in that tradition but focuses on an issue that has been little explored to date, the relationship between capital flow surges and sudden stops.<sup>3</sup> This issue has been the focus of many popular discussions. We seek to fill this gap by drawing on the recent focus on distinguishing among net and gross flows to investigate the relationships among capital flow surges and reversals.

The terminology used to identify extreme behavior of capital flows is sometimes confusing. In section 2 we draw on some of the recent literature to attempt to clarify some of the definitional issues in a way that matches statistical measures with the way terms are used in

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<sup>1</sup> See, e.g., Calvo (2004) and Sula (2006).

<sup>2</sup> Other studies stressing the need to distinguish between net and gross flows are Bluedorn et al. (2013), Ghosh et al. (2014), and Janus and Riera-Crichton (2013).

<sup>3</sup> Exceptions are Agosin and Huaita (2011) and (2012).

general discussions. We focus on net versus gross measures of capital flows and on the relationships between sudden stops and capital flow reversals, terms that have often been used interchangeably in the literature.

We emphasize that while all of the statistical measures of capital flow surges in the literature focus on the same idea of unusually large capital flows there have been considerable differences in the specific ways that this concept has been implemented. Of course there have also been differences in the statistical measures used to identify episodes of sudden stops and capital flow reversals but they have already been better documented (Efremidze et al., 2011). Indeed in related research we found that the surge methods used in the recent literature differ by a factor of almost three in the number of surge episodes that they identify (Crystalin et al., 2014).

In section 3 we briefly highlight some of the possible reasons why surges may make sudden stops and reversals more likely. Here we draw heavily on the recent literature on behavioral finance and complexity economics. In section 4 we present the main empirical results. Despite the differences in numbers of surges identified we find that for all of the different measures of surges there is a greater than 50 per cent and as high as 78 percent conditional probability of they are being followed by sudden stops or reversals. The relationship is stronger, however, when measures of gross rather than net flows are used. This holds across all of the measures of surges. The majority of surges last only one year and these surges have a lower probability of being reversed than the 40 per cent or so of surges that last longer.

Contrary to views that previous capital flow surges are the predominant cause of sudden stops and reversals we find that a substantial proportion of sudden stops and reversals are not preceded by surges. Here the proportions vary considerably depending on the measure of surges used. For gross flows the percentages range from 28 to roughly 70 per cent while for net flows they vary from 36 to 72 per cent.

In section 4 we focus on the behavior of domestic versus foreign investors during sudden stops and reversals. As have several other recent studies, we find that the actions of domestic investors are quite important at times. Thus concerns about instabilities in capital flows should not focus exclusively on the behavior of foreign investors. In section 5 we offer a brief discussion of two factors, current account deficits and the composition of capital flows that appear to have important influences on the probabilities that surges will end in sudden stops or reversals. Our analysis does not go as far to apply regression analysis in this paper. We focus on initial empirical exploration of relationships with conditional probabilities. Section 6 concludes with brief discussions of implications for policy and directions for further research.

## **2. CLARIFYING DEFINITIONS AND STATISTICAL MEASURES OF SURGES, REVERSALS, AND SUDDEN STOPS**

Data for international capital flows typically comes from the financial account of the balance of payments statistics. In the early literature capital flows were measured on a net basis which includes both the asset and liability sides of the financial account. A significant decrease in this net balance was generally referred to as a sudden stop following the focus on this phenomenon by economists such as Calvo (1998) and Dornbusch et al. (1995). However more recent research highlighted the fact that both capital inflows and outflows could be generated by transactions of domestic residents as well as foreign investors and that reversals of net capital flows need not be caused only by sudden stops of capital inflows. Thus it was not appropriate to label all reversals of net capital flows as sudden stops as had been done in much of the earlier literature. This gave rise to efforts to distinguish between the behavior of domestic and foreign investors using the available data on changes in assets and liabilities. These have been generally referred to as gross

as opposed to net flows.<sup>4</sup> When the concern is with potential instabilities generated by the behavior of foreign investors, surges and sudden stops should be measured by the behavior of the gross flows of foreign investors. On the other hand, recent research has shown that domestic residents can also account for large shift in capital flows.

Forbes and Warnock (2012) have distinguished among four types of large capital movements: surges<sup>5</sup>, stops, flight, and retrenchment, with the first two categories referring to the behavior of foreign investors and the latter two to the behavior of domestic residents. Cavallo et al. (2013) go further and provide the most complete taxonomy of the various possible types of relationships among foreign, domestic, and net capital flows during large events. Unfortunately from the perspective of using labels that coincide with normal usage of the language, Cavallo et al. (2013) label all of the different combinations as types of sudden stops. They include a sharp increase in capital outflows from domestic residents under their broad category of sudden stops which surely conflicts with normal usage.

We agree with Rothenberg and Warnock (2011) who refer to the need to identify episodes "in the way the literature defines them in words" (p509). They emphasize the difference between what they call "true" sudden stops and sudden flights. Their operationalization of their true sudden stop measure is open to question, however. They first identify episodes of capital flow reversals using net capital flows and then define a true sudden stop as one where the decline in foreign inflows is greater than the increase in domestic outflows. For some purposes this analytic category is useful, but it doesn't conform to standard usage of a sudden stop as a sharp

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<sup>4</sup> The generally available data gives assets and liabilities only on a net basis however. So we only have net gross flows. Thus we cannot identify the gross inflows and outflows of residents and foreign investors. While for convenience we will refer to domestic and foreign investors, capital flows are often initiated by borrowers as well.

<sup>5</sup> Reinhart and Reinhart (2008) refer to surges as capital flow bonanzas.

drop in capital inflows from abroad.<sup>6</sup> In many cases such events will also involve outflows of domestic capital. In these cases net reversals will be greater than the true sudden stops of foreign investors.<sup>7</sup> The Asian crisis offers a prime example. Even if the outflows by domestic residents exceeded the large drop in foreign inflows by our definition this would still be a case of a sudden stop, albeit accompanied by large domestic outflows.. In other words it seems perfectly consistent with common usage that a severe crisis could involve both sudden stops and sudden flight.

Looking at the behavior of both domestic and foreign investors is important even where the behavior of one of the groups isn't large enough to qualify as an extreme event. The most important economic effects of capital flows such as pressures for currency appreciation and depreciation and balance of payments crises result from net flows. Studying gross flows as a separate category, on the other hand, not only leads to a better match between definitions and statistical measures but also helps to develop a better understanding of the factors that influence different types of capital flows. Looking at just the net flows can hide many clues about the factors influencing the behavior of different types of capital flows. This can be important both for policy and for testing different theories about the behavior of capital flows.

In summary we believe that it is most useful to define sudden stops as sharp reductions in capital inflows from abroad. These will not always necessarily require a reversal from capital inflows to outflows. A fall in foreign inflows from say 8 to 1 per cent of GDP would qualify as a sudden stop even though the flows of foreign capital always stay positive. Where current account

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<sup>6</sup> We should stress that our argument is for the use of different terminology, not that the concept that Rothenberg and Warnock developed is not useful for some purposes. Indeed in section 4 following Calderon and Kubota (2013) and Cowan et al. (2007), we further investigate the extent to which reversals are primarily foreign driven, domestic investor driven, or mixed.

<sup>7</sup> In other cases sudden stops may be accompanied by inflows of domestic capital making the net reversals smaller than the gross ones.

balances had adjusted to the large initial inflows, the drop from +8 to +1 per cent of GDP would likely cause more disruption than a switch from 1 percent positive to 1 percent negative.

Such sudden stops need not always lead to a reversal in net flows. Retrenchments of investments by domestic investors could offset the drop in inflows by foreigners. Of course capital flight by domestic residents could make net reversals greater than the amount of the sudden stop.

In section 3 we focus on the behavior of sudden stops of foreign investors ("true sudden stops") and on the more traditional measure of large reversals in net capital flows.

### **3. REASONS WHY SURGES CAN MAKE REVERSALS AND SUDDEN STOPS MORE LIKELY**

There are many reasons to expect that capital surges are likely to increase the probability of sudden stops. To the extent that capital flows to emerging markets are generated by cyclical conditions in the advanced economies, capital that flows into emerging markets from advanced economies when liquidity is loose will likely be reversed as credit conditions tighten in the advanced economies. Large capital inflows may also generate conditions in the receiving countries that make large reversals more likely. Surges in capital inflows may lead to currency appreciation under flexible rates or monetary expansion under fixed rates which lead to a worsening of current account balances.<sup>8</sup> This in turn makes countries more vulnerable to currency crises and capital flow reversals. In the spirit of second generation currency crisis models, Montiel (2013) provides a model in which such current account worsening can interact

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<sup>8</sup> Of course most countries have the ability to at least partially offset such direct effects through, for example, sterilized intervention, although factors such as political pressures may often keep them from doing so. Amri et al. (2014) find that capital flow surges are linked to credit booms considerably less frequently than is often assumed.



with currency mismatches, large short term debt and low reserves to create multiple equilibria, thus allowing a likely shift from a good (capital boom) to a bad (sudden stop) equilibrium.

There is also a fairly widespread belief that capital that has moved internationally will be more sensitive to changes in conditions than capital has remained at home, in part because of the well documented home country bias. For example it is not uncommon for monetary authorities to worry that when slumps or crises occur foreign investors are much more likely to flee the stock market than domestic investors.<sup>9</sup>

In addition, factors emphasized in the behavioral finance and complexity economics literatures suggest the possibility that internal dynamics may contribute to boom-bust episodes in capital flows in a way similar to what many believe occur at times in stock markets.<sup>10</sup> As both Fama (2014) and Shiller (2014) note, discussions of speculative bubbles are often poorly specified, but this doesn't mean that such phenomena do not exist. As Shiller stresses bubbles do not require wildly irrational behavior. Typically bubbles and surges begin with new developments that do call for substantial adjustments. The bubble like behavior begins when such adjustments are pushed too far. In many cases imperfect incentive structures generate private incentives to follow strategies of herding and excessive risk taking.

Furthermore, actors are typically operating with limited information in the face of complex uncertainties. Thus it is not surprising that they may be herding in the use of the “lenses” or “mental models” through which situations are viewed. Switches from surges to reversals can reflect shifts from focusing primarily on the positive factors to emphasis on the negative ones. Such behaviorally biased changes in perceptions of the most important

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<sup>9</sup> For discussion of the Korean example see Willett et al. (2009).

<sup>10</sup> Agosin and Huaita (2011) apply Minsky's theory to capital flow booms and reversals, while Efremidze et al. (2014) provide a broader analysis that draws also on complexity economics and other aspects of behavioral finance. Of course, the possibility of speculative bubbles is still challenged by some believers in efficient markets, see for example Eugene Fama's Nobel lecture (2014). Support for the possibility of bubbles is gaining ground among economists, however. See, for example, Robert Shiller's Nobel lecture (2014).

fundamentals can cause shifts in capital flows much larger than would be expected from rational responses on actual changes in the fundamentals. In other words, on top of potentially rational behavior under uncertainty, psychological biases such as collective mood swings from optimism to pessimism could generate and/or amplify swings from capital surges to reversals.

Most often, however, we expect that rather than pure mood shifts, transitions from surges to sudden stops are generated by developments that cause reevaluations of positive and negative fundamentals. This was the case for much of the contagion surrounding the Asian crisis in 1997, where the Thai crisis caused investors and borrowers to reevaluate the risks of substantial currency depreciations and the health of financial sectors in a number of other Asian countries.<sup>11</sup> This was a classic case of a wakeup call that caused market participants to realize that they had been operating with a false mental model or balancing of positive and negative fundamentals.

Thus we have many possibilities to explain occasional rapid shifts from large capital inflows to large outflows. It is also important to recognize, as Shiller (2014) emphasizes, that not all bubbles end in crashes. This is also true of surges and large reversals, hence suggesting that some of such non-sudden-stop type surges may also have had bubble type elements.<sup>12</sup>

#### **4. EMPIRICAL RESULTS**

In this section we present empirical results which are primarily based on two-way conditional probabilities among episodes of surges, sudden stops and reversals. We also explore regularities across decades, how surges with different durations are related to reversals, contrast

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<sup>11</sup> See, for example, Willett et al. (2004b).

<sup>12</sup> Efficient market type explanations are also possible. Portfolio theory suggests that in the face of expected improved risk-return properties of an asset we should primarily observe stock adjustments rather than large continuing flows. Since the stock adjustment element may involve substantial lags for some types of international flows such flows could continue for some time before portfolios and loan books are fully reallocated, after which large capital inflows would cease.

domestic and foreign capital flows driven reversals, and examine influence of capital flow surge compositions on the likelihood of reversals. Due to space constraints of the paper and the amount of initial empirical analysis, we plan to present multivariate regression analysis in a separate paper.

We use annual data for 46 emerging market countries from 1980 to 2010.<sup>13</sup> As mentioned earlier, we calculated seven different types of surge measures but only one type of indicator for sudden stops and reversals. Literature on surges is younger than on sudden stops and reversals and there are previous studies contrasting various measures of sudden stops and reversals.<sup>14</sup> To keep the analysis as simple as possible and possible comparison combinations to reasonable level, we chose a commonly used method for sudden stops and reversals. We define capital flow reversals and sudden stops as large decreases in capital flows. More specifically, in a given year, a capital flow reversal takes place if the decrease in net capital flows exceeds three percent of GDP. Likewise, if the decrease is in gross foreign inflows we use the term sudden stop.<sup>15</sup> This definition assures that the capital flow changes are economically important and allows easy comparison across countries.

While presenting results based on a simple measure of reversals and sudden stops, for this paper we chose to provide a more comprehensive look to the surge measures. Crystalin et al. (2014) survey and examine the definitions of capital flow surges that have been used in the

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<sup>13</sup> We include some of the lower income European countries such as Greece. A full list of the countries is given in appendix A.

<sup>14</sup> See Efremidze et al. (2011) and Zhao et al. (2014).

<sup>15</sup> Studies used several additional criterions for measuring capital flow reversals and sudden stops. Calvo et al. (2004) required the capital account surplus and in the previous year and Cavallo and Frankel (2008) defined reversals if a country experiences a negative economic growth in the same or following year. Honig (2008) and Hutchison, Noy and Wang (2010) use additional criterion of sudden stop which is that an economy to have current account deficit improvement in the same year or in the following year of a sudden stop. Kim (2013) used these additional criterions to calculate the sudden stops and reversals, and he showed that the numbers of episodes are slightly different but these methods capture over 90% of the same episodes. Thus, in this paper we focus on the basic requirement which is the change in capital flows are greater than three percent of GDP. A number of additional methods have also been used in the literature. For a recent survey see Efremidze et al. (2011).

recent literature and find that there are substantial differences in the number of surges identified by the different methods. Appendix B provides the definitions of seven surge measures that are used in the following sections.<sup>16</sup>

We find that the largest number of episodes identified was almost three times the lowest number of episodes identified. We begin by investigating whether these different surge methods also lead to differences in the proportions of surges that end in reversals and sudden stops.

### ***Proportions of Surges Ending in Reversals or Sudden Stops***

In Table 1, we present the numbers of surges identified by the various methods and how they are related to sudden stops or reversals within next 2 years of a surge. The number of surge episodes range from 57 to 159 based on gross capital flows and from 53 to 161 based on net capital flows. Despite these wide ranges the average numbers of surges identified using the gross and net measures are similar, average of 99 episodes for each type. There is also a little difference in the number of sudden stops identified for gross flows, 140, and reversals of net flows, 142 (Table 4, Panel A)<sup>17</sup>.

The proportions of surges that end in sudden stops or reversals vary much less than the numbers of surges identified by the various methods. On average 61.9% of gross flow surges are followed by reversals (with a range of 43.2%-71.9%), while 57.5% of net surges are followed by reversals (the range: 47.5%-67.9%). When we turn to the results on sudden stops, we observe that on average 71.5% of gross surges are followed by sudden stops (with range of 48.6%-

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<sup>16</sup> All of these methods look at measures of deviations from individual country trends. In a paper which came to our attention after our paper was substantially completed, Molnar et al. (2013) use a measure based on deviations from group trends.

<sup>17</sup> These numbers are averages. The numbers of sudden stop and reversal episodes varies due to the statistical analysis requirements in relation to different surge measures for a given sample. Reversals and sudden stops in the first two years of the sample (1980 and 1981) are not counted in two-way frequency analysis if there is no surge episode in those two years, as we are looking to measure frequencies of reversals or sudden stops occurring within two years from previous surge episode.

80.7%), while only 51% of net surges lead to sudden stops (the range is 44%-60.4%). Gross surges are followed by more reversals or sudden stops than net surges, on average 4.4 percentage point higher probability for reversals and 20.5 percentage point higher for sudden stops. The differences are much larger for Surge 3 and Surge 6 indicators.

Thus, one implication is that policy makers should pay particular attention to surges in gross foreign flows. While gross surges are associated with only modestly higher conditional probabilities of reversals relative to net surges the gross flows are much more likely to end in sudden stops than are net surges. This evidence supports the importance of focusing on gross flow surges in addition to net flow surges and to define sudden stops as large drops in gross foreign capital flows only and to analyze them separately from reversals in net flows.<sup>18</sup>

As we expected there is a tendency for the surge methods that identify fewer surges to be associated with a higher proportion of sudden stops and reversals since these methods identify the episodes with largest capital inflows, but the relationship isn't a simple linear one. Therefore, officials should use more than one definition to identify surges and perhaps develop a metric that combines several of them<sup>19</sup>.

INSERT TABLE 1 HERE

### ***Duration of Surges***

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<sup>18</sup> It can be argued that reversals in net flows are more disruptive than sudden stops of gross flows, but the latter can also generate substantial disruptions in financial markets.

<sup>19</sup> We also calculate percentages based on whether there is a sudden stop or reversal within the following one year. Naturally the percentages go down, but not by as much as one might expect. For gross flows the average percent that end in sudden stops drops by only about 3 percent, while for net flows it drops by about 6 percent. The modest changes in probabilities suggest that if a surge is not followed by a sudden stop or reversal within one year, then there is still a possibility of such an event in the second year, but the likelihood of it taking place is very low.

Another interesting set of questions involves the typical length of surges and whether longer surges are more or less likely to be followed by sudden stops or reversals. These issues are addressed in Tables 2 and 3. To keep the numbers manageable, we report only the averages from the different methods. In Table 2 we report the proportions of surges of different lengths for both gross and net surges. We find quite similar patterns of duration for both types with roughly sixty percent lasting only one year and twenty percent lasting two years.<sup>20</sup> The proportions continue to drop as longer surges are considered, with less than ten percent lasting more than three years.

INSERT TABLE 2 HERE

In Table 3 we report the percentages of eventual reversals of surges of different lengths. Consistent with Table 1 we find that the probability of reversals is substantially higher for gross than net surges for all duration lengths. We find that two year surges are more likely to be reversed than those that last only one year, with the percentages rising from 56 to 76 percent for gross flows and from 31 to 47 percent for net flows.<sup>21</sup> As we move to three year surges there is somewhat lower tendency for the probability of gross surges to end in sudden stops and even lower likelihood for net surges to end in reversals. Four year surges are less likely to be reversed than two or three year surges, but slightly more likely than one year surges. However, the number of four year surges is sufficiently low for statistical purposes, thus we put little weight on

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<sup>20</sup> For an analysis of the length of surges using duration or survival analysis see Molnar et al. (2013). On the analysis of the duration of crises see Mecagni et al. (2007). Furceri et al. (2012) find that most reversals only last one year, but about a quarter of them last three years or more.

<sup>21</sup> Using a different methodology Agosin and Huaita (2012) also find that the probability of reversals increases for longer surges.

the results of the four year surges.<sup>22</sup> Overall, longer duration surges (2 and 3 years long) have substantially greater probability to reverse either as sudden stops or reversals.

INSERT TABLE 3 HERE

### ***Proportions of Reversals and Sudden Stops That Are Preceded by Surges***

Another inference from the results is that the relationship between surges and subsequent reversals or sudden stops is weaker than is often assumed. A substantial proportion of sudden stops and reversals are not related to prior surges. Recent arguments by economists such as Agosin and Huaita (2011) have challenged what they consider to be the traditional view that most capital flow reversals are due to policy failures of the recipient countries. They argue instead that "capital inflow booms ... are the ultimate cause of capital account crises, or sudden stops" (p664). Our analysis also stresses the importance of capital flow surges in generating reversals but we do not find them to be as dominant a cause as Agosin and Huaita (2011) argue. Some of our disagreement comes down to the meaning of "usually" in their statement that "...capital account crises, or sudden stops, are usually caused by capital surges..." (p670). Table 4 shows that on average less than half of sudden stops or reversals were preceded by surges. We believe this finding strains the common meaning of usually. On the other hand these percentages vary a good deal with the methods of calculating surges. Thus it is clear that avoiding capital flow surges is not a sufficient condition for avoiding disruptive sudden stops and capital flow reversals.

INSERT TABLE 4 HERE

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<sup>22</sup> We also calculate the average after dropping the highest and lowest values. The results are very similar with those using the total values.

### ***The Two-Way Relationship between Sudden Stops and Reversals***

We also documented two-way frequencies between sudden stops and reversals (see Table 5). Within the proximity of two years sudden stops and reversals overlap about 80% of the time. Thus, they are closely related and having a sudden stop means that there is also high likelihood of having a reversal. This is also so the other way around. Thus for investors or policy makers spotting one of them first can be a clear warning sign for expecting the other within a two-year window (as we see in our sample). Still they differ enough that it is important to consider them separately.

INSERT TABLE 5 HERE

### ***The Roles of Domestic and Foreign Investors***

Recent literature has appropriately pointed out that it is important to consider the behavior of domestic as well as foreign capital. While the most popular image is of capital flow reversals being generated by foreign investors, this is far from always being the case. In the 1960s and 70s considerable attention was given to problems of capital flight from developing countries. As many countries began to adopt more prudent economic policies and international capital mobility increased it is not surprising that attention began to focus more strongly on the behavior of foreign investors.

In Table 6 and Figure 1, we see that foreign investors have been the predominant force in a majority of capital flow reversals, but that domestic investors lead in a sufficiently large minority of cases that it would be dangerous to ignore them. The last row shows that there were foreign outflows in 122 episodes out of the total of 150 reversals, over 80 percent – the vast majority of reversals. On the other hand, in 95 episodes out of 150 reversals, over 60 percent,



there were domestic outflows. Overlap of foreign and domestic outflows took place only 44.7 percent of the time. Thus importance of foreign flows dominates and as we proposed earlier having a distinctly defined category of events for large gross foreign outflows – sudden stops – makes sense. Moreover, these results support the arguments that foreign investors are the most important actors in the emerging markets’ capital flow reversals, but that domestic investors also play a substantial role.

INSERT TABLE 6 HERE

INSERT FIGURE 1 HERE

While most of the policy focus has been on the behavior of foreign capital the importance of domestically generated flows has increased over time as capital controls have been reduced. This is shown by looking at the numbers by decade; only two reversals (6.3%) out of 32 involved only domestic outflows in 1980s, while the number increased to over 20% in 1990s and 2000s. In over 40 percent of the cases there were both domestic and foreign outflows.

Forbes and Warnock (2012) have stressed that when foreign capital flows out domestic residents may repatriate some of their own foreign investments to fill in part of a financing short fall. One way to investigate this issue is to see how frequently net capital flow reversals are greater than the sudden stops in foreign gross flows. When the net flow changes are smaller it implies that the behavior of domestic investors is partially offsetting the behavior of foreign capital, while when the changes in net flows are larger this implies that domestic investors are adding to the shift in foreign capital flows.

In Table 7, we see that for net reversals for the total period in 96 cases (64%) the net reversals are greater than the gross foreign capital reversals while in 54 cases (36%) the gross

foreign capital reversal were greater than the net. This suggests that while on average domestic investors change behavior in the same direction as foreign investors in a substantial minority of cases they act to partially offset the behavior of foreign investors. We also see that the proportion of offsetting cases has been increasing over time. While the percentage is 31.2% in the 1980s, it rises to 45.5% in the 2000s.

On the other hand, with sudden stops in gross foreign capital flows instances where the changes in gross flows exceed those in net flows represent 76.6%. This frequency has been increasing over time, going from 76.6% in the 1980s to 83.6% in the 2000s.

INSERT TABLE 7 HERE

We also find that in some episodes the differences between the behavior of domestic and foreign investors are so great that the net and gross flows actually move in opposite directions. Table 8 shows that this has occurred 18 percent of the time for net reversals and 17.2 percent for gross reversals.

INSERT TABLE 8 HERE

To investigate further the relative roles of domestic and foreign investors in capital flow reversals, we follow Cowan et al. (2007) and Calderon and Kubota (2013) and classify reversals as being largely foreign driven or largely domestic driven or mixed. They define foreign driven reversals as where the change of foreign flows over total flows is greater than 75%; domestic driven episodes are when that amount is less than 25%; and mixed episodes are where ratio is in between 25% to 75%. As shown in Table 9, we find that roughly 60 percent of the reversals were

foreign driven, almost 23 percent were domestic driven and 18 percent were mixed.<sup>23</sup> However, when we consider reversals that were preceded by surges the proportion that were foreign driven rises to 73.8 percent, while only 53.7 percent of non-surge related reversals were foreign driven. It shows that when reversals are preceded by surges they are more likely to be driven by foreign investors.

INSERT TABLE 9 HERE

Looking at the results by decades in Table 10, we see that foreign investors have been a consistently important source of capital flow reversals in emerging markets for the past three decades. On the other hand, while the numbers of domestic driven episodes were always lower than foreign driven ones, they increased substantially since the 1980s. Interestingly both here and in Table 4 we find much smaller change between the 1990s and 2000s.

INSERT TABLE 10 HERE

### ***Some Factors That Contribute to Reversals and Sudden Stops***

It is important for policy makers to know that there is a substantial probability that capital flow surges will be reversed. Many surges are not reversed, however, so it is important to investigate the factors that make particular surges more likely to be reversed.<sup>24</sup> A substantial investigation of this issue is beyond the scope of this paper but we wish to report that our preliminary research suggests an important consideration is the size of current account

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<sup>23</sup> These results are broadly similar to those found by Cowan et al. (2007) using a data set of both advanced and emerging economies from 1975 to 2004.

<sup>24</sup> See Broto et al. (2011), for example, for the factors that affect the volatility of various types of capital flows. For theoretical discussion of key factors generating capital flow surges and reversals, including the role of factors emphasized in the literature on behavioral finance, see the analysis and references in Agosin and Huaita (2011), Calvo et al. (2008), Efremidze, Rutledge, and Willett (2015), and Montiel (2013).

deficits.<sup>25</sup> Figure 2 shows that as current account deficits grow beyond three percent of GDP, the probabilities of both reversals in net flows and sudden stops of foreign flows begin to increase substantially.

INSERT FIGURE 2 HERE

The composition of capital surges may also have an important effect on the probabilities of reversals. It is commonly argued that while foreign direct investment flows can be subject to sudden stops and reversals, this is much less likely than for other types of flows (see, for example, Sula and Willett, 2009). The theoretical literature has pointed to the potential instabilities of portfolio flows (see, for example, Calvo and Mendoza, 2000) but Willett et al. (2004a) found that the banking sector was by far the largest source of outflows during the Asian crises. Likewise Cavallo et al. (2013) found that the banking sector was the largest source of sudden stops and reversal episodes in their sample. Using a different methodology, Kim (2013) found similar results.<sup>26</sup>

In Figure 3, we provide an example which shows the average proportions of different types of capital flows in surges of foreign inflows that did and did not end in sudden stops. Portfolio equity flows show only small differences, while bond flows rise from 21 percent in the cases of surges with sudden stops to 31 percent in the cases of surges that do not end in sudden

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<sup>25</sup> Econometric studies also find the current account to have a major influence on reversals. See the analysis and references in Agosin and Huaita (2011). Agosin and Huaita argue that current account deficits are endogenous to capital surges so that they are not a basic causal factor in reversals. This correspondence is considerably less than one to one, however, so that the size of current account deficits can add additional information on the probability of a reversal. Forbes and Warnock (2011) and Crystallin (2015) find that global risk factors are also a very important determinant. There is a much larger empirical literature on the determinants of currency crises. While Efremidze et al. (2011) find that the correlations between measures of currency crises and capital flow reversals is much lower than would be expected, this literature suggests many useful variables to test for their possible effects on the probabilities of surges being followed by reversals. The ratio of short-term foreign debt to international reserves is one such factor.

<sup>26</sup> See also Levchenko and Mauro (2007) and Bluedorn et al. (2013). The latter find little difference between the short term volatility of bank related and portfolio flows, but we have argued that from a policy perspective such short term volatility is less important than large inward and outward flows of capital such as surges and reversals (see Sula and Willett, 2009).

stops. As expected FDI shares show a large difference, rising from 31 percent in sudden stop cases to 46 percent for non-sudden-stops. The largest change is for the share of bank loans which rises from 14 percent in non-sudden-stop related surges to 38 percent for surges that do end in sudden stops. This clearly suggests that special attention should be given to surges that have large flows of banking sector loans in them

INSERT FIGURE 3 HERE

#### **4. CONCLUDING REMARKS**

Our paper adds to the growing literature on the importance of disaggregating net capital flows and focusing on the interrelationship among large movements in capital flows resulting from the behaviors of both domestic and foreign agents. Our particular addition to this literature is our focus on the relationship between capital flow surges and reversals and sudden stops.

We argue, as have several recent papers, that true sudden stops should refer only to the behavior of foreign investors and that this is not adequately captured by the traditional focus on net capital flows. We suggest a definition of true sudden stops based on gross foreign flows that differs from what is in the current literature as a subset of net capital flow reversals and investigate the behavior of the both types of measures.

We find that on average according to both net and gross measures a substantial proportion of capital flow surges end in sudden stops or reversals (about 60 percent on average). There is strong relationship between reversals and sudden stop episodes. We find about 80 percent overlap between instances of sudden stops (as newly redefined in this paper which focuses on gross foreign capital changes) and reversals in net capital flows. Furthermore, we find that tracking gross capital surges with various measures, their composition in terms of bank loans and other types of flows, duration of surges, and identifying sudden stops and reversals

separately provides better understanding of the level of reversibility of such capital flows. Moreover, reversals are not always caused primarily by foreign capital. Our results support recent papers stressing that the behavior of domestic investors should not be neglected. The proportion of surges in gross foreign capital flows that end with large reversals or sudden stops is higher than those of net capital flows. The difference is substantial for sudden stops but only modest for reversals.

One important issue for further research is how to best measure capital flow surges given that there is such variation in the measures that have been used so far. Undoubtedly the best measures are likely to vary depending on the purpose for which they are being used. One important purpose strongly related to policy concerns is to identify the likelihood that large capital inflows will be reversed. We found a good deal of variation in the conditional probabilities that surges identified by the different measures will be reversed. Since at present there is no clear theory based argument about which surge measure is best it would seem reasonable to consider the possible usefulness of developing composite indicators.

The tendency of capital flow surges to frequently reverse has important policy implications. Basic international monetary theory suggests that the optimal policy responses to capital inflows that are expected to continue for a substantial period of time is to adjust to these flows either through currency appreciation under flexible rates or unsterilized intervention under fixed rates. The latter brings additional monetary expansion with a balance of payments surplus or less contraction with a deficit. This is the textbook adjustment mechanism for the gold standard.

On the other hand, where the inflows are expected to be only temporary, sterilized intervention under either fixed or flexible rates is optimal.<sup>27</sup> This avoids temporary adjustments of the exchange rate or money supply which would then be reversed and resulting in reallocations of resources that would be generated. The implementation of such optimal policies of course requires knowledge of which inflows are temporary and which are long term. This cannot be known with certainty.

The theory of economic policy suggests that policy responses should be muted where there is uncertainty. This offers a rationale for leaning against the wind policies under flexible rates and partial sterilization under fixed rates. The amount of action should vary with the expectations of the probabilities that inflows will be reversed. The types of analysis presented in this paper and other recent research begins to offer some basis for forming judgments of these probabilities and point to important directions for further policy relevant research.<sup>28</sup> Our analysis suggests that it will be important to add the relationship between capital flow surges and reversals to the types of recent empirical studies that have investigated domestic and global factors affecting domestic and foreign capital flows.<sup>29</sup> However, our finding that a majority of reversals are not preceded by surges implies that focus should not lie exclusively on surges.

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<sup>27</sup> This of course assumes that capital mobility is not so high that sterilization is impossible. Research suggests that for many emerging market countries while capital mobility is substantial it is not so high that short run sterilization policies will typically be ineffective. See, for example, Clark et al. (2012) and Ouyang et al. (2008).

<sup>28</sup> There are many other types of policy issues relevant to dealing with unstable capital flows and their effects such as limiting amounts of unhedged short term foreign currency denominated debt as part of prudential financial regulation and supervision. For recent discussions see Ostry et al. (2012) and IMF (2011).

<sup>29</sup> For example, see Sula (2010). Also See, Broner et al. (2013), Calderon and Kubota (2013), Cavallo et al. (2013) and Forbes and Warnock (2012). Disaggregation by types of capital flows is also important. See, for example, Cavallo et al. (2013).

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## Appendices

### Appendix A. List of Countries

Argentina	Lithuania
Bangladesh	Malaysia
Botswana	Mexico
Brazil	Morocco
Bulgaria	Pakistan
Chile	Panama
China	Peru
Colombia	Philippines
Croatia	Poland
Czech Republic	Portugal
Egypt	Romania
Estonia	Russia
Greece	Singapore
Hong Kong	South Africa
Hungary	Spain
Iceland	Sri Lanka
India	Syrian Arab Republic
Indonesia	Thailand
Ireland	Turkey
Israel	Ukraine
Italy	Uruguay
Korea	Venezuela
Latvia	Zimbabwe

## Appendix B. Descriptions of Capital Flow Surge Methods<sup>30</sup>

**Surge1:** This method defines an inflow as a surge if the inflows are greater than trend (measured by HP-filter) by at least one standard deviation and are higher than 3 per cent of GDP. Note that both trend and standard deviation are measured based on the level of inflows. This method has been implemented by the IMF-Strategy, Policy and Review Department (2011).

**Surge2:** The method defines a surge when the ratio of capital inflows to GDP is greater than its HP-filter trend by at least one standard deviation or if the ratio is above the 75<sup>th</sup> percentile of the whole-sample distribution. This method differs from the first method in that all calculations in the second method are based on the ratio of capital inflows to GDP, as used by Balakrishnan et al. (2013).

**Surge3:** This method classifies inflows as a surge if the ratio to GDP exceeds the top 75<sup>th</sup> percentile of the country's historical capital flows to GDP ratio provided that the flow is above the top 75<sup>th</sup> percentile of the entire cross country sample (Ghosh et al., 2014). This is the only method that uses full sample to identify surge episodes.

**Surge4:** Surges in this method are defined with inflows that exceed the sample mean by at least one standard deviation and the ratio of capital inflows to GDP is greater than 3 per cent (Agosin and Huaita, 2012). Similar to the first method, the fourth method also uses the ratio of capital inflows to GDP to calculate the long run tendency and standard deviation.

**Surge5:** This method codes an inflow as a surge when the ratio of inflows to GDP exceeds its trend (measured by HP-filter) by at least one standard deviation and the ratio is greater than 3% of GDP (Furceri, Guichard, and Rusticelli, 2012).

**Surge6:** Following Caballero (2012), this method uses population instead of GDP to normalize inflows. One benefit for using per capita concept is to eliminate conditions such as an increase in the ratio of inflows to GDP while inflows were actually decreasing but have been offset by a higher decrease in GDP. A surge is measured as an inflow per capita that exceeds its trend (measured by HP-filter) by at least one standard deviation and the capital flow to population ratio

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<sup>30</sup> This comes from Crystallin et al. (2014).

is positive. Although theoretically it is possible to have an increasing ratio while inflows were actually decreasing, our sample indicates out of 622 cases only three of them related to this case.

**Surge7:** The first attempt to empirically identify a surge, of which we are aware of, was by Sula (2006).<sup>31</sup> A surge measure is identified with a large and abrupt increase in capital inflows, and captures both – level and change effects of capital inflows. This method defines an inflow as a surge if the increase in capital inflows as a percentage of GDP over a 3-year period is greater than 3% and the value of inflows as a percentage of GDP in that year is greater than 3%. The rationale for not using a single year lag is that the capital inflows may increase suddenly in one year and continue to be very high for consecutive years without another abrupt increase. In such a case, if the surge is defined as a one-year difference in capital inflows, the measure will only detect the beginning of the surge but will miss the continuation. The second criterion ensures that the level of inflows is large enough relative to GDP. This condition allows us to filter out the episodes of sudden capital flow recoveries from previous large outflows to small inflows in the current year.

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<sup>31</sup> See Sula (2010) for a more compact version of this study.

## TABLES

**Table 1. The Conditional Probabilities of Surges Being Followed by Sudden Stops and Reversals**

<i>Panel A</i>				
<b>Gross Capital Flow Surges Followed by Sudden Stops or Reversals</b>				
		<i>Number of Surges</i>	<i>% followed by Sudden Stops within 2 years</i>	<i>% followed by Reversals within 2 years</i>
Gross	Surge 1	57	80.7	71.9
Gross	Surge 2	159	65.4	55.4
Gross	Surge 3	102	79.4	62.8
Gross	Surge 4	65	73.9	64.6
Gross	Surge 5	107	72.0	63.6
Gross	Surge 6	57	80.7	71.9
Gross	Surge 7	146	48.6	43.2
<b>Average</b>		<b>99</b>	<b>71.5%</b>	<b>61.9%</b>
<i>Panel B</i>				
<b>Net Capital Flow Surges Followed by Sudden Stops or Reversals</b>				
		<i>Number of Surges</i>	<i>% followed by Sudden Stops within 2 years</i>	<i>% followed by Reversals within 2 years</i>
Net	Surge 1	53	60.4	67.9
Net	Surge 2	161	47.8	52.2
Net	Surge 3	126	47.6	54.0
Net	Surge 4	70	50.0	60.0
Net	Surge 5	105	51.4	58.1
Net	Surge 6	59	55.9	62.7
Net	Surge 7	116	44.0	47.4
<b>Average</b>		<b>99</b>	<b>51.0%</b>	<b>57.5%</b>



**Table 2. Durations of Surges**

<b>Gross</b>	Average % of surges of each duration	Highest	Lowest
1yr	0.59	0.73	0.39
2yr	0.21	0.25	0.08
3yr	0.10	0.20	0.03
≥ 4yrs	0.11	0.00	0.32
<b>Net</b>	Average % of surges of each duration	Highest	Lowest
1yr	0.62	0.77	0.50
2yr	0.23	0.31	0.12
3yr	0.07	0.15	0.01
≥ 4yrs	0.08	0.19	0.00

**Table 3. The Probabilities of Surges of Different Lengths Ending in Reversals and Sudden Stops**

<b>Gross</b>	Average % that end in sudden stops	Highest	Lowest
1yr	0.56	0.70	0.32
2yr	0.76	0.96	0.65
3yr	0.80	1.00	0.41
≥ 4yrs	0.66	0.93	0.00
<b>Net</b>	Average % that end in reversals	Highest	Lowest
1yr	0.31	0.38	0.24
2yr	0.47	0.70	0.30
3yr	0.40	0.77	0.00
≥ 4yrs	0.33	1.00	0.00

**Table 4. Proportions of Sudden Stops and Reversals Preceded by Surges****Panel A****Gross Surges Related to Reversals or Sudden Stops (within 2 years)**

		<i>Number of Reversals</i>	<i>% of Reversals Related to Surges</i>	<i>Number of Sudden Stops</i>	<i>% of Sudden Stops Related to Surges</i>
Gross	Surge 1	145	28.3	142	32.4
Gross	Surge 2	140	62.9	140	74.3
Gross	Surge 3	139	46.0	143	56.6
Gross	Surge 4	141	29.8	138	34.8
Gross	Surge 5	145	46.9	143	53.9
Gross	Surge 6	145	28.3	142	32.4
Gross	Surge 7	136	46.3	130	54.6
	<b>Average</b>	142	<b>41.2%</b>	140	<b>48.4%</b>

**Panel B****Net Surges Related to Reversals or Sudden Stops (within 2 years)**

		<i>Number of Reversals</i>	<i>% of Reversals Related to Surges</i>	<i>Number of Sudden Stops</i>	<i>% of Sudden Stops Related to Surges</i>
Net	Surge 1	138	26.1	136	23.5
Net	Surge 2	135	62.2	126	61.1
Net	Surge 3	131	51.9	125	48.0
Net	Surge 4	136	30.9	128	27.3
Net	Surge 5	136	44.9	132	40.9
Net	Surge 6	138	26.8	136	24.3
Net	Surge 7	139	39.6	131	38.9
	<b>Average</b>	136	<b>40.3%</b>	131	<b>37.7%</b>

Note: Number of reversals and sudden stops vary for each surge measure, due to elimination of reversals and sudden stops in the first two years of the sample, if there was no surge in those two years.

**Table 5. Sudden Stops and Reversals Occurring within 2 Years of Each Other**

**Panel A**

Number of Sudden Stop Episodes	153
% of Sudden Stops related to Reversals	<b>81.7%</b>

**Panel B**

Number of Reversal Episodes	160
% of Reversals related to Sudden Stops	<b>78.1%</b>

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**Table 6. Foreign vs Domestic Capital Outflows During Net Capital Flow Reversals**

	Total Number of Reversals	Foreign	Domestic	Foreign and Domestic	Only Foreign	Only Domestic
1980s	32	30 93.8%	21 65.6%	19 59.4%	11 34.4%	2 6.3%
1990s	52	41 78.8%	36 69.2%	25 48.1%	16 30.8%	11 21.2%
2000s	66	51 77.3%	38 57.6%	23 34.8%	28 42.4%	15 22.7%
<b>Total Period</b>	<b>150</b>	<b>122</b> <b>81.3%</b>	<b>95</b> <b>63.3%</b>	<b>67</b> <b>44.7%</b>	<b>55</b> <b>36.6%</b>	<b>28</b> <b>18.7%</b>

Notes: Only domestic or only foreign capital outflows are identified if one of them represents more than 75% of the combined capital outflows during an episode of net capital flow reversal.

**Table 7. Frequencies of Size Comparisons of Net Flow Changes to Gross Flow Changes in the Episodes of Net Reversals and Gross Sudden Stops**

	Total number of Episodes	Total Period	1980s	1990s	2000s
$\Delta \text{Net} > \Delta \text{Gross}$	Net Reversals (150 Cases)	96 (64.0%)	22 (68.8%)	38 (73.1%)	36 (54.5%)
	Gross Sudden Stops (145 Cases)	34 (23.5%)	12 (32.4%)	13 (24.5%)	9 (16.4%)
$\Delta \text{Gross} > \Delta \text{Net}$	Net Reversals (150 Cases)	54 (36.0%)	10 (31.2%)	14 (26.9%)	30 (45.5%)
	Gross Sudden Stops (145 Cases)	111 (76.6%)	25 (76.6%)	40 (75.5%)	46 (83.6%)

**Table 8. Episodes Where Net Flows and Foreign Investments Have Same Signs**

	Total Period	1980s	1990s	2000s
Net Reversals (150 Cases)	123 (82.0%)	28 (87.5%)	42 (80.8%)	52 (78.8%)
Gross Sudden Stops (145 Cases)	120 (82.8%)	34 (91.9%)	41 (77.4%)	45 (81.8%)

**Table 9. Surges and Domestic or Foreign Driven Reversals**

	Foreign Driven	Domestic Driven	Mixed
<b>Total Reversal Episodes</b>	<b>59.3%</b>	<b>22.7%</b>	<b>18.0%</b>
Reversals Preceded by Surge Episode	73.8%	16.7%	9.5%
Reversals Not Preceded by Surge Episode	53.7%	25%	21.3%

Notes: Domestic or foreign driven reversals are identified if one of them represents more than 75% of the combined capital outflows during an episode of net capital flow reversal. Net Surge1 method was used for this table results.



**Table 10. Reversals Driven by Foreign or Domestic Flows by Decades**

	Foreign Driven	Domestic Driven	Mixed
1980s	21 (66.6%)	3 (9.4%)	8 (25.0%)
1990s	28 (53.8%)	16 (30.8%)	8 (15.4%)
2000s	40 (60.6%)	15 (22.7%)	11 (16.7%)
<b>Total</b>	<b>89 (59.3%)</b>	<b>34 (22.7%)</b>	<b>27 (18.0%)</b>

Notes: Only domestic or only foreign capital outflows are identified if one of them represents more than 75% of the combined capital outflows during an episode of net capital flow reversal.