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The global financial cycle and capital flows: Taking stock

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Abstract

Since the global financial crisis, a rich and expanding literature on the so-called global financial cycle (GFCy) has emerged. This has fueled a debate in academic and policy circles on how to measure the GFCy, and how it impacts international capital flows, possibly in a time-varying way. We review the literature that has shown the relevance of the GFCy, as well as the heterogeneity of its impact on capital flows and its variations over time. We assess how various indicators of the GFCy affect episodes of large capital flows, and find a robust effect especially on episodes driven by non-resident investors. Non-linearity and instability over time, notably a less strong impact after the global financial crisis, are found at least for some GFCy indicators.

KEYWORDS
capital flows, global financial cycle, push factors, structural factor analysis

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1 | INTRODUCTION

How sensitive are international capital flows to global financial conditions? This question has long concerned policymakers, especially in emerging economies, and the seminal contribution by Rey (2013) points to financial globalization having led to a Global Financial Cycle (henceforth denoted

by GFCy) distinct from the business cycle. While a consensus has developed on the existence of the GFCy, the presence and magnitude of its impact on international capital flows remains debated.

In this paper, we take stock of the nexus between the GFCy and capital flows in two steps. We first review the growing literature on the drivers of capital flows, measures of the GFCy, and the connection between the two. We then assess how the main measures of the GFCy matter for episodes of *extreme* capital flows, that is, times when flows are usually large (sudden stops, surges, retrenchments, and flights). This follows the emphasis on such episodes in the recent literature (such as de Crescenzio & Lepers, 2021; Forbes & Warnock, 2012, 2021), motivated by the fact that large movements in capital flows are likely costlier than normal volatility, and thus of more relevance to policymakers.

Our analysis considers four questions. First, what are the salient findings from the growing literature on the GFCy impact on capital flows? Second, how close are the various standard measures of the GFCy? Third, does the GFCy matter for the various types of large flow episodes, and does it do so evenly across measures? Fourth, do we observe non-linear effects, or an impact that varies over time?

We provide the following answers to these questions. Regarding the first, the literature has moved from taking individual variables to proxy for the GFCy (VIX, US monetary policy, USD exchange rate) towards building synthetic measures based on principal component analysis that extract the common factor across many countries of an indicator related to single class of assets or variables (such as equity prices). The contributions that consider the link between GFCy and capital flows include papers that undertake a panel analysis of capital flows on the GFCy measures, as well as papers that assess the co-movement of measures of the GFCy with the principal component of capital flows. The general message is that the GFCy matters for capital flows, with tighter conditions leading to lower flows. The literature has moved towards assessing non-linear and time-varying effects, and finds that the impact of the GFCy can be larger in already challenging times, and has tended to weaken since the global financial crisis of 2008.

To answer the second question, we contrast various standard measures of the GFCy. These are the Index of Implied Stock Market Volatility (VIX) computed by CBOE, the common component of equity prices across a broad range of countries, the excess bond premium, the effective exchange rate of the USD, and the leverage of broker-dealers. Normalizing all five indicators, we find that they are fairly correlated, with the relation being stable through time (except for a lower co-movement with the VIX since the global financial crisis). Moreover, the measures are countercyclical in terms of US real GDP growth and oil prices, while the correlations with US interest rates and a global measure of the size of central banks' balance sheets are mixed.

To address the third question, we construct episodes of large capital flows using the standard approach of Forbes and Warnock (2021), and regress their occurrence on the GFCy measures. We find that the various GFCy measures matter in a heterogeneous way, with a stronger role for flows driven by non-resident investors (stops and surges), and a weaker one for episodes driven by domestic investors.

We finally consider whether the GFCy impact is non-linear or varies through time, and find mixed evidence. For both stops and surges we find that the effect of the GFCy measures is stronger when it is large, in particular with the global financial crisis, and declines in the post crisis period, though not in all specifications.

This paper is organized as follows. Section 2 provides an overview of how the literature on the drivers of capital flows, the GFCy, and the linkage between the two has evolved. In Section 3 we consider how a range of standard GFCy measure impact episodes of large capital flows, and document the dimension of heterogeneity. Section 4 concludes.

2 | THE GLOBAL FINANCIAL CYCLE AND CAPITAL FLOWS: WHAT DOES THE LITERATURE SHOW?

There is a rich literature on the drivers of international capital flows, and their connection with global conditions. In this section, we review this literature in three steps. We first consider contributions linking capital flows to specific variables, including global "push" factors and country-specific "pull" factors. We then discuss how the literature has moved from individual measures of the GFCy towards synthetic indices encompassing a range of indicators through principal component approaches, and the relation with domestic financial cycles. We finally review the connection between the synthetic indices of the GFCy and corresponding indices of capital flows.

2.1 | Drivers of capital flows

Our discussion starts with contributions linking capital flows to a range of drivers overall, before presenting papers that focus on times of extreme capital flows.

2.1.1 | General literature

Economists have long been interested in the drivers of international capital flows, and the era of financial globalization since the mid-1990s has only reinforced the relevance of the issue. The steady increase in cross border flows and holdings came to an abrupt halt with the 2008–2009 crisis, especially for flows connected to banks (Milesi-Ferretti & Tille, 2011). While flows have subsequently recovered, this rebound has been partial and quite heterogeneous across regions and types of flows, with banking flows in particular remaining below pre-crisis levels in advanced economies (Bussière et al., 2016; McQuade & Schmitz, 2017). A report by the Committee on the Global Financial System (CGFS (2021)) provides a broad analysis of the pattern since the global financial crisis, showing the shift from banking flows towards portfolio investment in the form of equity and – more importantly – bonds.

Several papers assess the drivers of capital flows through panel regressions, focusing on a number of factors. This literature, surveyed in Koepke (2019), splits the factors into two groups, namely *push* factors that reflect global conditions and *pull* factors related to the recipient countries' specific characteristics. The interest in global push factors is motivated by the presence of waves of large capital flows that affect several countries. The literature has converged on a narrow list of relevant push factors, including risk aversion indicators (such as the VIX, or measures of economic policy uncertainty), measures of monetary policy stances in the world's major economies (including the policy interest rate and global liquidity), the effective exchange rate of the USD against other currencies, given its central role in the international financial system, and indicators of real activity (commodity prices, growth in major economies). The pull factors include domestic output growth, indicators of asset return, depth of financial markets, and measures of country risk and institutional quality.

The literature finds clear empirical evidence of the role of push factors (CGFS, 2021; Koepke, 2019). While there is a consensus that push factors matter overall, the pattern becomes more heterogeneous when the analysis proceeds to a more granular level. There is less unanimity regarding

the relative importance of specific push factors for different types of flows, and as well as across different regions and time periods. While push factors, and especially global risk, have been key drivers of capital flow volatility, recent evidence points to a reduced role for some factors after the global financial crisis (Avdjiev et al., 2020a; CGFS, 2021). For instance, CGFS (2021) shows that the shift away from banking to bond flows has weakened the role of the VIX in driving total flows, even though risk remained an important determinant of bond flows. Buono et al. (2020) provides a contrasting view, finding that the VIX has become more relevant for portfolio debt flows after the taper tantrum of 2013. The reduced role for global risk, especially for banking flows, has been linked to increasing regulation of banks and the rising intermediation role of non-bank financial institutions (NBFI) operating through portfolio flows (Avdjiev et al., 2020a; CGFS, 2021). Amiti et al. (2017) focus on banking flows and contrast the role of global supply factors against that of country specific demand and supply factors. They find that in crisis times country specific factors matter more, with a role for supply factors, as countries depending on banks exposed to adverse shocks are particularly affected.

Other push factors have gained in importance. For instance, China is playing an increasing role with spillovers through several channels. These include growth (Ahmed et al., 2019), financial conditions (Lawson et al., 2019) and monetary policy (Miranda-Agrippino et al., 2020). Commodity prices are another important determinant of capital flows, especially for exporters in emerging markets (Clark et al., 2020; Molina & Viani, 2019). Dieppe et al. (2018) for instance document the important role of both oil demand and supply shocks for portfolio flow dynamics.

The role of push factors is also quite heterogeneous across regions. Relying on a detailed dataset of fund-level investment flows during the 2008 financial crisis and its aftermath, Fratzscher (2012) finds that the role of global factors is more relevant for some regions, and that it has been more moderate in the post-crisis years, when flows became more responsive to country-specific pull factors. Nier et al. (2014) analyze whether the sensitivity of private capital flows to EME to push factors is state contingent. They find that the VIX indeed becomes a dominant driver of capital flows during periods of stress, while other determinants generally lose their significance in those times.

2.1.2 | Episodes of extreme flows

While understanding the general drivers of capital flows is a relevant exercise, policymakers are more particularly concerned about times when capital flows are unusually large, as such massive movements are more likely to fuel imbalances or abrupt changes in macroeconomic variables (for instance, so-called sudden stops in net inflows may lead to sharp economic downturns). The literature has thus paid particular attention to such episodes. Researchers have pointed out that sudden stops tend to follow times of unusually high capital inflows (Agosin & Huaita, 2012; Furceri et al., 2012; Ghosh et al., 2014). The literature has also shown the need for a detailed look at different types of flows as some of these, such as bank flows, are more prone to sudden reversals (Levchenko & Mauro, 2006). Drivers are also heterogeneous: Li et al. (2019) show that while global factors matter more for sudden stops in equity flows in high-income economies, they are more relevant for bond flows to emerging economies.

Earlier contributions focusing on sudden stops in *net* capital inflows documented a contrasting pattern across drivers of *incidence* (i.e., does a sudden stop happen or not) and *magnitude* (i.e., how large is the sudden stop) with global push factors mattering more for the former, and local pull factors affecting the latter. For instance, Catão and Milesi-Ferretti (2014) find that net foreign

liabilities, especially in debt and the current account, are powerful predictors of external crises, whereas higher official reserve holdings tend to reduce the likelihood of crises. Edwards (2007) finds that a flexible exchange rate regime reduces the probability of experiencing a capital flow contraction, especially when capital mobility is high. Comelli (2015) confirms that the explanatory power of global factors for sudden stops varies across different emerging markets.

Over the last decade, the literature has moved beyond sudden stops, or other episodes, in *net* flows towards a broader perspective looking at *gross* capital flows. The first step has been to distinguish between sudden stops driven by a reduced appetite of foreign investors (lower gross inflows) and the ones caused by a flight by domestic investors (higher gross outflows). Cavallo et al. (2015) find that stops driven by foreign investors tend to have more adverse consequences, even when the reduction in gross inflows does not lead to a stop in net inflows. Rotheberg and Warnock (2011) similarly find that episodes driven by domestic investors tend to be shorter and less damaging.

The next step has seen researchers broaden the scope beyond times of sudden stops to include more episodes where capital flows were larger than historical norms. Ghosh et al. (2014) look at times of surges (large increases in capital inflows), while Forbes and Warnock (2021, 2012) consider a detailed taxonomy of episodes of gross inflows and outflows, namely stops (low inflows), surges (high inflows), flights (high outflows) and retrenchments (low outflows). Forbes and Warnock (2012) find that global push factors, in the form of the VIX, the US policy interest rate, and global liquidity, are major drivers of the likelihood of countries experiencing an episode, with regional contagion also mattering. In a subsequent paper, Forbes and Warnock (2021) find that the pattern has materially changed since the global financial crisis of 2007–2008. Specifically, the VIX, liquidity and monetary policy have become much less relevant, while the role of commodity prices has increased. de Crescenzio and Lepers (2021) rely on monthly data including the large capital flows movements during the Covid crisis and confirm the reduced role of the VIX, along with a rising role for oil prices. The authors distinguish across various types of flows, and show that the changing relevance of push factors seen for overall capital flows is especially pronounced for portfolio flows.

In addition to large movements in capital flows, researchers have also considered times of currency crises. Gupta et al. (2007) find that the impact is heterogeneous, as only 60% of currency crises are contractionary. They also find that high capital inflows before the crisis and financial openness increase the probability of a contractionary crisis, while trade openness decreases it.

A recent line of research goes beyond the impact of drivers on the average value of capital flows, and instead estimates it across various segments of the distribution (Eguren-Martin et al., 2020; Gelos et al., 2022). As policymakers are more concerned about times of particularly low flows, a factor that matters for the left tail of the distribution is relevant, even if its impact on the mean is moderate.

2.2 | Measuring the global financial cycle

2.2.1 | Methods

While there is a consensus that global financial conditions are relevant, the question remains on how to best measure them. As described above, the literature has first focused on some specific variables, such as the VIX or the monetary policy stance in major economies. A shortcoming of this approach is that it can confuse the cause of movements in financial conditions with the measure of these conditions. In addition, specific variables only illustrate one segment of financial conditions, and their relevance to some forms of capital flows may not extend to others.[1]

Researchers have thus developed broader measures by considering the extent to which financial variables co-move across countries. This is motivated by the fact that the price of risky assets, such as stocks, shows strong co-movements across countries. One can then construct a measure of the GFCy using principal component analysis. This is done for instance by Miranda-Agrippino and Rey (2021, 2020, 2015) and Rey (2013), who develop a measure of the principal component of the price of risky assets (equity). Habib and Venditti (2019) similarly develop a global stock market conditions indicator.

In constructing a composite measure of the GFCy, researchers must decide which variables to include. This is a non-trivial task given the many dimensions of financial activities. Should one focus only on a common component in asset prices or capital flows, consider price or quantity indicators, or focus on specific segments of financial markets? Should capital flows themselves be considered (with a risk of circular reasoning), as they play a significant role in the transmission to other key economic variables, or should they be left out as they are not a causal factor? Several papers have considered a measure of "global liquidity", which is understood as the availability of funds for purchases of goods or assets (Eickmeier et al., 2014). Global liquidity is proxied by several variables such as money and credit aggregates, market interest rates and implied stock market volatility indices.

2.2.2 | Patterns of the global financial cycle

Several contributions have assessed the behavior of country-level financial cycles, as well as the pattern of co-movements with business cycles and across countries. Some papers rely on a principal component approach across various indicators, while other focus on credit cycle measured as deviation from a trend based on bypass filters.

The measures computed by Miranda-Agrippino and Rey (2021, 2020) show a pattern of financial conditions that matches narratives of financial market situations, with booms before 1990 and especially before 2008, a sharp contraction during the global financial crisis, and only a partial recovery in subsequent years when tensions remained in the euro area. Using a VAR approach, the authors point to US monetary policy as a major driver of global financial conditions.

Taking a long historical view for 17 advanced economies, Jordà et al. (2019) consider international synchronization for credit, residential and equity prices. They show that synchronization has increased, pointing to a more relevant global dimension. This is especially pronounced for equity prices, driven by synchronization of risk premia, that goes well beyond the co-movements in real economic activity.

2.2.3 | Domestic and global cycles

While work on the global financial cycle has risen in recent years, there is a longstanding literature assessing financial conditions at the level of individual countries. These domestic financial cycles can display properties that are different from the global one. A broad message from the literature is that while the business cycle shows short and medium-term movements, the domestic financial cycle is primarily medium-term movements and some of its components (credit and residential property price) co-move with the business cycle. The evidence of international co-movements between financial cycles is mixed depending on the country samples, as well as the specific financial variables considered, with stronger joint fluctuations in bond and equity prices than in credit and residential prices.

Ha et al. (2020) focus on G7 countries and compute measures of global as well as national cycles for macroeconomic variables, and for financial variables. This allows them to contrast the co-movements of the principal components of the cycles from the spillovers, which are the impact of a type of variable (financial) on another (macro) with a lag. They find a prominent global business cycle driving GDP, and that movements in equity and residential prices spill over to the global component of the business cycle at times of crises. While they find evidence of global financial cycles at the level of specific asset classes, this does not translate into a global cycle spanning the various segments of financial activity.

de Winter et al. (2022) undertake a joint assessment of business and credit cycles for eight advanced economies using an unobserved component time series approach. Financial cycles are mostly of medium term duration, while the business cycle displays movement at short and medium horizons. The authors find evidence of co-movements at the medium-term horizon between business and financial cycles, driven by residential prices. While credit and residential property prices co-move to some extent, the pattern is limited to some countries. In terms of international co-movements, these are more evident in the short-term, driven by crisis periods. Co-movements in the medium-term cycles are moderate and show no evidence of increases in recent years.

Focusing on the euro area, Oman (2019) constructs cycle indicators for various measures of asset prices and credit volumes using bypass filters. He shows that domestic financial cycles are less synchronized than business cycles. In addition, the extent of financial synchronization has decreased after the global financial crisis, especially between countries with moderate cycle (such as Germany) and periphery countries with volatile cycles, a development that can results from the reduction of European bank's cross-border activity. A broad assessment for 17 countries in the European Union is presented by Rünstler et al. (2018), drawing on different approaches for computing national financial cycles based on residential prices, equity and bond prices, interest rates and credit volumes. The authors provide evidence of credit and residential cycle with medium-term frequencies that co-move with the business cycle at this horizon. While GDP growth shows strong co-movements across European economies, the extent is lower for equity and bond prices, and even lower for credit and residential property prices due to the heterogeneity in residential markets and financing structures. The magnitude of domestic national cycles is also different, being lowest in Germany and highest in some periphery countries.

Adarov (2022) applies a dynamic factor method to financial and real activity variables over a broad sample of 34 countries since 1960. He computes different global cycles for different segments of financial markets (credit, residential prices, equity prices, and fixed income asset prices), as well as country-specific cycles spanning the various segments. Financial cycles display a longer duration than business cycles, and the paper identifies a strong regional component, especially in Asia and Europe. The global cycle appears to be primarily driven by the US interest rates and the risk appetite proxied by the VIX index.

A contrast between global and domestic financial cycles is presented by Aldasoro et al. (2020). Domestic financial cycles are computed using a bypass filter on credit and residential property prices, while the global cycle relies on the measure of Miranda-Agrippino and Rey (2021) augmented with international capital flows. While both cycle reflects movements in the risk appetite by financial intermediaries, they present several differences. Domestic cycles movements take place over the medium-turn, and are correlated with GDP, while the global financial cycles fluctuations take place at higher frequencies and are more relevant for advanced economies.

A long-term view of national cycles is presented in Aikman et al. (2015) who rely on data from the late 19th century. The credit cycle displays a longer duration than the business cycle, and

co-movements across countries are relatively moderate, except in times of banking crises that often follow credit booms.

Tian et al. (2023) present a broad assessment of the co-movements of financial cycles using a panel of 25 advanced and emerging economies. Using a dynamic factor approach, they compute global cycles for various asset prices and capital flows. The cycles of capital flows and prices are highly similar, especially for the equity price cycle, but show different durations across different asset prices, the longest being for housing prices. The authors show that their measures of GFCy move in steps with the ones of Miranda-Agrippino et al. (2020), and a measure based on country-level cycles built following Oman (2019). By contrast, co-movements with the VIX are more limited.

2.3 | The global financial cycle and capital flows

2.3.1 | Channels of transmission

Before discussing the empirical evidence of co-movement of the GFCy measures and capital flows, we review the literature on the transmission channels.

In addition to the standard trade-based spillovers present in international macroeconomic models, a body of theoretical work shows how financial conditions can lead to large international co-movement. The core point of this linkage is the presence of leverage constraints faced by financial intermediaries, which give rise to an international financial accelerator. Devereux and Yetman (2010) show that borrowing constraints affecting global investors lead to strong international co-movements in macroeconomic variables. Kollmann et al. (2011) include a global bank in a DSGE model, and show that when the bank is subject to an equity requirement, losses on loans in one country are transmitted globally.

A central message of the literature is the transmission through international financial markets relies on the presence of financial constraints. As these are not always present, the co-movements between financial conditions and capital flows can be heterogeneous through time, with periods of low co-movements alternating with periods of financial stress where financial intermediaries are constrained, and international transmission is strong. This state-dependent transmission has led the literature to consider models of occasionally binding constraints. Akinci and Chahrour (2015) show that occasional constraints can match a set of stylized facts about sudden stop events. Good news about future productivity raises leverage during times of expansions, increasing the probability that the constraint binds in future periods, leading to a sudden stop. At that time, the constraint leads output, consumption and investment to fall substantially below trend. A similar pattern emerges in Devereux and Yu (2020), as well as Bianchi and Mendoza (2018) and Mendoza (2010) where a lending boom puts a country at risk of a sharp crisis should adverse shocks subsequently occur. Akinci and Queraltó (2018) develop a model with leverage constraints with several points along the international bank lending chain, and show how domestic and international risk premia arise endogenously, leading to a strong transmission of shocks.

Several papers provide empirical assessments of these transmission mechanisms. The global role of US monetary policy is documented by various authors. Miranda-Agrippino and Rey (2015) and Habib and Venditti (2019) show that their measure of global risky asset prices is sensitive to monetary policy in the United States, and that its movements impact the activity of global banks and international capital flows.[2] Miranda-Agrippino et al. (2020) broaden the focus to include policy in Europe and China. They find that the GFCy is affected by US monetary policy. By contrast, the policy of the ECB and the PBoC operates more through real trade channels. Cecchetti

et al. (2020) document a similar pattern of the impact of monetary policy shocks in the major economies, where US monetary policy is the one that most strongly affects the financial leverage of firms across the world.

Ha et al. (2020) focus on G7 countries and contrast financial and macroeconomic cycles. They document different global cycles for different segments of financial markets, and show that they lead to spillovers indirectly through their impact on the global macroeconomic cycle.

Bruno and Shin (2015) show that the funding conditions of banks in core economies are strongly transmitted to financial intermediaries and macroeconomic conditions in peripheral countries, leading to a global liquidity cycle. van Wincoop (2013) calibrates a model with leverage constraints and provides a more skeptical view on the magnitude of transmission that they can generate. Coimbra and Rey (2017) develop a model where financial cycles emerge as movements in interest rates change aggregate leverage through shifts in the composition of financial intermediaries with different leverage constraints. Cesa-Bianchi et al. (2018) propose a model of the GFCy centered on the leverage of broker-dealers. In their empirical analysis, they show that an increase in the leverage of US broker-dealers leads to a boom in cross border credit flows, house prices and consumption, as well as a real exchange rate appreciation and current account deterioration in emerging economies. Kumhof et al. (2020) stresses the money creation by financial intermediaries as a major driver of gross international capital flows.

2.3.2 | Empirical evidence on the global financial cycle and capital flows

How is the GFCy measured by the principal component of risky asset prices related to capital flows? A first approach is to include the GFCy as an explanatory variable in a panel regression of capital flows. Habib and Venditti (2019) find that their GFCy measure significantly impacts capital flows in a broad panel of countries, both for aggregate flows and when considering specific types of flows. Cerutti et al. (2019) by contrast, reach a skeptical conclusion for the role of the GFCy. Specifically, they document that it has only limited explanatory power for capital flows, with relatively low R^2 from the regressions. Eller et al. (2020) construct a series of global measures of macroeconomic indicators and financial conditions. They find that these global factors account for a large share of the variance of capital flows across a broad range of countries, with an increase in the relevance of the GFCy in recent years.

A second approach is to contrast the principal component of financial variables (the GFCy) with the similarly-built principal component of international capital flows. This approach points to a closer fit, albeit with varying dimensions. Davis et al. (2021), Aldasoro et al. (2020), and Miranda-Agrippino and Rey (2021) show that two principal components account for nearly half the volatility of gross capital flows across a broad sample of countries. They then assess the co-movments of these two components with typical push factors for capital flows. The first component of capital flows is closely correlated to the GFCy based on risky asset prices, while the second component co-moves closely with commodity prices. Furthermore, the first component of flows plays a major role for both inflows and outflows to advanced economies, but does not deliver as good a fit for flows to emerging markets. Including the second component substantially improves the fit for outflows from emerging economies, reflecting that for many of them, commodity exports are a major source of trade.

Davis et al. (2021) document a sizable heterogeneity across different types of flows, as well as between gross inflows and outflows, which explains why net flows are also affected.[3] Specifically, they allow for country-specific loadings on the two factors for capital flows, and find that gross

flows are more sensitive to the GFCy for countries with high integration (of assets or liabilities) in the form of non-contingent assets, and for countries that are net debtors (although for these, the sensitivity is stronger for inflows), especially in non-contingent assets.

The literature based on GFCy measures derived from principal components also shows several dimensions of heterogeneity. Habib and Venditti (2019) show that co-movements between capital flows and the GFCy is highest during periods of high global risk aversion. Adrian et al. (2019) show that the impact of the price of risk is non-linear, while Friedrich et al. (2021) document that the constraint that the GFCy puts on policy autonomy is reduced in periods of high volatility in financial markets. Studies that refine the assessment across segments of the distribution of capital flows also show a varied pattern. Chari et al. (2020) document the impact of changes in risk appetite by global investors on the tails of the distribution of capital flows. Gelos et al. (2022) present a quantile regression analysis and show the contrasted impact of various drivers not only across different segments of the distribution of flows, but also depending on the time horizon. Kaminsky et al. (2020) take a long view and show that the impact of the GFCy has changed over time and geography.

Our review of the literature shows a rich and growing literature on the connections between global financial conditions and international capital flows, including several approaches for constructing the GFCy. Table 1 presents our succinct overview of the key elements from this body of research discussed above.

3 | ASSESSING THE IMPACT OF THE GLOBAL FINANCIAL CYCLE ON EPISODES OF LARGE CAPITAL FLOWS

Our review of the literature shows that the impact of the GFCy on capital flows is quite heterogeneous across types of flows, countries, and financial conditions (with a different impact when financial stress is high). Policymakers could thus be left with a lack of a clear message on the relevance of the GFCy.

From a policy perspective however, not all capital flows movements are equally relevant. In particular, policymakers are particularly concerned about times of unusually large movements in flows, as these are more likely to materially disrupt economic conditions. For instance, large inflows can fuel imbalances and large outflows trigger a credit crunch. The general heterogeneity of the GFCy impact on flows may therefore not be an issue if the impact is more robust when focusing on episodes of large flows, that is, if the heterogeneity reflects a different behavior between normal times and crisis times about which policymakers care.

With this motivation in mind, we consider the connection between various measures of the GFCy and episodes of unusually large capital flows. We first present some measures of the GFCy and our procedure to identify large flows, and then turn to an econometric analysis of whether the GFCy's drive episodes.

3.1 | An overview of global financial cycle measures

3.1.1 | Measures from the literature

We start with our GFCy measures. We consider a series of indicators covering both the price and quantity dimensions of global financial markets. This reflects two (non excessively exclusive) views of global financial integration: that focusing on quantities such as capital flows (e.g.,

TABLE 1 Summary of the literature on the effect of the GFCy on capital flows.

	GFCy index (asset prices, ↑ = tightening)		Individual variables (VIX, global liquidity, US policy, ↑ = tightening)		Commodity (oil) price	
	Effect	Post-GFC change	Effect	Post-GFC change	Effect	Post-GFC change
Impact on actual flows (panel)						
Gross capital flows	< 0	decrease	< 0	decrease (?)	> 0	increase
FDI flows	< 0		< 0			
Portfolio flows	< 0		< 0			
Banks flows	< 0		< 0			
Impact on probability of large flows (panel)						
Capital flows stops			> 0	decrease	> 0	increase
			ADV, EME, portfolio		EME, portfolio	
Capital flows surges			< 0	decrease	< 0	increase
			EME, portfolio		EME, portfolio	
Impact on principal components						
Gross capital flows (1st component)	< 0					
	ADV, debt IFI					
Gross capital flows (2nd component)					> 0	
					EM, outflows	

Note: (?) indicates contrasted results across papers.

Lane & Milesi-Ferretti, 2001) or that based on arbitrage conditions for prices and risk premia (e.g. Dedola & Lombardo, 2012). As quantities and prices could give different signals, understanding the reliability and robustness of available indicators of the GFCy is a necessary first step.[4]

We consider five GFCy measures at a quarterly frequency between 1990 and 2020, a sample that also covers the most recent observations for the Covid-19 crisis. Specifically, our analysis includes four price-based indicators and one quantity-based one. The price-based measures include (1) the VIX index, (2) the global stock market factor as in Habib and Venditti (2019) and Miranda-Agrippino and Rey (2020), (3) the excess bond premium of Gilchrist and Zakrajsek (2012), and (4) the HP-filtered USD nominal effective exchange rate following Bruno and Shin (2015), Hofmann et al. (2016) and Avdjiev et al. (2019) reflecting the financial channel of the exchange rate.[5] Our quantity measure is (5) the leverage of broker-dealers, as in Bruno and Shin (2015).

In addition to these five measures used in our econometric exercise, we consider three additional indicators, namely the EMBI spread, and portfolio and banking flows to emerging economies. The extra indicators are not used in our regression analysis, to avoid circular reasoning when assessing the link between the GFCy and flows. To ensure full comparability, all the GFCy measures are standardized and re-scaled so that an increase denotes a tightening of financial conditions. Table A1 in the Online Appendix provides a detailed presentation of the data and sources.

3.1.2 | Stylized facts on the global financial cycle

Before proceeding to the econometric analysis, we illustrate our GFCy measures and present correlations between them, as well as with selected macroeconomic variables. We contrast the correlations before and after the 2008–2009 crisis to gain a first assessment of any change across time.

Figure 1 presents the GFCy variables. For ease of reading, we adjust the signs so that an increase always represents a tightening of financial conditions. The left panel displays the VIX, the global stock market factor (GFSM), and the excess bond premium (EBP). We observe that the global stock market factor is not very correlated with the other two measures. The right panel shows the VIX along with broker-dealers leverage and the nominal effective exchange rate of the USD. We observe that the leverage is not so closely related to the other measures, especially in the second part of the sample.

Table 2 reports the correlations between the five different GFCy measures, as well as the EMBI and flows to emerging markets over the whole sample.[6] As higher values of the measure indicate tighter global financing conditions (and reductions of EM capital flows), we expect the correlations to be positive. This is indeed largely the case, but not to a high extent. While the correlations are positive, the measures do not move in lockstep, with correlations largely below 50%. The global stock market factor stands out with a relatively low correlation with the other GFCy measures. Contrasting the correlations before the global financial crisis (until 2007, Table A2 in the Online Appendix) and after (from 2010, Table A3 in the Online Appendix) shows that the co-movement tends to have weakened, although there are many exceptions. Since 2010, the correlation between the VIX, the leverage of broker dealers and the USD fall materially, while the correlation between the VIX and the global stock market factor increases. Interestingly, the correlation between broker-dealers leverage and capital flows switches from positive (as expected) initially to negative sign, possibly due to the larger role played by financial regulation post crisis.

TABLE 2 Correlations between different GFCy measures: Full sample 1990-2021 GFCy measures rescaled with zero mean and unit variance. Increase indicates a tightening of financing conditions.

	VIX	Global stock market factor (-)	EBP	USD NEER	Broker dealers leverage (-)	EMBI spread	Portfolio flows to EME (-)	Bank flows to EME (-)
VIX	1							
Global stock market factor (-)	0.14***	1						
	(0.000)							
EBP	0.75***	0.10***	1					
	(0.000)	(0.000)						
USD NEER	0.22***	0.19***	0.31***	1				
	(0.000)	(0.000)	(0.000)					
Broker dealers leverage (-)	0.55***	0.025***	0.53***	0.35***	1			
	(0.000)	(0.000)	(0.000)	(0.000)				
EMBI spread	0.53***	−0.12***	0.57***	0.33***	0.39***	1		
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)			
Portfolio flows to EME (-)	0.34***	0.29***	0.44***	0.55***	0.18***	0.37***	1	
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)		
Bank flows to EME (-)	0.49***	0.26***	0.46***	0.58***	0.49***	0.41***	0.71***	1
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	

p-values in parentheses, *$p < 0.05$, **$p < 0.01$, ***$p < 0.001$.

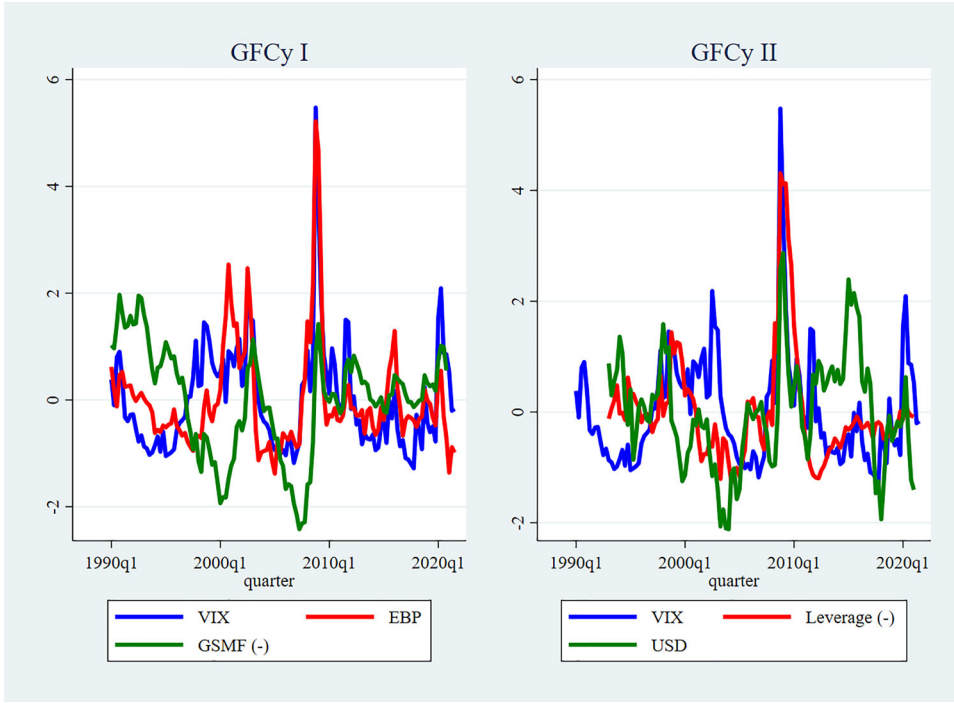

FIGURE 1 Measures of the GFCy.
[Colour figure can be viewed at wileyonlinelibrary.com]
Note: All measures of the GFCy are expressed so that an increase represents a tightening of financial conditions. GFCy, global financial cycle.

In addition to the co-movement between our five GFCy measures, we consider the correlations with several macroeconomic variables (Table A4 in the Online Appendix). These are the US (shadow) policy interest rate, the size of the G7 central banks' balance sheet relative to GDP, the growth rate of real US GDP, the oil price growth in USD, and the yield on US 10-year government bond. We expect the GFCy to be positively correlated with US interest rates, and negatively so with central bank balance sheets, US growth and oil price growth (as a tighter GFCy is associated with weaker real activity). An issue is that the relation between the GFCy and variables related to US or global monetary policy is affected by endogeneity, as the policy variables could react to, rather than drive, the GFCy. Indeed, we see that while the correlation with real variables are negative and significant as expected, the ones with policy variables are weak, or even with the opposite sign in the case of central banks' balance sheets. The pattern is broadly unchanged when restricting to the pre-crisis years or the post-crisis period (respectively Tables A5– A6 in the Online Appendix).

Overall, the GFCy measures considered are positively correlated, as expected, although to a smaller extent between the global stock market factors and the other measures. We find a smaller correlation at the time of the global financial crisis, but this is not a precise pattern. The GFCy measures are counter-cyclical in terms of US growth and oil prices, but the correlations with US interest rates and a measure of the global balance sheet are mixed, possibly indicating that policy reacts to, rather than drives, the GFCy.

TABLE 3 Frequency of capital flow episodes.

Episode	All countries	Advanced countries	Emerging and developing countries
Sudden stop	14,3%	14,5%	13,0%
Flight	13,2%	13,9%	12,2%
Surge	14,8%	14,0%	15,8%
Retrenchment	12,6%	13,0%	12,2%

Note: Quarterly data for 189 countries, 1990-2021. For more information on the data see Scheubel and Stracca (2019).

3.2 | Identifying capital flow episodes

Our analysis of capital flows relies on the updated quarterly database of Scheubel and Stracca (2019). We take a narrower sample than the 189 countries covered in the database, focusing on countries that have experienced at least one period of unusual capital flows, and with available data for our various control variables. This leaves us with a sample of between 1500 and 21,000 quarterly observations, depending on the specification and the variables.[7] Table A7 in the Online Appendix contains a description of the underlying data and the construction of the quarterly data.

We focus on episodes of large movements in capital flows, following the approach of Forbes and Warnock (2021, 2012) and Ghosh et al. (2014). We distinguish between gross outflows (purchases of foreign assets by residents) and gross inflows (purchases of domestic assets by non-residents). Unlike Forbes and Warnock (2021), we focus on *private* capital flows, as reserves flows are driven by specific policy considerations.[8]

Our computation takes the approach of Scheubel et al. (2019) adjusted for quarterly data.[9] An episode of large flows is defined as follows, denoting capital flows of type x in quarter t by c_t^x, with $x \in i, o$ indicating inflows or outflows. We first compute the 4-quarter moving sum $S_t^x = \sum_{h=0}^{3}\left(c_{t-h}^x\right)$, and then take the year-over-year change in that moving sum $\Delta S_t^x = S_t^x - S_{t-4}^x$. Third, we compute the first and second moments of that change over the previous 16 quarters, namely the mean $\overline{\Delta S_{t-h}^x} = \left(\sum_{h=1}^{16} \Delta S_{t-h}^x\right)/16$, and standard deviation $\sigma = \sqrt{\sum_{h=1}^{16}(\Delta S_{t-h}^x - \overline{\Delta S_{t-h}^x})^2/16}$. Finally, we define capital flow episodes as quarters where ΔS_t^x is at least two standard deviations above the mean for one quarter (and one standard deviation above the mean subsequently for at least one additional quarter).

We identify episodes in both advanced (ADV) and emerging and developing economies (EME). Table 3 reports the frequency of each capital flow episode in our entire sample, as well as for each of the two groups. Episodes are at least equally common in advanced countries, due to the higher volatility in their capital flows, probably in turn reflecting higher capital account openness.

For illustration, Figure 2 presents the percentage of countries experiencing a specific episode (blue line), alongside the standardized VIX (red line). The episodes in question are sudden stops (left panel) and surges (right panel). As found in the literature, episodes are highly clustered in waves. The number of sudden stops is positively related to the VIX and peaked in the late 1990s and during the global financial crisis. As expected, the number of surges is negatively correlated with the VIX, with a particularly high number in the years preceding the global financial crisis. The finding of a correlation between the clustering of episodes and a measure of the GFCy does not reveal the structural reason behind it, as it could be that (i) these episodes are directly influenced by the value of the GFCy and/or that (ii) the clustering is facilitated, but not determined by the GFCy. We disentangle these possibilities through our econometric analysis in Section 3.3.1.

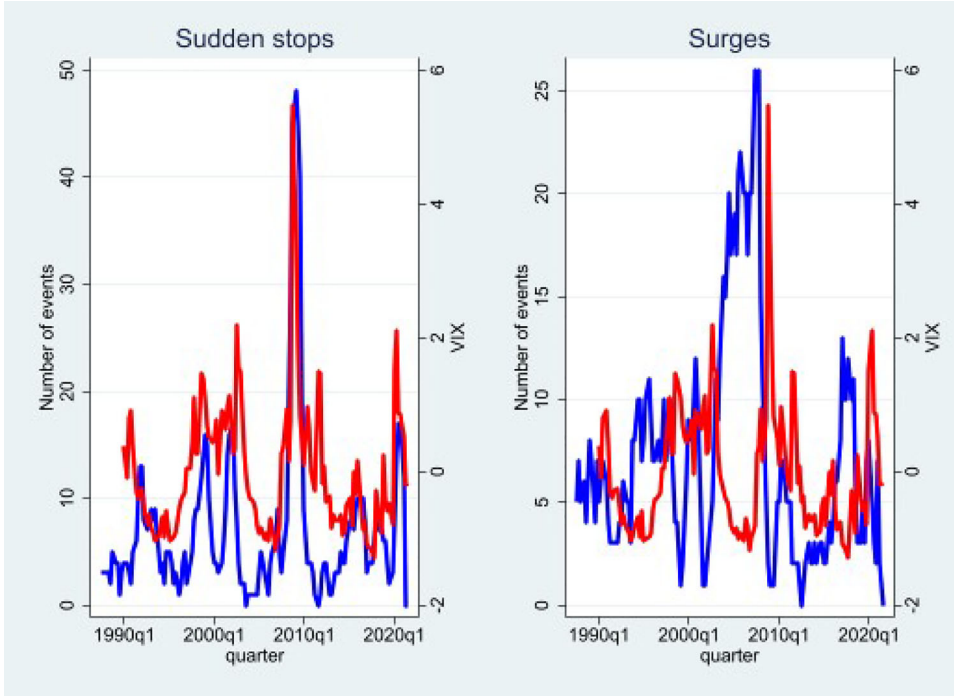

FIGURE 2 Global prevalence of sudden stops and surges versus the VIX as measure of the GFCy. [Colour figure can be viewed at wileyonlinelibrary.com]

Note: VIX (red line, rhs) and percentage of countries experiencing a capital flows episode (blue line, lhs). GFCy, global financial cycle; VIX, Index of Implied Stock Market Volatility.

3.3 | Does the global financial crisis drive capital flow episodes?

3.3.1 | Econometric approach

We now turn to the econometric assessment of the links between the GFCy and episodes of large capital flows. Specifically, we estimate a panel regression of the dummy equal to one in quarters where an episode occurs on the GFCy measure and several controls. As episodes are relatively rare events, we use a complementary log–log (CLOGLOG) regression with country fixed effects:[10]

$$ln(-ln(1 - EPISODE_{it})) = k_i + \beta GFCy_t + \gamma X_{i,t-1} + \epsilon_{it} \quad (1)$$

where $EPISODE_{it}$ is a dummy equal to one when an episode starts in country i in quarter t, $GFCy_t$ is the specific measure of the GFCy, and $X_{i,t-1}$ is a vector of time-varying country-specific controls. These include (1) de iure financial openness measured by the Chinn-Ito index (Chinn & Ito, 2006), (2) a dummy if the country has a fixed exchange rate arrangement (according to the classification of Klein and Shambaugh (2008)), (3) the composite risk rating from the International Country Risk Guide (ICRG) that measures the quality of the country's institutions, (4) the current account to GDP ratio, (5) the foreign currency debt to GDP ratio, and (6) average inflation in the last 3 years. We also consider two measures of access to the global financial safety net, namely (7) IMF access (which we define as 430% of a country's IMF quota), and (8) foreign exchange reserves relative to GDP.[11] Standard errors are robust for heteroscedasticity and serial correlation. Note that the vector

of controls X_i includes quarterly variables (see Table A7) with lag $t-1$, and variables converted to a quarterly frequency from an original annual one with lag $t-4$.

The key coefficient in our analysis is β, which we expect to be *positive* for sudden stops and flights (a tightening of financial conditions raises the probability of outflows) and *negative* for surges and retrenchments. In terms of scaling, the coefficients are associated with a *one standard deviation* change in the specific GFCy measure.

Note that we are assuming, in line with previous literature, that the GFCy variable is exogenous for developments in individual countries. In fact, previous papers such as Rey (2013), Miranda-Agrippino and Rey (2015), Miranda-Agrippino and Rey (2020) and Habib and Venditti (2019) have convincingly shown that the GFCy is driven by global factors, as also explained in the literature review section. Also note that the US is excluded from the sample, to further mitigate the risk of reverse causality.

In addition to our baseline specification, we add a robustness analysis, allowing for heterogeneous effects of the GFCy using interactions terms,

$$ln(-ln(1-EPISODE_{it})) = k + \beta GFCy_t + \rho\overline{GFCy_{t-1}} + \gamma X_{i,t-1} + \delta GFCy_t Z_t + \epsilon_{i,t} \qquad (2)$$

where the variable Z_t allows us to consider non-linear effects, one by one given the limited size of our sample. We first consider whether the impact of the GFCy depends on its level by considering Z_t to be (1) the GFCy itself (the interaction being then a quadratic term), or (2) a dummy equal to 1 when the GFCy is at least one standard deviation above its mean, i.e. when conditions are particularly "tight". This is motivated by the possibility that the effect of the GFCy may be asymmetric between tighter and looser financial conditions, due for instance to occasionally binding financial constraints. A worsening of the GFCy may then have a stronger marginal effect than an improvement, leading to a *convex* relationship between the GFCy and capital flow episodes. This would translate into a *positive* coefficient δ, with a larger impact of the GFCy in stressed times. Next, we consider whether the impact has changed through time by considering Z_t to be (3) a dummy for the global financial crisis (2008-09), and (4) a dummy for the post-2010 sample.

Finally, we also test if there are lags in the transmission of the GFCy. We therefore include the term, $\overline{GFCy}_{t-1}$, which is the accumulated level of the GFCy in the previous 2 years (average of quarters $t-8$ to $t-1$). If this term is significant in addition to, or instead of, the contemporaneous level of the GFCy, the impact builds up over time which could be plausibly argued for, say, large inflows as captured by surges. In other words, it is possible that what matters for surges is how long conditions remain favorable.[12]

3.3.2 | Baseline results

This section presents estimates of Equation (1) across the various episodes and measures of the GFCy. The results are shown in Tables 4 to 7, each corresponding to a specific type of episode. In each table we present the results for our various GFCy measures (with increases representing tighter conditions), namely the VIX (column 1), the VIX without controls to increase the sample size (column 2), the global stock market factor (column 3), the excess bond premium (column 4), the USD nominal effective exchange rate (column 5), and the leverage of broker-dealers (column 6).

Table 4 reports the results for *sudden stops*. All GFCy measures have the expected sign and are significant, with tighter conditions raising the probability of a sudden stop. As the GFCy measures

TABLE 4 GFCy effect on the probability of a sudden stop.

	(1) VIX	(2) VIX without controls	(3) Global stock market factor (-)	(4) EBP	(5) USD	(6) Leverage broker dealers (-)
GFCy	0.390***	0.464***	0.416***	0.395***	0.566***	0.563***
	(0.038)	(0.023)	(0.100)	(0.040)	(0.081)	(0.048)
Chinn-Ito index, t-4	−0.147**		−0.123**	−0.145**	−0.106*	−0.154**
	(0.065)		(0.058)	(0.064)	(0.063)	(0.067)
Peg (Klein and Shambaugh), t-4	0.199		0.201	0.191	0.010	0.111
	(0.161)		(0.143)	(0.156)	(0.164)	(0.176)
Composite risk rating, t-1	0.011		0.012	0.011	0.006	0.006
	(0.011)		(0.010)	(0.011)	(0.011)	(0.012)
Current account/GDP, t-1	−0.169		−0.238	−0.178	−0.353	−0.354
	(0.167)		(0.151)	(0.160)	(0.237)	(0.247)
Foreign currency debt/GDP, t-1	0.001		0.007	0.003	0.005	0.007
	(0.007)		(0.006)	(0.007)	(0.008)	(0.009)
Inflation, 3-quarter average, t-1	0.001		0.000	0.000	0.000	0.000
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
IMF Access, t-4	−0.045*		−0.027	−0.044*	0.007	−0.006
	(0.025)		(0.023)	(0.025)	(0.023)	(0.024)
Foreign exchange reserves/GDP, t-1	−0.019		−0.038	−0.018	−0.042	0.006
	(0.082)		(0.079)	(0.081)	(0.096)	(0.061)
Observations	1,053	6,389	1,053	1,053	1,002	1,002
Number of countries	47	66	47	47	47	47

Note: Results from CLOGLOG regressions with sudden stop episode as the dependent variable, including country fixed effects. Each column corresponds to the specific GFCy measure listed. Quarterly data from 1990 to 2021. Robust standard errors are in parentheses. EBP, GSMF and USD refer respectively to the excess bond premium, the global stock market factor and the dollar nominal effective exchange rate, appropriately de-trended and standardized. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

are all normalized, we can contrast the magnitude of the effects. We see that the USD exchange rate and the leverage of broker dealers have the strongest impact. In terms of controls, we find a lower risk in countries with more open financial accounts, and higher IMF access (albeit not robustly for the later). Interestingly, the absence of controls does not materially change the effect of the VIX (column 2).

Turning to *surges*, Table 5 shows that they are more likely when financial conditions are loose (a negative coefficient on the GFCy). This is broadly observed across measures, with the strongest effect for the global stock market factor. One exception is the leverage of broker dealers that is insignificant. Among the controls, we find a higher probability of large inflows for countries

TABLE 5 GFCy effect on the probability of a surge.

	(1) VIX	(2) VIX without controls	(3) Global stock market factor (-)	(4) EBP	(5) USD	(6) Leverage broker dealers (-)
GFCy	−0.292***	−0.337***	−0.492***	−0.299***	−0.418***	−0.042
	(0.085)	(0.041)	(0.079)	(0.095)	(0.085)	(0.075)
Chinn-Ito index, t-4	−0.155**		−0.166**	−0.159**	−0.184**	−0.173**
	(0.072)		(0.072)	(0.071)	(0.073)	(0.071)
Peg (Klein and Shambaugh), t-4	0.131		0.137	0.160	0.273	0.195
	(0.171)		(0.177)	(0.172)	(0.172)	(0.171)
Composite risk rating, t-1	0.025**		0.018	0.024*	0.024**	0.029**
	(0.012)		(0.012)	(0.012)	(0.012)	(0.012)
Current account/GDP, t-1	−0.246		−0.227	−0.234	−0.669***	−0.597***
	(0.174)		(0.171)	(0.173)	(0.227)	(0.225)
Foreign currency debt/GDP, t-1	0.009		0.006	0.008	0.007	0.004
	(0.007)		(0.007)	(0.007)	(0.008)	(0.008)
Inflation, 3-quarter average, t-1	0.000		0.000	−0.000	0.000	0.000
	(0.001)		(0.001)	(0.001)	(0.000)	(0.001)
IMF Access, t-4	0.051***		0.035*	0.048**	0.021	0.041**
	(0.019)		(0.020)	(0.019)	(0.020)	(0.019)
Foreign exchange reserves/GDP, t-1	0.044		0.054*	0.044	0.044	0.051
	(0.031)		(0.033)	(0.032)	(0.040)	(0.033)
Observations	1,053	6,389	1,053	1,053	1,002	1,002
Number of countries	47	66	47	47	47	47

Note: Results from CLOGLOG regressions with surge episode as the dependent variable, including country fixed effects. Each column corresponds to the specific GFCy measure listed. Quarterly data from 1990 to 2021. Robust standard errors are in parentheses. EBP, GSMF and USD refer respectively to the excess bond premium, the global stock market factor and the dollar nominal effective exchange rate, appropriately de-trended and standardized. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

with better institutions (higher composite risk rating) and more IMF access, and less capital account openness.

Turning to the episodes driven by resident investors, Table 6 shows that tighter conditions (except for the global stock market factor) raise the likelihood of a *retrenchment*; by contrast, they have no effect (except for leverage) on *flights* (Table 7). In terms of the country controls, being in a peg increases the frequency of flights, whereas financial openness (perhaps surprisingly) tends to reduce it.

Overall, our results show that the GFCy measures matter in particular for episodes driven by non-resident investors (sudden stops and surges), as well as retrenchments but play a somewhat

TABLE 6 GFCy effect on the probability of a retrenchment.

	(1) VIX	(2) VIX without controls	(3) Global stock market factor (-)	(4) EBP	(5) USD	(6) Leverage broker dealers (-)
GFCy	0.208***	0.183***	−0.096	0.234***	0.172*	0.256***
	(0.048)	(0.028)	(0.093)	(0.049)	(0.088)	(0.060)
Chinn-Ito index, t-4	0.041		0.038	0.043	0.059	0.057
	(0.059)		(0.059)	(0.059)	(0.063)	(0.063)
Peg (Klein and Shambaugh), t-4	−0.065		−0.059	−0.078	−0.017	0.001
	(0.145)		(0.143)	(0.143)	(0.156)	(0.156)
Composite risk rating, t-1	0.009		0.012	0.010	0.003	0.001
	(0.009)		(0.009)	(0.009)	(0.010)	(0.010)
Current account/GDP, t-1	0.017		0.016	0.016	−0.319*	−0.305
	(0.017)		(0.010)	(0.013)	(0.191)	(0.188)
Foreign currency debt/GDP, t-1	−0.003		−0.003	−0.003	−0.010	−0.009
	(0.002)		(0.002)	(0.002)	(0.007)	(0.007)
Inflation, 3-quarter average, t-1	0.000		0.000	0.000	0.000	0.000
	(0.000)		(0.000)	(0.000)	(0.000)	(0.000)
IMF Access, t-4	0.022		0.018	0.022	0.023	0.022
	(0.019)		(0.020)	(0.019)	(0.021)	(0.020)
Foreign exchange reserves/GDP, t-1	−0.033		−0.035	−0.038	−0.025	−0.011
	(0.087)		(0.083)	(0.089)	(0.085)	(0.076)
Observations	1,059	6,421	1,059	1,059	1,007	1,007
Number of countries	47	66	47	47	47	47

Note: Results from CLOGLOG regressions with a retrenchment episode as the dependent variable, including country fixed effects. Each column corresponds to the specific GFCy measure listed. Quarterly data from 1990 to 2021. Robust standard errors are in parentheses. EBP, GSMF and USD refer respectively to the excess bond premium, the global stock market factor and the dollar nominal effective exchange rate, appropriately de-trended and standardized. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

weaker role for capital flights. Some country specific variables matter, especially access to IMF support, the exchange rate regime and the measured quality of institutions.

3.3.3 | Is the effect of the global financial cycle linear and stable?

To assess the potential for non-linear and heterogeneous effects, we estimate equation (2) which interacts the GFCy with various measures.[13] For brevity, we focus on sudden stops (as they show the largest effect of the GFCy) and surges, and on the VIX, excess bond premium and the USD

TABLE 7 GFCy effect on the probability of a flight.

	(1) VIX	(2) VIX without controls	(3) Global stock market factor (-)	(4) EBP	(5) USD	(6) Leverage broker dealers (-)
GFCy	−0.001	0.053*	−0.134	−0.089	−0.070	0.190***
	(0.061)	(0.031)	(0.086)	(0.075)	(0.087)	(0.062)
Chinn-Ito index, t-4	−0.174***		−0.180***	−0.173***	−0.163***	−0.167***
	(0.063)		(0.063)	(0.063)	(0.061)	(0.061)
Peg (Klein and Shambaugh), t-4	0.527***		0.541***	0.535***	0.460***	0.449***
	(0.151)		(0.152)	(0.151)	(0.150)	(0.150)
Composite risk rating, t-1	0.014		0.013	0.013	0.010	0.010
	(0.010)		(0.010)	(0.010)	(0.011)	(0.011)
Current account/GDP, t-1	−0.003		−0.002	−0.003	−0.235	−0.189
	(0.019)		(0.018)	(0.019)	(0.202)	(0.194)
Foreign currency debt/GDP, t-1	−0.004*		−0.005*	−0.004*	0.004	0.002
	(0.002)		(0.002)	(0.002)	(0.007)	(0.007)
Inflation, 3-quarter average, t-1	−0.000		−0.000	−0.000	−0.008	−0.010
	(0.001)		(0.001)	(0.001)	(0.010)	(0.011)
IMF Access, t-4	0.009		0.005	0.009	0.022	0.030
	(0.019)		(0.019)	(0.019)	(0.019)	(0.019)
Foreign exchange reserves/GDP, t-1	−0.099		−0.101	−0.105	−0.102	−0.098
	(0.111)		(0.113)	(0.112)	(0.107)	(0.109)
Observations	1,059	6,421	1,059	1,059	1,007	1,007
Number of countries	47	66	47	47	47	47

Note: Results from CLOGLOG regressions with a flight episode as the dependent variable, including country fixed effects. Each column corresponds to the specific GFCy measure listed. Quarterly data from 1990 to 2021. Robust standard errors are in parentheses. EBP, GSMF and USD refer respectively to the excess bond premium, the global stock market factor and the dollar nominal effective exchange rate, appropriately de-trended and standardized. ***, **, and * indicates statistical significance at the 1%, 5%, and 10% level, respectively.

exchange rate among our GFCy measures.[14] The results are presented in a series of tables (all shown for brevity in the Online Appendix), each corresponding to one type of episode and one GFCy measure. The tables are structured as follows. For reference, we show the baseline results with controls (column 1) and with the lagged level of the GFC, that is, $\overline{GFCy}_{t-1}$. We then restrict the sample to emerging and developing economies (column 2), include the square of the GFCy (column 3), the GFCy if it is one standard deviation above its mean, that is, "very tight" (column 4), and finally include the interaction of the GFCy with the crisis years 2008–2009 (column 5), and with the post crisis years 2010–2020 (column 6).

Starting with *sudden stops*, Table A8 shows that the direct effect of the VIX is robust across specifications. Perhaps surprisingly, it is not stronger for emerging economies (column 2). We find no evidence of non-linearity (columns 3 and 4), even though our estimate of the direct effect is less precise in column 4. By contrast, we find that the effect has varied across time, and became overall insignificant after the global financial crisis (column 6), in line with previous results by Forbes and Warnock (2021). The lagged value in the previous 2 years for the VIX is insignificant in all specifications.

Considering the USD exchange rate as our measure of the GFCy (Table A9), we again do not see a different effect for emerging economies, possibly reflecting the dominant role of the exchange rate on international banking activity in USD that is more sizable in advanced economies. We do, however, find evidence of non-linearities in terms of magnitude and heterogeneous effects over time. Specifically, the impact is larger when the GFCy is already tight (columns 3 and 4). This reflects the fact that the effect is concentrated in specific years, namely the ones of the global financial crisis (column 5), while there is no effect in the post crisis years (the direct and interacted coefficients cancel each other out in column 6).

Turning to the excess bond premium as the GFCy measure (Table A10), we see some evidence of a stronger effect when the GFCy is high (column 4), as well as a stronger effect in the global financial crisis (but no difference pre- and post-crisis, see column 6). Interestingly, for this GFCy measure we have evidence of lagged effects, as the value in the previous 2 years tends to prevail, in terms of significance, over the contemporaneous value of the excess bond premium.

We next undertake the same exercise for *surges*. Table A11 shows that the negative effect of the VIX on the likelihood of experience a surge in inflows is generally consistent across specifications. The effect however appears to be asymmetric, driven by observations with high values of the GFCy (see column 4) and the effect is practically absent post crisis (see column 6). Turning to the dollar exchange rate as the GFCy measure (Table A12), we find again that the negative effect is consistent, and there is also a consistent effect for the dollar value in the previous 2 years, suggesting that effects accumulate over time. Finally, the analysis with the excess bond premium (Table A13) shows again an effect of the level of this GFCy measure in the previous 2 years in addition to the contemporaneous value. As for the USD, we find that the negative effect appears to be driven mostly by observations with a high level of the bond premium (see column 4) but in this case the effect appears to be stable over time.

Overall, while we some find evidence for non-linear effects and time variation, this is sensitive to the type of non-linearity as well as the specific GFCy measure. In term of the impact depending on the level of the GFCy, for both stops and surges it seems that the GFCy has a stronger impact when it is already high, in particular with the global financial crisis, while the impact declines significantly post crisis (though not for all measures). Except for the VIX for surges, and for stops when using the excess bond premium as the GFCy measure, there is also a delayed effect of the GFCy, which points to a role for accumulated effects of global financial conditions on capital flow episodes.

4 | CONCLUSIONS

This paper takes stock of the connection between the GFCy and international capital flows, drawing from a rich and growing literature. Our review of the various contributions shows that research has moved towards broader measures of the GFCy, and several contributions point to a changing impact of financial conditions in recent years, although this is not a universal finding.

We complement the literature by assessing how various standard GFCy indicators matter in times of large capital flows, which are more relevant from a policy perspective. We make three points. First, GFCy measures are strongly positively correlated among themselves, as expected. The correlation has only moderately decreased after the global financial crisis, except for the VIX that has generally become less correlated with other GFCy measures. Second, we document the impact of the GFCy across different types of episodes, and show that it matters broadly, especially for foreign-driven episodes (sudden stops and surges). Third, we find some evidence of non-linear effects and heterogeneity across time, with a decrease in the relevance of the GFCy in the post crisis environment in some, though not all, specifications. Moreover, the GFCy in the years prior appears to play a role, again only in some specifications, for stops and surges thereafter, even controlling for the contemporaneous level of the GFCy.

Overall, we conclude that the nexus between our measure of the GFCy and capital flow episodes is heterogeneous, with a strong and well-established link for most flows, and reasonably steady over time. Looking forward, several avenues for possible work emerge. First, the presence of non-linearities could be assessed at the level of specific capital flows (such as banking). Second, the changing relevance of some GFCy measures could reflect some policy measures, such as stronger macroprudential policy. Allowing the impact of the GFCy to differ depending on the presence of ex-ante measures focused on resilience and ex-post measures aimed at crisis fighting would shed light on what policy mix allows countries to be better able to absorb the movements of the GFCy, which are likely to be a persistent feature of the international financial system.

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DATA AVAILABILITY STATEMENT

Data available on request from the authors

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ENDNOTES

[1] For instance, the VIX reflects uncertainty, risk and risk perceptions in the US stock market. It may be possible that bank flows are less affected by this aspect, but more sensitive to other aspects, such as the cost of dollar funding proxied by the exchange rate.

[2] This has fueled a debate on whether policymakers in periphery countries now have a more limited set of controls on economic conditions, even when they operate under a flexible exchange rate (Rey, 2013). This has led to an

active debate (see for instance Aizenman et al., 2016), on which we do not elaborate, as it is not the focus of our paper.

[3] The impact on net flows is not a given even when the GFCy clearly affects gross outflows and inflows, because a similar effect on gross flows would cancel out in net terms.

[4] In work done in parallel with ours, Avdjiev et al. (2020a) compare the price-based measured of the GFCy in Miranda-Agrippino and Rey (2015) with one quantity-based measure of the GFCy defined as the first principal component of the total external flows to GDP in 31 countries. They find (as we do) that the two measures largely overlap and are strongly correlated.

[5] Dollar appreciation hurts dollar borrowers' balance sheets and lenders' risk-taking capacity, particularly so in emerging markets.

[6] Note that correlations are reported, in each table, on the common sample for all variables, not on the bilateral sample (i.e., the sample for which the two series are available). This implies that the correlation between two given variables might be slightly different from one table to the other.

[7] The number of countries depends on the type of episode, but is generally below 50 for each of them.

[8] Following previous studies (e.g., Alfaro et al., 2014, 2008), we categorize foreign direct investment (FDI) flows as private flows. Other components (portfolio investment, derivatives, other investment) are accounted for separately for the central bank/monetary authorities, general government, deposit-taking corporations and other sectors. We exclude all flows from and to central banks and general government. A detailed explanation of the computations of private flows is provided in Appendix B of Scheubel and Stracca (2019).

[9] In particular, refer to tab. 1 in Scheubel et al. (2019).

[10] Results are very similar using a standard logit regression.

[11] More information on the variables is in Scheubel and Stracca (2019).

[12] We thank a referee for suggesting this possibility.

[13] Avdjiev et al. (2020b) and Habib and Venditti (2019) find evidence of time variation in the influence of the GFCy on capital flows, but consider overall flows instead of large flow *episodes*.

[14] Results for other types of episodes are available on request.

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