

WP/21/34

IMF Working Paper

Facing the Global Financial Cycle: What Role
for Policy Responses?

by Nicoletta Batini and Luigi Durand

I N T E R N A T I O N A L M O N E T A R Y F U N D

IMF Working Paper

Independent Evaluation Office

Facing the Global Financial Cycle: What Role for Policy Responses?

Prepared by Nicoletta Batini and Luigi Durand*

Authorized for distribution by Prakash Loungani

February 2021

IMF Working Papers describe research in progress by the authors and are published to elicit comments and to encourage debate. The views expressed in IMF Working Papers are those of the authors and do not necessarily represent the views of the IMF, its Executive Board, or IMF management.

Abstract

In this paper we ask whether countries can influence their exposure to changes in global financial conditions. Specifically, we show that even though we can model cross-country capital flows via a global factor that closely tracks changes in global financial conditions, there is a large degree of heterogeneity in the sensitivity of each country to this same global factor. We then evaluate whether this cross-country heterogeneity can be attributed to different policy choices, including measures of capital flow management, such as capital controls and macroprudential policies. In our main results, we show that higher levels of capital controls and macroprudential policies both dampen the sensitivity to the global factor. Furthermore, we show that countries' monetary and exchange rate policies can also be successfully deployed. Overall, our results have implications that extend beyond the surge that preceded the 2008 global financial crisis, and that closely resonate in light of the financial disruptions that followed the COVID-19 pandemic.

JEL Classification Numbers: F30, F32, F38, F42.

Keywords: Capital Flows, Global Financial Cycle, Capital Controls, Macroprudential Policy, IMF Institutional View.

Authors' E-Mail Addresses: nbatini@imf.org; ldurandl@jhu.edu

* The analysis and conclusions set forth are those of the authors and do not necessarily represent the views of the IEO, the IMF, its Executive Board or IMF management. We thank Suman S. Basu, Vassili Bazinas, Mahir Binici, Greg Duffee, Gaston Gelos, Olivier Jeanne, Sebnem Kalemli-Özcan, Valerio Nispi Landi, Pablo Morra, Alessandro Rebucci, Jonathan Wright and Jeromin Zettelmeyer, for comments and suggestions.

Contents

1	Introduction	5
2	Literature Review and Motivation	6
2.1	Global Financial Cycle	6
2.2	Factor Models	7
2.3	Push and Pull literature	8
2.4	Capital Flows Management Measures: Over-hype?	9
3	Data and Methodology	9
3.1	Capital Flow Data	10
3.2	Pull Variables	11
3.2.1	Fundamentals	11
3.2.2	Policy Variables	12
4	Dynamic Factor Model with Time-Varying Factor Loadings	19
4.1	Econometric Framework	20
4.2	Estimation Results	22
5	Global Capital Inflows Surges	23
5.1	Identification of Capital Flows Episodes	23
5.2	Complementary log-log Model	26
5.3	Marginal Effects	27
5.4	Clog-log: Regression Results	28
6	The Role of Domestic Policies and Fundamentals during Capital Inflows Surge Episodes	30
6.1	Baseline Regression Results	31
6.2	Disaggregation of Capital Controls Measures	33
6.3	WaMaFi Index without CFMs component	34
6.4	Complementarity of CFMs and Warranted Macroeconomic Adjustments	35
7	Conclusion	35
8	Appendix	37
8.1	Tables	37
8.2	Figures	54
8.3	WaMaFi Index: Data Details	56

8.4	Factor Model with Time-Invariant Factor Loadings	57
8.4.1	Estimation Results	57
8.4.2	What Drives the Sensitivity of Capital Flows to the GFCy?	58
8.5	Dynamic Factor Model with Time-Varying Loadings: Estimation Details	60

List of Figures

1	Cross-Border Capital Flows	5
2	Managing Capital Flow Surges according to the IV	17
3	WaMaFi Index and Gross Inflows	19
4	Estimated Factor, VIX and Miranda-Agrippino Factor	22
5	Time-Varying Factor Loadings	24
5a	Time-Varying Factor Loadings	25
6	Identification of Capital Flows Episodes: The case of South Africa	26
7	Global Financial Cycle and Number of Capital Inflows Surges	26
8	Global and Local Episodes by Year	29
9	Average Marginal Effect of the GFCy on the prob. of a surge	30
10	Correlation between GFCy sensitivity and CFMs	33
11	Capital Flows	54
11a	Capital Flows	55
12	Estimated Factor Loadings	57
13	Variance Decomposition	58

List of Tables

1	Summary Statistics	37
2	Bayesian Model Averaging for Gross Inflows	38
3	Codification of Capital Inflows Surges	39
4	Surges in Private Inflows: A CLogLog Regression Analysis	41
5	Summary Statistics	44
6	Sensitivity to GFCy during Surges in Private Inflows	45
7	Distinguishing between Inflows and Outflows Controls	47
8	Distinguishing between Non-Residents Inflows and Outflows Controls	48
9	Distinguishing between Residents Inflows and Outflows Controls	49

10 WaMaFi Index 50

11 Interaction between WaMaFi Index and Macroprudential Policy Index 51

12 Interaction between WaMaFi I. and Non-Residents Controls 52

13 Interaction between WaMaFi I. and Residents Controls 53

References 63

Facing the Global Financial Cycle: What Role for Policy Responses?

Nicoletta Batini and Luigi Durand*

January 17, 2021

Abstract

In this paper we ask whether countries can influence their exposure to changes in global financial conditions. Specifically, we show that even though we can model cross-country capital flows via a global factor that closely tracks changes in global financial conditions, there is a large degree of heterogeneity in the sensitivity of each country to this same global factor. We then evaluate whether this cross-country heterogeneity can be attributed to different policy choices, including measures of capital flow management, such as capital controls and macroprudential policies. In our main results, we show that higher levels of capital controls and macroprudential policies both dampen the sensitivity to the global factor. Furthermore, we show that countries' monetary and exchange rate policies can also be successfully deployed. Overall, our results have implications that extend beyond the surge that preceded the 2008 global financial crisis, and that closely resonate in light of the financial disruptions that followed the Covid-19 pandemic.

JEL codes: *F30, F32, F38, F42.*

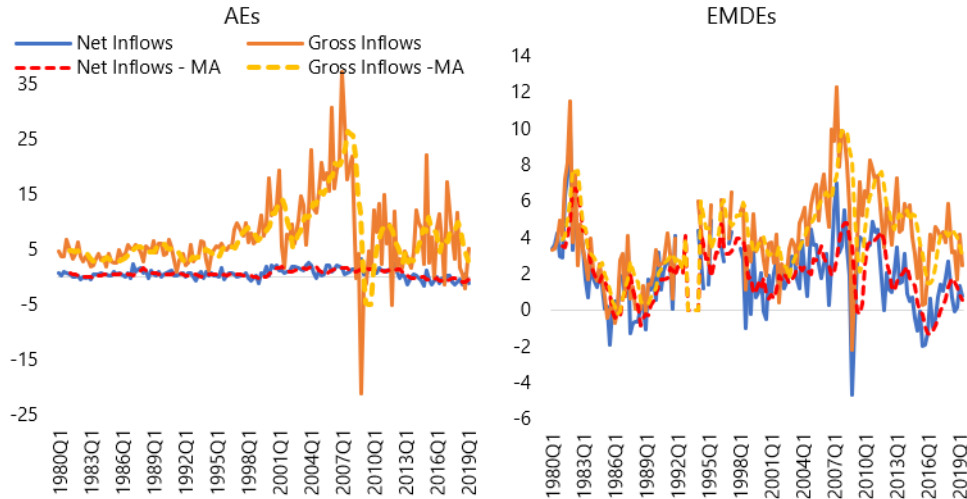
Keywords: *Capital Flows, Global Financial Cycle, Capital Controls, Macroprudential Policy, IMF IV.*

*Batini: IEO, International Monetary Fund (e-mail: nbatini@imf.org); Durand: IEO, International Monetary Fund (e-mail: ldurand1@jhu.edu). The analysis and conclusions set forth are those of the authors and do not necessarily represent the views of the IEO, the IMF, its Executive Board or IMF management. We thank Suman S. Basu, Vassili Bazinas, Mahir Binici, Greg Duffee, Gaston Gelos, Olivier Jeanne, Sebnem Kalemli-Özcan, Valerio Nispi Landi, Pablo Morra, Alessandro Rebucci, Jonathan Wright and Jeromin Zettelmeyer, for comments and feedback.

1 Introduction

International purchase of domestic assets by foreigners (“gross” capital inflows) have risen significantly from the mid-1990s to the first half of 2000s, both in Emerging Markets and Developing Economies (EMDEs) and Advanced Economies (AEs). In the aftermath of the Global Financial Crisis (GFC), inflows dropped sharply in 2008 for both groups but rebounded in 2009, only to fall again in late 2011 as the peripheral Euro Area sovereign debt crisis intensified (see Figure 1). A recent literature argues that gross inflows are influenced by international investor’s uncertainty and risk aversion, together with global banks’ leverage and risk-bearing capacity (Bruno and Shin (2014)). According to this view, the world features “powerful Global Financial Cycles (GFCys), with large common movements in asset prices, gross flows and leverage” (Rey (2015))¹. Recent events surrounding the reactions of capital flows to the Covid-19 crisis, reinforce this characterization, and further raise the concern of understanding if domestic policies can successfully influence the exposure to these globally-driven capital flows.

Figure 1: Cross-Border Capital Flows



Source: IMF, International Financial Statistics. Notes: flows are expressed as % share of group GDP. Dashed lines are quarterly moving averages. Data are quarterly over the period 1980Q1:2019Q1

In this work we show that (private) capital inflows evolution can be described by a common factor, which is highly correlated with established measures of the GFCy, such as the VIX and the principal component from a large panel of asset prices estimated by Miranda-Agrippino and Rey (2020b) (as also shown by Davis et al. (2019)), giving credit to Rey (2015). We then find

¹Although this description of reality is not unequivocally supported. For example, Cerutti et al. (2019b) argue that the GFCy is only responsible for at most one quarter in the observed heterogeneity in capital flows across countries.

that the sensitivity to this factor is very heterogeneous across countries both quantitatively and qualitatively. For example, while a tightening in global conditions leads to fall in capital inflows in some countries this is not the case for some of the other countries in the sample. These observations prompt us to investigate to what extent domestic fundamentals and policies may be at the source of these differences in outcomes.

We contribute to the literature on several grounds: first, we introduce and evaluate several measures of policy actions, such as the degree of sterilization, the resistance to exchange market pressures, and a novel index of macroeconomic and financial adjustments. These measures are well in tune with the literature on the GFCy, but have not yet been explicitly integrated within this stream of literature.

Second, and differently from the pre-existing literature, which assumes fixed sensitivity (factor loadings) to the common factor over long periods of time, we introduce a time-varying factor model where the estimated sensitivity to the GFCy is allowed to change over time. To our knowledge this is the first study that introduces a time-dimension to address this type of question. This methodology in turn allows us to depart from between estimators (i.e. averages of variables taken over the sample period, as done in [Davis et al. \(2019\)](#)) in order to focus on periods of surges of gross capital flows, which are at the core of the theoretical predictions of the GFCy.

2 Literature Review and Motivation

Our work draws from several strands of the literature and methodologies, which we describe in the next paragraphs.

2.1 Global Financial Cycle

Our starting point is the research on the GFCy: [Miranda-Agrippino and Rey \(2020b\)](#) document co-movements in gross inflows across countries and argues that these flows are not aligned with domestic countries' domestic conditions. Instead, gross inflows arise from "center" economies' policies. The very simple premise is that, when center countries monetary policy changes, this affects the leverage of global banks, which in turn has an impact on cross border capital flows and credit growth in domestic economies.

[Bruno and Shin \(2013\)](#) develop a model that formalizes this concept and also perform an empirical analysis that highlights the credit channel of monetary policy: an increase in the spread between the borrowing rates for the local banks (which corresponds to the lending rate for the global banks) and the US Fed Fund Rate (which corresponds to the wholesale funding rate of global banks), expands global banks' balance sheets and gives rise to greater risk-taking, which in

turn translates in further capital inflows and a real exchange rate appreciation in the domestic economy; this, eventually, improves local borrowers' balance sheets and, in so doing, further lowers the risk on the loan books of global intermediaries, which are then able to extend further credit to local banks. According to [Rey \(2015\)](#), the main implication of a GFCy is the mutation of the trilemma of international finance into a dilemma, in which the insulating properties of a flexible exchange rate become ineffective in maintaining monetary autonomy. [Kalemli-Özcan \(2019\)](#) presents a more nuanced view by arguing that while it is the case that GFCy spillovers affect countries irrespective of the exchange rate regime in place, preventing full exchange rate adjustment using monetary policy can be counterproductive in the face of risk premia shocks, when UIP deviations are endogenous to changes in interest rates. This happens in EMEs because, in a scenario with UIP deviations, an increase in the domestic policy rate, following a U.S. policy rate tightening, has a smaller effect on the exchange rate and a greater impact on the real economy, relative to a scenario without UIP deviations.

2.2 Factor Models

A growing literature employs latent factor models to study co-movements in international capital flows. For example, [Cerutti et al. \(2019b\)](#) use both static and dynamic factor models of gross capital flows and [Davis et al. \(2019\)](#) extract two factors from a static model of gross capital flows and verify that the first factor closely matches the common factor of [Miranda-Agrippino and Rey \(2020b\)](#) (MAR factor). Other works include [Sarno et al. \(2016\)](#) and [Barrot and Serven \(2018\)](#). One common question is then to study how domestic macroeconomic, financial and structural characteristics of the recipient countries, together with explicit policy levers, such as capital controls, affect the estimated sensitivity to the GFCy.

A first approach involves regressing the common factors loadings on a vector of explanatory variables, including measures of trade integration, financial regulation, financial development and financial liabilities. For example [Davis et al. \(2019\)](#) find that countries with larger net foreign liabilities are more exposed to the GFCy. The authors do not find a statistically significant association with measures of capital controls. Using a similar methodology, [Cerutti et al. \(2019a\)](#) use a dynamic factor model which distinguishes between emerging markets and advanced economies and among world regions. The authors' main finding is that market structure, i.e. the composition of investor's base, is a better predictor of countries' sensitivities to the GFCy compared to fundamentals². Compared to [Cerutti et al. \(2019a\)](#), our work emphasizes the role of policies,

²The composition of investor's base includes variables such as the share of foreign funding coming from Advanced Economies, and the correlation between BOP flows and flows, as reported by international equity funds. A high correlation then indicates a high predominance of global banks in driving capital flows.

especially around capital flows surge episodes.

A second approach consists instead in regressing the time series of capital flows over a set of key country-specific variables, controlling for common factors, as done in [Cerutti et al. \(2019b\)](#). This latter approach is more general as it investigates the drivers of capital flows instead of the the factors that influence the sensitivity to the GFCy. Other examples include [Fratzscher \(2012\)](#) who finds that explanatory variables such as differences in quality of domestic institutions, country risk and macroeconomic fundamentals are significant predictors of capital flows.

2.3 Push and Pull literature

Our work is also related to the vast literature on the role of push and pull factors as drivers of capital flows. The seminal works of [Calvo et al. \(1992\)](#) and [Fernandez-Arias \(1996\)](#) brought push factors to the center stage of the debate, by arguing that the pull interpretation is inconsistent with empirical evidence. For example, [Fernandez-Arias \(1996\)](#) shows how domestic economies' creditworthiness is tied to international interest rates, which affect investors' discount rate and, as a consequence, the present value of resources available for payment by the domestic economy. However the debate is far from settled, with some studies arguing for a greater role of pull factors ([Taylor and Sarno \(1997\)](#)). In this respect, some research has highlighted how the debate regarding the relative importance of push versus pull factors should differentiate between types of capital flows: for example, while push factors may be more important for portfolio flows ([Baek \(2006\)](#)), pull factors, such as productivity growth, may matter more for FDI flows ([De Vita and Kyaw \(2008\)](#)).

Following the Global Financial Crisis, a new wave of research developed more nuanced views with an emphasis on the circumstances that would make push factors relatively more important. An example is [Forbes and Warnock \(2012\)](#) who argue that global factors are often associated with sudden stops (that is, a fall in gross inflows) and retrenchments (that is, a fall in gross outflows). An interesting finding of the paper is the relatively lack of association between these episodes and measures of capital controls³. Similarly, [Carney \(2019\)](#), while acknowledging the increasing importance of push factors, also emphasizes that EMDEs bear a responsibility in contributing to building a system with less disruptive capital flows, through reforms in the domestic institutional frameworks, and also through the appropriate use of policy tools, including fiscal policy and the development of macroprudential toolkits. For instance, in a related research, [Coman and Lloyd \(2019\)](#) find that tightening of prudential policy in EMEs dampens the spillover from US monetary policy tightening by approximately a quarter.

³The authors nevertheless find an exception when looking at "flight" episodes, that is when domestic investors reduce their investments abroad, and at surge episodes, when considering Forex regulations.

Recent work analyses the transmission mechanism behind monetary policy spillovers. For example, [Giovanni et al. \(2017\)](#) examine, at a microeconomic level, how fluctuations in the VIX affect domestic credit market conditions, reflecting a “pass-through” effect of domestic banks’ funding costs on firms’ borrowing costs. In [Kalemli-Özcan \(2019\)](#) the GFCy affects the country risk-premium and, in this sense, capital flows to EMEs are driven by both global and country-specific risks.

2.4 Capital Flows Management Measures: Over-hype?

Despite the seemingly lack of support for capital controls in reducing the probability of sharp changes in capital inflows, and in affecting the sensitivity of a country to the GFCy, other empirical evidence supports the view that capital controls reduce the volume of capital flows and the probability of extreme episodes ([Nispi Landi and Schiavone \(2018\)](#)) and are effective in reducing portfolio inflows, following an exogenous U.S. monetary policy shock ([Wang and Wu \(2019\)](#)).

When turning to macroprudential policies (MPPs), the evidence is mixed; for example, while [Ostry et al. \(2012\)](#) find evidence that foreign currency related prudential measures reduce the share of a country’s foreign currency credit to total credit, the same does not hold for the share of debt to total external liabilities. [Forbes et al. \(2015\)](#) examine the effectiveness of capital controls and MPPs using a weekly database for 60 countries, over the period from 2009 to 2011, and conclude that while MPPs is successful in influencing financial fragility there is no significant impact on capital flows. There are however other studies that find strong evidence in support of the effects of MPPs on capital flows measures. An example is [Zhang and Zoli \(2014\)](#), who divide their sample in regions and find that in non-Asian economies MPPs affect equity inflows. Among macroprudential policies [Fendoğlu \(2017\)](#) finds that borrower-based tools, measures with a domestic focus and domestic reserves requirements are particularly effective in containing credit cycles. In [Gelos et al. \(2019\)](#) macroprudential policies are successful in reducing portfolio flows, but only so in the medium term. Other work suggests a role for macroprudential policies in influencing GDP: for instance macroprudential policies significantly lower the sensitivity of GDP growth to VIX movements and capital flows shocks in [Bergant et al. \(2020\)](#), and also reduce downside risks to growth in [Brandao-Marques et al. \(2020\)](#).

3 Data and Methodology

In this section we introduce the data used in the analysis, together with a description of the macroeconomic and financial explanatory variables that we consider when evaluating the sensit-

ivity of capital flows to the GFCy. In addition, we briefly describe the estimation methodology needed to extract the factors.

3.1 Capital Flow Data

We focus on private gross inflows⁴ from a sample of EMDEs. Since in EMDEs net inflows are largely driven by gross inflows, using gross or net flows to investigate drivers of international transactions in these countries is likely leading to similar results in estimation. Using gross flows, however, has the advantage to better capture the impact of changes in foreign investors' flows on domestic macroeconomic and financial stability, as emphasized by the theoretical literature on the GFCy (see for example [Miranda-Agrippino and Rey \(2020b\)](#)).

The source of the data is the IMF's Balance of Payment (BOP) database. Gross flows series describe transactions by non-residents in domestic financial assets ("gross inflows") and by residents in foreign financial assets ("gross outflows"). Notice that the difference between these two series is equal to net inflows. We analyze a series of aggregate capital inflows, which we compute as the sum of Foreign Direct Investments (FDI) flow, Portfolio Investments (PI) flows and Other Investments (OI) flows. FDI flows involve a controlling stake in a corporation (of at least 10%). PI flows involve both bonds and equity holdings flows that do not lead to controlling rights. OI flows is a residual category, which records transactions between residents and non-residents in a wide variety of instruments including loans, deposits and trade credits, and therefore can be broadly associated with banking flows.

We fit the model with annual data from 1996 to 2017. The sample of countries is as exhaustive as possible, with the exclusion for series in which there are gaps (we require all the three series to be available) or for which capital flows are consistently unavailable through the sample period. All data series are adjusted following [Forbes and Warnock \(2012\)](#)⁵. Capital flows series are normalized by trend GDP (extracted from an Hodrick-Prescott (HP) Filter of annual GDP series) as suggested by [Broner et al. \(2013\)](#), and then standardized before the model estimation, as recommended by [Choi \(2017\)](#), to address non stationarity in factor models⁶.

The final sample of countries that we have in our regression exercises is instead also restricted by the availability of the explanatory variables of interest and it is composed of: Argentina,

⁴In the main text we will interchangeably refer to private capital flows, as capital flows, for brevity.

⁵See Appendix A of [Forbes and Warnock \(2012\)](#) for a description of the methodology applied to fill gaps and NA in the series of capital flows.

⁶We use an HP filter to detrend the data for consistency with previous literature on the topic; alternative methodologies would have also been suitable, like for example the "Hamilton filter" ([Hamilton \(2018\)](#)), which has the benefit of avoiding potential issues associated with the use of an HP filter, including the introduction of spurious dynamics.

Bulgaria, Brazil, Chile, China, Colombia, Costa Rica, Czech Republic, Hungary, Indonesia, India, Israel, Korea, Sri Lanka, Morocco, Mexico, Pakistan, Peru, Philippines, Poland, Romania, Russia, Thailand, Turkey, Ukraine, Uruguay and South Africa.

3.2 Pull Variables

We consider two groups of macroeconomic and financial variables; the first group focuses on countries' fundamentals, while the second focuses on domestic policies. In the next paragraphs we proceed with descriptions of each variable together with a summary of arguments that highlight their relevance for this study (Also, in Table 1 we group the associated summary statistics).

3.2.1 Fundamentals

First, we include variables such as GDP growth, the current account, trade integration (measured as the sum of exports and imports over GDP), financial integration (measured as the sum of foreign assets and liabilities over GDP) and CPI inflation. The inclusion of GDP growth is justified on the grounds that the neo-classical model predicts that capital tends to flow to the countries with higher growth; the inclusion of the current account is usually justified as a driver of net flows; however, as we have highlighted in the introduction, EMDEs current account is largely driven by gross inflows, hence making this variable relevant within our context. Further, the CPI index is a reasonable way to capture price stability. Price stability matters for foreign capital inflows, both directly, by limiting the currency risk premium, but also (potentially) indirectly, to the extent that “a monetary regime that produces aggregate price stability will, as a by-product, tend to promote stability of the financial system”⁷ (Borio and Lowe (2002)).

Second, we account for both political and macro-financial risk: we include a measure of institutional quality, which we proxy using the International Country Risk Guide (ICRG) ratings Political Risk Index (Higher values indicate greater institutional quality). This variable is justified on the grounds that institutional investors are sensitive to the quality of domestic institutions (Ahlquist (2006)). Because the very concepts of institutional quality embeds a wide class of variables (for example, the level of foreign reserves, the level of press freedom and the degree of banks soundness), the introduction of a summary index is especially convenient as it allows to keep the model parsimonious.

The institutional measure of risk is complemented by a measure of financial risk, which we proxy by the level of gross debt to GDP.

⁷However, the relationship between price stability and financial stability remains disputed; see for example Blot et al. (2015), who find an unstable relationship.

Third, we include a measure of domestic financial development using the IMF Financial Development Index from [Sahay et al. \(2015\)](#), which summarizes the degree of development (in terms of depth), the degree of access and the efficiency of financial markets and financial institutions. This is motivated by previous literature, which uncovers a significant relationship between capital flows and financial development ([Nispi Landi and Schiavone \(2018\)](#)) and that argues that greater financial development can reduce the sensitivity of domestic financial conditions (such as stock returns and sovereign bond yields) to the GFCy ([Arregui et al. \(2018\)](#)).

Fourth, we also add a dummy variable that captures the presence of a currency peg, following the classification from [Shambaugh \(2004\)](#), and which is equal to 1 if there is a peg and zero otherwise.

Finally, and following [Davis et al. \(2019\)](#) we account for gross external assets and liabilities, which the authors argue represent a highly relevant driver of capital flows' sensitivity to the GFCy.

3.2.2 Policy Variables

The second group of variables focus on policy actions; we follow existing literature and also build new indexes, which we describe in more detail in the following paragraphs.

Resistance Index: We borrow from the literature on Resistance Indexes (see for example [Cardarelli et al. \(2010\)](#)) and quantify the extent to which a country is “leaning against the wind” of capital flows, by building a novel resistance index. In practice, the greater the Net Foreign Assets (NFA) for a given exchange rate change, the higher the degree of resistance.

We first introduce an Exchange Market Pressure (EMP) Index, which quantifies the total pressure on the exchange rate. This pressure is resisted through foreign exchange intervention or relieved by allowing the exchange rate to change. Specifically, we define:

$$EMP_{it} = \% \Delta e_{it} + \rho_{i,t} \Delta FX_{it} \quad (1)$$

where Δe_{it} is the quarter-on-quarter percentage change in the exchange rate, expressed so that an increase corresponds to an appreciation of the domestic currency (with respect to the USD), ΔFX_t is the quarter-on-quarter change in foreign reserves, measured in billions of USD (both series are available at a monthly frequency). The parameter $\rho_{i,t}$ is a conversion factor and it measures the change in the exchange rate associated with a \$1 billion USD intervention. The EMP Index falls when the exchange rate is either depreciating or the domestic central bank is

reducing international reserves⁸.

The monthly conversion factor $\rho_{i,t}$ is estimated by [Patnaik et al. \(2017\)](#) and reflects the degree of currency market liquidity: countries with more developed financial markets will have a smaller $\rho_{i,t}$, consistently with the assumption that, for a given amount of intervention, the impact on financial markets will be muted, *ceteris paribus*⁹.

The resistance index that we then use is given by:

$$RI_{it} = 1 - \frac{\% \Delta e_{it}}{EMP_{it}} \quad (2)$$

Notice that the index can take any values, with larger values being associated with greater resistance. That is, when the resistance index is high, the exchange rate is prevented to react as it would in the absence of a foreign reserves intervention. As done in [Cardarelli et al. \(2010\)](#), we bound the index to be between 0 and 1.

Hypothesis 1: To the extent that capital inflows are associated with a real exchange rate appreciation (see [Combes et al. \(2012\)](#)), we expect that countries that resist nominal exchange rate appreciation should be less sensitive to the GFCy. The argument is formalized in [Bruno and Shin \(2014\)](#), where real exchange appreciation begets capital inflows through the impact that the former has on the balance sheets of local intermediaries. However, in practice allowing for the exchange rate to fluctuate may also reduce the frequency of “one-way” bet positions from financial intermediaries, which could in turn decrease the sensitivity of the domestic economy to the GFCy, as, for example, discussed in [IMF \(2011\)](#).

Sterilization Index: Second, we use a measure of sterilization policy, following the methodology of [Aizenman and Glick \(2009\)](#); specifically, we calculate the change in the degree of sterilization using a regression of the year-on-year monetary authority’s change in holdings of net domestic assets on the change in net foreign assets, using monthly data. We include the year-on-year growth rate of nominal GDP to also control for additional explanatory variables that can influence money demand. The regression is given by:

$$\Delta DC_{it}/MB_{i,t-12} = \alpha + \beta_i \Delta NFX_{it}/MB_{i,t-12} + \phi_i \Delta GDP_{it}/GDP_{i,t-12} + u_{it} \quad (3)$$

⁸Notice that since $\rho_{i,t} \Delta FX_{it}$ is measured in units of percentage change of the exchange rate, it gives an estimate of the exchange rate change that would have occurred in a counter-factual without interventions.

⁹The concept of EMP was first proposed by [Girton and Roper \(1977\)](#); today there are several conventional EMP indexes (see [Eichengreen et al. \(1996\)](#), [Kaminsky et al. \(1998\)](#), [Sachs et al. \(1996\)](#) and [Weymark \(1995\)](#)). The index presented in [Patnaik et al. \(2017\)](#) has distinctive advantages compared to more conventional measures, as it allows for cross-country comparisons and also to capture periods with fixed (or modest changes in the) exchange rate.

Where NFX denotes net foreign assets expressed in domestic currency¹⁰ and DC is net domestic credit assets defined as

$$DC_{it} \equiv MB_{it} - NFX_{it} \quad (4)$$

The Monetary Base variable is constructed from the balance sheet of the central bank summing currency issued (both held in banks and outside banks) together with deposits of commercial banks with the central bank. The above identity naturally follows from the central bank balance sheet.

It is clear that when $\beta_i = -1$ there is full monetary sterilization (that is the monetary base remains unchanged), while in the case of $\beta_i = 0$ there is no sterilization. Because we are controlling for GDP growth, a negative unit coefficient implies that the central bank allows domestic credit to match changes in money demand that arise from GDP growth but does not allow for credit expansion when instead the flows only lead to reserves accumulation. There can be circumstances in which the estimated coefficient lead to $\beta_i < -1$, which means that the monetary authority is implementing a tightening, maybe to counteract inflationary pressures. Differently, when $\beta_i > 0$ monetary policy is expansionary. We run the above regression using monthly data (quarterly for GDP growth) in a rolling fashion, by adding one month at a time. We then collect the vector of country-specific estimated β_i coefficients, which we then include as a regressor in our main exercise¹¹.

Hypothesis 2: On one hand, sterilization of capital inflows prevents the domestic interest rate from falling, which begets further inflows and hence can possibly lead to an increase in the sensitivity of the domestic economy to the common factor. On the other hand, sterilization reduces the amount of credit growth, which should limit the extent of real exchange appreciation and therefore reduce the sensitivity of the domestic economy to the common factor (for a description of the impact of capital inflows sterilization see [Lee \(1997\)](#)). It follows that the impact of sterilization on the sensitivity to the GFCy is ambiguous.

Monetary and Fiscal Policy: Third, we include a measure of Monetary Policy and one of Fiscal Policy. The monetary policy variable is the short-term rate. For the case of fiscal policy we compute the deviation of government expenditures to GDP with respect to its backward-looking

¹⁰Net foreign assets are the central bank's claims on nonresidents less its liabilities to nonresidents. In most countries, the liability component is negligible so that net foreign assets of the central bank are equated with net official international reserves.

¹¹For convenience, in all of our regression exercises we will multiply the coefficient β_i by -1 , so that an increase corresponds to greater sterilization.

rolling trend¹². The latter is estimated using an HP filter (with a parameter set equal to 1000), using the first 5 years (when available) to construct a trend. A rolling backward-looking trend exploits only the information available up to the time in which there is an increase in government expenditures. This approach reflects the idea that from a foreign investor perspective it may be difficult to disentangle whether a given deviation from an expenditure trend is due to a temporary shock or whether instead it is paving the way to less fiscal discipline¹³.

Hypothesis 3: Fiscal consolidation limits capital inflows' absorption in the economy, which in turn limits exchange rate appreciation. In parallel, however, fiscal consolidation also improves a country's creditworthiness, which can lead to a higher domestic return, potentially increasing the sensitivity of the domestic economy to changes in global financial conditions (similarly, fiscal consolidation may reduce inflation expectations, which in turn would increase the expected return on domestic assets).

The overall effect of fiscal policy on capital inflows is therefore ambiguous and will reflect the relative impact that changes in fiscal policy have on country risk. It is generally suggested that a debt-to-GDP ratio of 40% shall be taken as a prudential limit for EMDEs to maintain fiscal sustainability (Abbas et al. (2019)). In our exercise we will evaluate whether the potential impact of changes in fiscal policies is dependent on the level of gross debt to GDP.

Capital Controls & Macroprudential Policies: Fourth, we include indexes of capital account restrictions (capital controls) from Fernández et al. (2016) and a measure of macroprudential policy index from Cerutti et al. (2017). In the case of capital controls, the index by Fernández et al. (2016) is an indicator variable that takes a value of zero or one depending on whether a restriction on international capital flows, in a given asset category, is in place, at a given time. In the first part of this study we will focus on the aggregate measure, but we will also distinguish between the sub-index on only inflows and the one targeting only outflows. The macroprudential policy index is based on 12 specific instruments including capital buffer, leverage ratio and loan-to-value ratio; each instrument is coded as a (0-1) binary variable, with the value equal to 1 starting when the instrument is in place and until it is discontinued. The final index is simply

¹²This measure of fiscal policy is valuable for its simplicity, as it is constructed using a variable that is readily available for the whole set of economies in our sample; however, it comes with an important caveat, which is that it will not always successfully capture the fiscal stance, for example when a country is running a persistently expansionary fiscal policy, which would inherently affect the trend. A more precise alternative measure would be the deviation from the *debt stabilizing primary balance*. Constructing the latter however requires more data, which is not readily available for some of the countries in our sample.

¹³For another application of a backward-looking HP filter in the context of lending booms see Gourinchas et al. (2001).

computed as the sum across categories in a given period.

Notice that neither index embeds an element capturing the intensity of the regulation; while on one hand this might be seen as a drawback, on the other hand it ensures objectivity.

Hypothesis 4: Higher capital account and macroprudential restrictions, if effective, should reduce the exposure to the GFCy. The current literature exposes several challenges when it comes to the impact of CFMs on international capital flows. Aside from the standard endogeneity arguments, which might render the estimated association positive, the [Fernández et al. \(2016\)](#) index, as many of the other indexes developed so far by the literature, cannot capture intensity changes in capital control regulations (i.e a tightening or loosening of restrictions). While there exist a few exceptions of indexes that quantify the intensive margin (for example, see [Pasricha et al. \(2018\)](#)), these are often limited to a restricted sample of countries.

Warranted Macro-Financial Adjustments Index (WaMaFi Index): Fifth, we include an index which reflects the prescriptions of the IMF Institutional View (IV) on capital flows management. The IV is a macroeconomic framework used to provide consistent advice to member countries on policies related to capital flows (see [Arora et al. \(2013\)](#)). The IV recognizes that, when faced with a capital flows disruption, CFMs can be used in certain circumstances even though “they should not substitute for warranted macroeconomic adjustment”. The index that we propose is based on the set of macroeconomic and financial policies adjustments that countries are advised to implement as a first line of defense, and it is therefore suited to capture the extent to which the prescription of the IV help dampen capital flows volatility and insulate the economy from the GFCy.

In order to summarize the policy choices that countries face when managing capital flows surges we consider a Venn Diagram, as shown in [Figure 2](#).

The three major areas in the diagram represent three relevant states: “Economy Overheating”, “Reserves Adequate” and “Exchange Rate Overvalued”. These three states can intersect, hence leading to occurrences that combine two or three of these features. Depending on the state that a given country is experiencing, the IV proposes the use of specific policy tools. Notice that the IV gives rise to 6 possible states,

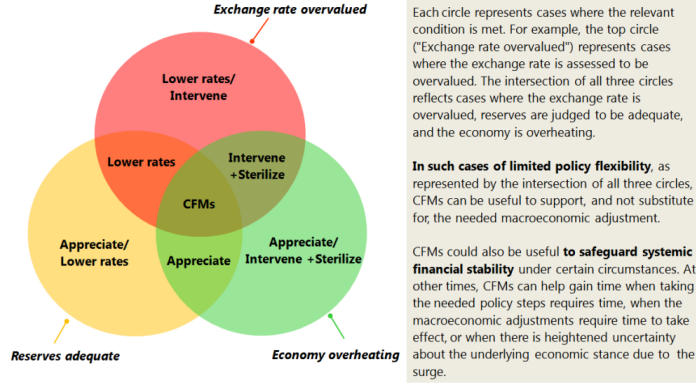
$$\mathcal{S} = \{Adeq.Res., Overh., Overv., Adeq.Res.\&Overv., Overv.\&Overh., Adeq.Res.\&Overh.\}$$

together with a residual state that allows using CFMs¹⁴.

As an example, consider an economy which experiences a capital inflow surge and which is characterized by both exchange rate overvaluation and overheating of domestic activity (expressed in

¹⁴In the Appendix we provide further details on the data used to codify each state.

Figure 2: Managing Capital Flow Surges according to the IV



Notes: Source: [Arora et al. \(2013\)](#)

our work as deviation of output from its potential level) but does not have an “adequate” level of reserves (as defined by the IMF ARA metric or, alternatively, when the latter is not available by looking at a measure of the import-cover ratio); then the appropriate policy mix that the IV recommends involves a combination of foreign exchange accumulation and sterilization. Foreign exchange accumulation is warranted as it allows to better align the country with its precautionary needs and it also alleviates exchange rate volatility, hence smoothing the impact of a surge on domestic balance sheets, as advocated by [Neely \(2008\)](#); at the same time, sterilization is warranted as it prevents the domestic interest rate from falling, which could further overheat the domestic economy and foster inflows of capital.

To construct our WaMaFi Adjustment index we start with (0-1) binary variables to code a policy response depending on whether it is in accordance with the IMF IV, given the state in which the country is in a given year. For example, if a country is currently overheating, does not have adequate reserves and the exchange rate is not overvalued, then we attribute a value of 1 if we observe an appropriate policy response that can be codified by either looking at the exchange rate appreciation or by looking at foreign exchange interventions (coupled with appropriate sterilization). Otherwise we attribute a value equal to zero. In this case the policy action should be aimed at helping external adjustment and counter domestic inflationary pressures.

Each of these binary (0-1) variables is then weighted to reflect the intensity of the undertaken policy action: to continue with our preceding example, the weight would be given by the percentage increase in the exchange rate and foreign reserves, where each value is scaled by the year on year change in the ratio of gross capital inflows to GDP, in order to allow for cross-country and years comparison; for example, in the case of the exchange rate:

$$I_{i,t}^s = 1 \times \left| \frac{\% \Delta e_{i,t}^s}{\Delta cf_{i,t}} \right|$$

where i denotes the country, t the time, $s = \{Overh.\}$ the state of the world, and $cf_{i,t}$ denotes capital flows (to GDP).

All indexes are straightforward to compute and follow from the Venn Diagram; the only exception is how we account for sterilization, when there is foreign reserves accumulation; in this latter case we assume that sterilization enters as a multiplicative term:

$$I_{i,t}^s = 1 \times \left| \frac{\% \Delta F X_{i,t}^s}{\Delta cf_{i,t}} \right| \times \left(- \hat{\beta}_{i,t}^{sterilization} \right)$$

where $\hat{\beta}_{i,t}^{sterilization}$ is the coefficient computed above; in the expression, we then attribute a larger weight to those countries that are sterilizing inflows more aggressively.

As a final step, for each one of the six states of the world (plus the residual CFM state), we then evaluate the distribution of the resulting weighted indices across the full sample of countries and years to determine the corresponding sample quantiles. We then map each one of the weighted index into a quantile, which gives a score between 0 and 5. The WaMaFi index, for each country-year pair takes a value between 0 and 5, depending on the country’s stance (the index will take a value of 0 when the country does not follow the IV) and the relative intensity of the taken policy action. We assume that when two different codifications for policy actions are compatible with the IV, for a given state of the world, (for example when, as described above, the country’s policy action can be codified by either looking at the change in the exchange rate or at the change in foreign reserves) we only include the highest of the two computed scores.

Given the novelty of the index, it is instructive to illustrate its evolution over time, also in comparison to changes in gross inflows. In Figure 3 we therefore show the average WaMaFi index together with the average gross inflows¹⁵ (the average is taken over the full sample of countries). Overall, the index tracks the changes in average gross inflows discretely well, especially in the run-up that preceded the 2008 global financial crisis. These results parallel the findings of [Batini and Durand \(2020\)](#), who develop a qualitative and more stylized index of “policy appropriateness” so as to show that EMEs pursue an active policy stance, when faced with capital inflows surges¹⁶.

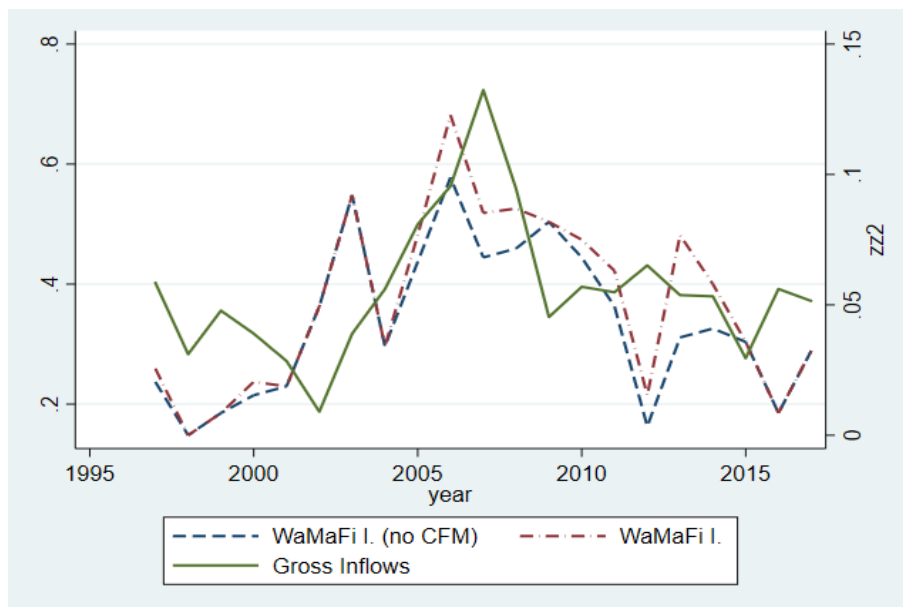
Hypothesis 5: Because a score of zero on the WaMaFi Index reflects no warranted macroeconomic adjustments aligned with the IV, while a positive score reflects warranted adjustments of monetary and exchange rate policies (with higher values indicating greater relative intensity

¹⁵The Figure also includes an alternative version of WaMaFi index, in which we removed the CFM component. Both series closely follow each other.

¹⁶An important caveat, (which also applies in the case of the “policy appropriateness” Index of [Batini and Durand \(2020\)](#)) is that the WaMaFi Index gives to each one of the policy actions (i.e. exchange rate policy, monetary policy, capital controls and macroprudential policies) an equal weight, and therefore does not allow for potential differences, in terms of how relatively effective each policy is in managing capital flows.

of adjustments, compared to other countries in the sample), it follows that a higher score on the WaMaFi Index should reduce countries’ sensitivity to the GFCy.

Figure 3: WaMaFi Index and Gross Inflows



Notes: The figure shows the average WaMaFi index (normalized to 1) together with the gross inflows (to GDP) series. Both averages are taken over the full sample of countries used in the regression exercises.

4 Dynamic Factor Model with Time-Varying Factor Loadings

Previous research on the GFCy relies on factor models where the sensitivity of each country to the global factor is kept fixed over the whole sample of analysis. The general approach then involves regressing the estimated factor loadings on a selection of explanatory variables (see for example [Davis et al. \(2019\)](#) and [Barrot and Serven \(2018\)](#)). This approach, which is based on the use of a between estimator (and, essentially, involves regressing the estimated factor loadings on the sample averages of the set explanatory variables) has the advantage of simplicity but the disadvantage of preventing a dynamic understanding of the relationships of interest, in particular during periods of abrupt changes in capital flows, such as during capital inflows surges. Capital inflows surges are however at the very core of the conceptualization of the GFCy and it is therefore essential to have a framework that can distinguish between the exposure to the GFCy during “normal” times versus periods of capital inflows surges.

In this section, and in order to overcome the limitations associated with the use of a between estimator based on sample averages, we introduce a factor model that allows for time varying factor loadings. The framework adds a temporal dimension to preceding analysis, which in turn can be exploited to investigate associations of interest around episodes of capital inflows surges. To our knowledge, Wang (2015) is the only work that introduces a panel framework that accounts for both the cross-sectional and intertemporal dimension of the role of domestic variables on financial sensitivity to global variables; in Wang (2015) however, time variation is model-free and instead simply computed as the rolling correlation between the VIX and domestic financial variables (i.e. stock indexes and the exchange rate).

In the following sections we then proceed to present an econometric model where loadings can vary over time, and discuss some of the main results.

4.1 Econometric Framework

We estimate a dynamic factor model with 1 factor and time-varying loadings¹⁷ following the model of Ritschl et al. (2016). In this section we introduce the main building blocks of the framework, while leaving further technical details to the Appendix. We model capital flows as:

$$CF_t = \Lambda_t F_t + E_t$$

Where CF_t is a $N \times 1$ vector that stacks each country's capital flows series, $cf_{i,t}$; Λ_t is a $N \times 1$ vector that stacks each country's factor loadings, $\lambda_{i,t}$; F_t is a 1×1 common factor and E_t is a $N \times 1$ vector of idiosyncratic elements. The variable F_t describes the systematic source of variation among capital flow series; $\lambda_{i,t}$ determines the strength of the association between country i flows with respect to the common component (where a higher value implies a stronger relationship).

We assume that the factor evolution is described by an AR(q) process:

$$F_t = \rho_1 F_{t-1} + \dots + \rho_q F_{t-q} + u_t$$

where $u_t = e^{h_t} \varphi_t$ and $\varphi_t \sim N(0, 1)$. The log-volatility h_t is described by a random walk without drift:

$$h_t = h_{t-1} + \eta_t$$

with $\eta_t \sim N(0, \sigma_\eta^2)$.

The error terms are instead described by an AR(p) process:

$$E_t = \Theta_1 E_t + \dots + \Theta_p E_{t-p} + \chi_t$$

¹⁷Notice that in order to estimate the model, we use all available-and-complete capital inflows series; this gives us a sample of 53 countries in total.

with Θ_i being a diagonal matrix and $\chi_t \sim N(0_{N \times 1}, \Omega_\chi)$ with

$$\Omega_\chi = \begin{bmatrix} \sigma_{1,\chi}^2 & 0 & \cdots & 0 \\ 0 & \sigma_{2,\chi}^2 & \vdots & \vdots \\ \vdots & \cdots & \ddots & 0 \\ 0 & \cdots & 0 & \sigma_{N,\chi}^2 \end{bmatrix}$$

Finally, we introduce time-varying factor loadings. In practice we assume that factor loadings, Λ_t are described as a driftless random walk:

$$\Lambda_t = I_N \Lambda_{t-1} + \epsilon_t$$

where I_N is a $N \times N$ identity matrix and $\epsilon_t \sim N(0_{N \times 1}, \Omega_\epsilon)$ with

$$\Omega_\epsilon = \begin{bmatrix} \sigma_{1,\epsilon}^2 & 0 & \cdots & 0 \\ 0 & \sigma_{2,\epsilon}^2 & \vdots & \vdots \\ \vdots & \cdots & \ddots & 0 \\ 0 & \cdots & 0 & \sigma_{N,\epsilon}^2 \end{bmatrix}$$

The disturbances χ_t and ϵ_t are assumed independent of each other.

The model is estimated using Gibbs Sampling with lags $p = 1, q = 2$ taking 100,000 draws and discarding the first 80,000 as burn-in. We set fairly loose priors, following [Del Negro and Otrok \(2008\)](#) (see Appendix for details). Also, after the estimation, we checked convergence of the Gibbs sampler through visual diagnostics including recursive mean plots of non-time varying parameters (such as, for example, the AR coefficients of the model).

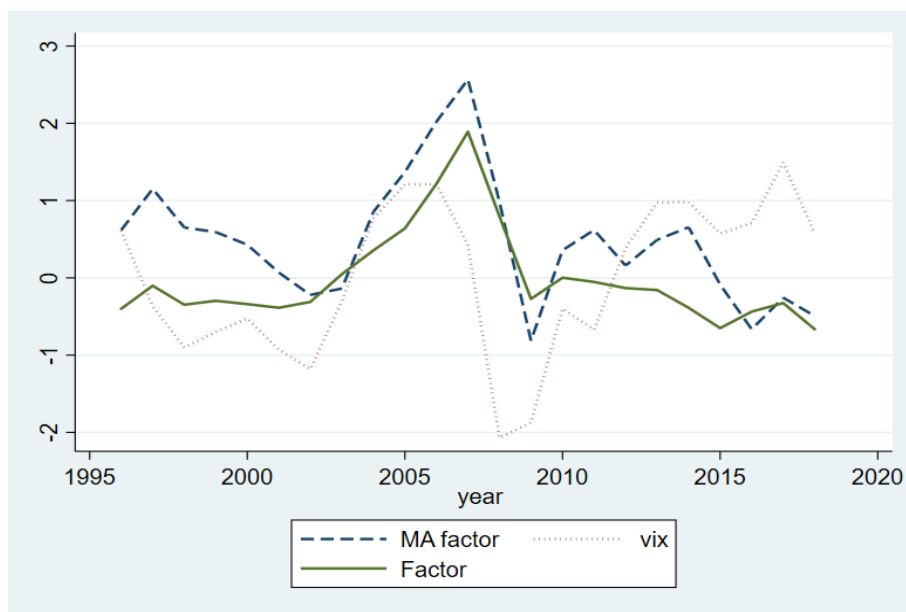
Notice that by fixing Λ_t over time we can also analyze the case of a fixed loadings factor model, similar to the one developed by [Neely and Rapach \(2011\)](#) and applied, within the context of the GFCy, by [Cerutti et al. \(2019a\)](#). In the Appendix we present a throughout analysis based on a fixed loadings version of the model. Here we report our main findings, which are broadly consistent with the preceding literature, namely: i) there is a high degree of cross-country heterogeneity in terms of exposure to the estimated global factor; ii) there is a high degree of cross-country heterogeneity in terms of the share of variance that can be accounted for by the global factor; iii) when performing a regression of the estimated factor loadings on the sample averages of the variables of interest there is no strong evidence in favor of a role for domestic policies.

4.2 Estimation Results

In this section we proceed to illustrate and interpret the estimated common factor, together with a description of the estimated factor loadings.

In Figure 4 we first illustrate the evolution of the estimated common factor, which mimics that of “classic” representations of the GFCy, namely the [Miranda-Agrippino and Rey \(2020b\)](#) factor and the VIX. Specifically, the Figure highlights a strong co-movement between the [Miranda-Agrippino and Rey \(2020b\)](#) measure of the GFCy and the factor estimated from the capital flow series. Notably, during the period preceding the global financial crisis, the two series point to a relaxation of financial conditions, which is then abruptly reversed starting in 2008-2009¹⁸. In this work we adopt the interpretation that an increase in the estimated factor corresponds to loosening of global financial conditions and vice-versa.

Figure 4: Estimated Factor, VIX and Miranda-Agrippino Factor



Notes: Comparison between estimated factor, the (negative of the) VIX and the MA factor.

In Figures 5 and 5a we also show the results for the estimated time-varying factor loadings. Unsurprisingly, the degree of time variation of the loadings tends to differ depending on the

¹⁸Interestingly, the correlation between the VIX and the other two series seems to diminish following the financial crisis, with the VIX steadily rising. This surprising evolution is at the centre of a recent literature: for example, [Miranda-Agrippino and Rey \(2020a\)](#) document an inversion in the response of the VIX to monetary policy shocks in the post 2009 period, and [Forbes and Warnock \(2020\)](#) show that there is less correlation between extreme capital flows movements and global risk following the financial crisis. Finally, [Avdjiev et al. \(2020\)](#) argue that the reaction of the international bank lending to the VIX has been declining since 2009.

country; for example, in some cases, such as Russia, the sensitivity consistently increases through time, while in other countries, such as South Africa, it remains fairly constant. Moreover, while in some countries the estimated loadings are significantly different from zero throughout the sample period, in other countries the loadings are either always insignificant, or only become significant around the 2008 financial crisis period (i.e. ARG). In general, the evolution of the loadings reflects the evolving exposure to the GFCy, while the significance of the loadings depends on the relevance of the GFCy factor in the evolution of total gross capital inflows¹⁹.

5 Global Capital Inflows Surges

Having described our modeling framework and presented some key results, in this section we turn to an analysis of gross capital inflows, with the objective of identifying globally driven capital inflows surges. This section is therefore instrumental to our main objective of this paper.

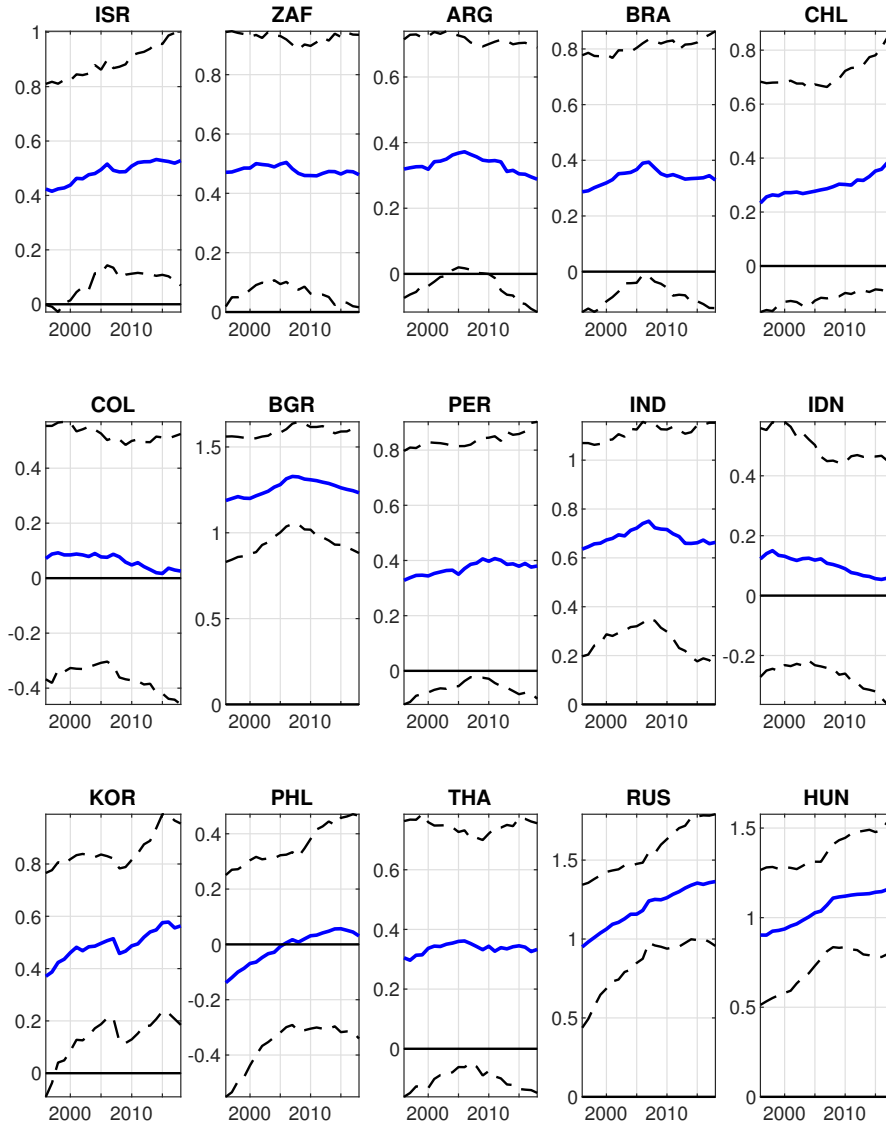
5.1 Identification of Capital Flows Episodes

In order to identify specific episodes of surges and retrenchments we first compute a 5 years rolling moving average series for each country’s gross capital flows series, and then we identify an “episodic” surge if the deviation of the series of gross inflows from its moving average in a given year exceeds one standard deviation of the series (calculated over the preceding 5 years). In addition to the above criteria, we also include a minimum threshold, which is set at 2% of GDP. A similar approach is followed by [Dell’Erba and Reinhardt \(2015\)](#) for the case of FDI. Overall, our methodology is in line with other works in the area of capital flows surges, including [Forbes and Warnock \(2012\)](#), [Scheubel et al. \(2019a\)](#) and [Cardarelli et al. \(2010\)](#). In [Table 3](#) and [4](#) we summarize the whole set of identified surges, by year and country (where a surge is codified with a binary variable equal to 1, and 0 otherwise).

It is useful to illustrate one country case: in [Figure 6](#) we therefore report our results for South Africa. Notice that the methodology captures relevant dates where there is an obvious uptick in capital inflows. Furthermore, notice that while in 1994 the capital flow series exceeds the one

¹⁹In order to appreciate these aspects, we plot, in [Figures 11](#) and [11a](#), the evolution of capital flows and of the GFCy for each country in the sample; consider HUN: the loading is steadily increasing from approx. 0.9 at the beginning of the sample to approx 1.2 in 2018; consistently with these results, the corresponding capital flows plot reveals how HUN capital flows tend to be closely aligned to the GFCy until 2009, before showing heightened sensitivity in the second part of the sample. Regarding the significance of the factor loadings, consider COL: in this latter case, the factor loading is highly insignificant; consistently, the capital flows series only shows a weak link with the GFCy; for this country, other factors (perhaps a factor reflecting oil prices, see [Davis et al. \(2019\)](#)) or idiosyncratic components might be more relevant drivers behind capital flows evolution.

Figure 5: Time-Varying Factor Loadings

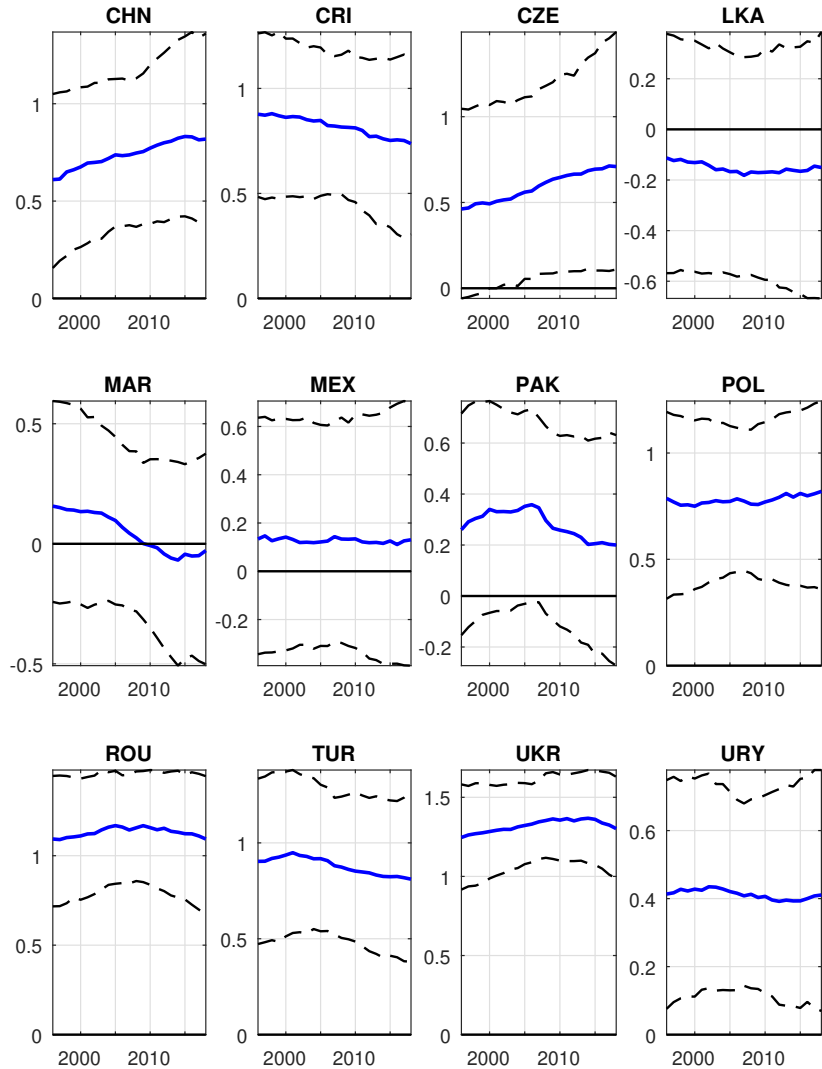


Notes: Solid lines represent the posterior mean and dashed lines represent the 16th and 84th percentiles.

standard deviation threshold, the event remains below the minimum threshold, and hence it is not recorded as a surge.

It is interesting to also visualize whether the evolution of the total number of capital flows episodes closely tracks the estimated global factor: as shown in Figure 7 there is a strong co-movement between our estimated measure of the global financial cycle and the number of capital inflows episodes that we identify in each period, across the sample of countries included in the

Figure 5a: Time-Varying Factor Loadings

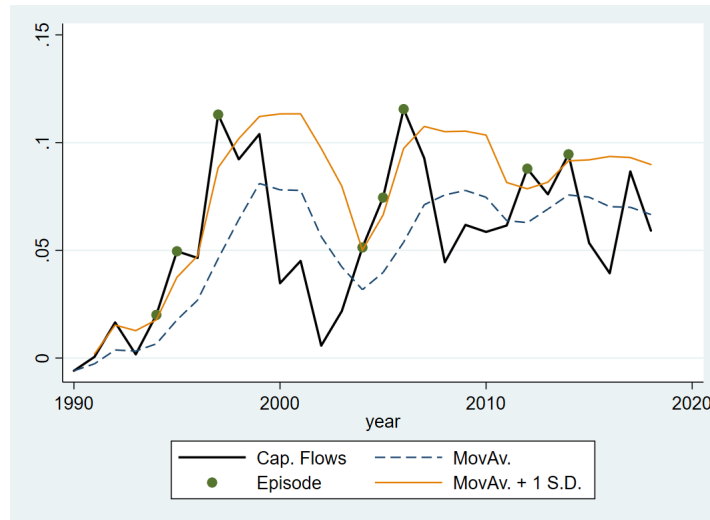


Notes: Solid lines represent the posterior mean and dashed lines represent the 16th and 84th percentiles.

analysis²⁰. This stylized fact supports the idea that changes in global financial conditions might be at the source of at least some of the capital inflow surges observed within emerging market economies.

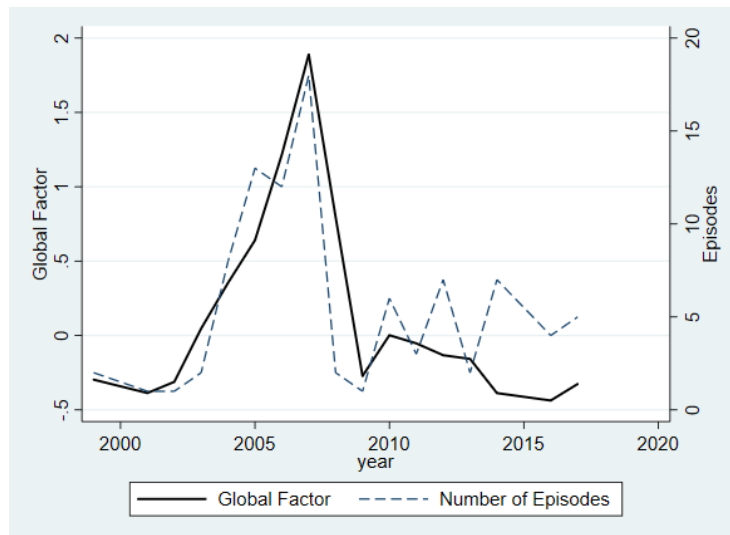
²⁰Although there is the caveat that the estimated global factor does not accurately predict the upsurge in episodes that preceded the taper tantrum, together with the following decline and eventual rebound; this observation further supports the argument of a reduction in the correlation between extreme capital flows movements and risk aversion (Forbes and Warnock (2020)), as we already highlighted above.

Figure 6: Identification of Capital Flows Episodes: The case of South Africa



Notes: The Figure shows the series of capital flows (Cap. Flows) for South Africa, the rolling moving average of the series (MovAv.), the estimated series of capital flows computed, by adding to the moving average, the standard deviation (MovAv. + 1 S.D.), together with the identified episodes (Episode).

Figure 7: Global Financial Cycle and Number of Capital Inflows Surges



Notes: The Figure shows the estimated global factor from the time varying factor model (left axis) together with the total number of identified capital inflows surges in the sample per year (right axis).

5.2 Complementary log-log Model

Having identified “episodes” of surges, we select the subset of episodes that can be attributed to positive swings in the GFCy (i.e. relaxation in global financial conditions). The motivation is that the time varying factor loadings ($\lambda_{i,t}$) characterize the relationship of capital flows with

respect to the GFCy and therefore it is important to exclude those episodes that are instead more likely attributed to other factors.

We estimate a complementary log-log model, which gives the probability of a surge occurring. The *cloglog* framework is generally used when the event probability is either small or large and it is therefore adequate for the study of capital flows episodes, as also explained in [Calderón and Kubota \(2019\)](#).

In terms of our application we regress the capital flows episodes identified above on the extracted principal component from the time varying loadings model and a set of explanatory variables. The specification for a given type of capital flows is then given by the following fixed effect *cloglog* model:

$$P\left(Episode_{i,t} = 1; F_t, \mathbf{X}_{i,t-1}\right) = 1 - e^{-e^{a_i + \beta F_t + \gamma' \mathbf{X}_{i,t-1} + \epsilon_{i,t}}}$$

where $Episode_{i,t} = 1$ denotes an episode happening in country i , at time t . Episodes are coded as binary variables $(0, 1)$, with a 1 denoting a surge episode; \mathbf{X} is a vector of control variables, which we further discuss below. We also include country fixed effects (a_i).

In the model, and given the focus on surges, we complement the explanatory variables from the previous exercises with a measure of private sector domestic credit growth; furthermore, we include a variable that tracks commodity prices in order to control for surges not directly related to financial flows.

Following the standard approach in the literature, and in order to somewhat reduce the problems of endogeneity and reverse causality all domestic variables are lagged by one year, unless specified otherwise.

Notice that in the model, the Maximum Likelihood effect of an increase in the global financial cycle on the probability of a capital inflow surge is given by:

$$\log\left(-\log\left(1 - P(Episode_{i,t} = 1; F_t, \mathbf{X}_{i,t-1})\right)\right) = a_i + \beta F_t$$

5.3 Marginal Effects

The above model estimates the probability of an episode happening. Since the model is non-linear we cannot detect whether an episode is driven by changes in global conditions by simply referring to the statistical significance of the estimated $\hat{\beta}$. Therefore, and in order to accurately estimate the role of the global factor, we next compute the marginal effect of the GFCy on the

probability of a capital flow episode happening, which is given by:

$$marg_{i,t} = \frac{\partial P(Episode_{i,t} = 1)}{\partial F_t}$$

The margin ($marg_{i,t}$) is calculated at each realized values of the global factor and other variables and it quantifies the marginal contribution for country i at time t of a change in the GFCy on the probability of a capital flow surge episode.

As a final step we then compute:

$$\xi_{i,t} = \frac{\partial marg_{i,t}}{\partial \hat{\beta}}$$

which is the deviation in the margin; this is calculated using the delta method for standard errors and it is a variance estimate. Using $marg_{i,t}$ and $\xi_{i,t}$ we can then select the subset of episodes where there is a statistical significant contribution coming from the GFCy on the probability of the identified capital flow episode.

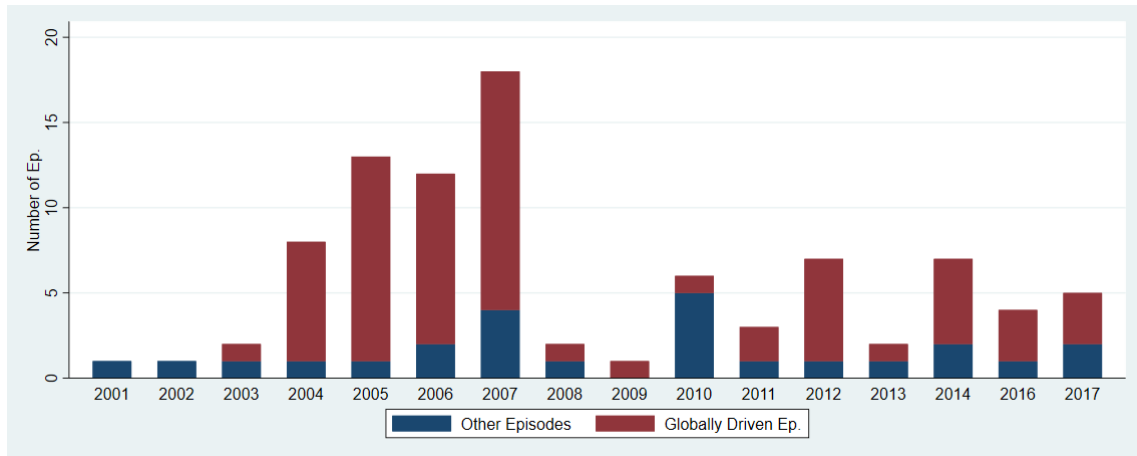
Overall we find that out of 94 total surges recorded in our sample, 45 episodes can be attributed to changes in the global financial cycle, with a 1% significance level; this number raises to 68 episodes, with a 5% significance level and to 76 at the 10% significance level. In Figure 8 we show the number of global and local episodes; the figure highlights that the highest number of globally driven episodes are clustered around the years preceding the 2008 financial crisis and that in the post-2009 years locally-driven episodes are relatively more frequent compared to the pre-crisis period²¹. There is a growing literature exploring how, in the post-2009 world, changes in the financial system and regulations (including macroprudential policies) might have affected the international transmission of core countries monetary policy shocks (a major driver behind fluctuations in the GFCy) and hence the likelihood of experiencing globally-driven surges. For example, [Miranda-Agrippino and Rey \(2020b\)](#) highlights the increasing relevance of asset managers and nonbank financial intermediaries in transmitting shocks. [Forbes and Warnock \(2020\)](#) underscore that what used to be “global waves” of capital flows have become smaller “idiosyncratic ripples” that are more difficult to explain with standard measures, such as global risk and global growth.

5.4 Clog-log: Regression Results

We show the results from the baseline model in Table 5. For completeness, we also report results for a modified version of the model that accounts for interaction terms between the global factor and the other variables. This is justified on the grounds that domestic variables can amplify or

²¹An interesting extension would be to compare these findings with the case of retrenchment episodes. We leave this extension for future research.

Figure 8: Global and Local Episodes by Year



Notes: Episodes are defined global when the deviation in the margins is significant at the 5% level.

contain the impact of global financial conditions on the probability of a surge (see for example [Scheubel et al. \(2019b\)](#)).

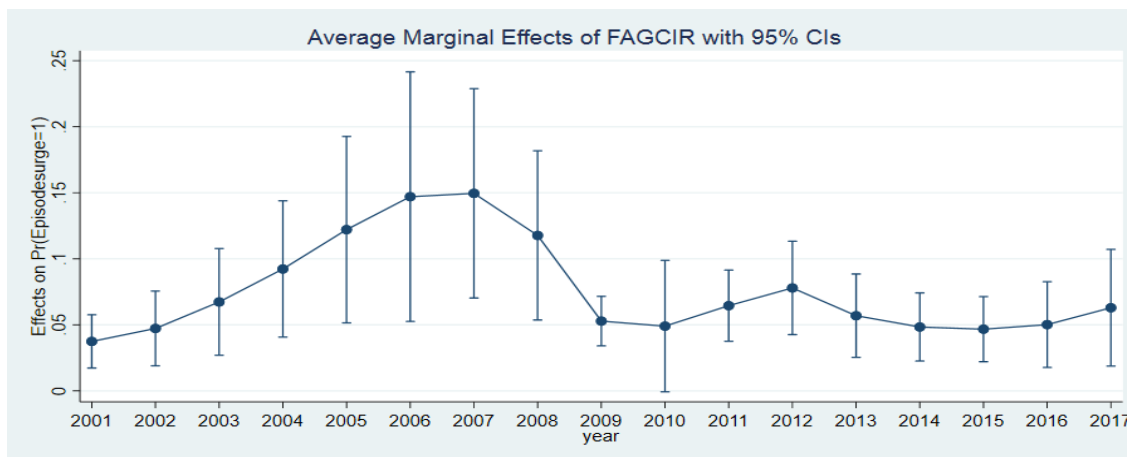
The regression results reported in Table 5 suggest that an easing of global financial conditions significantly increases the likelihood of a capital inflow surge, validating the main motivation behind this exercise. The overall impact of a relaxation of the GFCy on the probability of a surge can also be appreciated by calculating the Average Marginal Effects (AME) by year, as shown in Figure 9. Unsurprisingly, as shown in the Figure, the average marginal effect is steadily increasing throughout the pre-crisis period, before declining sharply. Afterwards, the AME is increasing again, before the kick-in from the taper tantrum in 2013.

Looking at what variables have a significant impact on the probability of a capital inflow surge, the framework suggests that fundamentals matter independently of the GFCy, while some policy variables become significant only in-so-far as they interact with the GFCy. On a general level, these results are consistent with the view that, while fundamentals might be pulling capital, independently of global conditions, domestic policies become consequential following changes in push factors. For instance, and as we have already stated in the introduction, to the extent that capital inflows surges arise from the feedback loop between an initial positive push shock and the resultant relaxation of domestic financial condition, tighter capital controls can help weaken the link.

Specifically, starting with variables that describe the fundamentals, we notice that the CPI index negatively impacts the probability of a surge, while a higher degree of institutional quality, a higher level of NFA and more trade integration, all tend to support the probability of inflow

surges. Interestingly, we also find that a peg regime increases the probability of a surge. Turning to statistically significant policy variables, we find that the impact of the GFCy is contained by a higher level of capital controls and expansionary fiscal policy in low debt countries. Other policy variables, despite not being statistically significant, are worthwhile of a discussion: specifically, the model also predicts that the effects of the GFCy are amplified by a higher domestic interest rate and higher capital inflows sterilization, while they are subsumed when a country is enacting more macroprudential policies measures, resisting exchange rate appreciation and scoring higher on the WaMaFi index.

Figure 9: Average Marginal Effect of the GFCy on the prob. of a surge



Notes: The Figure shows the average marginal effect of a relaxation of the GFCy in the model.

6 The Role of Domestic Policies and Fundamentals during Capital Inflows Surge Episodes

In this section we turn to the econometric analysis of how policies influence the exposure to global surge episodes. Before introducing the regression framework, we find useful to describe a selection of summary statistics concerning the policy variables of interest.

In order to make this preliminary discussion more meaningful we split the sample in three quantiles depending on the sample average factor loadings computed during either surge or non-surge years. For each subsample (surge years or non-surge years) we then compute the averages and standard deviations of the policy variables. We show the results in Table 6; the first block of the table reports averages taken over the non-surge years (first sub-block) and over the surge years (second sub-block). The second block is organized similarly and reports the corresponding

standard deviations.

Going through Table 6 it is interesting to highlight the following findings (which hold on average): During surge episodes the most exposed countries tend to (relatively to non-surge years) i) implement more warranted-macroeconomic adjustments ii) have a lower number of CFMs in place, iii) have a lower short term interest rate iv) have a looser or tighter fiscal policy depending on whether they belong to the low or high debt group, respectively v) they also tend to have lower values in the resistance index and degree of sterilization.

A different picture emerges in the case of countries with medium exposure: During surge episodes these countries tend to i) implement less warranted-macroeconomic adjustments ii) have higher levels of capital controls iii) have a lower short term interest rate iv) implement a tighter fiscal policy, v) have higher values in their their resistance index and degree of sterilization.

Finally, we observe that, during surges, the least exposed countries tend to i) implement less warranted-macroeconomic adjustments ii) have less capital controls but more macroprudential policies iii) have a lower short term interest rate iv) have a tighter fiscal policy (but only so in low debt countries) and v) have higher values in their their resistance index and degree of sterilization.

6.1 Baseline Regression Results

In this paragraph we introduce the baseline econometric framework and discuss the results. In particular, we estimate panel fixed effect regressions of the type:

$$\lambda_{i,t} = a_i + \delta Episode_{i,t} + (\beta'_1 + \gamma' \times Episode_{i,t}) \mathbf{X}_{i,t-1} + \beta'_2 \mathbf{Z}_{i,t-1} + T_t + e_{i,t} \quad (5)$$

where $Episode_{i,t}$ is a dummy variable, which takes the value of 1 in the years when country i experiences globally-driven episodes, and 0 otherwise. We include both country and time fixed effects (a_i, T_t , respectively). The vector \mathbf{X} includes all “policy variables” of interest and \mathbf{Z} contains the “fundamental” variables. In order to capture the role of policy variables around capital flows surges we also allow for an interaction term. In this sense our primary interest is toward the vector coefficient γ .

We include all episodes which are global (in a statistical significant sense) and we compare the cases for different significance levels of the surge (at the 1%, 5% and 10% levels). The regression includes country fixed effects (α_i) and time fixed effects (t_t). The dependent variable, $\lambda_{i,t}$, corresponds to the estimated posterior 50th percentile from the time varying factor loading model discussed in the previous sections. Higher values of the loadings should be interpreted as implying a larger exposure to the estimated global factor. Independent variables are lagged one period (one year) in order to reduce endogeneity, as commonly done in this stream of literature.

Results: Table 7 reports the main results: first, looking at $Episode_{i,t}$ we find that, indeed, periods of capital inflows surges are associated with a higher average sensitivity to the GFCy, *ceteris paribus* (albeit the coefficient, absent interactions, is statistically insignificant). Turning to policy variables, our analysis suggests that the use of both capital controls and macroprudential policies are effective at reducing the estimated sensitivity, but only during episodes of capital inflows surges²². This result contrasts with the conclusions of Davis et al. (2019) and suggests that international financial integration matters when it comes to domestic autonomy and a country’s resilience to global forces, giving credit to Rey (2015). Our finding that CFMs emerge as an effective tool directly speaks to the literature arguing against managing the exchange rate and in favor of alternative policy options that can influence risk spillovers related to U.S. monetary policy shocks. This tallies with findings in Kalemli-Özcan (2019) for example, who argues that, in EMDEs, exchange rate management through monetary policy is counterproductive on the grounds that, under risk spillovers, UIP deviations are endogenous to monetary policy. Countries can nevertheless act on the transmission channel of the GFCy by limiting credit growth and leverage during booms. Our results show that indeed, on average, countries can successfully rely on those type of instruments to shield their exposure to capital inflow surges. Notice that, as shown in Figure 10, the association is robust and the estimated significance does not result from the influence of outlier observations.

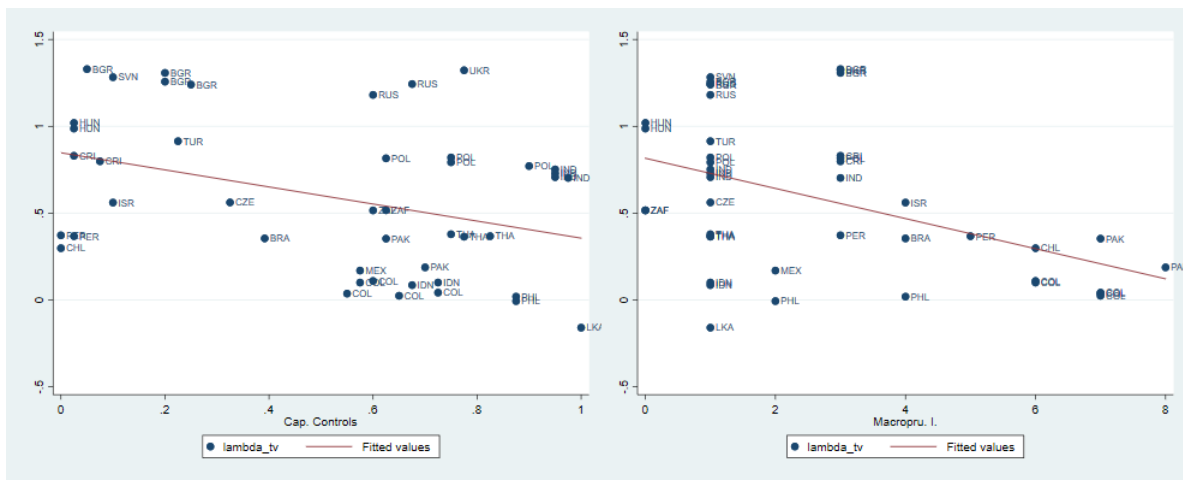
Importantly, we find that during periods of capital inflows surges, a higher score on the WaMaFi Index is significantly associated with a reduction in the sensitivity to the GFCy. Turning to fiscal policy our results confirm the role of public expenditures as a driver of capital flows, in high debt countries, where we find an economically significant positive effect associated with a positive deviation of public expenditures from trend. Concerning low debt countries we find that higher deviation of public expenditures from trend is associated with a lowered sensitivity to the GFCy during inflows surges.

Resistance to exchange rate appreciation is associated with a lowered sensitivity during non-episodes times, but this effect is muted during capital inflows surges, even though in both cases, coefficients turn out to be insignificant. One interpretation, generally considered in the literature, is that preventing exchange rate appreciation during inflows episodes can encourage one-way bet positions from international financial intermediaries. Moreover, we also find that higher sterilization tends to increase capital inflows sensitivity, even though we do not find statistical significance (and the coefficients with the interaction term flip sign when looking at the 5% and 10% significance classification of surges).

²²Notice that similar to the case of the Clog-log model, explanatory variables are included with a lag in the model; the interpretation should be that, on average, countries that are characterized by a higher level of capital controls and macroprudential policies display less sensitivity to the GFCy, during a capital inflow surge.

Turning to fundamentals, we find that both trade and financial integration are associated with higher sensitivity. Finally, we find a positive association, when it comes to net foreign assets; as we have already outlined, an interpretation is that, perhaps, foreign investors perceive that a higher level of net foreign assets implies higher net foreign assets return and that the latter represent a major stabilizing force against global income shocks, as documented by [Adler and Garcia-Macia \(2018\)](#).

Figure 10: Correlation between GFCy sensitivity and CFMs



Notes: The Left (Right) Figure shows the correlation between capital controls (Macroprudential Index) and the estimated sensitivity to the GFCy during capital inflows surges (selected at the 1% significance level).

6.2 Disaggregation of Capital Controls Measures

Until now, we have considered an aggregate measure of capital controls. This is justified both in order to streamline the presentation but also because countries might use capital controls on different flows as substitutes, making more challenging to estimate a significant relationship when looking at finer metrics. However, given the scope of this paper, it is natural to complement our baseline results with more granular measurements; we therefore re-estimate equation (5) by decomposing the capital control measure into i) the sub-indices targeting inflows and outflows ii) the sub-indices targeting inflows and outflows based on residency²³.

On a first pass, capital controls on inflows might be perceived as more likely to be enforceable, as it could be easier to discourage foreign investors than to close all the escape doors; also, the theoretical literature often emphasizes the role of controls on inflows to prevent capital flows surges (see [Jeanne and Korinek \(2010\)](#)). At the same time, capital controls on outflows, while

²³With the caveat that the sample size is adjusted depending on data availability on the disaggregated components.

in principle harder to effectively implement could still achieve their purpose, by discouraging international investors to buy assets in a country, if they get worried about their ability to take either the principal or their returns out in times of need (Bartolini and Drazen (1996)).

In Table 8 we present the results for the case of total inflows and total outflows controls²⁴. Interestingly, we find that only controls on capital outflows remain statistically significant (and only so when looking at the most stringent classification of globally-driven surges).

Turning to Tables 9 and 10, we further disaggregate the inflows and outflows controls by looking first at the restrictions affecting only non-residents and second at those restrictions that are instead targeted towards residents. The results confirm the statistical significance of capital controls on outflows, but also highlight the relevance of capital controls on non-residents inflows. Interestingly, Gupta and Masetti (2018) find that during surge episodes, on average, countries do not change pre-existing levels of capital controls restrictions, with the exception of loosening controls on resident outflows. The authors then suggest that, perhaps, this happens because countries are trying to mitigate the macroeconomic impact of surges (by reducing impediments on residents' ability to flight away). While our exercise differs in several ways both in terms of research question, sample and interpretation of the capital control variable²⁵, we believe that our results offer an interesting complementary perspective that is worthy of further scrutiny²⁶.

6.3 WaMaFi Index without CFMs component

In this paragraph we estimate a regression where the WaMaFi index is outstripped of the CFMs component. This modification to the baseline regression allows us to emphasize the more conventional macroeconomic and financial aspects of domestic adjustments and to confirm that the results are not exclusively driven by the use of CFMs (as it already qualitatively emerged from Figure 3). In Table 11 we report the results, which are highly significant across the three models and also remain quantitatively in line with the previous findings.

²⁴For expositional purposes, we report only the estimates associated with the capital control variables. Also, notice that the sample size is slightly different, based on data availability on capital controls measures.

²⁵Specifically, while we use a measure that quantifies the number of restrictions in place at a given time, Gupta and Masetti (2018) instead develop, and use, a measure that captures tightening and loosening of restrictions.

²⁶For example, even though it is well possible that capital controls on outflows discourage inflows preemptively as we suggest, we cannot discount the possibility that our results might be instead capturing the effects of previously imposed (and not subsequently removed) capital controls on outflows, which were perhaps put in place during past phases of capital outflows episodes; in this latter scenario, our estimated coefficients imply that countries that experienced capital outflows episodes in the past are less exposed to capital inflow surges in the future.

6.4 Complementarity of CFMs and Warranted Macroeconomic Adjustments

In the previous paragraphs we showed that higher levels of warranted macroeconomic adjustments, controlling for CFMs, lower the estimated sensitivity to the GFCy²⁷. In this paragraph we propose to modify equation (5) to allow for an interaction term between the WaMaFi Index (without CFMs component) and our measures of CFMs, during periods of surges. This extension allows us to condition the estimated impact of macroeconomic adjustments on the level of CFMs. Formally, equation (5) is now given by:

$$\lambda_{i,t} = a_i + \delta Episode_{i,t} + (\beta'_1 + \gamma' \times Episode_{i,t}) \tilde{\mathbf{X}}_{i,t-1} + \alpha_1 CFM_{i,t-1} + \alpha_2 WaMaFi_{i,t-1} + (\theta_1 + \zeta_1 \times Episode_{i,t}) CFM_{i,t-1} \times WaMaFi_{i,t-1} + \beta'_2 \mathbf{Z}_{i,t-1} + T_t + e_{i,t} \quad (6)$$

where $\tilde{\mathbf{X}}$ has the same interpretation as before, but without the CFM and WaMaFi Index components (and the variable CFM is either the level of capital controls or macroprudential regulations); we are interested in the coefficient ζ_1 ; specifically, $\zeta_1 < 0$ would suggest that, on average, the impact of warranted macroeconomic adjustments on the sensitivity to the GFCy during surge episodes is increasing in the degree of CFMs restrictions in place. We report the results in Tables 12, 13 and 14, which suggest a complementary role between macroeconomic policy levers and CFMs (especially so in the case of macroprudential policies).

These results also speak in relation to the concern that CFMs are used as a substitute for warranted macroeconomic adjustment; [Batini and Durand \(2020\)](#) argue that this concern seems largely unfounded. The results from this exercise further support the view that CFMs and other policy levers complement each other in dwarfing the sensitivity to the GFCy.

7 Conclusion

In this paper we first document that gross capital inflows in emerging and developing countries can be accurately described by a common factor that mimics current measures of the Global Financial Cycle (GFCy); we then estimate each country's sensitivity to this global factor and find significant heterogeneity in our sample. This result in turn motivates understanding whether these differences can be traced back to differences in fundamentals and to country-specific policy actions, including capital controls, macroprudential regulations and more standard levers of macroeconomic management, such as monetary and exchange rate policy. In this respect we

²⁷Equivalently, higher levels of CFM, controlling for warranted macroeconomic adjustments, lower the estimated sensitivity to the GFCy.

developed a novel index of “warranted” macroeconomic adjustments, along the lines of the IMF Institutional View of CFMs. The index tracks the evolution of gross capital inflows to emerging markets and therefore suggests that domestic economies do react when exposed to exogenous changes in global liquidity.

We then argue that a framework that aims to uncover the relation between exposure to the GFCy and policy actions but keeps the sensitivities of each country to the former fixed over the full sample is inadequate; we therefore introduce a model that allows for time variation in the sensitivities. This in turn allows us to concentrate on periods of capital inflows surges, which are at the core of the predictions of the GFCy. We define “globally-driven” capital inflows surges, and we find that they closely track the GFCy (i.e. during periods of relaxed global financial conditions, the number of “globally-driven” surges also raises). We then evaluate whether differences in policy stances around these surge episodes can account for differences in the estimated sensitivities, and we find that indeed countries with higher capital controls and, more significantly, higher macroprudential regulations and that enact “warranted” macroeconomic and financial adjustments, are less exposed to the GFCy. These results are in contrast with closely related research that instead do not find a significant role for capital controls and macroprudential regulations. These findings have potentially relevant implications since they suggest that, even though domestic policymakers might not hold the power to influence swings in global liquidity, they can still rely on conventional and less-conventional policy tools to counteract their exposure and, in so doing, help preserve domestic economic and financial stability.

During recent events, EMEs experienced large outflows as a consequence of the Covid-19 pandemic. Even though the crisis is unique and unprecedented under several dimensions, the sharp contraction of flows raises a set of similar questions in relation to the role that domestic policies play in containing capital flows pressures; for example, recent research suggests a major role of central banks (both AE and EMEs central banks) and of fiscal policy in stabilizing capital flows²⁸. Even though our results cannot be directly extended to the Covid-19 crisis, our paper gives a conceptual framework that can be used to further explore what policy actions helped in managing the outflows from EMEs, and in particular to account for the role of capital controls in times of crisis. We leave these investigations as an open avenue for future research.

²⁸See for example [Beirne et al. \(2020\)](#).

8 Appendix

8.1 Tables

Table 1: Summary Statistics

	μ	σ	Min	Max
λ (fact. loading)	0.57	0.41	-0.17	1.38
Short r.	0.07	0.08	0.00	0.86
Cap. Controls	0.48	0.32	0.00	1.00
Macropru. I.	3.10	2.14	0.00	10.00
Resistance I.	0.55	0.24	0.01	1.00
Sterilization I.	0.83	0.23	-0.01	1.23
G. Exp. (low Debt)	-0.02	0.07	-0.47	0.25
G. Exp. (high Debt)	-0.01	0.07	-0.40	0.26
WaMaFi I.	0.41	0.39	0.00	1.00
WaMaFi I. (Macro)	0.36	0.39	0.00	1.00
CPI	0.06	0.07	-0.02	0.55
Peg	0.20	0.40	0.00	1.00
Inst. Q.	0.67	0.08	0.44	0.84
Debt	0.45	0.22	0.04	1.52
Fin. Devlpt. I.	0.41	0.15	0.12	0.86
NFA	-0.48	0.27	-1.54	0.04
CA	0.00	0.06	-0.17	0.21
Trade Integr.	0.70	0.35	0.19	2.08
Fin. Integr	1.23	0.83	0.31	5.88
GDP growth	0.04	0.03	-0.15	0.14

Notes: Statistics are computed over the sample used to perform the baseline regression reported in Table 7 . CA=Current Account, G. Exp. = Government Expenditures, NFA=Net Foreign Assets (Other assets and liabilities).

Table 2: Bayesian Model Averaging for Gross Inflows

	(1)	(2)	(3)
	<i>Coef.</i>	<i>t - stat</i>	<i>PIP</i>
Cap. Controls	-0.02	-0.2	0.10
Short Rate	-1.88	-0.67	0.42
Macropru. I.	0.00	0.08	0.08
Resistance I.	0.12	0.4	0.20
Sterilization	0.16	0.55	0.31
G. Exp. (low Debt)	5.33	1.31	0.70
G. Exp. (high Debt)	-0.32	-0.24	0.14
Peg	0.08	0.38	0.19
WaMaFi I.	-0.06	-0.08	0.08
CPI	6.99	1.46	0.83
Inst. Q.	0.20	0.49	0.26
Debt	-0.06	-0.24	0.14
Fin. Devlpt. I.	0.10	0.36	0.17
NFA	0.14	0.37	0.18
CA	0.63	0.42	0.22
Trade Int.	0.27	1.02	0.59
Fin. Int.	0.03	0.39	0.19
GDP Growth	0.22	0.14	0.10
Observations	27		

Notes: This table reports the results of the Bayesian Model Averaging for gross inflows. Along with coefficients and t-statistics, the table also reports individual Post-Inclusion probabilities (PIPs). Variables with the highest PIPs are considered the most robust correlates. All independent variables are expressed as sample means. CA=Current Account, G. Exp. = Government Expenditures, NFA=Net Foreign Assets (Other assets and liabilities).

Table 3: Codification of Capital Inflows Surges

iso	1996	1997	1998	1999	2000	2001	2002	2002	2004	2005	2006	2007	2008
ARG	0	1	0	0	0	0	0	0	0	0	1	1	0
BGR	0	1	0	1	0	0	0	1	1	0	1	1	0
BRA	0	0	0	0	0	0	0	0	0	0	1	1	0
CHL	0	0	0	1	0	0	0	0	0	0	0	1	1
CHN	0	1	0	0	0	0	0	0	1	1	0	0	0
COL	1	1	0	0	0	0	0	0	0	1	0	1	0
CRI	0	0	0	0	1	0	1	1	0	1	1	1	0
CZE	0	0	0	0	0	0	0	0	0	0	0	1	0
HUN	0	0	0	1	0	0	0	0	1	1	0	1	1
IDN	0	0	0	0	0	0	0	0	0	1	0	0	0
IND	1	0	0	0	0	0	0	0	0	1	1	1	0
ISR	1	1	0	1	1	0	0	0	0	0	1	0	0
KOR	1	0	0	0	0	0	0	0	0	0	1	1	0
LKA	0	0	0	0	1	0	0	0	0	0	0	0	0
MAR	0	0	0	0	0	0	0	0	0	0	0	0	0
MEX	0	0	0	0	0	1	0	0	0	0	0	1	0
PAK	0	0	0	0	0	0	0	0	0	1	1	1	0
PER	0	0	0	0	0	0	1	0	0	0	0	1	0
PHL	1	0	0	0	0	0	0	0	0	1	1	1	0
POL	0	0	1	1	0	0	0	0	1	0	0	1	0
ROU	0	0	0	0	1	1	0	0	1	1	0	0	0
RUS	0	0	0	0	0	0	0	1	0	1	0	1	0
THA	0	0	0	0	0	0	0	0	1	1	1	0	0
TUR	0	0	0	0	1	0	0	0	1	1	1	0	0
UKR	0	0	0	0	0	0	0	0	1	1	0	1	0
URY	1	0	0	0	0	1	0	0	0	0	0	0	0
ZAF	0	1	0	0	0	0	0	0	1	1	1	0	0

Continues on next page

Table 3: Codification of Capital Inflows Surges (continued)

Country	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
ARG	0	0	0	0	0	0	0	1	1	1
BGR	0	0	0	0	0	1	0	0	0	0
BRA	0	1	0	0	0	0	0	0	0	0
CHL	0	0	1	0	0	0	0	0	0	0
CHN	0	0	0	0	0	0	0	0	0	0
COL	0	0	1	0	1	1	0	0	0	0
CRI	0	0	0	1	0	0	0	0	0	0
CZE	0	0	0	0	0	0	0	1	1	0
HUN	0	0	0	0	0	0	0	1	0	0
IDN	0	1	0	1	0	1	0	0	0	0
IND	0	0	0	1	0	1	0	0	0	0
ISR	0	0	0	0	0	0	0	1	0	0
KOR	0	0	0	0	0	0	0	0	0	0
LKA	0	0	1	1	0	0	0	0	0	0
MAR	1	0	1	0	0	1	0	0	0	0
MEX	0	1	0	0	0	0	0	0	0	0
PAK	0	0	0	0	0	1	0	0	1	1
PER	0	1	0	1	0	0	0	0	0	0
PHL	0	1	0	0	0	0	0	0	1	1
POL	0	0	0	0	0	0	0	1	0	0
ROU	0	0	0	0	0	0	0	0	1	1
RUS	0	0	0	0	1	0	0	0	0	0
THA	0	1	0	0	0	0	0	0	1	0
TUR	0	0	0	0	0	0	0	0	0	0
UKR	0	0	0	0	0	0	0	0	0	1
URY	0	0	0	1	0	0	0	0	0	0
ZAF	0	0	0	1	0	1	0	0	0	0

Notes: The Table codifies capital inflows surges with a binary indicator for each country and year in the sample, where 1 indicates a capital inflow surge, as defined in the paper and 0 indicates that no surge is detected.

Table 4: Surges in Private Inflows: A CLogLog Regression Analysis

	(1) Episode S.	(2) Episode S.
GFCy	0.469*** (3.19)	0.594** (2.24)
Commodity I.	0.282 (1.55)	0.365* (1.88)
Credit gr.	1.784 (0.75)	2.199 (0.83)
Short r.	2.702 (1.33)	2.506 (0.84)
Cap. Controls	-0.0588 (-0.05)	1.997 (1.64)
Macropru. I.	-0.0719 (-0.33)	-0.00582 (-0.03)
Resistance I	-0.463 (-0.60)	-0.240 (-0.28)
Sterilization	-0.928 (-0.70)	1.017 (0.54)
G. Exp. (low Debt)	-2.707 (-0.95)	-0.489 (-0.17)
G. Exp. (high Debt)	-0.173 (-0.06)	-1.298 (-0.40)
WaMaFi I.	0.575 (1.30)	0.635 (1.24)
CPI	-8.003** (-2.09)	-6.971 (-1.63)
Peg	0.959** (2.16)	1.005** (1.99)
Inst. Q.	13.93*** (3.76)	17.31*** (3.46)
Debt	1.732 (1.11)	-0.340 (-0.18)

Continued on next page

Table 4: Surges in Private Inflows: A CLogLog Regression Analysis (continued)

	(1)	(2)
	Episode S.	Episode S.
Fin. Develpt. I.	-4.344 (-1.22)	-6.373* (-1.74)
NFA	3.484*** (2.75)	3.308** (2.50)
CA	-1.483 (-0.32)	0.611 (0.11)
Trade Integr.	3.708* (1.85)	2.881 (1.15)
Fin. Integr.	-0.658 (-1.16)	-0.386 (-0.54)
GDP growth	1.814 (0.23)	-2.119 (-0.25)
GFCy \times Credit gr.		-1.774 (-0.80)
GFCy \times Short r.		3.098 (1.26)
GFCy \times Cap. Controls		-2.704** (-2.01)
GFCy \times Macropru. I.		-0.194 (-1.06)
GFCy \times Resistance I		-0.174 (-0.27)
GFCy \times Sterilization		-1.131 (-0.91)
GFCy \times G. Exp. (low Debt)		-6.163** (-2.27)
GFCy \times G. Exp. (high Debt)		2.419 (1.09)
GFCy \times WaMaFi I.		-0.151 (-0.40)
Observations	422	422

Notes: Surges in Private Inflows, Pull and Push Factors: A Complementary Log-Log Regression Analysis. Dependent Variable: Binary variable that takes the value of one whenever there is a surge in gross inflows.

t-statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country. All domestic independent variables are lagged by one year to reduce endogeneity. Variables are standardized to improve convergence and reduce multi-collinearity.

Table 5: Summary Statistics

λ	Cap. C.	WaMaFi I.	Macropru I.	Short r.	G. Exp. (L. D.)	G. Exp. (H. D.)	Resist. I.	Stz.
Episode S. =0 (μ)								
Low	0.161	0.672	0.294	4.068	0.067	0.001	-0.009	0.522 0.884
Medium	0.491	0.307	0.347	2.440	0.061	-0.023	-0.007	0.542 0.803
High	1.052	0.440	0.431	2.819	0.091	-0.006	-0.003	0.581 0.824
Episode S. =1 (μ)								
Low	0.152	0.642	0.282	4.727	0.060	-0.031	0.005	0.561 0.890
Medium	0.543	0.593	0.295	2.143	0.059	-0.065	-0.018	0.588 0.810
High	1.097	0.306	0.629	2.143	0.073	-0.001	-0.058	0.575 0.759
Episode S. =0 (σ)								
Low	0.150	0.185	0.383	2.136	0.040	0.064	0.037	0.246 0.188
Medium	0.109	0.325	0.371	1.761	0.092	0.083	0.069	0.247 0.275
High	0.213	0.328	0.404	2.037	0.109	0.057	0.089	0.252 0.210
Episode S. =1 (σ)								
Low	0.144	0.201	0.389	2.658	0.037	0.064	0.039	0.191 0.140
Medium	0.130	0.347	0.367	1.769	0.036	0.123	0.090	0.227 0.263
High	0.203	0.277	0.396	1.389	0.074	0.030	0.078	0.242 0.246

Notes: WaMaFi. I. excludes CFMs. Surges are selected at a 5% significance level

Table 6: Sensitivity to GFCy during Surges in Private Inflows

	(1)	(2)	(3)	
	$p < 0.01$	$p < 0.05$	$p < 0.10$	$p < 0.99$
Episode S.	0.016 (0.759)	0.019 (1.243)	0.022 (1.362)	0.029* (1.711)
Short r.	0.076 (1.316)	0.069 (1.275)	0.068 (1.293)	0.073 (1.315)
Episode S. \times Short r.	0.160 (1.512)	0.237*** (3.538)	0.225*** (3.256)	0.128*** (2.913)
Cap. Controls	-0.025 (-0.799)	-0.023 (-0.774)	-0.025 (-0.839)	-0.022 (-0.728)
Cap. Controls \times Episode S.	-0.026** (-2.182)	-0.013 (-1.380)	-0.015 (-1.650)	-0.018 (-1.592)
Macropru. I.	0.002 (0.326)	0.002 (0.425)	0.002 (0.435)	0.002 (0.367)
Macropru. I. \times Episode S.	-0.007*** (-2.933)	-0.005*** (-3.018)	-0.005*** (-3.086)	-0.003** (-2.475)
Resistance I	-0.014 (-1.185)	-0.014 (-1.142)	-0.013 (-1.114)	-0.012 (-1.096)
Episode S. \times Resistance I	0.013 (0.644)	0.002 (0.105)	0.004 (0.227)	-0.007 (-0.346)
Sterilization	-0.000 (-0.000)	0.005 (0.164)	0.005 (0.147)	0.006 (0.172)
Episode S. \times Sterilization	0.013 (0.518)	-0.008 (-0.458)	-0.012 (-0.730)	-0.017 (-0.868)
G. Exp. (low Debt)	-0.047 (-0.943)	-0.039 (-0.744)	-0.038 (-0.731)	-0.034 (-0.656)
Episode S. \times G. Exp. (low Debt)	-0.279*** (-3.431)	-0.119* (-1.745)	-0.124* (-1.775)	-0.132* (-1.895)
G. Exp. (high Debt)	0.147** (2.521)	0.144** (2.421)	0.140** (2.336)	0.150** (2.449)
Episode S. \times G. Exp. (high Debt)	0.016 (0.194)	0.010 (0.198)	0.026 (0.482)	-0.004 (-0.086)
WaMaFi I.	0.009* (0.326)	0.008 (0.425)	0.008 (0.435)	0.007 (0.367)

Continued on next page

Table 6: Sensitivity to GFCy during Surges in Private Inflows (continued)

	(1)	(2)	(3)	
	$p < 0.01$	$p < 0.05$	$p < 0.10$	$p < 0.99$
	(1.877)	(1.650)	(1.555)	(1.206)
WaMaFi I. \times Episode S.	-0.033*** (-3.192)	-0.022** (-2.576)	-0.019** (-2.483)	-0.009 (-0.879)
CPI	0.047 (0.733)	0.054 (0.813)	0.056 (0.868)	0.051 (0.805)
Peg	0.011 (1.241)	0.012 (1.346)	0.012 (1.356)	0.013 (1.441)
Inst. Q.	-0.079 (-0.504)	-0.075 (-0.482)	-0.073 (-0.474)	-0.078 (-0.506)
Debt	-0.052 (-1.076)	-0.053 (-1.122)	-0.054 (-1.137)	-0.055 (-1.154)
Fin. Develpt. I.	0.066 (0.570)	0.067 (0.598)	0.065 (0.577)	0.054 (0.474)
NFA	0.060** (2.217)	0.062** (2.274)	0.062** (2.258)	0.059** (2.165)
CA	0.009 (0.097)	0.003 (0.028)	0.002 (0.025)	0.013 (0.133)
Trade Integr.	0.093* (1.883)	0.098* (2.007)	0.098* (2.006)	0.096* (1.905)
Fin. Integr.	0.022** (2.371)	0.022** (2.494)	0.023** (2.505)	0.023** (2.479)
GDP growth	-0.138 (-1.481)	-0.144 (-1.601)	-0.145 (-1.597)	-0.136 (-1.499)
Observations	423	423	423	423
R_a^2	0.313	0.320	0.321	0.314

Notes: Panel Regression Analysis. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. In the first column the Episode S. dummy variable only includes surges that are globally-driven at the 1% significance level, as described in the text; the second and third columns instead also include globally-driven episodes that are significant at the 5% and 10% significance level, respectively, while the last column includes all episodes.

Table 7: Distinguishing between Inflows and Outflows Controls

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Cap. C. (Outf.)	-0.022 (-0.814)	-0.022 (-0.841)	-0.023 (-0.882)
Cap. C. (Outf.) \times Episode S.	-0.033** (-2.406)	-0.010 (-1.099)	-0.012 (-1.452)
Controls	Yes	Yes	Yes
Observations	423	423	423
R_a^2	0.312	0.318	0.319
Cap. C. (Inf.)	-0.019 (-0.776)	-0.015 (-0.641)	-0.017 (-0.701)
Cap. C. (Inf.) \times Episode S.	-0.015 (-1.180)	-0.014 (-1.281)	-0.015 (-1.501)
Controls	Yes	Yes	Yes
Observations	423	423	423
R_a^2	0.304	0.313	0.314

Notes: Sensitivity to GFCy during surges in Private Inflows: Distinguishing between inflows and outflows controls. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the capital controls variables.

Table 8: Distinguishing between Non-Residents Inflows and Outflows Controls

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Cap. C. (Outf. N.Res.)	-0.001 (-0.058)	-0.003 (-0.182)	-0.005 (-0.280)
Cap. C. (Outf. N.Res.) \times Episode S.	-0.024* (-1.919)	-0.004 (-0.412)	-0.005 (-0.547)
Controls	Yes	Yes	Yes
Observations	410	410	410
R_a^2	0.325	0.330	0.331
Cap. C. (Inf. N.Res.)	-0.021 (-1.320)	-0.022 (-1.343)	-0.023 (-1.350)
Cap. C. (Inf. N.Res.) \times Episode S.	-0.020* (-1.951)	-0.022** (-2.247)	-0.019* (-1.993)
Controls	Yes	Yes	Yes
Observations	413	413	413
R_a^2	0.319	0.331	0.332

Notes: Sensitivity to GFCy during surges in Private Inflows: Distinguishing between Non-Residents inflows and outflows controls. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the capital controls variables.

Table 9: Distinguishing between Residents Inflows and Outflows Controls

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Cap. C. (Outf. Res.)	-0.015 (-0.895)	-0.015 (-0.903)	-0.015 (-0.916)
Cap. C. (Outf. Res.) \times Episode S.	-0.032** (-2.535)	-0.011 (-1.082)	-0.012 (-1.496)
Controls	Yes	Yes	Yes
Observations	417	417	417
R_a^2	0.326	0.329	0.330
Cap. C. (Inf. Res.)	-0.019 (-0.976)	-0.020 (-1.033)	-0.020 (-1.050)
Cap. C. (Inf. Res.) \times Episode S.	-0.021 (-1.441)	-0.005 (-0.535)	-0.006 (-0.704)
Controls	Yes	Yes	Yes
Observations	420	420	420
R_a^2	0.307	0.314	0.314

Notes: Sensitivity to GFCy during surges in Private Inflows: Distinguishing between Residents inflows and outflows controls. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the capital controls variables.

Table 10: WaMaFi Index

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
WaMaFi I.	0.008 (1.465)	0.006 (1.140)	0.006 (1.052)
WaMaFi I. \times Episode S.	-0.031*** (-2.840)	-0.021** (-2.241)	-0.017** (-2.172)
Controls	Yes	Yes	Yes
Observations	423	423	423
R_a^2	0.310	0.317	0.318

Notes: Sensitivity to GFCy during surges in Private Inflows: WaMaFi Index without CFMs component. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the WamaFi Index.

Table 11: Interaction between WaMaFi Index and Macroprudential Policy Index

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Macropru. I.	0.000 (0.015)	0.000 (0.088)	0.000 (0.092)
WaMaFi I.	-0.004 (-0.586)	-0.004 (-0.630)	-0.004 (-0.734)
WaMaFi I. \times Macropru. I.	0.004* (2.010)	0.004** (2.087)	0.004** (2.173)
WaMaFi I. \times Macropru. I. \times Episode S.	-0.006** (-2.352)	-0.007*** (-3.377)	-0.006*** (-3.719)
Controls	Yes	Yes	Yes
Observations	423	423	423
R_a^2	0.300	0.314	0.316

Notes: Sensitivity to GFCy during surges in Private Inflows: Interaction between WaMaFi Index without CFMs component and Macroprudential Policy Index. Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the variables of interest.

Table 12: Interaction between WaMaFi I. and Non-Residents Controls

	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Cap. C. (Outf. N.Res.)	-0.000 (-0.011)	0.000 (0.016)	-0.001 (-0.057)
WaMaFi I.	0.009 (1.104)	0.010 (1.178)	0.010 (1.203)
WaMaFi I. \times Cap. C. (Outf. N.Res.)	-0.005 (-0.451)	-0.010 (-0.925)	-0.012 (-1.051)
WaMaFi I. \times Cap. C. (Outf. N.Res.) \times Episode S.	-0.041***	-0.018*	-0.015
Controls	Yes	Yes	Yes
Observations	410	410	410
R_a^2	0.321	0.329	0.330
Cap. C. (Inf. N.Res.)	-0.019 (-1.175)	-0.019 (-1.213)	-0.020 (-1.251)
WaMaFi I.	0.012 (1.493)	0.010 (1.374)	0.011 (1.391)
WaMaFi I. \times Cap. C. (Inf. N.Res.)	-0.017 (-1.200)	-0.019 (-1.320)	-0.021 (-1.475)
WaMaFi I. \times Cap. C. (Inf. N.Res.) \times Episode S.	-0.049*** (-3.471)	-0.032** (-2.094)	-0.027* (-1.955)
Controls	Yes	Yes	Yes
Observations	413	413	413
R_a^2	0.321	0.331	0.332

Notes: Sensitivity to GFCy during surges in Private Inflows: Interaction between WaMaFi I. without CFMs component and inflows and outflows controls (Non Residents). Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the variables of interest.

Table 13: Interaction between WaMaFi I. and Residents Controls

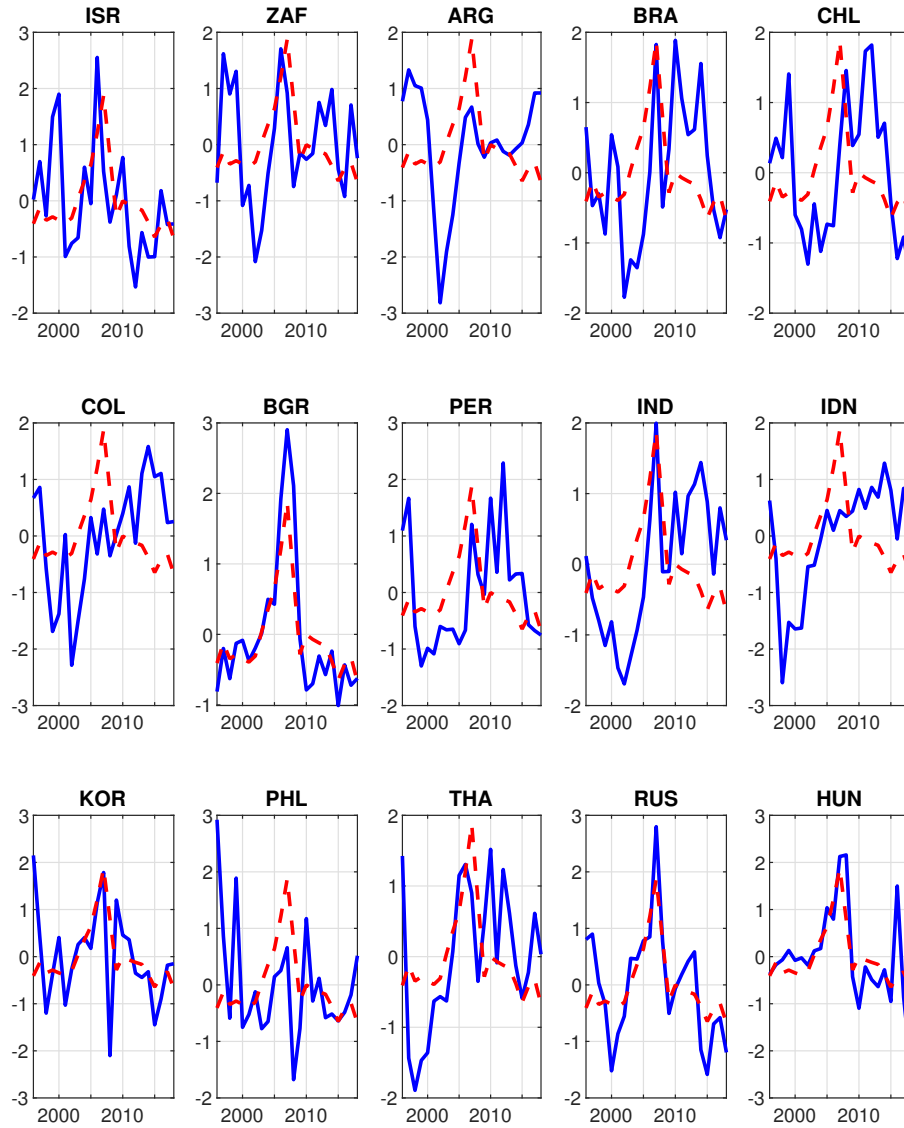
	(1)	(2)	(3)
	$p < 0.01$	$p < 0.05$	$p < 0.10$
Cap. C. (Outf. Res.)	-0.020 (-1.145)	-0.019 (-1.082)	-0.019 (-1.090)
WaMaFi I.	0.002 (0.260)	0.001 (0.108)	0.001 (0.140)
WaMaFi I. \times Cap. C. (Outf. Res.)	0.011 (0.992)	0.011 (0.854)	0.010 (0.754)
WaMaFi I. \times Cap. C. (Outf. Res.) \times Episode S.	-0.043*** (-3.454)	-0.027** (-2.387)	-0.024** (-2.225)
Controls	Yes	Yes	Yes
Observations	417	417	417
R_a^2	0.323	0.329	0.329
Cap. C. (Inf. Res.)	-0.022 (-1.095)	-0.021 (-1.090)	-0.022 (-1.115)
WaMaFi I.	0.003 (0.408)	0.001 (0.158)	0.001 (0.203)
WaMaFi I. \times Cap. C. (Inf. Res.)	0.008 (0.709)	0.007 (0.560)	0.006 (0.462)
WaMaFi I. \times Cap. C. (Inf. Res.) \times Episode S.	-0.038*** (-2.801)	-0.019 (-1.602)	-0.017 (-1.515)
Controls	Yes	Yes	Yes
Observations	420	420	420
R_a^2	0.305	0.312	0.313

Notes: Sensitivity to GFCy during surges in Private Inflows: Interaction between WaMaFi I. without CFMs component and inflows and outflows controls (Residents). Dependent Variable: Estimated 50th percentile of the time varying factor loadings. t -statistics in parentheses.

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Robust Standard errors and Fixed Effects by country and time. All domestic independent variables are lagged by one year to reduce endogeneity. The regression follows the same specification as in Table 7. In order to streamline the presentation we only report the coefficients associated with the variables of interest.

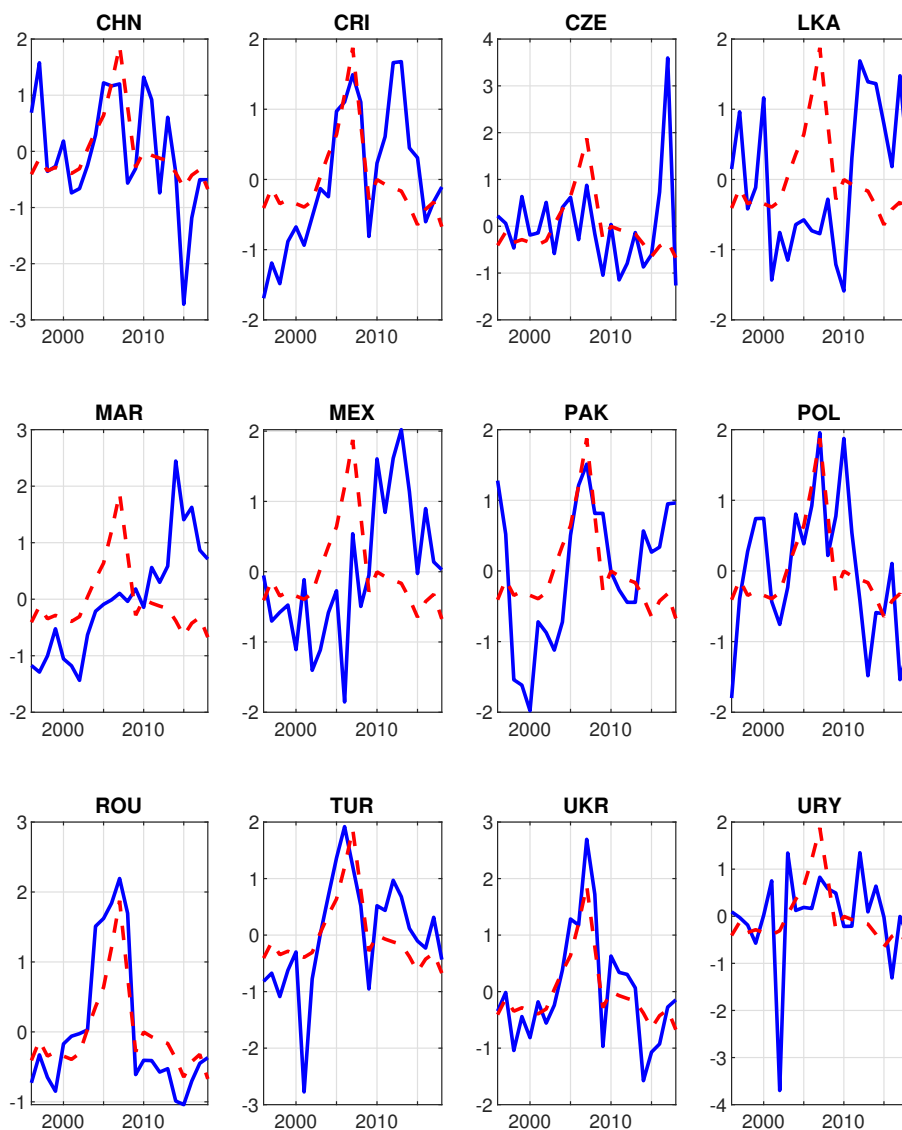
8.2 Figures

Figure 11: Capital Flows



Notes: Solid lines represent the (standardized) series of capital flows to GDP and dashed lines represent the 50th percentile of the estimated common factor.

Figure 11a: Capital Flows



Notes: Solid lines represent the (standardized) series of capital flows to GDP and dashed lines represent the 50th percentile of the estimated common factor.

8.3 WaMaFi Index: Data Details

In this section we include a summary of the data series and criteria used to map each state of the world into a quantifiable metric used to build the WaMaFi Index.

There are six possible states (excluding the residual state that allows for CFMs).

$$\mathcal{S} = \{Adeq.Res., Overh., Overv., Adeq.Res.\&Overv., Overv.\&Overh., Adeq.Res.\&Overh.\}$$

We discuss in turn *Adequate Reserves*, *Overheating* and *Overvaluation*, as the other states are derived from combination of these three. Finally we also discuss the case of CFMs

We quantify *Adequate Reserves* by looking at the Reserves over ARA EM metric. As described in IMF (2016), The ARA EM metric includes four components reflecting potential drains on the balance of payments: (i) export income to reflect the potential loss from a drop in external demand or a terms of trade shock; (ii) broad money to capture potential residents' capital flight through the liquidation of their highly liquid domestic assets; (iii) short-term debt to reflect debt rollover risks; (iv) other liabilities to reflect other portfolio outflows. Reserves in the range of 100-150 percent of the composite metric are considered adequate for precautionary purposes. There are few countries for which the ARA metrics is not available; for these cases we instead rely on a standard import cover ratio, by assuming that the amount of foreign reserves should cover three months of total imports (we use the annual data on imports and divide the number by four to approximate the metric.)

We quantify *Overheating* if GDP growth exceeds its potential as computed by the IMF World Economic Outlook (WEO) database. As a general rule if the data is missing we perform an HP decomposition of the GDP growth series and take the trend as representing potential GDP.

We quantify exchange rate *Overvaluation* by relying on EQCHANGE, a dataset developed by the CEPII on effective exchange rates and which contains data on exchange rate misalignments (Couharde et al. (2018)). The methodology relies on the Behavioral Equilibrium Exchange Rate (BEER) estimates in order to define an equilibrium real effective exchange rate (see Clark and MacDonald (1999)); currency misalignment are derived as the difference between observed real effective exchange rate and its estimated equilibrium level.

We quantify the residual CFMs state using both the yearly changes in total capital inflows restrictions, from Fernández et al. (2016) and also using the macroprudential measure of tightening and loosening actions from Alam et al. (2019). Notice that this macroprudential policy

measure is different from the one used in the main text as an individual regressor, which instead reflects the number of regulations in place at a given time. The main motivation for introducing a measure of tightening and loosening to codify the CFMs state of the WaMaFi Index is that we aim at explicitly capturing policy changes²⁹.

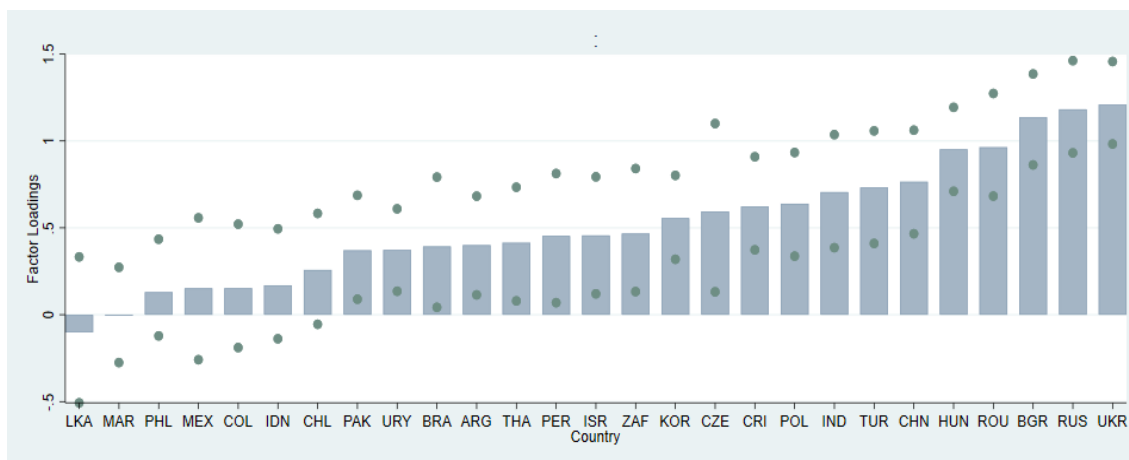
8.4 Factor Model with Time-Invariant Factor Loadings

In this section we present results for a model in which factor loadings are kept fixed. We first present some results related to the estimation of the model and then we proceed with an econometric exercise.

8.4.1 Estimation Results

We start with a description of the country-specific factor loadings (we omit a description of the estimated factor, as it is already presented in the main text), which represent the correlation between the series of capital flows and the estimated global factor. As illustrated in Figure 12 we find significant cross-country heterogeneity, with some countries having very low exposure.

Figure 12: Estimated Factor Loadings



Notes: Estimated Factor Loadings with 86% confidence bands.

We then quantify the importance of the model in explaining the variation in the observed capital flows series through a variance decomposition for each country in the sample; notice that given a 1 factor model (with series already taken in deviation from their time series mean), the

²⁹Unfortunately, we do not have access to a dataset of tightening and loosening of capital controls that encompasses the sample of countries under analysis, and we therefore simply proxy policy actions by taking the first differences of the index from Fernández et al. (2016)

variance can be decomposed as

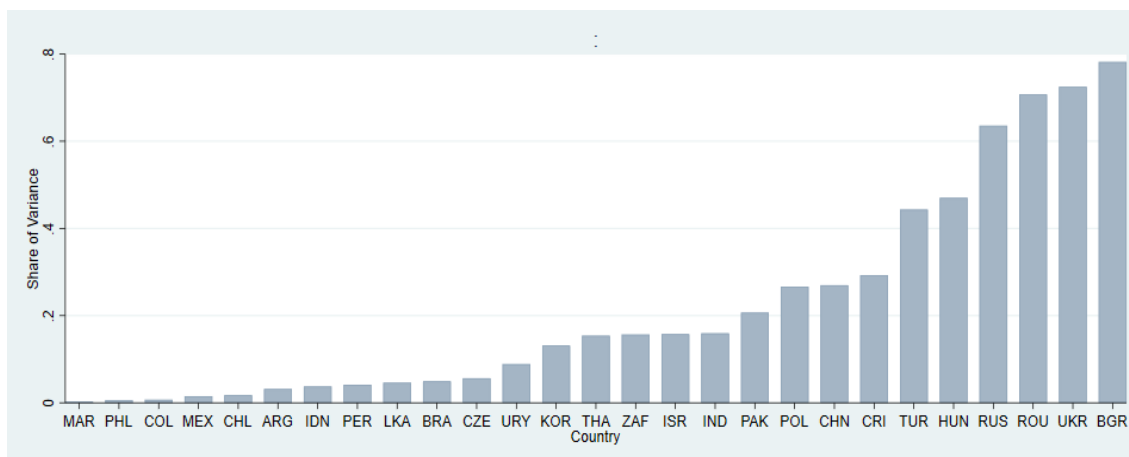
$$V(\tilde{cf}_{i,t}) = 1 \approx \frac{\hat{\lambda}_i^2}{V(cf_{i,t})} + \frac{V(\hat{\epsilon}_{i,t})}{V(cf_{i,t})} \quad (7)$$

where $V(x)$ represents the variance of series x , \tilde{x} represents the standardized series, and the second equality follows from observing that the covariance between the factor and the idiosyncratic terms is small, by definition, and that $V(F_t) = 1$. It then follows that

$$R_i^2 \equiv 1 - V(\hat{\epsilon}_{i,t})/V(cf_{i,t}) \quad (8)$$

In Figure 13 we illustrate the main results, which again confirm a high degree of cross-countries heterogeneity in terms of exposure to the GFCy.

Figure 13: Variance Decomposition



Notes: Estimated Variance Decomposition from dynamic factor model

8.4.2 What Drives the Sensitivity of Capital Flows to the GFCy?

In this section we study which domestic policy actions and economic fundamentals, if any, bear an influence on the exposure to the first common factor. In order to do so we regress λ_i on the sample average of the explanatory variables discussed in the paper³⁰.

This exercise, by its nature, is characterized by a small sample size, which combined with model uncertainty makes any prediction based on a simple between estimator not satisfactory.

A viable alternative is to rely on a Bayesian Model Averaging (BMA) Exercise, as done by [Cerutti et al. \(2019a\)](#) and [Masanjala and Papageorgiou \(2008\)](#), among others.

³⁰We maintain the caveat that, for a few countries, we only have limited coverage of specific explanatory variables, so that the sample mean will only be partially representative of the potential exposure to the GFCy.

The main idea of BMA is to regress the $n \times 1$ vector containing the dependent variable Λ on an intercept, α and a number of explanatory variables that are selected from a set of k variables included in a $n \times k$ design matrix X . Define the rank of matrix X as $r(\iota : X) = k + 1$, where ι is a $n \times 1$ vectors of 1s.

We can then select a sub-matrix $n \times k_j$ from X , call it X_j , where $(0 \leq k_j \leq k)$. The model, call it M_j , is then given by:

$$\Lambda = \alpha \iota + X_j \times \beta_j + \sigma \epsilon$$

where ϵ follows a n -dimensional normal distribution with zero mean and an identity covariance matrix, β_j is a k -dimensional vector of coefficients and σ is a scaling parameter.

The method then involves considering all subset of variables contained in X , so that the total numbers of evaluated models equals 2^k .

The posterior probability of any given parameter of interest, call it Δ , is given by a weighted average across all models:

$$P_{\Delta|\Lambda} = \sum_{j=1}^{2^k} P_{\Delta|\Lambda, M_j} P(M_j|\Lambda)$$

where $P(M_j|\Lambda)$ is the posterior model probability.

The posterior model probability is defined as:

$$P(M_j|\Lambda) = \frac{l_{\Lambda}(M_j)p_j}{\sum_{h=1}^{2^k} l_{\Lambda}(M_h)p_h}$$

where $l_{\Lambda}(M_j)$ is the the marginal likelihood of model M_j , which is given by:

$$l_{\Lambda}(M_j) = \int p(\Lambda|\alpha, \beta_j, \sigma, M_j)p(\alpha, \sigma)p(\beta_j|\alpha, \sigma, M_j)d\alpha d\beta_j d\sigma$$

with $p(\Lambda|\alpha, \beta_j, \sigma, M_j)$ from the model j and the other two terms indicating the relevant priors. We use non-informative priors on the error-variance and a Gaussian informative priors on the parameters³¹.

Summary of Results: In Table 2 we present the results from the exercise; the variables with higher Posterior Inclusion Probability (PIP) are the most robust correlates with the estimated sensitivities. PIPs are the sum of Posterior Model Probabilities for all models where a given regressor was included. For example, a PIP equal to approximately 1 on a given variable x would indicate that virtually all of the posterior model mass is based on models that included that same variable x .

³¹In the paper the BMA exercise is performed following the algorithm of [De Luca and Magnus \(2011\)](#).

Overall, we find relatively low PiPs for all of our covariates, with few exceptions: first, with respect to the CPI inflation, which has a PiP of 0.83, second with respect to fiscal policy in low debt countries, with a PiP of 0.70 and third with the level of trade integration, with a PIP of 0.59. All three variables tend to increase the sensitivity to the GFCy and all three variables belong to the “Fundamentals” category.

We find moderate PiPs for the cases of the short term rate, the degree of sterilization, the degree of institutional quality, the degree of trade integration and the current account. The coefficient associated with resistance to appreciate is positive, possibly as a result of the endogenous relationship characterizing policy actions (i.e. countries that are more prone to resist appreciation of the exchange rate are also more exposed to the GFCy).

Surprisingly, we find that the sensitivity is decreasing in the short term rate. This result is nevertheless consistent with the coefficient found for the case of CPI inflation.

Within the other set of covariates, we find relatively low PiPs for the cases of capital controls, the macroprudential index and the WaMaFi index. Despite the lack of robustness, the associated coefficients for the cases of capital controls and the macroeconomic adjustments point to the “expected” direction, as higher levels of both variables are associated with a lower sensitivity to the GFCy.

The sign found for the case of NFA³² suggests that a higher level of the latter is associated with a higher exposure to the GFCy. This result can be easily interpreted, by observing that, as documented in [Adler and Garcia-Macia \(2018\)](#), a higher level of NFAs acts as an insurance against negative domestic shocks, hence fostering foreign investors’ willingness to enter the domestic market, at times of relaxed global financial constraints.

Overall, this exercise is only suggestive of potential relationships and does not lead to robust results regarding the effectiveness of policy levers and CFMs in the management of the sensitivity to the GFCy. The exercise has two major limitations, as it only consider averages of variables over the sample years and it is based on fixed sensitivities over time.

8.5 Dynamic Factor Model with Time-Varying Loadings: Estimation Details

In this section we provide further details on the the time-varying factor model of [Del Negro and Otrok \(2008\)](#).

³²We exclusively look at the “other assets” category, as it is the one that mostly resonate within the literature on the GFCy. We also estimate models that include other types of assets and we do not find significantly robust results.

The model is estimated using a Gibbs sampling algorithm, which requires specifying priors assumptions. We use convenient priors as initial conditions and we limit the amount of informativeness to a few key parameters.

We distinguish between the parameters that enter into the factor equation, the parameters in the stochastic volatility equation, the parameters involved in the law of motion of the idiosyncratic component and the parameters in the law of motion of the factor loadings.

Starting with the AR parameters, $\rho_1, \rho_2, \dots, \rho_q$ we specify the following shrinkage prior:

$$\rho^{prior} \sim N(\underline{\rho}, \underline{V}_\rho)$$

where $\underline{\rho} = 0_{q \times 1}$ and

$$\underline{V}_\rho = \tau_1 \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1/2 & \vdots & \vdots \\ \vdots & \dots & \ddots & 0 \\ 0 & \dots & 0 & 1/q \end{bmatrix}$$

For the AR parameters of the idiosyncratic shocks, Θ we specify:

$$\Theta^{prior} \sim N(\underline{\Theta}, \underline{V}_\Theta)$$

with $\underline{\Theta} = 0_{p \times 1}$ and

$$\underline{V}_\Theta = \tau_2 \begin{bmatrix} 1 & 0 & \dots & 0 \\ 0 & 1/2 & \vdots & \vdots \\ \vdots & \dots & \ddots & 0 \\ 0 & \dots & 0 & 1/p \end{bmatrix}$$

We fix $\tau_1 = 0.2$ and $\tau_2 = 1$ as in [Ritschl et al. \(2016\)](#). Moving to the variance of the disturbances in χ_t we assume that they are distributed following an Inverse Gamma (IG) distribution:

$$\sigma_\chi^{2prior} \sim \text{IG}\left(\alpha_\chi/2, \delta_\chi/2\right)$$

and we set $\alpha_\chi = 0.05 \times T$, $\delta_\chi = 1$, which gives an agnostic prior.

In the case of constant factor loadings, we set the prior of each factor loading as:

$$\lambda^{prior} \sim N(\underline{\lambda}, \underline{V}_\lambda)$$

where $\underline{\lambda} = 0$ and $\underline{V}_\lambda = 100$.

When we allow for time variation in the factor loadings we specify the prior for the variance of the disturbance in ϵ_t :

$$\sigma_\epsilon^{2prior} \sim \text{IG}\left(\alpha_\epsilon/2, \delta_\epsilon/2\right)$$

where $\alpha_\epsilon = 0.1 \times T$ and $\delta_\epsilon = 0.1^2$.

Finally we have the variance of the innovations in η_t and we adopt the following:

$$\sigma_\eta^{2prior} \sim \text{IG}\left(\alpha_\eta/2, \delta_\eta/2\right)$$

where we set $\alpha_\eta = T$ and $\delta_\eta = 0.05^2$.

Notice that we are making the weight of the priors relative to the sample explicit and that we apply the belief that the time variation in the stochastic volatility is lower relative to that in the loadings.

The algorithm follows [Ritschl et al. \(2016\)](#) and it involves four sequential blocks: first, $\rho_s, \theta_r, \sigma_g$ for $s = 1, \dots, q, r = 1, \dots, p$ and $g = \chi, \epsilon, \eta$ are calculated. Second, conditional on these estimated values the factor F_t is found; third, conditional on these two blocks' results, the factor loadings are estimated. As a final step, the stochastic volatility is found. These “four blocks” procedure is then repeated by conditioning on the last iteration step. Because these iterations have the Markov property, as the number of steps increases, the conditional posterior distributions of the parameters and the factor converge to their respective marginal posterior distributions at an exponential rate.

References

- Abbas, S. A., Pienkowski, A., Rogoff, K. 2019. Sovereign debt: A guide for economists and practitioners. Oxford University Press.
- Adler, G., Garcia-Macia, D. 2018. The stabilizing role of net foreign asset returns. International Monetary Fund, Working Paper No. 18/79.
- Ahlquist, J. S. 2006. Economic policy, institutions, and capital flows: Portfolio and direct investment flows in developing countries. *International Studies Quarterly*, 50, 681–704.
- Aizenman, J., Glick, R. 2009. Sterilization, monetary policy, and global financial integration. *Review of International Economics*, 17, 777–801.
- Alam, Z., Alter, M. A., Eiseman, J., Gelos, M. R., Kang, M. H., Narita, M. M., Nier, E., Wang, N. 2019. Digging Deeper—Evidence on the Effects of Macroprudential Policies from a New Database. International Monetary Fund, Working Paper No. 19/66.
- Arora, V., Habermeier, K., Ostry, J. D., Weeks-Brown, R. 2013. The liberalization and management of capital flows: An institutional view. *Revista de economia institucional*, 15, 205–255.
- Arregui, N., Elekdag, S., Gelos, G., Lafarguette, R., Seneviratne, D. 2018. Can countries manage their financial conditions amid globalization?
- Avdjiev, S., Gambacorta, L., Goldberg, L. S., Schiaffi, S. 2020. The shifting drivers of global liquidity. *Journal of International Economics*, p. 103324.
- Baek, I.-M. 2006. Portfolio investment flows to Asia and Latin America: Pull, push or market sentiment? *Journal of Asian Economics*, 17, 363–373.
- Barrot, L.-D., Serven, L. 2018. Gross capital flows, common factors, and the global financial cycle. The World Bank, Policy Research Working Paper 8354.
- Bartolini, L., Drazen, A. 1996. Capital account liberalization as a signal. National Bureau of Economic Research, Working Paper No. 5725.
- Batini, N., Durand, L. 2020. Analysis and advice on capital account developments: Flows, restrictions, and policy toolkits. IEO Background Paper BP/20-02/03 for IEO evaluation of “IMF Advice on Capital Flows”.
- Beirne, J., Renzhi, N., Sugandi, E., Volz, U. 2020. Financial market and capital flow dynamics during the covid-19 pandemic. ADBI, Working Paper 1158.

- Bergant, K., Grigoli, F., Hansen, N.-J., Sandri, D. 2020. Dampening global financial shocks: Can macroprudential regulation help (more than capital controls)?
- Blot, C., Creel, J., Hubert, P., Labondance, F., Saraceno, F. 2015. Assessing the link between price and financial stability. *Journal of Financial Stability*, 16, 71–88.
- Borio, C. E., Lowe, P. W. 2002. Asset prices, financial and monetary stability: exploring the nexus. BIS, working paper No. 114.
- Brandao-Marques, L., Gelos, G., Narita, M., Nier, E. 2020. Leaning against the wind: a cost-benefit analysis for an integrated policy framework.
- Broner, F., Didier, T., Erce, A., Schmukler, S. L. 2013. Gross capital flows: Dynamics and crises. 60, *Journal of Monetary Economics*, 113–133.
- Bruno, V., Shin, H. S. 2013. Capital flows, cross-border banking and global liquidity. National Bureau of Economic Research, No 19038.
- Bruno, V., Shin, H. S. 2014. Cross-border banking and global liquidity. *The Review of Economic Studies*, 82, 535–564.
- Calderón, C., Kubota, M. 2019. Ride the wild surf: An investigation of the drivers of surges in capital inflows. *Journal of International Money and Finance*, 92, 112–136.
- Calvo, G., Leiderman, L., Reinhart, C. 1992. Capital inflows and real exchange appreciation in Latin America: the role of external factors. *IMF Economic Review*, 108–51.
- Cardarelli, R., Elekdag, S., Kose, M. A. 2010. Capital inflows: Macroeconomic implications and policy responses. *Economic Systems*, 34, 333–356.
- Carney, M. 2019. Pull, push, pipes: sustainable capital flows for a new world order. Bank of England, Speech given at the Institute of International Finance.
- Cerutti, E., Claessens, S., Laeven, L. 2017. The use and effectiveness of macroprudential policies: New evidence. *Journal of Financial Stability*, 28, 203–224.
- Cerutti, E., Claessens, S., Puy, D. 2019a. Push factors and capital flows to emerging markets: why knowing your lender matters more than fundamentals. *Journal of International Economics*, 119, 133–149.
- Cerutti, E., Claessens, S., Rose, A. K. 2019b. How important is the global financial cycle? evidence from capital flows. *IMF Economic Review*, 67, 24–60.

- Choi, I. 2017. Efficient estimation of nonstationary factor models. *Journal of Statistical Planning and Inference*, 183, 18–43.
- Clark, P. B., MacDonald, R. 1999. Exchange rates and economic fundamentals: a methodological comparison of beers and feers. In *Equilibrium exchange rates*, Springer, 285–322.
- Coman, A., Lloyd, S. 2019. In the face of spillovers: prudential policies in emerging economies. Bank of England, Staff Working Paper No. 828.
- Combes, J.-L., Kinda, T., Plane, P. 2012. Capital flows, exchange rate flexibility, and the real exchange rate. *Journal of Macroeconomics*, 34, 1034–1043.
- Couharde, C., Delatte, A.-L., Grekou, C., Mignon, V., Morvillier, F. 2018. Eqchange: A world database on actual and equilibrium effective exchange rates. *International economics*, 156, 206–230.
- Davis, J. S., Valente, G., Van Wincoop, E. 2019. Global capital flows cycle: Impact on gross and net flows. National Bureau of Economic Research, Working Paper 25721.
- De Luca, G., Magnus, J. R. 2011. Bayesian model averaging and weighted-average least squares: Equivariance, stability, and numerical issues. *The Stata Journal*, 11, 518–544.
- De Vita, G., Kyaw, K. S. 2008. Determinants of capital flows to developing countries: a structural var analysis. *Journal of Economic Studies*, 35, 304–322.
- Del Negro, M., Otrok, C. 2008. Dynamic factor models with time-varying parameters: measuring changes in international business cycles. FRB of New York Staff Report, No 326.
- Dell’Erba, S., Reinhardt, D. 2015. FDI, debt and capital controls. *Journal of International Money and Finance*, 58, 29–50.
- Eichengreen, B., Rose, A. K., Wyplosz, C. 1996. Contagious currency crises. Technical report, National Bureau of Economic Research.
- Fendoğlu, S. 2017. Credit cycles and capital flows: Effectiveness of the macroprudential policy framework in emerging market economies. *Journal of Banking & Finance*, 79, 110–128.
- Fernández, A., Klein, M. W., Rebucci, A., Schindler, M., Uribe, M. 2016. Capital control measures: A new dataset. *IMF Economic Review*, 64, 548–574.
- Fernandez-Arias, E. 1996. The new wave of private capital inflows: push or pull? *Journal of development economics*, 48, 389–418.

- Forbes, K., Fratzscher, M., Straub, R. 2015. Capital-flow management measures: What are they good for? *Journal of International Economics*, 96, S76–S97.
- Forbes, K. J., Warnock, F. E. 2012. Capital flow waves: Surges, stops, flight, and retrenchment. *Journal of International Economics*, 88, 235–251.
- Forbes, K. J., Warnock, F. E. 2020. Capital flow waves—or ripples? extreme capital flow movements since the crisis. National Bureau of Economic Research, Working Paper No. 26851.
- Fratzscher, M. 2012. Capital flows, push versus pull factors and the global financial crisis. *Journal of International Economics*, 88, 341–356.
- Gelos, G., Gornicka, L., Koepke, R., Sahay, R., Sgherri, S. 2019. Capital flows at risk: Taming the ebbs and flows.
- Giovanni, J. d., Kalemli-Ozcan, S., Ulu, M. F., Baskaya, Y. S. 2017. International spillovers and local credit cycles. NBER Working Paper No. 23149.
- Girton, L., Roper, D. 1977. A monetary model of exchange market pressure applied to the postwar canadian experience. *The American Economic Review*, 67, 537–548.
- Gourinchas, P.-O., Valdes, R., Landerretche, O. 2001. Lending booms: Latin america and the world. Technical report, National Bureau of Economic Research.
- Gupta, P., Masetti, O. 2018. Capital flow measures: structural or cyclical policy tools?. The World Bank, Policy Research Working Paper 8418.
- Hamilton, J. D. 2018. Why you should never use the hodrick-prescott filter. *Review of Economics and Statistics*, 100, 831–843.
- IMF. 2011. Recent experiences in managing capital inflows—cross-cutting themes and possible policy framework.
- IMF. 2016. Guidance note on the assessment of reserve adequacy and related considerations.
- Jeanne, O., Korinek, A. 2010. Excessive volatility in capital flows: A pigouvian taxation approach. *American Economic Review*, 100, 403–07.
- Kalemli-Özcan, e. 2019. Us monetary policy and international risk spillovers. Technical report, Proceedings of the Jackson Hole Symposium (forthcoming).
- Kaminsky, G., Lizondo, S., Reinhart, C. M. 1998. Leading indicators of currency crises. *Staff Papers*, 45, 1–48.

- Lee, J.-Y. 1997. Sterilizing capital inflows. 7, IMF Economic Issues.
- Masanjala, W. H., Papageorgiou, C. 2008. Rough and lonely road to prosperity: a reexamination of the sources of growth in africa using bayesian model averaging. *Journal of applied Econometrics*, 23, 671–682.
- Miranda-Agrippino, S., Rey, H. 2020a. The global financial cycle after Lehman. In *AEA Papers and Proceedings*, 110.
- Miranda-Agrippino, S., Rey, H. 2020b. US monetary policy and the global financial cycle. *The Review of Economic Studies*, 87, 2754–2776.
- Neely, C. J. 2008. Central bank authorities' beliefs about foreign exchange intervention. *Journal of International money and Finance*, 27, 1–25.
- Neely, C. J., Rapach, D. E. 2011. International comovements in inflation rates and country characteristics. *Journal of International Money and Finance*, 30, 1471–1490.
- Nispi Landi, V., Schiavone, A. 2018. The effectiveness of capital controls. *Bank of Italy Temi di Discussione (Working Paper) No, 1200*.
- Ostry, J. D., Ghosh, A. R., Chamon, M., Qureshi, M. S. 2012. Tools for managing financial-stability risks from capital inflows. *Journal of International Economics*, 88, 407–421.
- Pasricha, G. K., Falagiarda, M., Bijsterbosch, M., Aizenman, J. 2018. Domestic and multilateral effects of capital controls in emerging markets. *Journal of International Economics*, 115, 48–58.
- Patnaik, I., Felman, J., Shah, A. 2017. An exchange market pressure measure for cross country analysis. *Journal of International Money and Finance*, 73, 62–77.
- Rey, H. 2015. Dilemma not trilemma: the global financial cycle and monetary policy independence. *National Bureau of Economic Research, Working Paper No 21162*.
- Ritschl, A., Sarferaz, S., Uebele, M. 2016. The US business cycle, 1867–2006: A dynamic factor approach. *Review of Economics and Statistics*, 98, 159–172.
- Sachs, J., Tornell, A., Velasco, A. 1996. Financial crises in emerging markets: the lessons from 1995. Technical report, National bureau of economic research No w5576.
- Sahay, R., Čihák, M., N'Diaye, P., Barajas, A. 2015. Rethinking financial deepening: Stability and growth in emerging markets. *Revista de Economía Institucional*, 17, 73–107.

- Sarno, L., Tsiakas, I., Ulloa, B. 2016. What drives international portfolio flows? *Journal of International Money and Finance*, 60, 53–72.
- Scheubel, B., Stracca, L., Tille, C. 2019a. The global financial cycle and capital flow episodes: a wobbly link? ECB Working Paper No 2337.
- Scheubel, B., Stracca, L., Tille, C. 2019b. Taming the global financial cycle: What role for the global financial safety net? *Journal of International Money and Finance*, 94, 160–182.
- Shambaugh, J. C. 2004. The effect of fixed exchange rates on monetary policy. *The Quarterly Journal of Economics*, 119, 301–352.
- Taylor, M. P., Sarno, L. 1997. Capital flows to developing countries: long and short-term determinants. *The World Bank Economic Review*, 11, 451–470.
- Wang, J., Wu, J. 2019. The dilemma and international macroprudential policy: Is capital flow management effective? Paper Available at SSRN 3333803.
- Wang, L. 2015. Market sensitivity to global financial cycle: International evidence and implication for china's capital account liberalization. Paper.
- Weymark, D. N. 1995. Estimating exchange market pressure and the degree of exchange market intervention for canada. *Journal of International Economics*, 39, 273–295.
- Zhang, M. L., Zoli, M. E. 2014. Leaning against the wind: macroprudential policy in Asia.