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Large capital inflows, sectoral allocation, and economic performance☆

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ABSTRACT

This paper describes the stylized facts characterizing periods of exceptionally large capital inflows in a sample of 70 middle- and high-income countries over the last 35 years. We identify 155 episodes of large capital inflows and find that these events are typically accompanied by an economic boom and followed by a slump. Moreover during episodes of large capital inflows, capital and labor shift out of the manufacturing sector, especially if the inflows begin during a period of low international interest rates. However, accumulating reserves during the period in which capital inflows are unusually large appears to limit the extent of labor reallocation. Larger credit booms and capital inflows during the episodes we identify increase the probability of a sudden stop occurring during or immediately after the episode. In addition, the severity of the post-inflows recession is significantly related to the extent of labor reallocation during the boom, with a stronger shift of labor out of manufacturing during the inflows episode associated with a sharper contraction in the aftermath of the episode.

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1. Introduction

The last 30 years have seen a sustained process of financial globalization, with countries around the world opening their capital accounts and joining international financial markets. With the passing of time, both in academic and policy circles an initially benign view toward openness to international capital flows has given way to a more skeptical approach. The IMF's inclusion of capital controls in its recommended policy toolbox epitomizes the shift in thinking (Ostry et al., 2010; WEO, 2011). Not only are episodes of large capital inflows thought to set the stage for subsequent financial crises, but the impact of inflows on economic performance during tranquil times has also been called into question (Giavazzi and Spaventa, 2010; Powell and Tavella, 2012).

Fig. 1 summarizes the experience of Spain, which was in many ways typical of the countries in the Eurozone periphery. Following the launch of the Euro, Spain received large capital inflows resulting in sustained current account deficits (panel a) and coinciding with a consumption boom (panel b). Moreover, Spain experienced a shift of resources out of sectors producing tradable goods such as manufacturing and into the production of nontradable goods, such as construction (panel c). During the same period, Spain saw a slowdown in productivity growth (panel d). These developments have led some authors to draw a connection between episodes of large capital inflows and slowdowns in productivity growth, since capital inflows can trigger a movement of resources toward nontradable sectors characterized by slow productivity growth (Benigno and Fornaro, 2014; Reis, 2013).

While the narrative evidence from the Eurozone periphery appears compelling, it remains unclear to what extent these countries' experience is typical of recipients of large capital inflows. In the second half of the 1990s, Brazil received capital inflows and ran current account deficits that were unusually large by historical standards (Fig. 2, panel a). While Brazil did experience a consumption boom (panel b), the share of employment dedicated to manufacturing was steady or rising, reversing its earlier downward trend (panel c). Similarly, the inflows episode in Brazil saw a net improvement in TFP (panel d). Precisely how periods of large capital inflows affect recipient economies thus remains an open

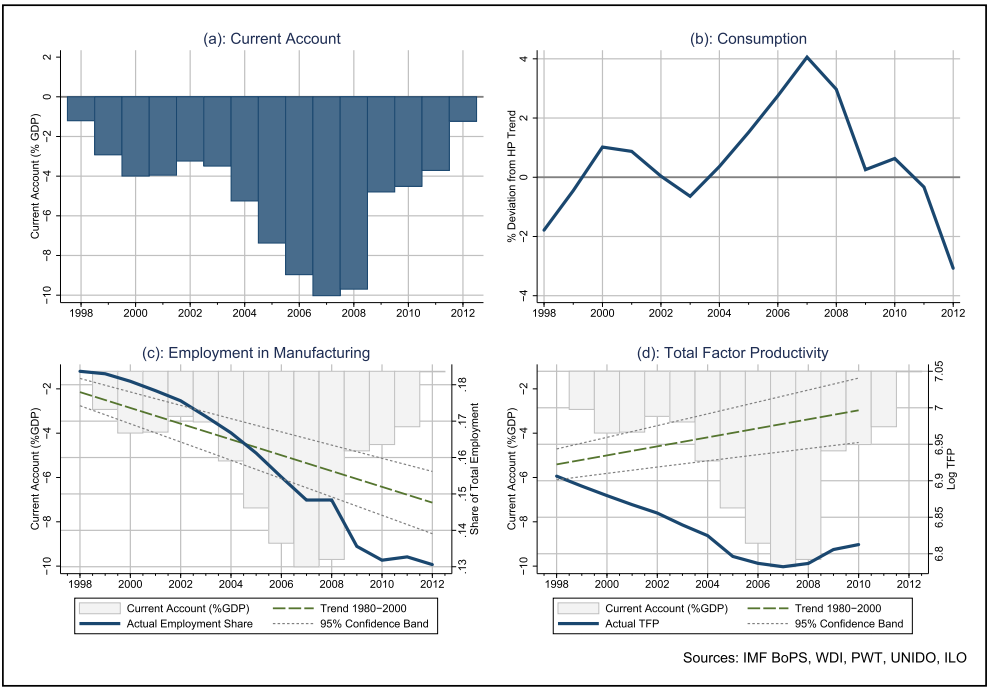

Fig. 1. Spain: Capital inflows and macroeconomic performance, 1998–2012.

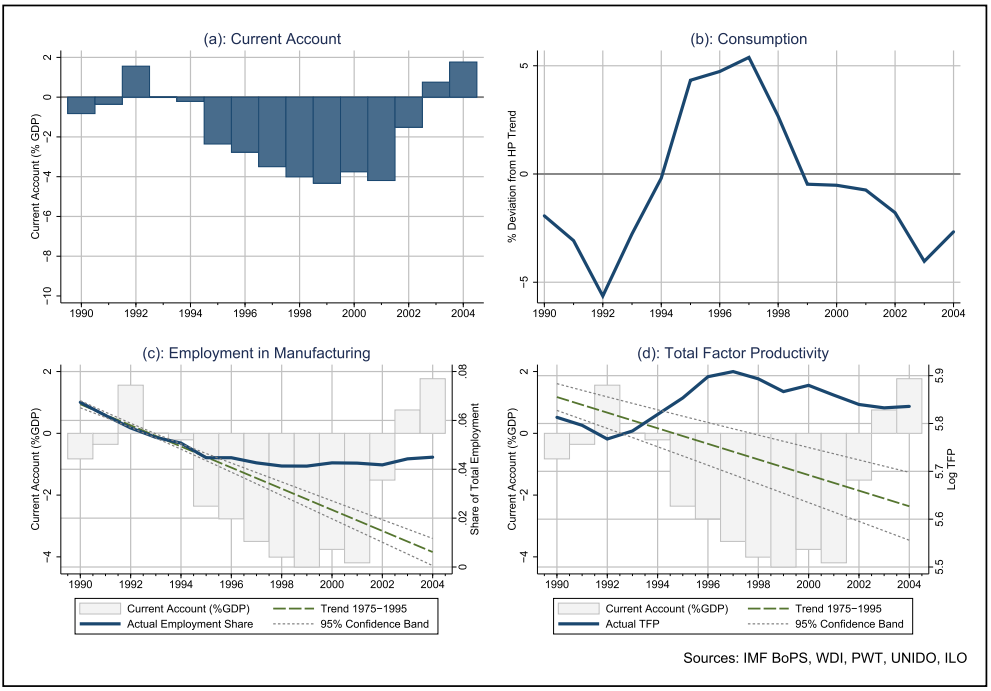

Fig. 2. Brazil: Capital inflows and macroeconomic performance, 1990–2004.

question. Moreover, the issue remains directly relevant to policymakers due to the surge of capital flows to emerging market economies in the five years after the 2008 financial crisis and the slowing of those capital flows that began in mid-2013.

This paper provides a systematic analysis of how large capital inflows affect macroeconomic performance and the sectoral allocation of productive resources. We identify 155 episodes of large capital inflows over the last 35 years in a group of 70 middle- and high-income countries. We find that these episodes coincide with an economic boom in which output, consumption, investment, employment, and domestic credit all rise initially. However, once capital inflows subside and credit contracts, the boom gives way to a recession. Alongside these aggregate macroeconomic dynamics, at the sectoral level we find that large capital inflows are associated with an expansion of nontradable sectors, such as services and construction, at the expense of sectors producing tradable goods, including agricultural products and manufactured goods.

Studying the manufacturing sector in detail, we find that the share of both employment and investment allocated to manufacturing drops during episodes of large capital inflows. In particular, while the reallocation of investment is a general phenomenon in our sample, the reallocation of labor occurs specifically during episodes in which governments do not offset capital inflows through substantial purchases of foreign assets, and during episodes that begin when international liquidity is abundant. Hence, our empirical results are consistent with the predictions of a standard two-sector small open economy model, according to which capital inflows driven by an increase in access to foreign capital should generate a shift of productive resources out of sectors producing tradable goods, and into sectors producing non-tradable goods (Rebelo and Vegh, 1995; Reis, 2013; Benigno and Fornaro, 2014)

We next consider how the behavior of macroeconomic indicators during an inflows episode relates to the probability that the episode coincides with a capital flows reversal or a sudden stop. Evidence from probit regressions suggests that, while economic conditions before and during the episodes of large capital inflows are not systematically related to whether or not capital flows reverse sharply, both

a larger credit boom and larger capital inflows are associated with a higher probability of a sudden stop, in which a capital flows reversal is accompanied by an output contraction.

We also investigate the existence of a relationship between the behavior of the economy during the inflows and the post-inflows slump. Regressing post-episode macroeconomic performance more generally on conditions before and during the boom, we find that larger expansion credit and inflows are associated with a deeper fall in GDP, consumption, investment, employment and TFP at the end of the episode. Moreover, the reallocation of labor out of manufacturing is robustly and significantly related to economic performance after large capital inflows come to an end, with a stronger shift of labor out of manufacturing during the inflows episode associated with a sharper contraction in the aftermath of the episode. Reserve accumulation during the episode appears to dampen the negative aftereffects of large capital inflows, even when we control for the sectoral reallocation with which it is correlated. It thus appears that foreign reserve accumulation acts through multiple channels to insulate the economy from the dislocation associated with episodes of large capital inflows.

This paper contributes to two areas of literature. First, in focusing on episodes of unusually large capital inflows, our work is related to the study of what have been called capital flow bonanzas or surges. Our methodology, taken from the literature on credit booms (Gourinchas et al., 2001; Tornell and Westermann, 2002; Mendoza and Terrones, 2008), identifies periods in which the *level* of capital inflows is unusually large. By contrast, the literature on surges has generally examined the causes (Forbes and Warnock, 2012) and consequences (Reinhart and Reinhart, 2009; Kalantzis, 2014) of unusually large *changes* in capital inflows. Ghosh et al. (2014) study unusually high levels of capital inflows, but they examine the causes of such episodes specifically in emerging markets, while we focus on the consequences of large capital inflows in both emerging and advanced economies. The experience of Eurozone countries highlights the value of our approach. Capital inflows to Spain grew steadily, eventually exceeding 10 percent of GDP, but never jumped as in a surge.

The work closest to our paper is research by Cardarelli et al. (2010) and Caballero (2014), both of whom also examine episodes in which the level of capital inflows is unusually high. Whereas Cardarelli et al. (2010) analyze policy responses to large capital inflows, we study the effects of such episodes on the real economy. Caballero (2014) focuses on how large inflows affect the likelihood of banking crises, whereas our work highlights the way large capital inflows affect the sectoral allocation of resources. In addition, using a slightly different measure of capital inflows than these papers allows us to examine episodes over a longer time span. In particular, in contrast to much previous work our data include the large capital flows to the Eurozone periphery in the mid-2000s as well as recent capital flows to emerging markets.

Second, our work contributes to research on how external factors interact with the sectoral allocation of production to affect economic performance. Rodrik (2008) documents that an undervalued exchange rate is associated with faster economic growth, and presents evidence that the reallocation of resources into the production of tradable goods generates this relationship. Analyzing the impact of sectoral allocation on aggregate productivity in more detail, McMillan and Rodrik (2011) show that a shift of productive resources into relatively less productive sectors has in many countries severely dampened aggregate productivity growth, even as resource allocation within sectors has improved. However, both these papers look at relatively long term effects, while this paper focuses on how capital flows are related to sectoral allocation at business cycle frequency.[1] Bussière et al. (2015) do use annual data to analyze how the real exchange rate affects economic performance, as well as the role of capital flows in that relationship. However, although sectoral reallocation plays an important role in their theoretical model they do not examine reallocation in their empirical analysis. Finally, Converse (2014) presents evidence that the financial uncertainty generated by volatile international capital flows can shift the sectoral allocation of investment in emerging markets, depressing aggregate TFP and growth.

The key novelty of our paper with respect to these two literatures lies in the systematic description of how the share of productive resources allocated to manufacturing behaves in a large sample of

[1] Likewise, Alfaro et al. (2014) and Gourinchas and Jeanne (2013) analyze the long-run relationship between capital flows and productivity, while we focus on short-run relationships.

episodes of large capital inflows. Earlier studies of exchange rate based stabilization programs (Rebelo and Vegh, 1995) and of credit booms (Gourinchas et al., 2001; Tornell and Westermann, 2002; Mendoza and Terrones, 2008) have documented that the share of tradable sectors in GDP drops with inflows of capital. However, to the best of our knowledge, we are the first ones providing *direct* evidence on the allocation of labor and investment across sectors in a large sample of inflows episodes, and connecting the sectoral reallocation of resources during the inflows to the post-inflows slump.

The rest of the paper begins by describing the data and methodology we use to identify episodes of large capital inflows in Section 2. In Section 3 we examine how key macroeconomic variables and the sectoral allocation of productive resources behave during and after inflows episodes. In Section 4 we consider how the behavior of the economy during the inflows relates to the probability that an episode ends up in a reversal or a sudden stop and how it affects the post-episode economic performance more generally. Section 5 concludes.

2. Data and methodology

2.1. Identifying capital inflows episodes

As a measure of capital inflows into the economy we use the current account deficit plus the increase in holdings of official reserves.[2] All data on international capital flows are taken from the IMF's Balance of Payments Statistics (BoPS) data base. We chose to base our analysis on a broad measure of capital inflows because this is typically the focus of the theoretical literature on capital flows and sectoral allocation of resources (Rebelo and Vegh, 1995; Benigno and Fornaro, 2014; Reis, 2013). Recent empirical literature points toward the existence of important differences in the behavior of private and public flows (Alfaro et al., 2014; Gourinchas and Jeanne, 2013) as well as gross and net flows (Rothenberg and Warnock, 2011; Forbes and Warnock, 2012; Broner et al., 2013), and in section 2.3 we do indeed analyze the extent to which the episodes we identify coincide with different types of gross flows. Nonetheless, a study separately examining episodes driven by different types of flows would be an interesting topic for future research.

We do add reserve accumulation to our measure of capital inflows, however, in order to be able to differentiate between large capital inflows and the policy response to them.[3] When the government purchases foreign reserves, it offsets the liabilities incurred when foreigners acquire claims on domestic residents. By adding reserve accumulation to the current account, we undo this netting out. This allows us (in Sections 3 and 4) to explore in detail whether the strategy of reducing the current account deficit through the acquisition of official reserves affects how the economy responds to large capital inflows.

Having selected our preferred inflows measure, we normalize by GDP in order to capture the size of the flows relative the economy.[4] We then detrend the normalized series using an HP filter because we observe in the data that numerous economies exhibit medium- or long-run trends in the size of capital inflows, presumably for varying structural reasons. Most obviously, the neoclassical growth model predicts that capital-scarce economies will receive capital inflows that diminish in size as the economy converges to its steady-state level of capital.[5] A downward trend in capital inflows is also consistent with models of convergence to a technological frontier (as in Krugman, 1979 or Grossman and Helpman, 1991). We are not interested in large capital flows that emerge in the course of a long-run trend, but rather on short- and medium-term fluctuations in capital inflows that occur along this transition path in response to shocks. Detrending the series allows us to identify precisely such events.

[2] A current account deficit carries a positive sign in what follows, since this corresponds to net capital inflows.

[3] Reinhart and Reinhart (2009) describe reserve accumulation less the current account balance as "the best indicator of capital flows," but ultimately use the current account balance in order to lengthen the period covered by their analysis. In excluding changes in reserves from our net capital inflows measure, our approach is similar to that of Ghosh et al. (2014), who also subtract government borrowing from official sources.

[4] Specifically, the capital inflows are measured in current US dollars and then normalized by GDP in current US dollars.

[5] Chapter 2 of Obstfeld and Rogoff (1996) provides a textbook treatment on the role of capital flows in the neoclassical growth model.

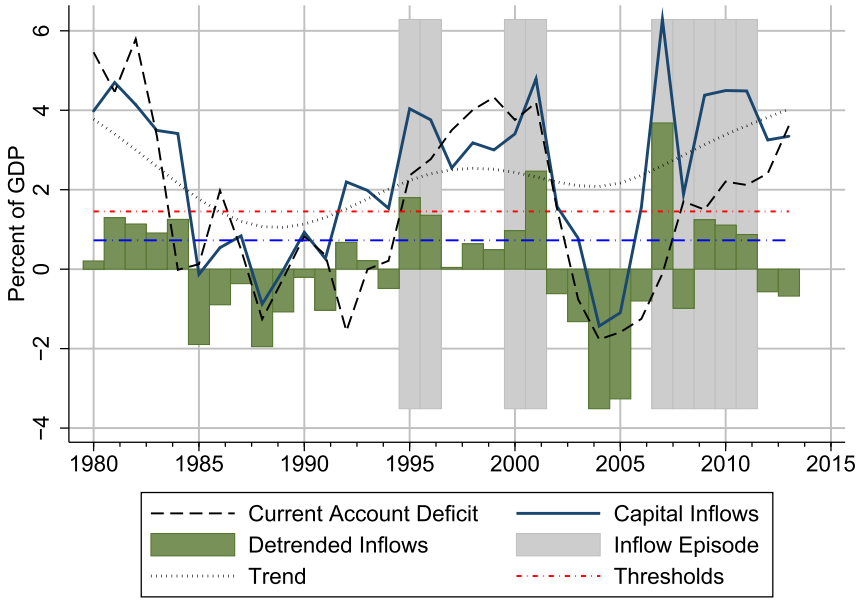

Fig. 3. Identifying episodes of capital inflows: Brazil.

In order to identify periods of exceptionally large capital inflows, we follow a procedure commonly used in research on credit booms (Gourinchas et al., 2001; Mendoza and Terrones, 2008) which has more recently been applied to international capital flows (Cardarelli et al., 2010; Caballero, 2014). We calculate the long-run standard deviation of our detrended capital inflows measure for each country, and flag years in which inflows rise more than one standard deviation above their trend.[6] These flagged country-years mark the existence of an episode of large capital inflows. An episode begins when inflows first rise more than half a standard deviation above their trend level and ends when they again come within half a standard deviation of their trend.[7]

The case of Brazil, depicted in Fig. 3, demonstrates the merits of our approach to identifying large capital inflows. First, at several points the Brazilian authorities have offset large capital inflows by purchasing substantial foreign exchange reserves. This can be seen in the divergence of the current account (the dashed line) and our measure of capital inflows (the solid line). To highlight the clearest and most recent example, note that during the four years after the 2008 financial crisis, Brazil received approximately US$50 billion in capital inflows, an average of 4.5 percent of GDP per year. At the same time, the country's foreign exchange reserves nearly doubled. The accumulation of assets by the monetary authorities meant that Brazil's current account deficit averaged only 2.5 percent of GDP during a time of large capital inflows, much discussed by policy-makers and the media as well as evident in the data.

[6] Unlike Gourinchas et al. (2001) and Cardarelli et al. (2010) we take the trend over the entire sample period for each country, rather than a country-year-specific expanding window tend. This is because our rationale for detrending differs substantially. Cardarelli et al. (2010) study policy responses to capital inflows and therefore detrend in order to determine whether contemporary policy-makers would have seen the inflows as unusually large. We detrend to determine whether the inflows are large relative to the long-run trajectory of the economy. This difference in motivation makes the long-run trend more appropriate than an expanding window.

[7] In the terminology used by Mendoza and Terrones (2008), we set the entry and exit thresholds for the detrended current account equal to 0.5.

In Fig. 3 we also plot the HP trend—the dotted line. This shows how the typical size of capital inflows has varied over time, and supports our use of HP filtered inflows to decide when capital inflows are unusually large. What would have been considered an unusually large capital inflow in the late 1980s would not stand out as particularly large in the late 2000s.

Although for some countries balance of payments data extend as far back as the 1940s, the IMF Balance of Payments data cover substantially fewer countries prior to the early 1970s. We therefore restrict our attention to capital inflows episodes occurring between 1975 and 2010. We exclude from the analysis countries with a population that never exceeds one million, as well as those with annual GDP that remains below one billion dollars throughout the period we study. This has the virtue of excluding several offshore financial centers where the relationship between capital flows and the real economy might differ substantially from the typical economy. We also remove from our dataset major oil exporters and countries eligible to receive World Bank International Development Association (IDA) assistance.[8] Where oil price movements and donors' willingness to provide foreign aid determine the external balance, the relationship between capital inflows and the real economy presumably differs substantially from most other economies.

We experimented with alternate methodologies for identifying episodes in order to verify the robustness of our results to the use of different capital inflows measures, detrending methods, and thresholds. Thus, we identified episodes using two alternate measures of capital inflows: the raw current account as a share of GDP and the current account in constant US dollars normalized by population. We also detrended the current account using a linear trend rather than an HP filter. Finally, we raised the threshold for identifying episodes from one to 1.5 standard deviations, and (separately) lowered the exit and entry threshold from 0.5 to zero.

Using alternate inflows measures does change the set of events that are identified as episodes of large capital inflows, while alternate detrending methods and thresholds alter the average length of the episodes. Since a linear trend is less flexible than an HP trend, the variable can diverge from the trend for longer. Likewise, a lower threshold prolongs the duration of those episodes which do not start and stop abruptly.

2.2. Other variables

Having identified episodes of large capital inflows, we are particularly interested in how these episodes end. Do inflows gradually taper off or do they stop abruptly? Does the economy experience a hard landing once inflows subside? Following the large literature on crises and sudden stops, we identify capital flow reversals and sudden stops using the methodology developed by Calvo et al. (2004).[9] In this classification scheme, a reversal occurs when the year-on-year change in capital inflows is at least two standard deviations below the mean. A sudden stop occurs when a reversal coincides with an output contraction. We deem a capital inflows episode to coincide with a reversal or sudden stop if one of these events occurs at any point during the episode or in the year immediately after the episode ends.

Several authors have suggested a link between aggregate productivity and capital inflows (Aoki et al., 2010) as well as closely related variables such as the real exchange rate (Rodrik, 2008). In order to further explore these links we calculate total factor productivity (TFP) for a broad sample of countries over an extended time period using data on output and investment obtained from the Penn World Tables (Heston et al., 2013) and employment data from the International Labor Organization's LABORSTA data set.

Macroeconomic data are from the standard sources, including the IMF International Financial Statistics (IFS) and the World Bank World Development Indicators (WDI). We also analyze international liquidity conditions at the time of capital inflows episodes, taking movements of the effective Federal

[8] The main criterion for IDA eligibility is a PPP-adjusted per-capita GDP of less than US $1,195. The IDA provides grants as well as concessional lending to eligible countries.

[9] Rothenberg and Warnock (2011) and Forbes and Warnock (2012) use this approach to identify both surges and sudden stops in gross capital flows.

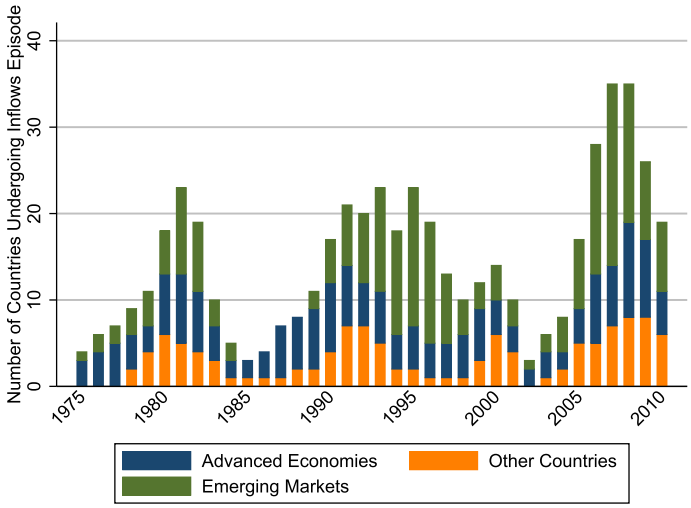

Fig. 4. Frequency of large inflows episodes over time.

Funds rate, obtained from the Federal Reserve Economic Database (FRED) as a proxy for changes in the rates attached to international lending. We calculate real rates by subtracting from the nominal rate inflation during the previous year, which we use as a proxy for expected inflation. To measure the risk aversion of major international investors we use the VIX index. The VIX measures the implied volatility of S&P index options and thus reflects the price of risk in U.S. equity markets. When the price of risk and thus the VIX is low, it can be inferred that risk aversion is low.

We obtain data on manufacturing sector employment, value-added, and investment from the UNIDO INDSTAT2 database. As the UNIDO data are in nominal terms, we deflate them using the aggregate GDP deflator (taken from the WDI), as is standard in the literature (e.g. Kroszner et al., 2007; Ciccone and Papaioannou, 2009; Gupta and Yuan, 2009; Levchenko et al., 2009; Rajan and Subramanian, 2011).[10] The data appendix provides detailed descriptions of which data were drawn from which source.

2.3. Descriptive statistics

Our baseline methodology identifies 155 episodes of large capital inflows occurring in 70 countries between 1975 and 2010. Of these, 54 took place in advanced economies and 67 in emerging markets. A full list of these episodes is provided in the data appendix.[11] Our methodology captures nearly all well known examples of large capital inflows. These include events in emerging markets such as the lead-up to crises in Latin America in the early 1980s, the exchange-rate-based based stabilization programs in the region later in the decade, which were accompanied by large inflows (Végh, 1992; Rebelo and Vegh, 1995), and the run-up to the East Asian crises during the mid-1990s.

In addition, our sample includes advanced country cases such as Scandinavia and the United Kingdom in the early 1990s, and the Eurozone periphery in the mid-2000s. We also pick up less well-

[10] Since industry-level deflators are not available for a broad set of countries, the alternate approach taken by Koren and Tenreyro (2007) is to use US industry-level deflators. We use the method most widely used in the literature.

[11] We define emerging markets broadly, including in this category countries in either the JPMorgan Emerging Market Bond Index (EMBI) or the S&P/International Finance Corporation Emerging Markets Database Investable Index (S&P IFCI Index). Advanced economies are the high-income members of the OECD.

Table 1
Capital inflows episodes: Summary statistics.

	Number of episodes	(% of total)	Ave. Duration (years)	Ave. CA deficit (%GDP)
Total	155		3.5	4.7
Advanced Economies	54	(35.3)	3.4	3.2
Latin America	28	(18.3)	3.4	5.5
Asia	24	(15.7)	3.7	1.9
Eastern Europe	25	(16.3)	3.6	7.0
Middle East	5	(3.3)	3.8	9.6
Sub-Saharan Africa	17	(11.1)	2.9	5.0

Sources: IMF BoPS, authors' calculations.

Table 2
Capital inflows episodes and types of capital flows.

	Advanced economies	Emerging economies	Other economies	Total
Total Episodes:	54	67	34	155
Of which, coincide with:				
Large Gross Inflows (% of Group Total)	23 (42.6)	42 (62.7)	14 (41.2)	79 (51.0)
Large Portfolio Inflows (% of Group Total)	22 (40.7)	24 (35.8)	12 (35.3)	58 (37.4)
Large FDI Inflows (% of Group Total)	25 (46.3)	31 (46.3)	14 (41.2)	70 (45.2)
Large Other Inflows (% of Group Total)	28 (51.9)	45 (67.2)	24 (70.6)	97 (62.6)
Large Reserve Accumulation (% of Group Total)	26 (48.1)	37 (55.2)	23 (67.6)	86 (55.5)

Sources: IFS, WDI, authors' calculations.

known episodes that did not end in a crisis, such as inflows to Canada in the late 1980s. Importantly, the episodes we identify include the large capital inflows to emerging markets such as Brazil, Indonesia, and Turkey following the 2008 crisis. The number of episodes we identify is broadly consistent with the findings of Reinhart and Reinhart (2009), who identify 207 capital flow "bonanzas" in middle- and high-income countries between 1980 and 2007, of which 112 last more than one year.

Fig. 4 plots the number of countries undergoing episodes of large capital inflows in each year. The number of episodes varies substantially over time, with increases in the number of episodes in the early 1980s and 1990s, and again in the late 2000s. Notably, the number of countries receiving exceptionally large inflows was significantly larger during the most recent surge in episodes than in the past. Presumably this pattern reflects the fact that governments have consistently liberalized controls on capital inflows since the 1970s, as documented for example by Chinn and Ito (2006). The type of countries receiving large inflows has also fluctuated. During the late 1980s advanced economies were nearly the only countries receiving large inflows. More recently, the majority of large inflows episodes have taken place in emerging markets, although other economies, which comprise smaller and relatively poorer countries sometimes called frontier markets, have also seen their share in the number of episodes increase.

Table 1 provides descriptive statistics about the episodes of large capital inflows that we identify, broken down by region. Overall roughly one third of the episodes occur in advanced economies, while Latin America, Asia, and Eastern Europe have experienced similar shares of the episodes. The average episode of large inflows lasts approximately three and a half years, with little variation across regions in the typical length. With the exception of Asia, the size of the current account relative to the economy during these episodes is substantially larger in emerging markets than in advanced economies.

The measure of capital inflows that we use to identify episodes of unusually large flows is deliberately general, capturing net inflows of all types apart from those initiated by the domestic government in each country. However, in Table 2, we look more closely at the behavior of component flows in each episode. Overall half of these episodes coincide with unusually large gross inflows, with this share significantly higher for emerging economies than for the rest.[12] Portfolio flows—so-called hot

[12] Here we use the same criteria to identify unusually large component flows that we used in identifying large net inflows.

Table 3
Capital inflows episodes, reversals, & sudden stops.

	Advanced economies	Emerging economies	Other economies	Total
Total Episodes:	54	67	34	155
Of which:				
Ending in Reversal (% of Group Total)	45 (83.3)	53 (79.1)	24 (70.6)	122 (78.7)
Of which:				
Ending in Sudden Stop (% of Group Total)	19 (35.2)	19 (28.4)	4 (11.8)	42 (27.1)

Sources: IFS, WDI, authors' calculations.

money—are large in 37 percent of episodes, a share that is constant across country groups. In 45 percent of episodes, FDI flows were unusually large, and again this share does not vary substantially between country groups.

Finally, large flows in the residual other flows category, which is primarily comprised of cross-border lending by banks but also includes trade credit, were present in just over 60 percent of the cases we study. This finding is consistent with, for example, recent work by Bruno and Shin (2014) documenting the important role played by banks in cross-border capital flows. Moreover, in this paper we study not only recent episodes but also episodes that took place in the late 1970s and early 1980s when bank lending played a relatively more important role in cross border capital flows. Bank flows also were a substantial part of the capital flows in the Eurozone in the 2000s.

Table 3 examines the relationship between the capital inflows episodes that we identify, capital flow reversals, and sudden stops. Of the episodes of unusually large capital inflows that we study, 122 (79 percent) end in a reversal as defined by Calvo et al. (2004). Just over 40 of the inflows episodes (27 percent) coincided with a sudden stop.[13] Table 3 suggests that the probability than an episode ends up in a capital flows reversal is similar for advanced and emerging economics, while sudden stops occur somewhat more frequently in advanced economies.

3. Event study

3.1. Aggregate economic variables

In this section we characterize the behavior of several macroeconomic variables during a typical episode of large capital inflows. To this end, we compute the mean and median path of a set of macroeconomic indicators across all our episodes. In order to capture both the buildup and end phase of each episode, we consider nine-year windows that begin two years before the start of each inflows episode. In general, this window captures the point at which the variables first diverge from their trend level as well as the trough of the post-boom drop. To ensure that the patterns we uncover in this section do not reflect mere changes in the composition of the sample, we include here only episodes for which a full nine years of data are available.[14]

As is standard in much of the literature (e.g. Gourinchas et al., 2001; Mendoza and Terrones, 2008; Cardarelli et al., 2010), we focus on the cyclical component of each variable by looking at the deviations from an HP trend. In each of the graphs in this section, time zero marks the start of the episodes. Vertical lines mark the start and the average length of an inflows episode, which is just over three years.[15]

[13] Recall that according to Calvo et al. (2004) and others (Rothenberg and Warnock, 2011; Forbes and Warnock, 2012), a reversal occurs when the year on year change in capital inflows is at least two standard deviations below the mean. A sudden stop occurs when a reversal coincides with an output contraction (Calvo et al., 2004).

[14] As we saw in the previous section, several of the episodes in our sample occur in the late 2000s, and thus a full six years of data are not available after the onset of these episodes, which are consequently omitted from this portion of the analysis. In particular, the decision to include only episodes with a full nine years of data leads us to exclude the post-2008 episodes of large capital inflows to emerging markets from the analysis, since complete data are not yet available.

[15] This is slightly shorter than the average length in Table 1 because here we include only episodes with complete data.

Fig. 5 paints a stark picture of how domestic variables behave during a typical episode of large capital inflows. First, large inflows are associated with an economic boom. In fact, at the peak of the typical episode GDP is around 2 percentage points above trend. The boom is driven by a significant rise in consumption, and by an even more marked increase in investment. The boom is also accompanied by a significant rise in private credit, suggesting the existence of a link between capital inflows and access to credit by the private sector. Both a rise in employment and in measured TFP contribute to the increase in production. However, since we measure TFP using a Solow residual, we cannot distinguish whether the rise in TFP is due to an improvement in productivity, or to increased capacity utilization during the economic boom that accompanies episodes of large capital inflows.[16]

In contrast with the boom taking place during the inflows, the aftermath of the typical episode of large capital inflows is characterized by an economic contraction. In fact, beginning with the fourth, or fifth in the case of private credit, year after the start of the episode all the variables apart from TFP fall significantly below trend. Employment exhibits a particularly large fall, since the magnitude of its drop below trend after the end of the episode is larger than the pickup occurring at the start of the episode. This pattern suggests that the return of capital inflows to their long run trend might cause economic disruption, a point to which we will return in Section 4.2.

Fig. 6 examines the path of external variables during episodes of large capital inflows. Large capital inflows coincide with an appreciation of the real exchange rate, represented by a rise in the index plotted in Fig. 6, peaking at just over two percent above its trend level late in the episode. This finding is consistent with the real exchange rate appreciations associated with credit booms (e.g. Gourinchas et al., 2001; Mendoza and Terrones, 2008) and with exchange-rate-based stabilization programs (Végh, 1992; Rebelo and Vegh, 1995), which constitute a subset of the episodes we study here. The real exchange rate remains above its trend value for approximately five years, or two years longer than the length of an average episode. The current account deficit goes from an average of just under two percent of GDP prior to the start of the episode to between five and six percent in the first two years after the start of the episode, before returning to its original level after five years. At the same time, foreign reserves increase in the period before the start of the episode to fall back to 1% above trend during the average length of the episode.[17] Hence, on average, the impact of capital inflows on the current account is only partially offset by the accumulation of reserves by the central bank.

In Fig. 7, we look at international liquidity conditions during episodes of large capital inflows, as captured by two measures of financial conditions in the US. First, we take the US real interest rate as a proxy for the international interest rate. The typical episode is preceded by a period of low interest rates, with the real Fed Funds rate significantly below its HP trend. The US interest rate then rises to or slightly above its trend level, although the standard error bands indicate that the level of interest rates during these episodes varies substantially. We do not investigate here whether low international interest rates have a causal role in generating episodes of large capital inflows. However, the pattern of low rates preceding such episodes is consistent with panel data evidence from Fratzscher (2012) that U.S. interest rates are an important driver of portfolio flows, as well as with the VAR analyses by Bruno and Shin (2013) and Rey (2013) showing that lower U.S. interest rates drive increases in cross-border lending by banks.

Second, we test whether prevalent attitudes towards risk in major financial markets vary around the episodes that we identify, using the VIX index as a measure of risk aversion (Fig. 7, right panel). As the episode begins, the VIX is typically below its long run average (the horizontal line in the graph), indicating that risk aversion is lower than usual when episodes begin. Risk aversion rises during the first two years before returning to its long run average around the time the typical episode ends.[18] As with global interest rates, we do not examine in detail whether risk appetite is a cause of inflows episodes, but we do note that the pattern we uncover is consistent with the findings of Forbes and

[16] See Basu and Fernald (2001) for the evidence on the procyclicality of capacity utilization and the challenges it poses for measuring TFP over the business cycle.

[17] We measure reserve accumulation using the net change in official reserves from the balance of payments, which gives the increase in reserves net of valuation changes.

[18] We observe the same pattern if we employ an alternate measure of risk such as the spread between the yield on medium-grade corporate bonds (rated Baa by Moody's) and that on highly rated (Aaa) corporate bonds.

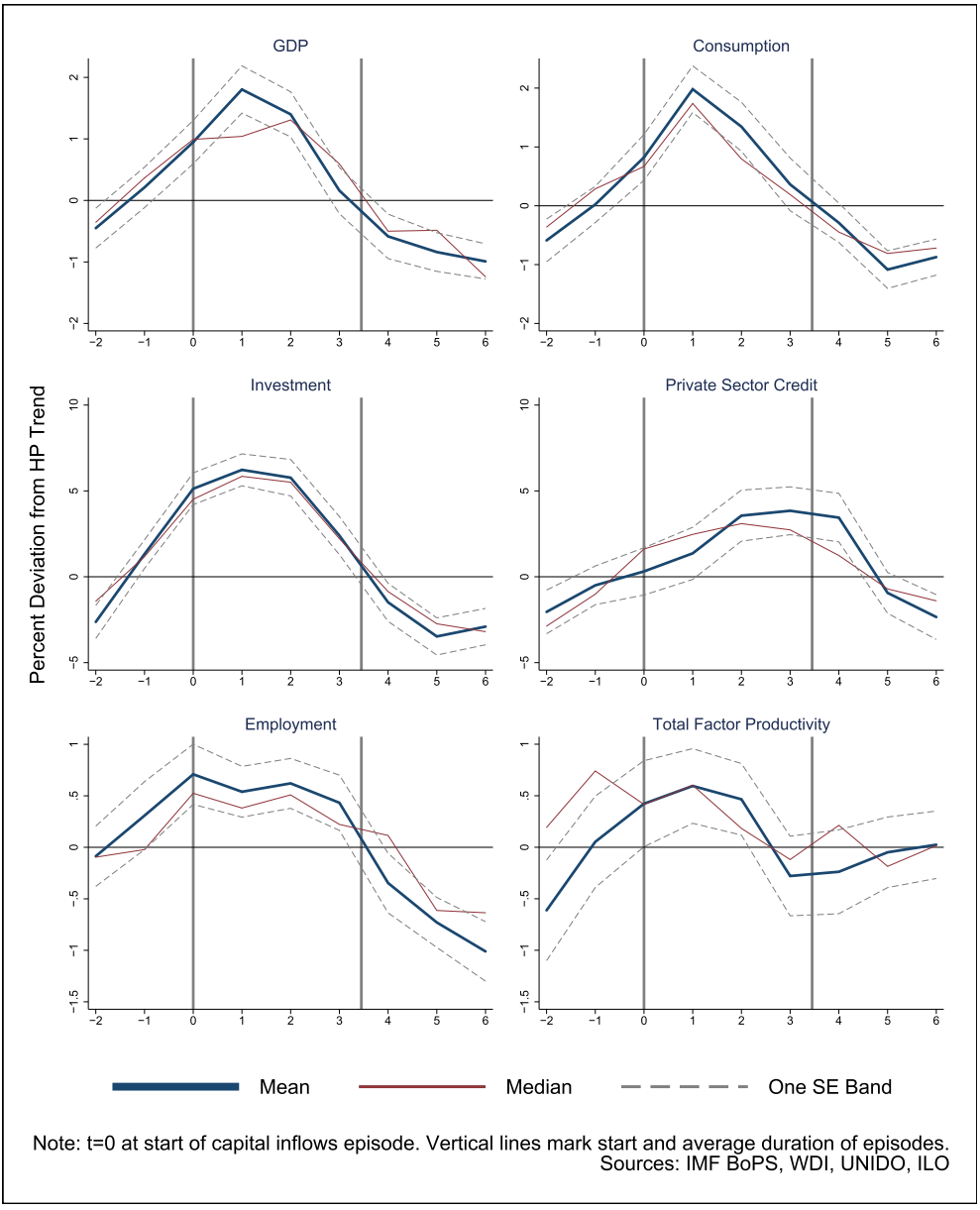

Fig. 5. Capital inflows episodes and the domestic economy.

Warnock (2012) and Fratzscher (2012) as well as Rey (2013), who present evidence of a causal role for changes in risk appetite in driving cross-border capital flows.

3.2. Sectoral allocation of production

Having characterized the aggregate behavior of the economy during our episodes, we now turn our attention to the sectoral allocation of production. In particular, we are interested in documenting how

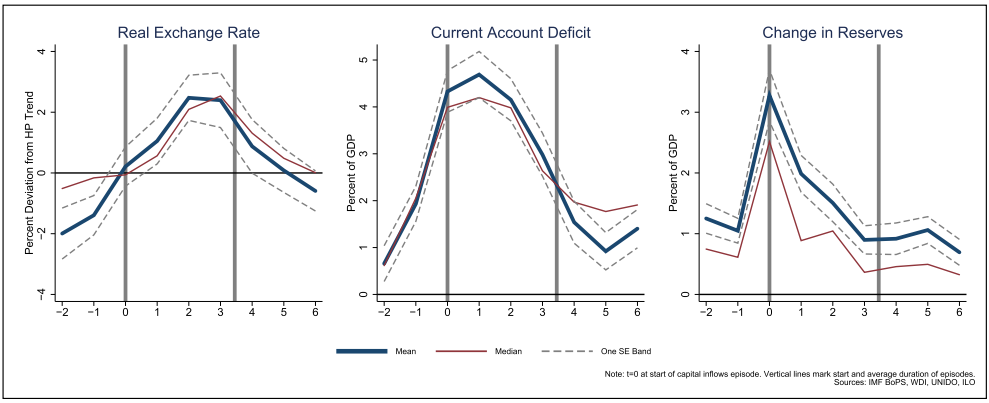

Fig. 6. Capital inflows episodes and the external sector.

the composition of GDP and the allocation of productive resources across different sectors behave during large capital inflows. As was the case with the macroeconomic variables we examined, we detrend the sectoral shares using an HP filter, because these exhibit clear time trends in nearly all countries in the sample. In advanced economies, the sectoral shares of tradables in general, and manufacturing in particular, fall steadily over time, reflecting a structural shift towards services. By contrast, the importance of tradables and manufacturing rises steadily over time in most emerging and developing economies.

Fig. 8 plots changes in the shares of gross value added produced by four sectors: agriculture, mining, services, and manufacturing. In the top left panel, we see that the share of agriculture in value added drops significantly during the typical episode and returns to its trend level when the episode ends. To the extent that agricultural products are tradable, this is consistent with two-sector small open economy models in which a consumption boom is accompanied by a shift in production towards nontradable goods. However, the top right panel of Fig. 8 provides some evidence that the share of mining rises above trend during episodes of large capital inflows. Since metals and hydrocarbons are tradable goods, this appears at odds with the idea that capital inflows episodes are associated with a shift out of tradables production. At the same time, the data show substantial heterogeneity, with particularly wide confidence intervals. We therefore suspect that some of the episodes in our sample correspond to periods in which funds from abroad are used to finance the development of mineral resources. Again consistent with the theoretical literature, the share of value added in services is on average slightly below its trend level before the episode begins, then rises to its trend level or slightly above for the duration of the typical episode. Finally, manufacturing value added is at or above its trend level at the start of these episodes, but drops steadily for four years before beginning to return to trend.

The fall in manufacturing value added is consistent with, among others, Rebelo and Vegh (1995), Rodrik (2008), and Kalantzis (2014) who find that manufacturing value added typically falls during episodes of real exchange rate appreciation. However, precisely during periods of real exchange rate overvaluation, the sectoral share of real value added may not give reliable information on the sectoral allocation of productive resources. Consider an episode of real appreciation. The domestic price level rises faster than the foreign price level, but the price of tradable goods will move together with international prices more closely than will the price of nontradable goods. As a result, episodes of real appreciation will tend to be periods in which the price of nontradables like services rises faster than the price of tradables like manufacturing. However, as discussed in Section 2, standard practice when using sectoral data for a wide sample of countries (including the WDI data we use here) is to deflate all sectors using the GDP deflator, due to the limited availability of data on sectoral price changes.[19] As a

[19] An exception is Kalantzis (2014), who uses sectoral price deflators for a narrower sample of countries.

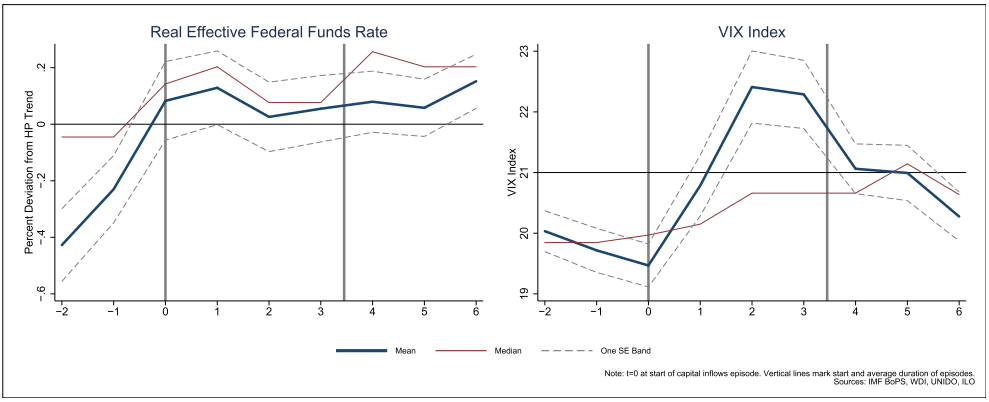

Fig. 7. Capital inflows episodes and international conditions.

result, real value added in tradables, including agriculture and manufacturing, will mechanically tend to grow more slowly than real value added in services during periods of real appreciation.

To have a better sense of how capital inflows affect sectoral production, we therefore look at the sectoral allocation of productive resources during the episodes we study. This allows us to determine the extent to which production is truly shifting, irrespective of movements in output prices. In particular, we examine employment in the manufacturing sector as a share of total employment and investment in manufacturing as a share of total investment. Here we limit our analysis to

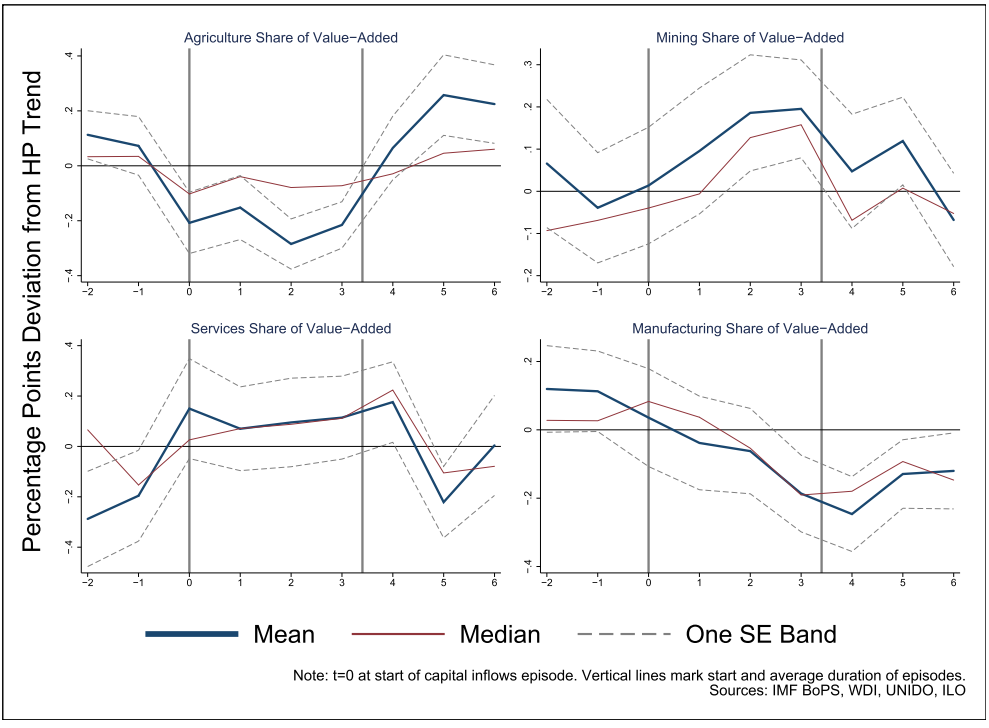

Fig. 8. Capital inflows episodes and sectoral allocation of value added.

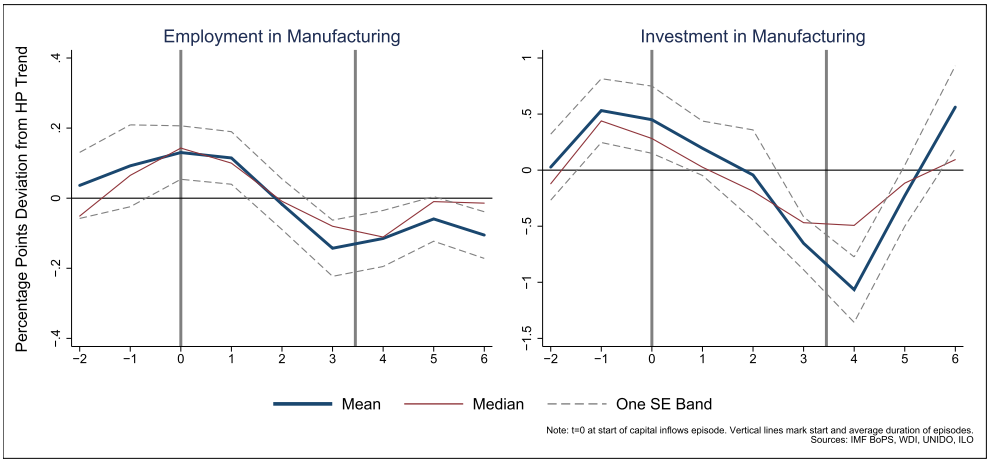

Fig. 9. Capital inflows episodes and sectoral allocation of resources.

manufacturing in order to maximize the number of capital inflows episodes included in the analysis, since data on the shares of employment and investment allocated to agriculture, mining, and services are not widely available.

Fig. 9 makes clear that the share of productive resources allocated to manufacturing drops during episodes of large capital inflows. In fact, while the share of manufacturing in both employment and investment is above trend when the episode begins, by the end of the episode both shares are significantly below trend. Hence, Fig. 9 provides *direct* evidence of a reallocation of productive resources out of manufacturing, and presumably into nontradable sectors, during episodes of large capital inflows. In this sense, of the two country cases highlighted in the introduction to this paper, the case of Spain rather than that of Brazil is typical of countries experiencing unusually large capital inflows.

We now consider whether the reallocation of resources across sectors is connected with two other dimensions: the extent to which the government accumulates foreign reserves during the episode, and the international liquidity conditions when the episode begins. Let us start with the accumulation of foreign exchange reserves by the central bank. Standard two-sector small open economy models predict that the allocation of productive resources between tradable and nontradable sectors should respond to changes in the current account, rather than to capital inflows per se.[20] Hence, theory suggests that, to the extent that reserve accumulation by the central bank offsets the impact of capital inflows on the current account, we should expect the reallocation of resources out of manufacturing to be *larger*, when the accumulation of reserves by the central bank during an episode is *smaller*.

Motivated by this insight, we compare the behavior of the share of employment in manufacturing in episodes with below-average reserve accumulation to those with above average reserve accumulation.[21] The results are illustrated by Fig. 10. Where reserve accumulation is below average, the share of employment in manufacturing is on average at or slightly above trend when the episode begins, but drops significantly below trend during the second and third year of the episode before moving back towards its trend level four years after the episode begins. Moreover, the magnitude of the drop is much larger than was the case for the entire sample. By contrast, episodes in which reserve

[20] See Rebelo and Vegh (1995) and Benigno and Fornaro (2014). See also Benigno and Fornaro (2012), which present a theoretical framework in which the accumulation of reserves by the central bank induces a shift of resources toward the tradable sector.

[21] Once again we measure reserve accumulation using the net change in official reserves from the balance of payments, which gives the increase in reserves net of valuation changes.

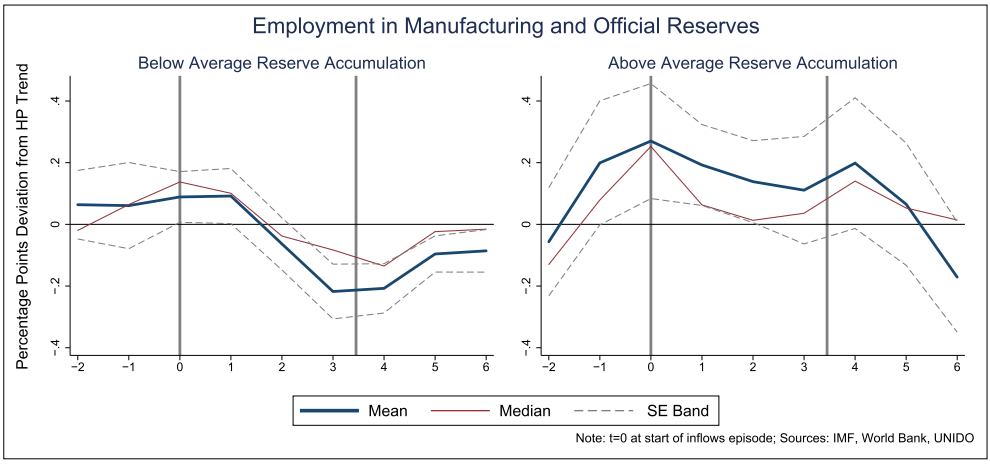

Fig. 10. Capital inflows episodes and sectoral allocation, high and low reserve accumulation.

accumulation is above average show a rise in the share of employment in manufacturing as the episode begins. The share then moves gradually back towards its trend level.[22] Hence, the behavior of the share of employment in manufacturing suggests that the accumulation of reserves by the central bank might mitigate the contraction in manufacturing during episodes of large capital inflows, in line with the predictions of standard two-sectors small open economy models. The behavior of manufacturing investment, on the other hand, shows no divergence between episodes with low versus high reserve accumulation (to conserve space, we do not include these graphs).

We now turn to the role of the international liquidity conditions at the onset of the episodes that we identify. In general, easy access to credit from abroad generates a boom in consumption. While the increase in tradable consumption results in a current account deficit, nontradable consumption requires a shift of resources out of the tradable sector and into the production of nontradables (see Rebelo and Vegh, 1995 and Benigno and Fornaro, 2014, for a detailed theoretical exploration of this mechanism). So the sectoral allocation of productive resources can be driven also by international financial conditions.

Fig. 11 compares the behavior of the share of employment in manufacturing during episodes that begin when the Federal Funds rate is below average with episodes beginning when the Fed Funds rate is above average. The left panel shows that, for those episodes that were preceded by below average Federal Funds rates, manufacturing employment drops throughout the duration of the typical episode before beginning to recover. Where the Fed Funds rate is high when the episode begins, the share of manufacturing employment rises significantly before returning to its trend level around the time the typical episode ends. In addition, a nearly identical pattern emerges if we divide the episodes according to the level of the VIX just before the start of each episode (see the appendix). Where risk aversion is low at the outset manufacturing employment drops, while where risk aversion is above average, manufacturing employment rises. Hence, the reallocation of employment out of manufacturing seems to be a feature of those episodes that take off when international liquidity is abundant.

In the first part of this section, we showed that on average productive resources shift out of manufacturing during episodes of large capital inflows, and indeed the reallocation of investment out of manufacturing appears to be a general feature of periods in which capital inflows are unusually large. However, we also find that the reallocation of employment out of manufacturing is not a universal feature of the episodes in our sample. Rather, employment shifts out of manufacturing during

[22] These patterns hold when the median rather than the mean is used to divide episodes, and regardless of whether reserve accumulation is normalized by GDP or by the level of capital inflows.

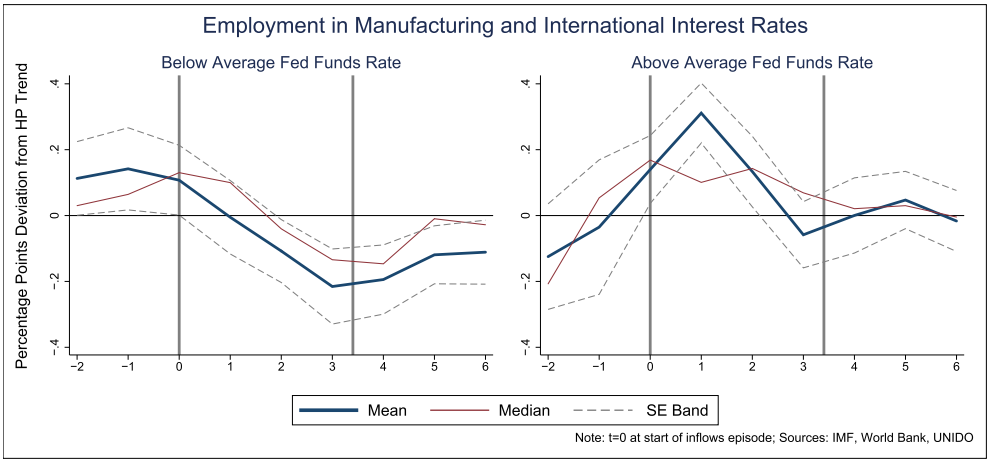

Fig. 11. Capital inflows episodes and sectoral allocation, high and low international interest rates.

episodes in which reserve accumulation has been relatively low but moves very little in cases where governments actively purchase foreign assets. Employment also shifts out of manufacturing during episodes which begin at times of abundant international liquidity. In the next two sections, we show that this distinction—episodes in which reallocation occurs versus those where it does not—is particularly important, because the allocation of employment is significantly related to how the economy fares in the aftermath of large capital inflows.

4. The aftermath of large capital inflows

4.1. Capital flow reversals and sudden stops

Policymakers often cite the risk that an episode of large capital inflows might create the conditions for a financial crisis and a recession as one of the key reasons why it is necessary to monitor and intervene in capital flows. In fact, the event study in Section 3 showed that on average episodes of large capital inflows set the stage for a slump. In this section we ask whether the behavior of several macroeconomic indicators before or during the episode, in particular the sectoral allocation of production, can provide any information about whether the episode is likely to end in a hard or a soft landing. We begin by testing how various economic variables are related to two broad measures of the outcome of each episode: Whether or not the episode coincides with a reversal or a sudden stop.[23]

We model the probability that a sudden stop will occur during or immediately after episode i using a probit specification in which y_i is equal to one if a reversal (regression 1 in Table 4) or a sudden stop (regression 2) occurs during episode i or in the year immediately afterwards. The results are very similar if we employ a linear probability model or a logistic regression model (these results are provided in the Appendix).

$$Pr(y_i = 1|X_i) = \Phi(\gamma_1 INFLOWS_i + \gamma_2 CREDIT_i + \boldsymbol{\gamma}_3' ALLOCATION_i + \boldsymbol{\gamma}_4' FED\_FUNDS_i + \boldsymbol{\gamma}_5' POLICY_i) \quad (1)$$

Since episodes of large inflows are associated with credit booms, we first examine whether the size of the credit boom affects the probability of a sudden stop or reversal. In particular, we include in the

[23] As in Section 2 we identify sudden stops using the methodology of Calvo et al. (2004).

Table 4
Probit regression results episode characteristics, reversals, and sudden stops.

Dependent variable:	Reversal (1)	Sudden stop (2)
Capital inflows[a]	0.086 (0.072)	0.141* (0.076)
Private credit[b]	−0.007 (0.014)	0.052*** (0.019)
Manuf. employment[c]	−0.181 (0.424)	−0.496 (0.532)
Manuf. investment[c]	−0.062 (0.142)	0.101 (0.163)
Fed funds rate[d] during episode	0.08 (0.091)	0.135 (0.108)
Fed funds rate[d] before episode	0.123 (0.09)	−0.214** (0.103)
Reserve accumulation[e]	−0.143* (0.086)	0.026 (0.096)
Initial reserves[e]	0.035** (0.016)	−0.105*** (0.031)
Floating ER[f]	−0.382 (0.349)	−0.832** (0.423)
Financial openness[g]	−0.009 (0.106)	0.187 (0.14)
Observations	91	91
Pseudo R-Squared	0.097	0.396

Robust standard errors in parentheses; $^{**}p < 0.01$, $^{**}p < 0.05$, $^{*}p < 0.1$.
[a] Percentage points deviation from HP trend.
[b] Real, per capita terms; log deviation from HP trend.
[c] Share of total, percentage points deviation from HP trend.
[d] Percentage Points.
[e] Percent of GDP.
[f] Dummy for floating exchange rate regime, based on Ilzetzki et al. (2008).
[g] Chinn-Ito index of financial openness. Pre- and post-peak values are averages for 3 years before and after the year capital inflows peak. See the Data Appendix A for data sources.

regression the variable $CREDIT_i$, the average value of HP-detrended real credit to the private sector during episode *i*. The variable $INFLOWS_i$ is the average value of our HP-detrended capital inflows measure (the current account deficit plus reserve accumulation) during episode.

The vector $ALLOCATION_i$ contains two variables: the average share of manufacturing in total employment during the episode and the average share of manufacturing investment, measured as share of total investment. Once again, we measure the allocation variables as the deviation from their HP trends. In the previous section, we found that episodes of large capital inflows coincided with larger than normal shifts of resources out of the manufacturing sector. Here we examine whether these shifts render the economy vulnerable to a sudden stop.

The event study also indicated that the real Federal Funds rate was on average lower than its trend level just before episodes of large inflows. Therefore FED_FUNDS_i is a vector of two variables: the average US effective Federal Funds rate, in real terms, in the three years prior to the start of each episode and the average value of the real Fed Funds rate during each episode.

Finally, we include a vector of four variables ($POLICY_i$) capturing the policies in place before and during these episodes. To test whether policy-makers can effectively guard against sudden stops by accumulating foreign reserves once capital inflows grow unusually large, we include the average purchase of new reserves during the episode, measured as a share of GDP.[24] We also examine whether holding a pre-existing stockpile of foreign reserves can benefit the economy by including in the regression the level of foreign reserves before the episode starts. Finally, we include a dummy variable equal to one if the country has a floating exchange rate regime at the start of the episode (constructed using data from Ilzetzki et al., 2008, and updated through 2012) as well as the Chinn-Ito measure of financial openness when the episode begins (Chinn and Ito, 2006).

The regression results reported in Table 4 show that the variables we consider do not provide much information on whether the episode will coincide with a reversal of capital inflows. Reserve accumulation and the level of reserves do appear statistically significant. Somewhat counterintuitively, the results in regression (1) indicate that episodes in countries with higher initial reserves are more likely to end in sharp capital flows reversals. One possible interpretation is that this result could be driven by economies more exposed to capital flow volatility, such as the emerging markets, holding higher levels

[24] We use the change in reserves from the balance of payments, which captures the change in reserves net of valuation changes.

of reserves as a policy response, thus rendering the relationship between reserves and reversals positive. In any case, the model fit as captured by the pseudo R-squared is poor. Thus, it appears that neither the domestic or foreign macroeconomic conditions we consider, nor the policy variables we analyze, are systematically related to whether large inflows will end abruptly or smoothly.

By contrast, the model appears much more informative about whether the episodes we examine will coincide with a sudden stop. A larger expansion of domestic credit is significantly associated with an increased probability of a sudden stop.[25] Even controlling for domestic credit, the capital inflows variable is also significantly related to the probability of sudden stops. This suggests that the presence of unusually large capital inflows puts the economy more at risk of a sudden stop than does a purely domestic credit expansion. This is consistent with the work of Caballero (2014) who finds that surges in capital inflows increase the risk of banking crisis even in the absence of a lending boom. At the same time, we do not find evidence that the reallocation of productive resources across sectors during the inflows episode is significantly related to the likelihood that a sudden stop occurs.

We also find that episodes of capital inflows that start when the Fed Funds rate is low are more likely to end up in a sudden stop. Moreover, although reserve accumulation during the episode does not enter significantly, a higher pre-episode level of reserves is significantly associated with lower vulnerability to a sudden stop. Whereas the results from regression (1) indicated that holding larger reserves does not dampen capital flow volatility (as captured by the incidence of reversals), the negative coefficient on reserves in regression (2) suggests that reserves may in fact help to insulate the real economy from the impacts of volatility.[26] Finally, a floating exchange rate significantly reduces the probability that a sudden stop will occur.

4.2. Economic performance when capital flows fall

We now investigate the relationship between, on the one hand, what happens before and during large capital inflows and, on the other, macroeconomic performance in the aftermath of the episode. We saw in the previous section that macroeconomic and policy variables provided some information about the risk that a sudden stop would occur, and the literature has indeed shown that sudden stops have significant negative consequences for economic performance (Calvo and Reinhart, 2000; Gourinchas and Obstfeld, 2012). However, more than 70 percent of the episodes in our sample do not end in a sudden stop. We therefore estimate the following model

$$y_i = \alpha + \beta_1 INFLOWS_i + \beta_2 CREDIT_i + \beta_3' ALLOCATION_i + \beta_4' FED\_FUNDS_i + \beta_5' POLICY_i + \varepsilon_i \qquad (2)$$

Where the dependent variable y_i is the average of a measure of economic performance after the end of episode i. The dependent variables we consider are the average values of GDP, consumption, investment, employment, and TFP (all HP detrended) during the three years after the end of the episode.

We use the same set of explanatory variables as in the previous section. We first examine whether the extent of the credit boom ($CREDIT_i$) or the size of capital inflows ($INFLOWS_i$) affect economic outcomes after the episode. In the Section 3, we found that episodes of large capital inflows coincided with larger than normal shifts of employment and investment out of the manufacturing sector. Here we examine whether these shifts (again measured by the vector $ALLOCATION_i$) adversely affect economic performance after capital inflows come to an end. As in our analysis of sudden stops, FED_FUNDS_i includes the average US effective Federal Funds rate in both the three years prior to the start of each episode and during each episode.[27] And we again include a vector of variables $POLICY_i$ capturing the

[25] Gourinchas and Obstfeld (2012) find that credit expansion increases the probability of both banking and currency crises in emerging markets, but to a lesser extent in EMEs. Thus our work confirms that this credit-crisis relationship holds once we restrict our sample to periods of large capital inflows. Calvo and Reinhart (2000) document the close relationship between sudden stops and banking crises.

[26] Recall that according to the definition developed by Calvo et al. (2004) that we use here, sudden stops are by definition a reversal which is accompanied by a recession.

[27] Results are nearly identical if we use the VIX index as a measure of international liquidity conditions. See the appendix for these results.

Table 5
Regression results episode characteristics and economic performance.

Dependent Variable:	GDP[a](1)	Consumption[a] (2)	Investment[b](3)	Employment[b](4)	TFP[b](5)
Capital inflows[b]	−0.159 (0.119)	−0.474*** (0.139)	−0.665* (0.383)	−0.075 (0.111)	−0.293** (0.122)
Private credit[a]	−0.069*** (0.024)	−0.041 (0.032)	−0.260*** (0.086)	−0.033* (0.019)	−0.059*** (0.016)
Manuf. employment[c]	1.499*** (0.548)	1.812** (0.744)	3.814** (1.896)	1.273** (0.557)	−0.201 (0.438)
Manuf. investment[c]	−0.136 (0.232)	−0.078 (0.221)	−0.513 (0.807)	0.034 (0.283)	0.061 (0.206)
Fed funds rate[d] during episode	−0.151 (0.134)	−0.06 (0.152)	0.195 (0.528)	0.065 (0.124)	−0.001 (0.145)
Fed funds rate[d] before episode	0.138 (0.122)	0.212 (0.128)	0.419 (0.442)	0.201 (0.133)	0.179 (0.111)
Reserve accumulation[e]	0.188 (0.127)	0.314* (0.164)	1.203*** (0.42)	0.093 (0.129)	0.392*** (0.133)
Initial reserves[e]	0.008 (0.026)	−0.018 (0.022)	−0.063 (0.082)	0.01 (0.024)	0.012 (0.018)
Floating ER[f]	0.644 (0.408)	0.53 (0.468)	3.603** (1.498)	0.974** (0.45)	0.257 (0.432)
Financial openness[g]	−0.098 (0.155)	0.058 (0.188)	−0.268 (0.594)	−0.1 (0.159)	0.181 (0.179)
Observations	91	90	87	83	83
R-Squared	0.356	0.336	0.447	0.258	0.483

Robust standard errors in parentheses; **p < 0.01, **p < 0.05, *p < 0.1. Dependent variables are average values for the 3 years after each episode ends.

[a] Real, per capita terms; log deviation from HP trend.
[b] Percentage points deviation from HP trend.
[c] Share of total, percentage points deviation from HP trend.
[d] Percentage Points.
[e] Percent of GDP.
[f] Dummy for floating exchange rate regime, based on Ilzetzki et al. (2008).
[g] Chinn-Ito index of financial openness. See Appendix A for data sources.

policies in place before and during these episodes, including reserve accumulation during the episode, the level of reserves before the start of the episode, and the exchange rate regime and degree of de jure capital openness in place when the episode begins.

The coefficients on capital inflows in Table 5 are always negative and generally significant. This indicates that the size of the capital inflows the economy receives during the episode is systematically related to how the economy fares once inflows come to an end. A larger credit boom during the episode also has a negative relationship with post-episode macroeconomic outcomes. This confirms that the episodes we examine are typical of credit booms more generally. However the capital inflows variable is significant even after we control for the size of the domestic credit boom. Therefore the negative impact of the booms in our sample on post-episode output is significantly larger than would be the case during a purely domestic credit boom.

The positive and significant coefficient on the share of manufacturing employment in regression (1) indicates that less reallocation of employment away from manufacturing during the episode is significantly associated with a less severe recession afterwards.[28] Likewise, less labor reallocation away from manufacturing is associated with higher consumption, investment, and employment. By contrast, Table 5 shows no systematic relationship between the share of total investment allocated to manufacturing during episodes of large inflows and subsequent economic performance.

These findings suggest that, once we control for other relevant factors, the sectoral allocation of labor is significantly related to economic performance in the post-boom period. These findings are related to the analysis of Giavazzi and Spaventa (2010), who discuss the importance of the sectoral allocation of production for current account sustainability. However, our results indicate that the allocation of labor is more informative regarding post-episode performance than the sectoral allocation of investment.[29]

[28] In a large majority of the episodes in our sample, the share of labor the manufacturing sector falls below its trend (refer back to Fig. 9). When discussing our results we therefore interpret coefficients as estimates of the impact of reallocation *out* of manufacturing.

[29] This result might be due to frictions to the reallocation of labor across sectors once the inflows subside. For instance, the combination of nominal wage rigidities and a fixed exchange rate prevents the fall in real wages that might be needed to reallocate labor in the tradable sectors in the aftermath of an episode of large capital inflows, and thus generate unemployment (see Schmitt-Grohé and Uribe (2011) and Fornaro (2012)).

International liquidity conditions as measured by the Fed Funds rate do not appear significantly related to economic performance after the episode ends. Thus our results indicate that abundant international liquidity does not significantly affect macroeconomic variables once we control for the two channels through which it might affect the domestic economy—capital inflows and domestic credit conditions. Moreover, we saw in Section 3 that the extent of reallocation of employment away from manufacturing is greater in episodes that start during periods of low U.S. interest rates. Sectoral reallocation thus appears to be another channel through which abundant international liquidity affects macroeconomic outcomes in these episodes, but once we account for reallocation, U.S. interest rates themselves have no independent impact.

Turning to the policy variables in our regression, reserve accumulation during episodes of large inflows is always positively related to post-episode macroeconomic outcomes, and nearly always significantly so. By contrast, the level of official reserves prior to the start of the episode is never significant and fluctuates in sign. Moreover, the evidence for the effectiveness of the other two policy measures we study is not particularly strong. A floating exchange rate is positively associated with post-episode performance, but significantly related only to investment and employment. Financial openness at the start of the episode, on the other hand, does not appear to affect subsequent economic performance.

The relatively parsimonious specification we employ explains between one third and one half of the variation in the macroeconomic outcomes we analyze, and the size of the coefficients in Table 5 are economically meaningful. For instance, in the mid-2000s Ireland experienced an episode of large capital inflows, during which employment in the manufacturing sector ran 0.4 percentage points below its HP trend. According to the results in Table 5, this reallocation of labor is typically associated in the aftermath of the inflows with GDP being 0.6 percentage points lower that it would have been without such reallocation, investment being 1.5 percent lower, and employment 0.5 percentage points lower. Like the Eurozone periphery, countries in Eastern Europe received large capital inflows during the mid-2000s. In these countries (Poland, Hungary, Bulgaria, and the Baltic Republics) the share of the labor force in manufacturing actually rose to between 0.6 and 0.9 percentage points above its trend. Our results imply that this reallocation would typically coincide with post-episode GDP 0.9 and 1.3 percent higher than without reallocation, investment two or three percent higher, and employment between 0.8 and 1.1 percent higher.

Of course, from our simple empirical model it is not possible to draw conclusions about the channels that generate a correlation between the share of employment in manufacturing and the behavior of macroeconomic variables in the aftermath of an episode of large capital inflows, nor about the directions of causality. However, we think that the relationships uncovered by this empirical analysis are suggestive enough to warrant further research, perhaps aiming at empirically testing some of the channels suggested by the theoretical literature.

5. Conclusion

This paper has analyzed the experiences of 70 middle- and high-income countries that underwent episodes of large capital inflows between 1975 and 2010. A large majority of these episodes end in a sharp reversal of capital inflows, but less than a third of these reversals are sudden stops in which output contracts.

Our event study shows that in the typical episode output rises initially but then drops below trend as capital inflows subside. This is also true of investment, consumption, and employment. A credit boom also accompanies the episodes in our sample, collapsing when the episodes end. Aggregate productivity follows a similar path, remaining below its trend level for more than three years after the episode ends. The episodes that we identify typically begin in years when US interest rates are below average and when risk appetite in US financial markets is higher than average.

Large capital inflows also coincide with a shift of both labor and capital out of the manufacturing sector. While the reallocation of investment is a general feature of episodes of large capital inflows, the reallocation of labor away from manufacturing is a phenomenon particular to episodes in which the

accumulation of reserves by the central bank is low, as well as to episodes that begin during periods of abundant international liquidity.

Our regression analysis reveals that post-episode economic performance is significantly and negatively related not only to the size of the credit boom generated by capital inflows and the magnitude of those inflows, but also the extent to which labor moves out of manufacturing, with a stronger shift of labor out of manufacturing during the inflows episode associated with a sharper contraction in the aftermath of the episode. By contrast, international liquidity conditions and the allocation of investment are uninformative regarding the severity and length of the post-boom downturn.

Our findings therefore indicate that policy-makers should monitor the sectoral allocation of labor during periods of exceptionally large capital inflows. In fact, a shift in employment out of manufacturing may signal increased risk of a hard landing. However, on a positive note, our results also indicate that foreign exchange reserves management might help policymakers in dealing with the labor reallocation out of manufacturing during episodes of large capital inflows.

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Data Appendix

1. Data sources

Table A-1
Data sources.

Variable	Source
Current account	IMF Balance of Payments Statistics
Reserves	IMF Balance of Payments Statistics
Effective fed funds rate	FRED
Baa-Aaa corporate bond spread	FRED
VXO index	Bloomberg
Real exchange rate	WDI
Output	WDI
Consumption	WDI
Investment	WDI
Credit to the private sector	WDI
Tradables value-added	WDI
Nontradables value-added	WDI
Total employment	ILO LABORSTA
Manufacturing employment	UNIDO INDSTAT2
Manufacturing investment	UNIDO INDSTAT2
TFP	Penn World Tables
Exchange rate regime	Ilzetzki et al. (2008)
Capital controls	Chinn and Ito (2006)

2. Notes on the construction of selected data series

Total Factor Productivity: We calculate total factor productivity (TFP) using data on output and investment obtained from the Penn World Tables (Heston et al., 2013). We estimate initial capital stock using the method described in Klenow and Rodríguez-Clare (1997) and calculate capital stock for subsequent years using the annual values of investment obtained from the Penn World Tables. We use employment data from the International Labor Organization's LABORSTA data set rather than the labor force data provided by the Penn World Tables. This ensures that fluctuations in TFP around episodes of large capital inflows are not the result of changes in the unemployment rate. We calculate aggregate total factor productivity using standard growth accounting (e.g. as in Benhabib and Spiegel, 2005). This methodology allows us to measure TFP in nearly all of the 70 countries in which we observe episodes of large capital inflows.

The VIX: To measure the risk aversion of major international investors we use the VIX index. The VIX measures the implied volatility of S&P index options and thus reflects the price of risk in U.S. equity markets. When the price of risk and thus the VIX is low, it can be inferred that risk aversion is low. More specifically, we use the "original" VIX index or VXO, which measures the implied volatility of options on the S&P100 and which is available since the late 1980s. To obtain a measure of risk aversion from 1970 to 1986 we regress the realized volatility of the S&P 100 on the VXO for the post-1986 period and use the estimated coefficients to back-cast the VXO.

3. List of episodes

Table A-2
Capital inflows episodes in advanced economies.

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
United Kingdom	1987	1990	1990	4.0	3.7
Austria	1975	1979	1981	7.0	3.6
Austria	1995	1997	1998	4.0	2.5
Belgium	2008	2009	2009	2.0	1.0
Denmark	1985	1986	1987	3.0	4.2
Denmark	1997	1998	1999	3.0	−0.4
Denmark	2008	2008	2009	2.0	−3.2
France	1980	1981	1983	4.0	1.1
France	2006	2008	2008	3.0	1.1
Germany	1978	1979	1982	5.0	0.2
Germany	1991	1993	1995	5.0	1.2
Germany	1998	2002	2003	6.0	−0.0
Italy	1980	1981	1981	2.0	2.4
Italy	1988	1988	1991	4.0	1.4
Italy	2006	2009	2011	6.0	2.7
Netherlands	1977	1979	1980	4.0	−0.1
Netherlands	1992	1993	1993	2.0	−3.0
Netherlands	2000	2001	2002	3.0	−2.3
Netherlands	2008	2009	2009	2.0	−4.8
Norway	1976	1976	1977	2.0	11.4
Norway	1987	1988	1988	2.0	4.2
Norway	1996	1997	1999	4.0	−4.7
Sweden	1975	1976	1977	3.0	1.5
Sweden	1990	1991	1993	4.0	2.4
Canada	1975	1977	1978	4.0	3.9
Canada	1987	1989	1989	3.0	3.3
Canada	1998	1999	1999	2.0	0.5
Canada	2009	2010	2010	2.0	3.2
Japan	1980	1981	1981	2.0	0.3
Japan	1995	1995	1996	2.0	−1.7
Japan	2003	2004	2004	2.0	−3.4
Finland	1990	1993	1994	5.0	3.1

Table A-2 (*continued*)

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
Greece	1999	1999	2000	2.0	6.7
Greece	2006	2010	2011	6.0	12.0
Ireland	1980	1982	1982	3.0	10.7
Ireland	1993	1994	1995	3.0	−2.9
Ireland	2006	2009	2009	4.0	4.2
Portugal	1981	1982	1982	2.0	12.8
Portugal	1989	1990	1991	3.0	0.3
Portugal	2008	2009	2010	3.0	11.4
Spain	1987	1988	1991	5.0	2.2
Spain	2005	2005	2008	4.0	9.0
Australia	1981	1983	1983	3.0	4.3
Australia	1986	1987	1990	5.0	5.1
Australia	2003	2004	2006	4.0	6.2
New Zealand	1984	1985	1986	3.0	11.4
New Zealand	2005	2005	2007	3.0	7.0
Cyprus	1982	1983	1984	3.0	9.2
Cyprus	1989	1991	1992	4.0	6.2
Cyprus	1999	2000	2001	3.0	3.4
Cyprus	2005	2007	2008	4.0	9.1
Israel	1982	1983	1983	2.0	8.9
Israel	1993	1994	1997	5.0	4.3
Israel	2008	2010	2010	3.0	−2.8

Source: IMF, authors' calculations.

Table A-3
Capital inflows episodes in emerging economies.

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
Turkey	1993	1994	1997	5.0	1.1
Turkey	2005	2007	2007	3.0	5.4
South Africa	1975	1976	1976	2.0	5.9
South Africa	1981	1983	1984	4.0	3.2
South Africa	1995	1996	1997	3.0	1.4
South Africa	2004	2005	2008	5.0	5.2
Argentina	1997	2000	2000	4.0	3.4
Argentina	2004	2006	2007	4.0	−2.3
Brazil	1995	1996	1996	2.0	2.6
Brazil	2000	2000	2001	2.0	4.0
Brazil	2007	2008	2011	5.0	1.5
Chile	1978	1979	1981	4.0	8.6
Chile	1990	1991	1997	8.0	2.8
Colombia	1981	1981	1982	2.0	6.6
Colombia	1993	1994	1997	5.0	4.7
El Salvador	1981	1982	1982	2.0	5.4
El Salvador	1989	1990	1990	2.0	3.8
El Salvador	2007	2007	2008	2.0	6.6
Mexico	1980	1980	1981	2.0	5.9
Mexico	1990	1990	1993	4.0	4.7
Peru	1994	1997	1997	4.0	7.1
Peru	2007	2009	2012	6.0	1.9
Lebanon	2008	2008	2009	2.0	16.7
Egypt	1979	1980	1982	4.0	6.6
Egypt	2005	2006	2010	6.0	−0.1
India	2006	2006	2007	2.0	0.8
Indonesia	1995	1995	1996	2.0	3.3
Korea	1979	1981	1981	3.0	6.2
Korea	1991	1993	1996	6.0	1.4
Korea	2009	2010	2011	3.0	−2.6

(*continued on next page*)

Table A-3 (*continued*)

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
Malaysia	1981	1981	1983	3.0	11.4
Malaysia	1991	1991	1993	3.0	5.5
Malaysia	2003	2003	2004	2.0	−12.1
Pakistan	1992	1995	1996	5.0	5.1
Pakistan	2006	2008	2009	4.0	5.5
Philippines	1978	1981	1982	5.0	6.1
Philippines	1991	1995	1996	6.0	3.6
Philippines	2010	2011	2011	2.0	−3.1
Thailand	1989	1989	1991	3.0	6.6
Thailand	1994	1994	1996	3.0	7.2
Thailand	2005	2009	2010	6.0	−2.6
Vietnam	2007	2008	2008	2.0	9.9
Morocco	1976	1976	1977	2.0	15.4
Morocco	1981	1981	1982	2.0	12.0
Morocco	1990	1991	1991	2.0	1.1
Morocco	1999	2000	2001	3.0	−0.9
Tunisia	1977	1978	1978	2.0	9.4
Tunisia	1982	1983	1984	3.0	8.1
Tunisia	1992	1994	1994	3.0	6.5
Tunisia	2006	2007	2008	3.0	2.7
Bulgaria	2006	2006	2008	3.0	22.6
Russia	1995	1996	1998	4.0	−1.1
Russia	2006	2006	2007	2.0	−7.4
China	1993	1995	1996	4.0	0.1
China	2003	2003	2005	3.0	−4.0
Ukraine	2005	2009	2010	6.0	2.2
Slovak Republic	2005	2006	2007	3.0	5.7
Estonia	2006	2008	2008	3.0	13.5
Latvia	2006	2007	2007	2.0	22.5
Hungary	1993	1994	1995	3.0	8.0
Lithuania	1995	1996	1998	4.0	9.4
Lithuania	2006	2008	2008	3.0	12.9
Slovenia	2001	2001	2002	2.0	−0.6
Slovenia	2007	2007	2008	2.0	4.8
Poland	1992	1994	1995	4.0	2.1
Poland	1998	2000	2000	3.0	5.8
Poland	2007	2008	2010	4.0	5.5

Source: IMF, authors' calculations.

Table A-4
Capital inflows episodes in other economies.

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
Costa Rica	1980	1983	1983	4.0	11.7
Costa Rica	2006	2006	2007	2.0	5.4
Dominican Republic	1979	1979	1980	2.0	8.4
Dominican Republic	1991	1991	1993	3.0	4.0
Dominican Republic	2000	2000	2001	2.0	3.6
Dominican Republic	2005	2009	2011	7.0	5.8
Guatemala	1991	1992	1993	3.0	5.0
Guatemala	2000	2000	2001	2.0	6.1
Paraguay	1978	1980	1980	3.0	6.0
Paraguay	1986	1986	1987	2.0	11.8
Jamaica	1981	1983	1985	5.0	11.4
Jamaica	2000	2000	2001	2.0	6.2
Jordan	1991	1992	1992	2.0	12.4
Jordan	2005	2008	2009	5.0	12.2
Sri Lanka	1979	1983	1983	5.0	10.7
Sri Lanka	1991	1992	1995	5.0	5.5
Singapore	1980	1981	1982	3.0	10.4

Table A-4 (*continued*)

Country	Start year	Peak year	End year	Episode length	Ave. curr. Acct. Deficit (%GDP)
Singapore	1990	1991	1993	4.0	−9.3
Singapore	2008	2011	2012	5.0	−19.0
Mauritius	1978	1981	1981	4.0	11.6
Mauritius	1988	1988	1990	3.0	3.9
Mauritius	1999	2000	2000	2.0	1.9
Namibia	1999	2000	2001	3.0	−1.5
Namibia	2008	2010	2011	4.0	−0.3
Belarus	2007	2008	2011	5.0	10.1
Albania	1988	1990	1994	7.0	5.3
Albania	2008	2009	2009	2.0	15.5
Croatia	1995	1996	1997	3.0	7.2
Macedonia, FYR	1998	1999	2000	3.0	4.2
Macedonia, FYR	2005	2010	2011	7.0	4.9
Romania	1990	1991	1992	3.0	6.0
Romania	2004	2005	2007	4.0	10.2

Source: IMF, authors' calculations.

Appendix. Robustness Checks

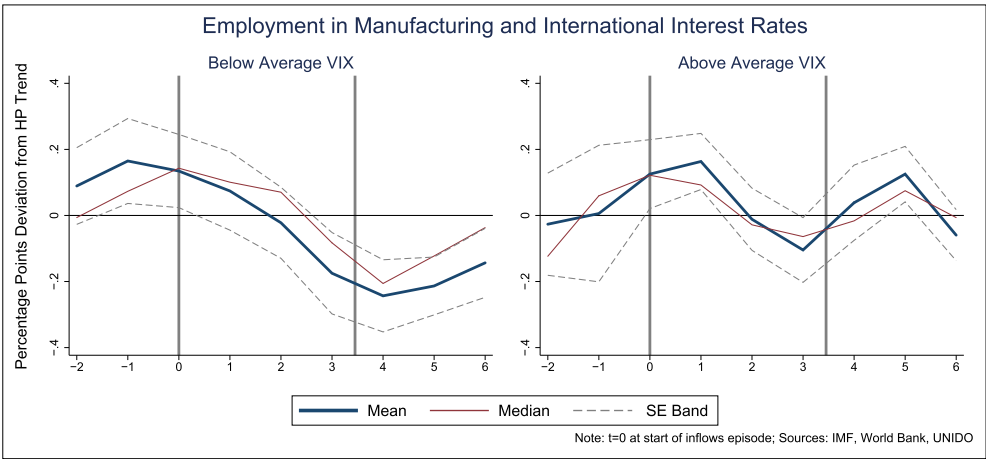

Fig. B-1. Capital Inflows Episodes and Sectoral Allocation, High and Low VIX.

Table B-1
Alternate specifications: Episode characteristics, reversals, and sudden stops.

Specification: Dependent Variable:	Linear		Logit	
	Reversal (1)	Sudden stop (2)	Reversal (3)	Sudden stop (4)
Capital inflows[a]	0.017 (0.017)	0.014 (0.02)	0.145 (0.125)	0.221 (0.135)
Private credit[b]	−0.001 (0.003)	0.011*** (0.004)	−0.01 (0.028)	0.091** (0.04)
Manuf. employment[c]	−0.049 (0.112)	−0.098 (0.093)	−0.357 (0.774)	−0.723 (1.031)
Manuf. investment[c]	−0.015 (0.042)	0 (0.033)	−0.091 (0.278)	0.127 (0.33)
Fed funds rate[d]	0.016 (0.026)	0.026 (0.026)	0.137 (0.161)	0.245 (0.198)
Fed funds rate[d]before episode	0.028 (0.023)	−0.047* (0.026)	0.195 (0.158)	−0.378** (0.192)

(*continued on next page*)

Table B-1 (*continued*)

Specification: Dependent Variable:	Linear		Logit	
	Reversal (1)	Sudden stop (2)	Reversal (3)	Sudden stop (4)
Reserve accumulation[e]	−0.033 (0.021)	0.01 (0.022)	−0.247 (0.154)	0.075 (0.186)
Initial reserves[e]	0.007** (0.003)	−0.008** (0.004)	0.061* (0.033)	−0.182*** (0.065)
Floating ER[f]	−0.111 (0.096)	−0.176* (0.091)	−0.727 (0.636)	−1.457* (0.841)
Financial openness[g]	0.001 (0.027)	0.064** (0.028)	−0.015 (0.185)	0.322 (0.257)
Observations	91	91	91	91
R-Squared	0.087	0.33	0.0944	0.392

Robust standard errors in parentheses; **p < 0.01, **p < 0.05, *p < 0.1.
[a] Percentage points deviation from HP trend.
[b] Real, per capita terms; log deviation from HP trend.
[c] Share of total, Percentage points deviation from HP trend.
[d] Percentage Points.
[e] Percent of GDP.
[f] Dummy for floating exchange rate regime, based on Ilzetzki et al. (2008).
[g] Chinn-Ito index of financial openness. Pre- and post-peak values are averages for 3 years before and after the year capital inflows peak. See Appendix 5 for data sources.

Table B-2
Alternate specification: Episode characteristics and economic performance.

Dependent Variable:	GDP[a](1)	Consumption[a](2)	Investment[b] (3)	Employment[b](4)	TFP[b](5)
Capital Inflows	−0.172 (0.108)	−0.479*** (0.122)	−0.647* (0.366)	−0.079 (0.108)	−0.282** (0.119)
Private Credit	−0.061*** (0.021)	−0.033 (0.029)	−0.255*** (0.079)	−0.035* (0.019)	−0.055*** (0.014)
Manuf. Employment	1.581*** (0.543)	2.026*** (0.719)	4.501** (1.962)	1.469** (0.608)	0.029 (0.441)
Manuf. Investment	−0.186 (0.239)	−0.151 (0.208)	−0.655 (0.793)	−0.032 (0.313)	−0.003 (0.187)
VIX Index[c]	−0.041 (0.057)	−0.072 (0.066)	−0.123 (0.209)	−0.039 (0.05)	−0.063 (0.046)
VIX Index[c] Before Episode	0.156** (0.076)	0.189** (0.086)	0.339 (0.266)	0.05 (0.072)	0.128* (0.067)
Reserve Accumulation[d]	0.206* (0.107)	0.315** (0.139)	1.168*** (0.393)	0.096 (0.117)	0.380*** (0.129)
Initial Reserves[d]	0.006 (0.022)	−0.021 (0.02)	−0.071 (0.079)	0.004 (0.022)	0.005 (0.018)
Floating ER[e]	0.680* (0.406)	0.536 (0.452)	3.472** (1.579)	0.884** (0.403)	0.176 (0.423)
Financial Openness[f]	0.062 (0.146)	0.208 (0.172)	−0.093 (0.595)	−0.114 (0.168)	0.249 (0.191)
Observations	91	90	87	83	83
R-Squared	0.384	0.379	0.454	0.238	0.503

Robust standard errors in parentheses; **p < 0.01, **p < 0.05, *p < 0.1. Dependent variables are average values for the 3 years after each episode ends.
[a] Real, per capita terms; log deviation from HP trend.
[b] Percentage points deviation from HP trend.
[c] VXO index, 1986–2012, and back-casted through 1970.
[d] Percent of GDP.
[e] Dummy for floating exchange rate regime, based on Ilzetzki et al. (2008).
[f] Chinn-Ito index of financial openness. See Appendix 5 for data sources.

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