# Financial Cycles and Domestic Policy Choices: A Dynamic Assessment*

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Working Paper

October 2019

***Abstract***

The emergence of a global financial cycle during the last decades has raised concerns about the ability of mostly smaller emerging market economies to insulate their economy from international spillovers. This paper considers capital controls and exchange rate regimes as a channel to buffer global financial shocks. Despite recent focus on exchange rate policies, we show that capital controls are as potent as floating exchange rates in dampening the response on domestic financial variables and the real economy. We reveal that stabilization benefits materialize over time due to the persistence inherent to financial and macroeconomic variables. We also show that two layers of insulation, i.e. capital controls and floating exchange rates do not provide any additional benefits. Thus the additional monetary independence from capital controls and floating exchange rates in line with the Mundellian Trilemma does not materially affect the propagation of global financial shocks onto the domestic economy, which suggests a pivotal point for the relevance of monetary independence in stabilizing the economy.

**Keywords:** Capital Controls, Exchange Rate Regimes, Global Financial Shocks, Trilemma, Local Projections

**JEL:** F31, F36, F38, F41

*We thank James Cloyne, Andreas Haufler, Òscar Jordà, Katheryn Russ and Alan Taylor for helpful advice, feedback and comments on the paper. Furthermore, we are grateful to participants of the Public Economics Seminar in Munich and Brown-Bag series in Davis. Florian Loipersberger acknowledges funding by the German Research Foundation (DFG) through GRK 1928.

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# 1 Introduction

Though financial crises are not exclusively a phenomena of the recent past, they tend to occur increasingly synchronized consistent with the level of financial integration. Particularly since the 1980s, as Figure 1 depicts, financial crises (proxied by banking crises according to Reinhart and Rogoff (2009)) appear much more frequently in advanced and developing countries. This has renewed interest into the costs and benefits of financial integration and the consequences of global financial shocks. Indeed as Jordà et al. (2013) document, financial crises are notably more costly in terms of output lost than regular recessions, both initially and over time.[1]

This harmonization of financial distress, which is consistent with a global financial cycle, has triggered a debate, initiated by Rey (2015), about the role of domestic policy in stabilizing the economy. Doubts have been raised about the ability of countries with floating exchange rates to insulate their economy from global trends (see Rajan (2015)), which has put the Trilemma into question. According to Mundell-Flemming's Trilemma (Mundell, 1963; Obstfeld et al., 2005), it is not feasible to have at the same time a fixed exchange rate, full capital mobility and monetary policy independence. Only two of these three may coexist.[2] [3] Focusing on a sample of countries with high capital mobility, Rey finds no support for floating exchange rate regimes in buffering global financial shocks and consequently concludes that the ability to set independent policy rates is insufficient to shape the macroeconomic situation of a country. This view has been recently questioned by Obstfeld et al. (2017) who document significant stabilization gains for open emerging market economies (EMEs) with flexible exchange rates. Though policy makers historically preferred floating exchange rate regimes over capital controls, recent research renewed interest in capital controls (Bianchi, 2011; Benigno et al., 2016) as a macroprudential tool for EMEs and the IMF reviewed its stance on the desirability of controls (Ostry et al., 2011). Yet evidence on their potential to attenuate global shocks is still limited. Even if there is a strong potential, it remains unclear whether floating exchange rate regimes perform superior to capital controls with respect to attenuating global financial shocks.

Another aspect, which has been neglected so far, relates to the timing of potential gains

[1] Despite financial synchronization, and the seemingly increased comovement of financial crises, there is no consensus on the channels through which financial shocks affect the domestic economy. Milesi-Ferretti and Tille (2011), for example, show that the impact of the global financial crisis of 2007/2008 was heterogeneous, particularly across developing and developed countries, which may be a consequence of investors' flight to "safe haven assets" and increased risk awareness. Demand for less risky assets during a crisis leads to financial flows from high-risk countries (e.g. emerging markets) to countries with lower risk (e.g. advanced economies).

[2] The Trilemma is based on the following cross-border arbitrage condition. When the exchange rate is pegged and an interest rate change of the base country is not accommodated by the domestic central bank, funds flow from the low to the high return country, which creates pressure on the exchange rate and the peg ultimately breaks. To restore monetary independence, it is either possible to let a floating exchange rate equalize returns or introduce capital controls, which limit the outflow of assets.

[3] Macroprudential policies, particularly currency-based prudential measures can act like capital controls. We do not analyze such policies in this paper but stress that our results regarding capital controls provide a lower bound to the extent that capital controls are substituted with macroprudential policies.

from different capital control and exchange rate regimes. This seems very relevant given the high persistence of many macroeconomic variables and may induce a consequential trade-off. If these tools dampen the propagation of global financial shocks with a delay, benefits would be postponed while costs associated with a floating exchange rate or capital controls accrue immediately.

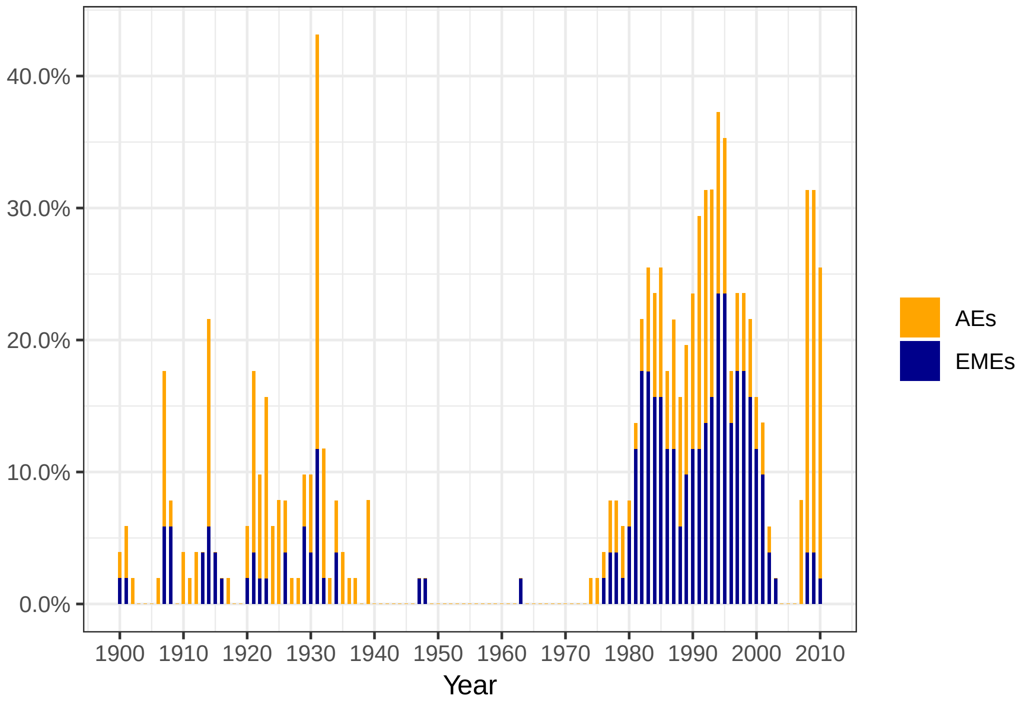



Figure 1: Banking crises throughout history

***Notes:*** The graph depicts the share of countries facing a banking crisis as defined in Reinhart and Rogoff (2009). The total share is split by advanced economies (AEs, orange) and emerging market economies (EMEs, blue).

In this paper, we shed light on all these issues and quantify the dynamic impact of global financial shocks on domestic financial variables (equity, housing, credit) and the real economy for EMEs conditioning on the stance of exchange rate and capital control regimes.

Taking the above arguments into account, it is ambiguous whether floating exchange rates or capital controls become obsolete or whether they are effective stabilization tools. If financial shocks decreased the necessity of floating exchange rates or capital controls, other policy goals could appear more attractive. The synchronization of global shocks could, for instance, essentially influence a government's decision to introduce a peg or join a currency union. Gains from pegging like enhanced stability and credibility may be particularly large for developing countries due to a general "fear of floating" (Calvo and Reinhart, 2002). Floating exchange rates may cause problems if debt is denominated in foreign currency or in the presence of balance sheet constraints on external borrowing (Calvo, 2002 and Eichengreen and Hausmann, 2005). These gains from a fixed exchange rate are more likely to outweigh the drawback of dependent monetary policy when global shocks force the domestic central bank to align its interest rate with other countries anyhow. Furthermore, particularly during crises, authorities may wish to impose capital controls to gain monetary independence when exchange rates are fixed. However, such policies are unwarranted if they provide no insulation and countries could instead reap the benefits of open financial markets like easier access to external financing (Chinn and Ito, 2006).

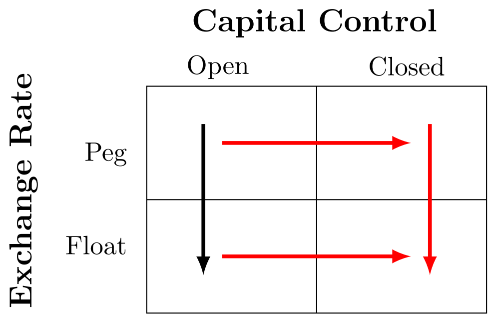



Figure 2: Classification Matrix

Overall, we contribute to the literature in three ways. First, we re-evaluate the effectiveness of floating exchange rate regimes as a tool to buffer global financial shocks on domestic stock, housing and credit markets as well as GDP for EMEs. We then extend the analysis to capital controls. Though we are not the first to analyze capital controls in general, this paper is the first empirical project that analyzes the effectiveness of capital controls in buffering international financial shocks. We thereby make use of a new dataset regarding capital controls, which has been assembled by Fernández et al. (2015). Second, we add a dynamic perspective via Local Projections. This allows us for the first time to fully analyze the temporal impact of exchange rate and capital control regimes on the domestic economy. Third, we analyze potential synergies between capital restrictions and a floating exchange rate. In other words, is the potentially dampening effect of floating exchange rates enhanced if capital controls are added and vice versa? Figure 2 summarizes our approach. The recent literature (Rey, 2015, Passari and Rey, 2015 and Obstfeld et al., 2017) examines the role of exchange rate regimes among open countries (black arrow). This paper expands the analysis of domestic policy choices by considering capital controls and their interaction with the exchange rate (red arrows).

Our findings based on quarterly data from 1995 - 2015 reveal that exchange rate arrangements and capital controls matter. Both measures significantly decrease the spillover effects from global financial shocks onto the domestic economy. The response on domestic financial markets as well as the real economy is significantly dampened in countries with a floating exchange rate or capital controls. Further, stabilization gains are mostly reaped with a delay due to the persistence of financial and macroeconomic variables. Previous contemporaneous estimates therefore underestimate the relevance of these policy choices. We further show that floating exchange rates and capital controls are mostly useful in isolation. In other words, we observe minor stabilization benefits of introducing capital controls in countries with a floating exchange rate and vice versa. The lack of synergies, despite additional monetary independence from capital controls and floating exchange rates as documented in Klein and Shambaugh (2015), hence suggests a pivotal point for the relevance of monetary independence in stabilizing the economy.

We briefly review the literature in Section 2 before we highlight some stylized facts motivating our approach in Section 3. In Section 4, we present our data. Section 5 provides the empirical model and addresses endogeneity concerns. We lay out our results in Section 6. Section 7 concludes.

## 2 Literature Review

This paper relates to two active areas of research: the Trilemma and global financial cycles. The Trilemma is tested by comparing the responsiveness of local mostly short-term bond interest rates towards a base interest rate in the anchor country. Countries with independent monetary policy should follow the base rate less closely ceteris paribus. Shambaugh (2004), for instance, finds that countries with pegs follow the interest rate of the base country more than countries without a peg. Obstfeld et al. (2005) study interest rates over history and conclude that the Trilemma constraints hold during most time periods. Klein and Shambaugh (2015) investigate middle ground policies. Their findings suggest that, in contrast to intermediate capital controls, intermediate exchange rate regimes allow for some monetary independence. Further, countries with capital restrictions and a floating exchange rate appear to have the greatest degree of monetary independence. Bekaert and Mehl (2017) confirm the Trilemma based on a de-facto measure of equity market integration covering 100 years of data. In a recent paper, Han and Wei (2018) examine the role of the Trilemma in the presence of common shocks (approximated by the VIX) and desired changes in the interest rate via a Taylor rule. Their results generally support the Trilemma but a flexible exchange rate regime tends to offer limited monetary autonomy when the center country lowers its interest rate. Overall and despite some minor differences in their conclusions, there seems to be broad empirical support for the Trilemma. We built on this literature to validate the notion of monetary autonomy in the presence of floating exchange rates or capital controls and quantify the effect of monetary independence on the propagation of of international financial shocks towards the domestic financial and real sector.

The second strand relates to the existence and implications of a global financial cycle. Financial cycles have been documented in numerous studies, e.g. Calvo et al. (1993), Reinhart and Reinhart (2008) and Ghosh et al. (2014), though its magnitude has been questioned by Cerutti et al. (2017). The authors quantify the importance of global cycles and show that they rarely explain more than a quarter of the variation in capital flows. We do not specifically address financial flows but show that financial cycles exert a large and significant impact on domestic financial and real variables particularly due to the high persistence of domestic variables.

Passari and Rey (2015), Rey (2015) and Miranda-Agrippino and Rey (2015) re-estimate the global financial cycle based on global asset prices and document co-movement in cross-border flows, asset prices and leverage. Rey and co-authors provide evidence that the global cycle dictates monetary policy regardless of the exchange rate regime. The Trilemma has therefore morphed into a Dilemma, i.e. Rey concludes that the ability to set autonomous monetary policy via floating exchange rates is insufficient to quantitatively affect domestic financial conditions. We contradict Rey's conclusion and show that exchange rate regimes matter for both a sample of EMEs and a pooled sample of EMEs and advanced economies (AEs). Further, we provide formal evidence in favor of capital control regimes. Rey's result regarding the irrelevance of exchange rate regimes is also questioned by Obstfeld et al. (2017), who document a significant impact of exchange rate regimes on housing and credit markets for EMEs following a financial shock. Stock markets, in contrast, are not significantly affected by exchange rate regimes, which is in line with Rey. Our study hence contributes to the debate between Rey and Obstfeld et al. (2017). We add a dynamic perspective and extend the framework to capital controls as a means to affect the domestic economy in the presence of global financial shocks. Further we investigate if a second layer of insulation, i.e. capital controls and a floating exchange rate, provides any (additional) benefits.

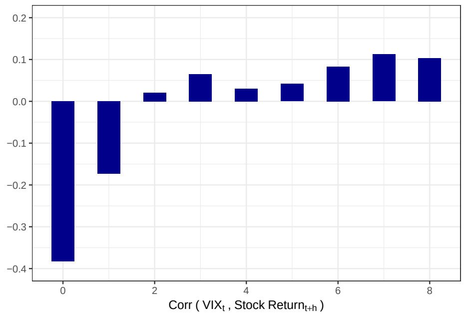
# 3 Stylized Facts

We start by presenting a series of stylized facts to support our dynamic approach via Local Projections and to obtain a first glance at the effectiveness of capital controls and exchange rate regimes. Figure 3 plots serial correlations between global financial shocks (proxied by the VIX, the volatility index of the S&P 500) and domestic financial and real variables over multiple horizons for a set of EMEs as defined in Appendix A1.

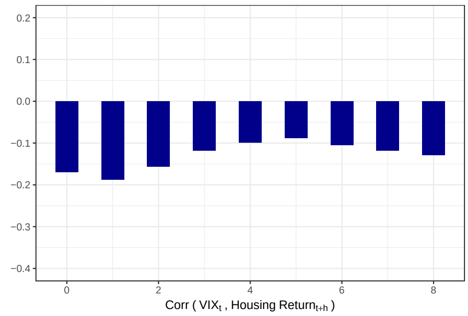
The figures depict a negative and persistent relation between financial shocks and domestic financial and real variables, particularly for housing and credit markets. Financial shocks are associated with mild but persistent credit contractions and more severe housing market declines over the course of two years. This pattern is consistent with a negative wealth effect and the financial accelerator mechanism (Bernanke and Gertler, 1989, Kiyotaki and Moore, 1997 and Gilchrist and Zakrajek, 2012). In a downturn, poor growth prospects decrease borrowers' creditworthiness and collateral values. Lenders respond with a reduced supply of credit and, sometimes, tighter lending standards, which reinforces the poor initial outlook. Figure 3 suggests that these effects are quite persistent. In contrast, stock markets and the real economy have a less persistent negative correlation with global financial shocks of about two to three quarters.

The next Figures relate to one of the key questions of this paper, i.e. whether the negative co-movement between the VIX and domestic variables differs by the state of the exchange rate and capital control regime. If exchange rate adjustments buffer financial shocks, correlations should be weaker for countries with a floating exchange rate versus countries with a fixed exchange rate. Further, to the extent that capital controls mitigate the spillovers of foreign induced financial shocks, we would expect lower correlations for economies with capital controls.

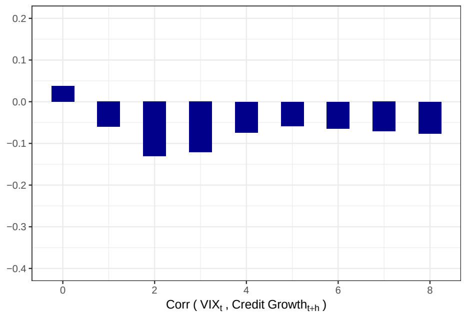
Figure 4 supports this claim for stock markets. Similar to the previous figures, we plot correlations among several horizons for subsamples consisting of countries with fixed versus floating exchange rates (Subfigure (a)) and closed versus open capital markets (Subfigure (b)). With respect to the exchange rate regime, countries with a floating exchange rate are exposed to a muted stock market decline over the first two quarters



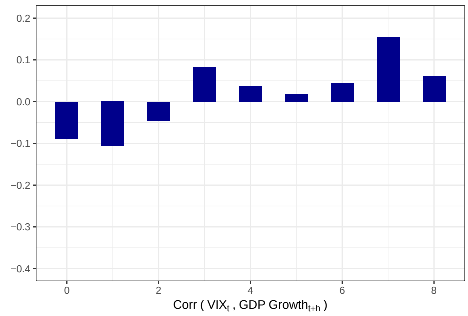

(a) Stock




(b) Housing




(c) Credit




(d) GDP

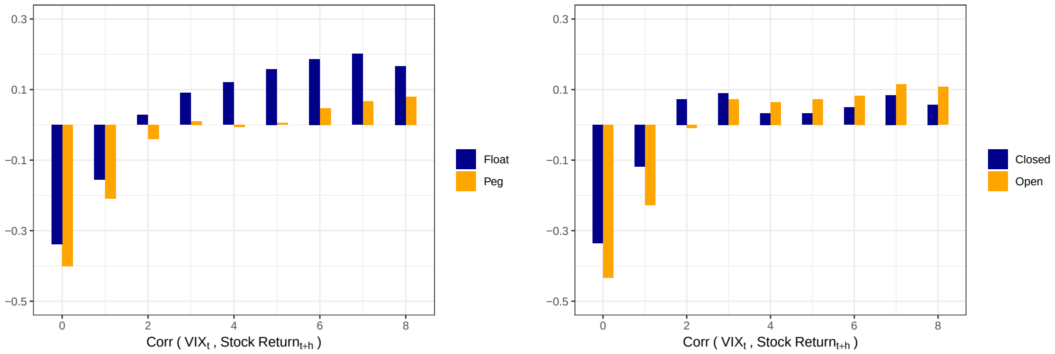
Figure 3: Serial correlations between the VIX and stock, housing, credit or GDP growth

***Notes:*** The graphs highlight the average correlation between the VIX in period (quarter) $t$ and stock returns, housing market returns, credit growth or GDP growth in period $t+h$ with $h \in \{0, 1, ..., 8\}$ for EMEs. The top and bottom 10% country specific correlations are excluded.

even though the initial difference in period 0 is relatively small. Hence, it is not surprising that Passari and Rey (2015) and Obstfeld et al. (2017) are unable to observe a significant effect of the exchange rate regime in their contemporaneous panel regression analysis. Furthermore, floating exchange rate regimes tend to support the recovery process as indicated by positive correlations starting in the third quarter after the initial shock. Inspecting capital controls, we observe a similar picture, however the gap fades after the first two quarters.

We repeat the same analysis for housing returns in Figure 5. Overall, the relative difference across regimes is more pronounced compared to stock returns. Housing markets in EMEs with a floating exchange rate (Subfigure (a)) or countries with tight capital controls (Subfigure (b)) experience almost zero correlation with global financial shocks or even enjoy a mild upswing, while the association is persistent and strongly negative for countries with a peg or open capital markets. Thus it appears that the negative correlation in Figure 3 is primarily driven by pegging countries and/or countries with no or limited capital controls.

We provide some evidence regarding the effect of floating exchange rates and capital controls on credit growth in Figure 6. Floating exchange rate regimes are associated with a reduction in credit which peaks about two quarters after the initial shock. Countries with a fixed exchange rate experience a slightly more pronounced decline in credit over the first year and an increasingly noticeable decline afterwards. This points towards a

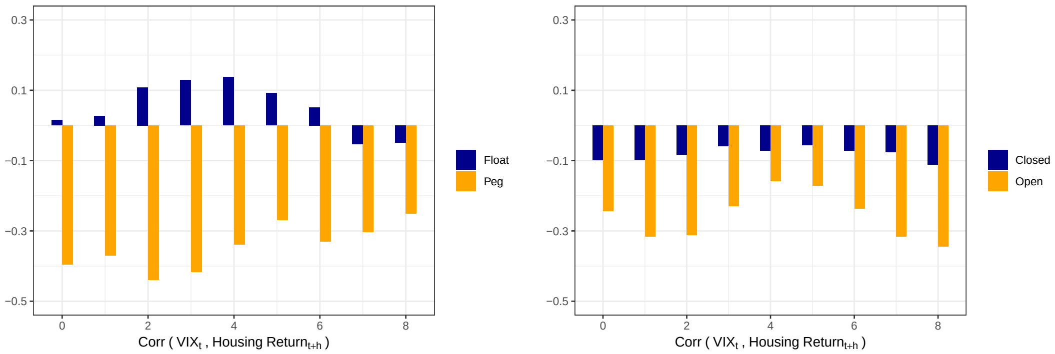



(a) Peg vs. Float

(b) Closed vs. Open

Figure 4: Stock: Serial correlations between the VIX and stock market returns split by exchange rate regime and capital controls

***Notes:*** The graphs highlight the average correlation between the VIX in period (quarter) $t$ and stock market returns in period $t + h$ with $h \in \{0, 1, ..., 8\}$, separately based on the exchange rate and capital control regime for EMEs. The top and bottom 10% country specific correlations are excluded.




(a) Peg vs. Float

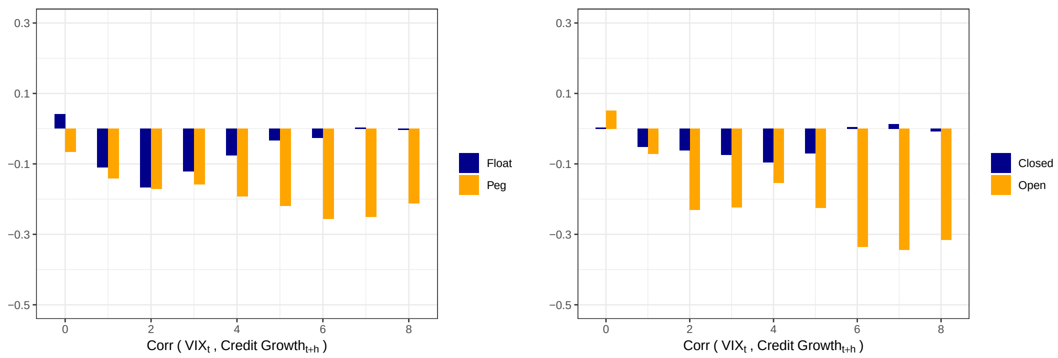
(b) Closed vs. Open

Figure 5: Housing: Serial correlations between the VIX and housing returns split by exchange rate regime and capital controls

***Notes:*** The graphs highlight the average correlation between the VIX in period (quarter) $t$ and housing returns in period $t + h$ with $h \in \{0, 1, ..., 8\}$, separately based on the exchange rate and capital control regime for EMEs. The top and bottom 10% country specific correlations are excluded.

delayed but more severe response for countries with a fixed exchange rate. Turning to Subfigure (b), it appears that open economies experience a considerable decline in credit while capital restrictions tend to isolate the credit market from foreign financial shocks.

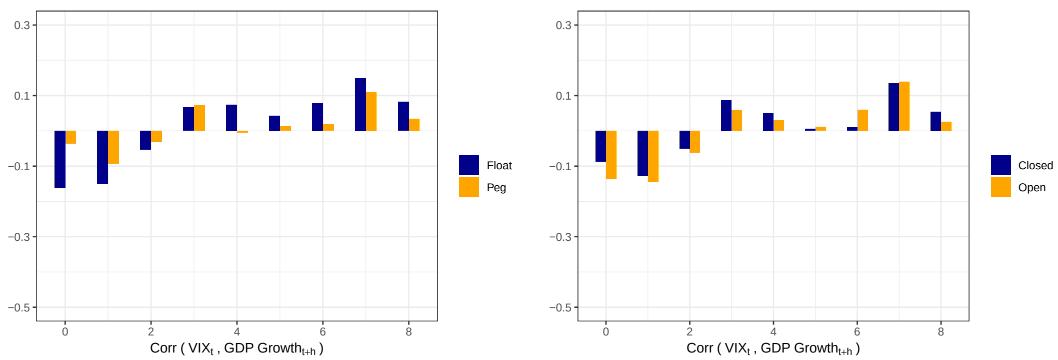
Last bot not least, Figure 7 displays serial correlations between the VIX and real GDP growth split by the exchange rate (Subfigure (a)) and capital control regime (Subfigure (b)). The difference between the different regime choices are weaker compared to the financial variables analyzed previously. Floating exchange rates tend to increase the correlation between GDP and global financial shocks. While this is bad news during the initial downturn, floating exchange rates seem to boost the recovery process. Capital controls in contrast seem to offer some insulation benefits initially over the first 3 quarters




(a) Peg vs. Float (b) Closed vs. Open

Figure 6: Credit: Serial correlations between the VIX and credit growth split by exchange rate regime and capital controls

***Notes:*** The graphs highlight the average correlation between the VIX in period (quarter) $t$ and credit growth in period $t+h$ with $h \in \{0, 1, ..., 8\}$, separately based on the exchange rate and capital control regime for EMEs. The top and bottom 10% country specific correlations are excluded.




(a) Peg vs. Float (b) Closed vs. Open

Figure 7: GDP: Serial correlations between the VIX and GDP growth split by exchange rate regime and capital controls

***Notes:*** The graphs highlight the average correlation between the VIX in period (quarter) $t$ and GDP growth in period $t+h$ with $h \in \{0, 1, ..., 8\}$, separately based on the exchange rate and capital control regime for EMEs. The top and bottom 10% country specific correlations are excluded.

with no clear pattern afterwards. As a prelude, we will emphasize a more favorable effect of floating exchange rates on GDP particularly for open economies in the subsequent regression analysis.

In sum, the preliminary statistics in this section suggest that stock, housing and credit markets as well as GDP co-move with global financial conditions. The relationship is particularly persistent for housing and credit markets, which justifies the subsequent dynamic approach via Local Projections. Further, the association differs across exchange rate and capital control regimes with a generally more muted response for countries with a floating exchange rate and/or capital controls. Since we have not controlled for other factors that may affect domestic financial conditions and global financial stress, these bivariate correlations are merely suggestive. The differences could simply result from a set of countries with specific characteristics, which happened to peg their exchange rate or impose capital controls. We provide more detailed results via regression analysis in the following Sections.

# 4 Data

We construct a quarterly panel dataset ranging from 1995 to 2015 to cover more recent periods of higher economic integration. The data is available for 40 EMEs and 31 AEs, though we mostly restrict ourselves to EMEs. Some countries may have missing values for certain periods. A list of all countries in our dataset can be found in Table A1 of the Appendix. Our primary focus is to analyze the effect of global financial shocks on domestic financial conditions in particular stock, housing and credit markets, and the real economy. Our choice for these variables is guided by the literature. Jordà et al. (2017) document that close to 50% of investable wealth is related to either equity or housing, further housing contributes to almost 50% of the capital stock. Credit growth has been identified as a predictor for major financial crises (Schularick and Taylor, 2012) and as an important driver for business cycle fluctuations (Jordà et al., 2013). We supplement the analysis by considering the real effects of policy choices in the face of changing global financial conditions. In this Section we focus on key considerations related to the choice and classifications of some important variables and refer to Appendix for more details and data sources.

The main independent variable, financial shocks, is proxied by the VIX. This index measures the volatility of the U.S. stock market (S&P 500) and is based on option prices (so-called "implied volatility"). As high values of the VIX are associated with plummeting asset prices around the world, it has been widely used in the literature to proxy for global financial conditions (Ghosh et al., 2015; Bruno and Shin, 2014; Miranda-Agrippino and Rey, 2015, among others). We also obtain volatility indices of the euro area (VSTOXX), Japan (Nikkei 225 VI) and UK (VFTSE).[4] For robustness, we construct the first principal component of the VIX and the other three indices to receive an alternative measure of global financial conditions which is less driven by the United States than the VIX.

To distinguish the effect among different exchange rate regimes as well as different capital control regimes, we need measures for both. Data on de-facto exchange rate regime classification is based on Ilzetzki et al. (2017). Their narrow definition contains 15 categories which we reclassify into two regimes based on conventions in the literature. Firstly, countries with no separate legal tender, currency unions and de facto or de jure bands that are narrower than or equal to 2% are classified as peggers. Bands wider than this threshold and freely floating countries are classified as floaters.

Our capital control measure follows the narrative approach by Fernández et al. (2015). The authors manually interpret and code inflow and outflow information for various financial instruments provided by the AREAER since 1995.

[4]The respective stock market indices are EuroStoxx 50, Nikkei 225 and FTSE 100.

We consider the average over all asset classes and inflows/outflows for classification and categorize the data into two categories.[5] We classify an observation as a closed economy if the restrictions are above the median (pooled over EMEs and time).[6] This strategy is the most conservative approach due to the continuity of the classification. Countries close to the threshold face restrictions of similar magnitude which reduces the potential significance of the regime dummy.

The relative share of countries by exchange rate and capital control classification is depicted in Figure A1.

# 5 Methodology

We run Local Projections (Jordà, 2005) to estimate the effect of a global financial shock on domestic financial conditions and the real economy over time. In essence, this approach estimates the impact of an independent variable today, $x_{i,t}$, on the outcome variable in the future, $y_{i,t+h}$, for every horizon $h = 0, 1, 2, \cdots, H$. In other words, for each $h$ we run a separate regression of the outcome variable $y$ in time $t + h$ on the explanatory variables in time $t$.

We choose a dynamic approach to account for the stylized facts reported in Section 3. Most macroeconomic variables are serially correlated and interlinked with each other within and across periods. Hence, any statistical model that aims at capturing the overall response to a shock should extend the horizon beyond the initial period.

Some studies, unrelated to our research question, estimate panel vector autoregressions (VAR) to account for dynamics. This approach can capture dynamic interdependencies within a panel framework (see Canova and Ciccarelli, 2013 for an overview). However, panel VAR models become increasingly complex as the cross-sectional dimension increases and simplifying restrictions are necessary to circumvent this "curse of dimensionality". Another drawback of autoregressive models is their lack of flexibility. The dynamics are entirely pinned down by a few autoregressive terms.[7]

Local Projections (LP) circumvent both of these issues and provide robust estimates. On the downside and related to the robustness of Local Projections, results are not necessarily efficient due to serially and cross-sectionally correlated standard errors. To account for possible cross-sectional and temporal dependence in the error term we compute Driscoll and Kraay (1998) robust standard errors by default.

[5] We verified the robustness of this choice by considering money market and bond restrictions only. The interest on debt securities is directly related to the policy rate via the yield curve. Restrictions on these categories are hence explicitly linked to the degree of monetary independence according to the Trilemma at the expense of a broader evaluation of capital controls. The results remain unchanged and are available upon request.

[6] We define the threshold based on EMEs only. Otherwise we would have insufficient variation in the capital control measure for EMEs. Most EMEs would be categorized as closed economies since most AEs face no serious restrictions.

[7] In the simplest case of a first-order autoregressive model ($y_t = \alpha y_{t-1} + \varepsilon_t$), the effect of $y_t$ on $y_{t+h}$ will be $(\alpha)^h$. In other words, the impulse response function only depends on a single parameter $\alpha$ and is restricted to an exponential form.

The regression equation for horizon $h$ is described as follows:

$$y_{i,t+h} = \gamma^h s_t + \lambda^h I_{\text{regime},i,t} + \delta^h (s_t \times I_{\text{regime},i,t}) + \beta^h x_{i,t} + \alpha_i^h + \varepsilon_{i,t}^h$$

For our purposes, we inspect domestic quarter-on-quarter real stock, housing, credit and GDP growth as outcomes $y_{i,t+h}$. We estimate impulse response functions over eight quarters i.e. $h = 0, 1, \cdots, 8$. The explanatory variables consist of the global shock $s_t$ (ln(VIX), first principal component of logged volatility indices) and an indicator for the regime, $I_{\text{regime},i,t}$. With respect to the regime, we estimate two versions of each model. In the first version, $I_{\text{regime},i,t}$ indicates a pegged exchange rate regime. In the second version, $I_{\text{regime},i,t}$ is an indicator for a regime with strong capital controls.[8]

Furthermore, we interact the shock variable $s_t$ and the regime indicator $I_{\text{regime},i,t}$ to analyze whether the shock has a different impact across regimes, which constitutes the main research question in this paper. Accordingly, $\delta^h$ is our main parameter of interest. $x_{i,t}$ represents the set of control variables and country fixed effects are denominated by $\alpha_i^h$.

We include several control variables. All our regressions control for the lagged dependent variable which is supposed to account for the dynamics of the respective variable. We also account for the initial stance of the real economy and include lagged GDP growth as a control variable throughout most regressions. GDP and domestic financial variables clearly influence each other, so do global financial conditions (Jordà et al., 2013). The lag structure is necessary to account for issues of reverse causality in horizon 0.

Many of the regressions also include the (shadow) federal funds rate as an explanatory variable, as well as the interaction of the funds rate with the exchange rate or capital control regime. This choice is guided by Rey (2016), who shows that US monetary policy shocks significantly affect the VIX and financial variables around the world. The interaction term is motivated by the Trilemma, which highlights a distinct effect of foreign monetary policy based on the regime classification. The inclusion of the federal funds rate allows us to distinguish co-movement due to common financial shocks from spillovers of monetary policy from advanced to peripheral economies.

We also specifically control for initial credit condition. Schularick and Taylor (2012) underline the ability of credit growth to predict financial crises. Hence credit growth is associated with global financial conditions proxied by the VIX and the domestic economy. We include lagged credit growth due to concerns related to reverse causality during the initial period.

One might be further worried about other global phenomena that could confound the effect of the financial shock. We thus confirm our results by adding time fixed effects $\theta_t^h$. This feature is useful in capturing effects of other global factors (e.g. commodity prices) that are highly correlated with the VIX and the dependent variable. In this case,

[8] We also experimented with a joint regression, i.e. a regression with two regime indicators, one for pegged exchange rates and one for tight capital controls, interacted with the global financial shock. Results do not change and are available upon request. We stick with separate regressions mainly to ease the comparison with Passari and Rey (2015) and Obstfeld et al. (2017).

parameters for the federal funds rate and the VIX cannot be estimated as they are constant across countries and therefore picked up by the time fixed effect. Nevertheless, it is possible to estimate the parameter of the interaction term between shock and regime, $\delta^h$, due to country specific variation in the regime indicator. More formally, this model can be written as:

$$y_{i,t+h} = \lambda^h I_{\text{regime},i,t} + \delta^h (s_t \times I_{\text{regime},i,t}) + \beta^h x_{i,t} + \alpha_i^h + \theta_t^h + \varepsilon_{i,t}^h$$

### 5.1 Endogeneity

One may be worried about endogeneity in the regime indicators. Capital controls and exchange rate regimes may be subject to financial conditions in general and may change following severe adverse shocks. However, as we visualize in the Appendix in Figure A1, exchange rate regimes as well as capital controls are fairly persistent over time and not related to global recessions. To further account for regime changes, we constrain our analysis to exchange rate and capital control regimes with a stable policy for plus minus 2 years, which covers the entire horizon of our impulse response analysis.

Another issue relates to the usage of the VIX. The VIX measures financial uncertainty and is therefore influenced by many factors, including financial variables, which serve as our dependent variables. However global financial shocks tend to emerge from AEs rather than EMEs, which provides additional reassurance to primarily analyze EMEs besides the policy relevance of capital control and exchange rate choices for this group.[9] The identifying assumption hence rests on the premise that global financial shocks are triggered by financial hubs and not EMEs. However in order to directly relate our results to Passari and Rey (2015) we include AEs in a subset of regressions.

## 6 Results

We split our findings regarding the impact of global financial conditions on local financial and real variables by exchange rate regimes in Section 6.1 and the degree of capital controls in Section 6.2. We shed light on potential synergies in Section 6.3.

### 6.1 Exchange Rate Regimes

We start by inspecting the effect of the VIX on domestic financial variables and output by exchange rate regime for EMEs.[10] The impulse response functions in Figure 8 depict the response of a one standard deviation shock to ln(VIX).[11] The underlying panel

[9] EMEs further experience more variation in regimes across time which is crucial to identify the effect of capital controls and exchange rates.

[10] The vast majority of AEs with a fixed exchange rate are in the Eurozone. This is problematic given that the Euro floats internationally.

[11] A one standard deviation increase of ln(VIX) almost amounts to the increase during the dot-com bubble.

regressions control for relevant domestic and common factors, such as domestic GDP and credit growth, the federal funds rate, and country and quarter fixed effects. A detailed Table with regression outputs and model specifications is available in Table A3 in the Appendix.[12] Due to time fixed effects, the coefficient on ln(VIX) is dropped because of perfect collinearity with the quarter-year dummy variables. The responses therefore plot the difference between a fixed exchange rate regime and a floating regime ($\delta^h$).[13] If flexible exchange rates dampen the transmission of foreign shocks, the response should be less negative or insignificant for floating regimes and more negative for countries with rigid exchange rates. This translates into a negative response for the difference between pegging and floating countries.

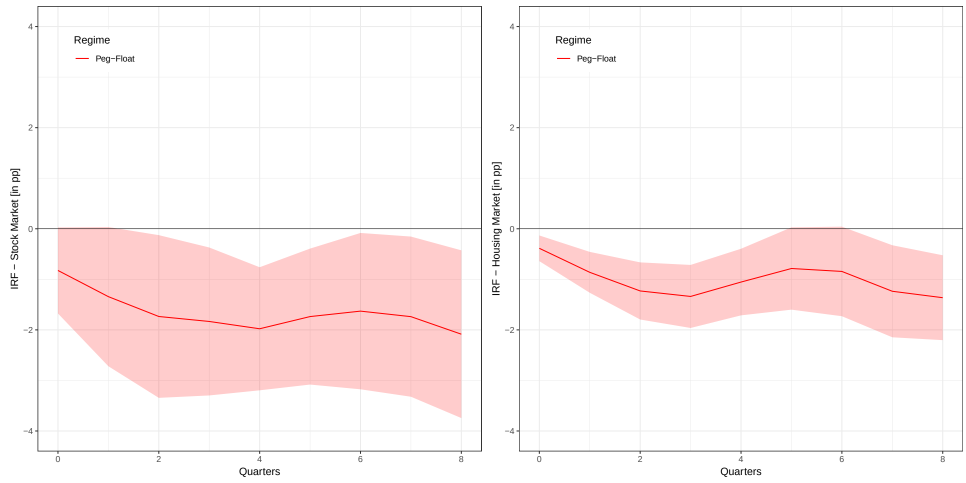
Subfigure (a) plots the effect of the global financial shock on domestic stock markets in percentage points based on different exchange rate classifications. The stock market response is insignificant contemporaneously, but turns significantly negative with a lag of one quarter at the 10% level. The difference in exchange rate regimes increases up to quarter 3 and then remains at -3 percentage points over the course of two years despite wide confidence intervals. Our contemporaneous insignificant result of about -0.5 percentage points resonates well with Obstfeld et al. (2017), who find a insignificant effect of about 0 to -1 percentage points for the initial period depending on the specific specification.

Subfigure (b) repeats the same analysis for housing returns. Once again, the impulse response functions depict a notable difference between pegging and floating countries. The difference is small with about -0.5 percentage points initially but nevertheless significant. The difference between pegging and floating countries increases up to -1.5 percentage points in quarter 3 and then essentially remains there. The gap turns out statistically significant in every quarter at least at the 10% level. The decline in house prices is economically relevant. The mean return is 0.6% per quarter, thus the peak difference of 1.5 percentage points between floating and pegging countries is in relative terms larger than for stock markets, which have an average return of 2%. Obstfeld et al. (2017) report values between roughly -3 and -5 percentage points for the initial period, depending on the model specification. Our estimates are thus smaller, though we would like to stress some differences with respect to the particular sample of countries and the additional control variables in our regression specification. Nevertheless we both stress significant initial effects on the housing market. Our dynamic analysis adds that these effects are quite persistent. In other words, the effect or gains of floating exchange rates unfold over multiple periods.

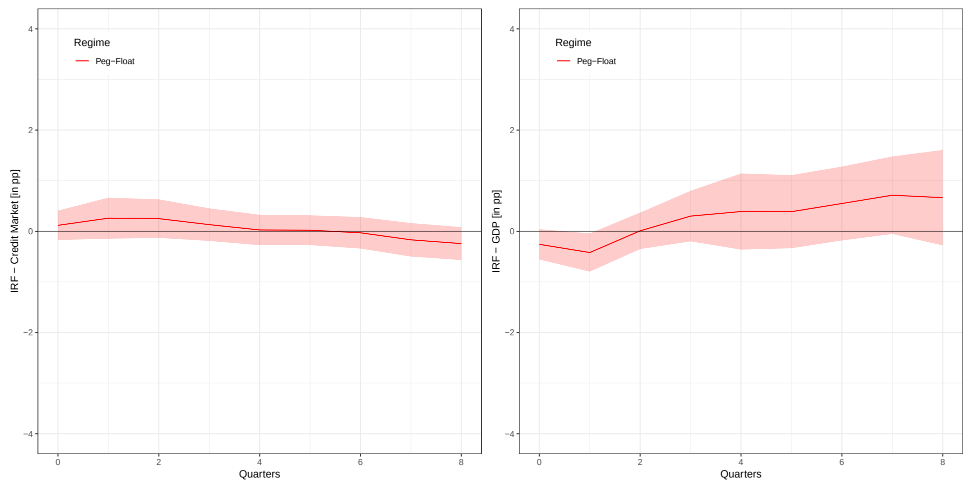
We continue by analyzing the difference between fixed versus floating exchange rates for domestic credit growth in Subfigure (c). Pegged exchange rate regimes tend to offer superior protection initially even though the difference is not statistically significant. In the second year after the initial shock, signs reverse and floating exchange rates offer long run benefits consistent with the stylized facts in Section 3. The overall difference

[12] To keep the table parsimonious, we restrict ourselves to $h \in \{0, 4, 8\}$.

[13] We remove time fixed effects as well as GDP, the federal funds rate and credit growth as controls in the Appendix in Figure A2 and the corresponding regression table in Table A4. This simple representation allows us to plot separate impulse response paths for both regimes and at the same time cover a wider range of countries. The responses reveal that negative global financial shocks exert a negative effect on local financial conditions and GDP, particularly for countries with a fixed exchange rate.




(a) Stock (b) Housing




(c) Credit (d) GDP

Figure 8: IRF: One standard deviation shock to ln(VIX) - peg vs. float

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real stock market returns, real housing market returns, real credit growth and GDP growth in EMEs with 90% confidence bands. The impulse response functions represent the difference between pegging and floating regimes.

is relatively small over the entire horizon with about 0.5 percentage points (the average credit growth rate is 1.5%). These results seem puzzling at first, given the association of credit growth and domestic financial conditions, particular for the housing sector and to a lesser extent to equity markets. Thus, we would expect that at least the different dynamics in the housing markets corroborate with credit growth gaps between countries with floating or fixed exchange rates. However, we reconcile this discrepancy in Section 6.3.3 where we show that credit growth is indeed distinct for countries with different exchange rate regimes, but only for a sample of countries with open capital markets, which have been the focus in the existing literature.

Evidently, domestic financial conditions respond to the global financial cycle. The analysis so far has stressed that exchange rate regimes play an important role in determining the degree of spillovers. But does this have any macroeconomic relevance?

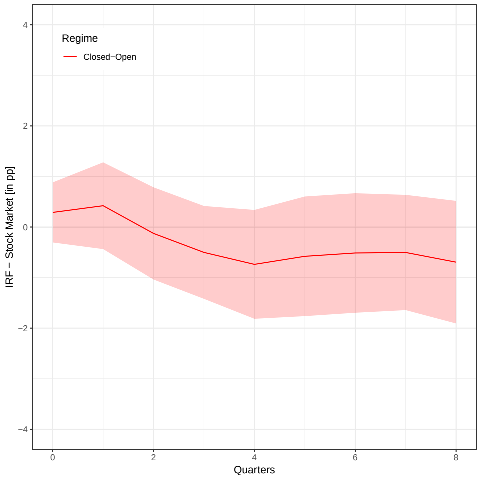
In other words, is GDP more affected under fixed exchange rates than flexible exchange rates? Subfigure (d) sheds light on this issue. While we generally observe a decline in GDP as Figure A2 in the Appendix shows, the difference between exchange rate regimes appears modest, even though GDP declines more for fixed exchange rate countries over the first two quarters. The effect is significant one quarter after the initial shock at the 10 % level, i.e. floating exchange rate regimes tend to buffer the effect of global financial shocks on the real economy. Countries with a floating exchange rate have about 0.25 percentage points higher growth against an average growth rate of 1.9 % among all countries in the sample. However, the effect vanishes soon after. In Section 6.3.4 we show that the effects of different exchange rate regimes on GDP are enhanced once one conditions on a sample of financially open countries as in di Giovanni and Shambaugh (2008) or Obstfeld et al. (2017).

## 6.2 Capital Control Regimes

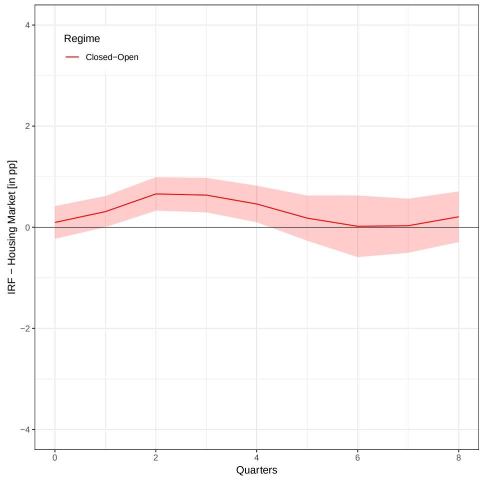
We continue the analysis with different capital control regimes in Figure 9. As with the previous set of results we restrict ourselves to EMEs. This is justified by the perception that capital controls are primarily related to smaller EMEs (Bianchi, 2011; Benigno et al., 2016). From a practical perspective, almost all AEs feature no or only minor capital flow restrictions. As such, advanced economies provide little variation in capital controls. Once again we control for relevant domestic and common factors, such as domestic GDP and credit growth, the federal funds rate, and country and quarter fixed effects. A detailed Table with regression outputs and model specifications is available in Table A5 in the Appendix. Similar to the previous Local Projections, time fixed effects don't allow us to plot the impulse response functions for both countries with strict or loose capital controls separately. Instead we graph the difference between countries with strong and weak controls ($\delta^h$). Results for Local Projections with country fixed effects and the lagged dependent variable only are available in Figure A3 and Table A6 in the Appendix. Most importantly, they suggest a negative response for countries with and without capital controls, though the response for countries with capital controls is not significant. Following a similar logic as with different exchange rate regimes, if capital controls dampen the transmission of foreign shocks, the response should be less negative or insignificant for countries with sufficient capital restrictions and more negative for countries with open capital markets. This would translate into a positive response for the difference between countries with and without capital controls.

Subfigure (a) shows the differential impact of a ln(VIX) shock on EMEs with significant and minor capital controls for equity markets. Overall we find a positive impact of 0.25 percentage points initially and one quarter after the shock. Thus equity markets of open economies tend to be more affected by global financial conditions. However, the result is not significant and smaller than the difference in Figure A3 where we do not control for time fixed effects, GDP, credit growth and the federal funds rate. The impulse response function switches signs after the first quarter but remains insignificant throughout the entire impulse response path.[14] Edwards (1999) has analyzed the case

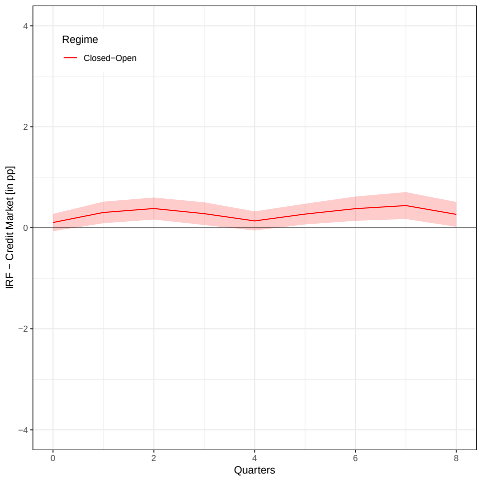
[14]Our capital control classification lumps over intermediate regimes. As such, we might see different results if we focus on purely open and closed economies. Unfortunately, this would drastically reduce the



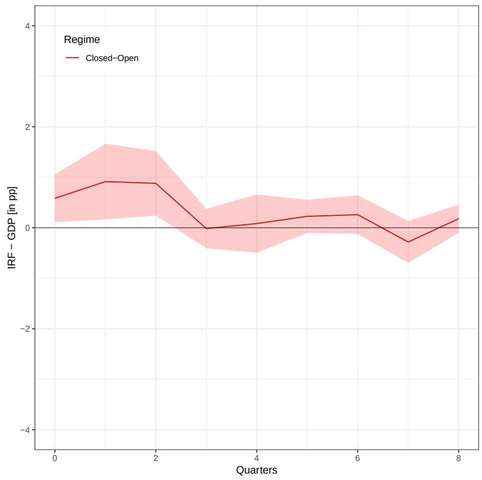

(a) Stock




(b) Housing




(c) Credit




(d) GDP

Figure 9: IRF: One standard deviation shock to ln(VIX) - closed vs. open

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real stock market returns, real housing market returns, real credit growth and GDP growth in EMEs with 90% confidence bands. The impulse response functions represent the difference between closed and open economies.

of Chile and similarly found no significant effect of capital controls on the local stock market. Thus, we believe that capital controls in general do not function well with regards to dampening the response on equity markets unless the controls are really tight.

Housing markets seem to be more affected by capital controls. As displayed in Figure A3, the response is significantly negative for more open economies, while the response is negative but insignificant for countries with stricter capital controls. This difference persists once we add all control variables in Subfigure (b). The gap between countries with more and less capital controls is positive, that is, tight measurements dampen the transmission onto the domestic housing market. The effect is small initially but increases and reaches its peak with about 0.8 percentage points two to four quarters

sample size.

after the initial shock, before it reverts back to zero. The difference is quite sizable economically and is larger than the average return in the housing sector of 0.6 %. Similarly to the exchange rate regimes, we observe that gains are reaped with a delay. We attribute this to the high persistence of financial variables.

Subfigure (c) suggests a significant gap in credit growth between countries with tight and minor capital controls, which is further supported by Figure A3 which shows a significant credit decline for open economies, while the effect for closed economies is insignificant and close to zero. The difference between both regimes is statistically significant with about 0.3 percentage points throughout the entire impulse response horizon. Thus, open economies are confronted with a sizable credit contraction which may in parts explain the response in the housing market, as well as the response in the real sector in Subfigure (d) to the extent that households and firms become credit constraint. The muted credit contraction for countries with some degree of capital controls is line with recent theoretical work on capital controls in small open economies (Bianchi, 2011, Korinek, 2018 and Mendoza, 2018 among others). This literature stresses that small open economies are subject to an externality and thus overborrow in good times, which ultimately results in fire-sales during bad times. Capital controls however can mitigate this policy by reducing the built up of credit and are thus able to reduce the volatility of credit following an exogenous foreign shock. Our results hence provide empirical support to this literature by examining a wide panel of mostly small EMEs.

We conclude this Section with the impulse response function for GDP growth in Subfigure (d). The significant positive gap during the first year suggests that sufficient capital controls provide insulation properties, which materially reduce the real costs of global financial shocks. The maximum growth rate differential between the capital control regimes amounts to almost 1 percentage point after a lag of 1 to 2 quarters. The difference is economically and statistically significant against an average growth rate of 1.9 % in the sample. It is worth emphasizing that we control for initial credit conditions in the economy, as such the response is consistent with endogenous propagation like the financial accelerator mechanism (Bernanke and Gertler, 1989). Endogenous credit developments might also contribute to tightening credit constraints in the real sector which exaggerate the initial effect over time (Kiyotaki and Moore, 1997).

### 6.3 Synergies between Policy Choices

The last two Sections highlighted that both, exchange rate and capital control regimes matter for the financial sector and the real economy. Fluctuating exchange rates as well as capital controls are able to buffer foreign induced financial shocks. The analysis did not rely on comparing fully closed economies with completely open economies, or economies with a free float versus a tight peg.

In this Section we go a step further and ask whether these beneficial properties of floating exchange rates and capital restrictions are related to the stance of monetary policy more general. Klein and Shambaugh (2015) highlight that two layers of insulation, i.e. capital controls and floating exchange rates provides the highest degree of monetary autonomy. As such we might expect that two layers yield more stabilization benefits due to the additional degree of freedom on monetary policy. As a second argument, one may simply be interested to verify if the measures synergize witch each other given that they provide advantages on their own. We incorporate this idea into our regression model based on subsample analysis. In particular we raise the question, as to whether different exchange rate regimes have a distinct effect on domestic variables conditioning on countries that either impose capital controls or not. We subsequently test if different degree of capital controls have an effect when we focus on countries with either a fixed or floating exchange rate regime.[15]

In the following subsections we examine potential synergies separately for equity, housing and credit markets as well as for the real economy.

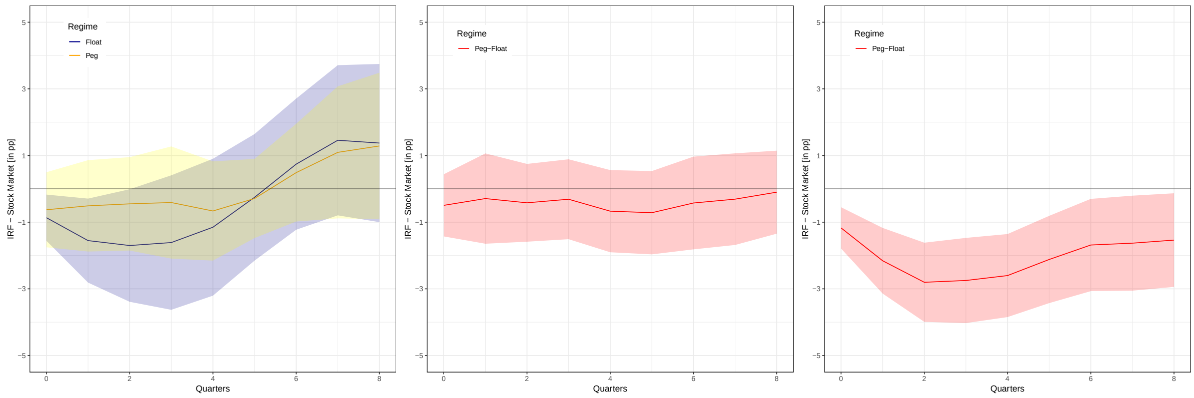
### 6.3.1 Stock Markets

We begin our subsample analysis with equity markets. Once again, we expose the domestic economy to an international financial shock (ln(VIX)) and analyze the effect on the domestic stock market based on different exchange rate and capital control regimes. However unlike in the previous Sections, we condition on subsamples of closed or open economies and countries with a floating or fixed exchange rate. We control for a variety of variables that could interfere the transmission of global financial shocks on domestic variables including country fixed effects.

Subfigure (a) in Figure 10 displays impulse response functions on local stock markets by exchange rate regime for EMEs with open capital markets, when we do not control for any confounding variables besides country fixed effects and lagged equity returns. We generally observe a decline in local stock markets, which tends to be stronger for countries with a floating exchange rate. Once we included all of our control variables besides credit growth in Subfigure (b), the difference between floating and fixed exchange rates has the expected sign, i.e. floating regimes tend to offer stabilization benefits, but the gap is not significant in line with Obstfeld et al. (2017).[16] We repeat the same analysis by focusing on closed economies in Subfigure (c). We see a significant gap between floating exchange rates and fixed exchange rates, consistent with the insulation benefits of the former. Thus Subfigure (b) and (c) point to gains from adopting a second layer of insulation via flexible exchange rates: Floating exchange rates are more effective for countries with (some) capital controls. Further details on the regressions as well as robustness checks are available in Table A7. We show that the results do not materially change if we replace the VIX with the first principal component of volatility indices of important AEs. We also inspect all countries (AEs and EMEs but only open capital markets). This allows us to relate our results to Passari and Rey (2015) who find insignificant effects for a pooled sample during the contemporaneous period. We observe insignificant effects in quarter 0 (-0.23) but significant effects in quarter 4 (-0.44) at the 10% level. Our results are thus

[15] We also considered a three-way-interaction term between capital controls, the exchange rate regime and the VIX to test for potential stabilization gains when imposing a second layer of protection. This specification avoids subsamples and thus increases country coverage. However this regression imposes interdependencies between regime choices (see Figure 2). For example, the potential gains from moving from peg + control towards float + control depend on the effect of moving from peg + no control to float + no control. We do not want to impose this ex-ante. Nevertheless, the results are very similar to the subsample analysis and available upon request.

[16] We omit credit in order to have a sufficiently large sample.




(a) Open Economies (b) Open Economies (c) Closed Economies

Figure 10: IRF: One standard deviation shock to ln(VIX) - peg vs. float

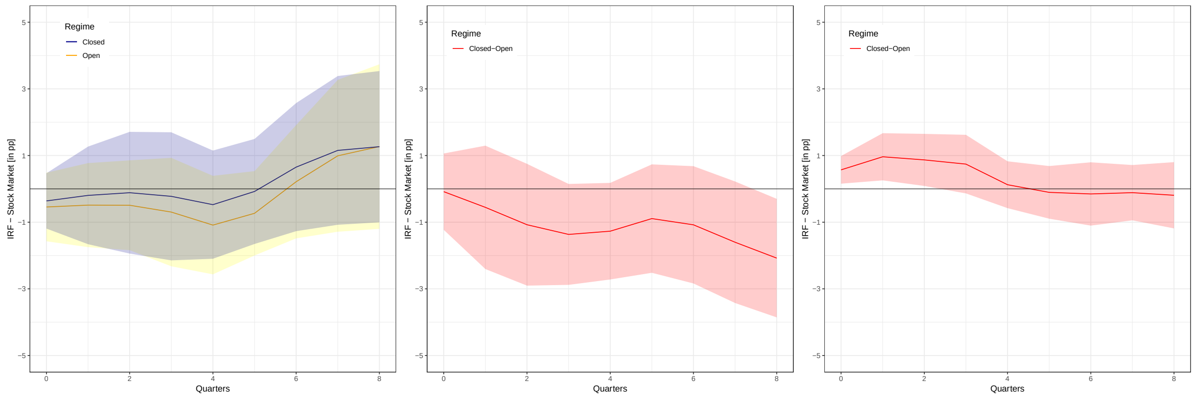
***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real stock market returns in EMEs with 90% confidence bands. The sample is restricted to open economies (Subfigures (a) and (b)) or closed economies (Subfigure (c)).

consistent with Passari and Rey (2015), nevertheless we are cautious to interpret these results given that most advanced economies with a fixed exchange rate are part of the eurozone which itself floats internationally.

Figure 11 shows the impact of a ln(VIX) shock on developing countries with and without capital controls. Subfigure (a) and Subfigure (b) depict the difference between capital control regimes for countries with a fixed exchange rate. Subfigure (a) highlights a dampening effect of capital controls even though the difference between open and closed economies is not significant. We control for confounding variables in Subfigure (b). The effect reverses, but remains insignificant. Once we condition the sample on economies with a floating exchange rate in Subfigure (c), capital controls seem to induce a stabilizing effect of up to one percentage point during the first two quarters. Thus at least with respect to stock markets, a second layer of insulation enhances stability in line with positive synergy effects. More monetary autonomy due to floating exchange rates and capital controls tends to improve the performance of stock markets, even though the effect of capital controls on top of floating exchange rates is mild. We provide more details and robustness checks in Table A8.

### 6.3.2 Housing Markets

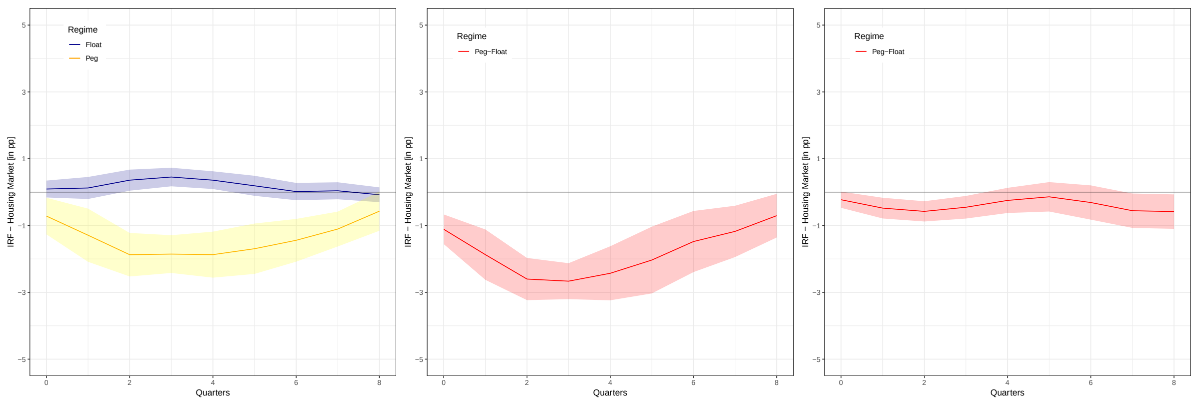
Figure 12 shows impulse responses for a one standard deviation ln(VIX) shock to local housing returns (in percentage points) for different exchange rate regimes. Subfigures (a) and (b) focus on countries with no serious capital restrictions, while Subfigure (c) examines countries with above median capital controls. The regressions underlying Subfigure (a) control for country fixed effects and lagged housing returns and are thus able to display the response for floating and pegging countries. Countries with a floating exchange rate regime and no serious capital controls show no sign of a negative impact on their housing market. The situation completely changes for countries with a fixed




(a) Pegging Economies (b) Pegging Economies (c) Floating Economies

Figure 11: IRF: One standard deviation shock to ln(VIX) - closed vs. open

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real stock market returns in EMEs with 90% confidence bands. The sample is restricted to countries with a peg (Subfigures (a) and (b)) or floating economies (Subfigure (c)).



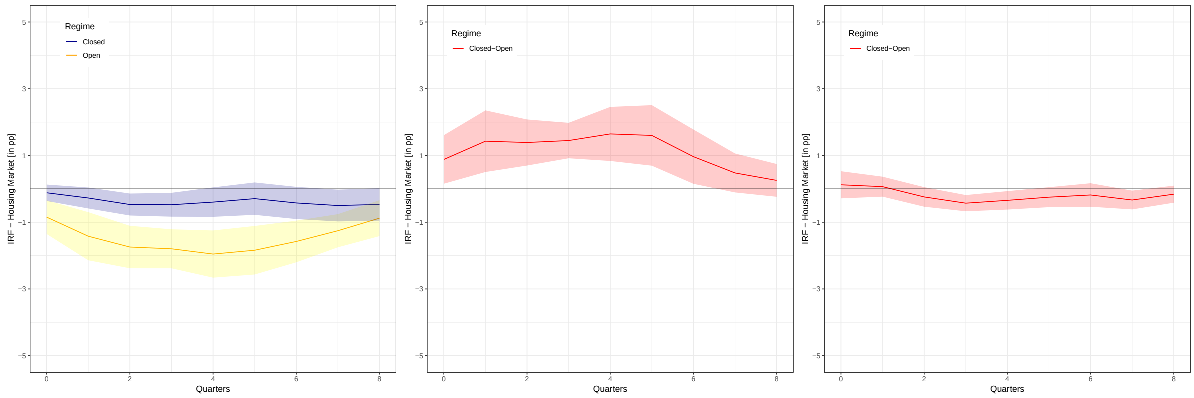

(a) Open Economies (b) Open Economies (c) Closed Economies

Figure 12: IRF: One standard deviation shock to ln(VIX) - peg vs. float

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real housing market returns in EMEs with 90% confidence bands. The sample is restricted to open economies (Subfigures (a) and (b)) or closed economies (Subfigure (c)).

exchange rate and weak or no capital controls. The response is negative and highly significant. The peak decline amounts to 1.8 percentage points half a year after the initial shock and persistently remains at this level for two more quarters until it reverts back. The drop is highly economically relevant considering the average quarterly housing return of about only 0.23%. Subfigure (b) highlights that this large difference between floating and pegging countries persists once we add more control variables.

Subfigure (c) displays the same regression for countries with higher capital controls. The difference between floating and pegging countries remains, but on a much smaller level and is mostly insignificant throughout most periods. Thus floating exchange rates seem to reduce the global spillovers of financial shocks onto domestic housing markets,




(a) Pegging Economies (b) Pegging Economies (c) Floating Economies

Figure 13: IRF: One standard deviation shock to ln(VIX) - closed vs. open

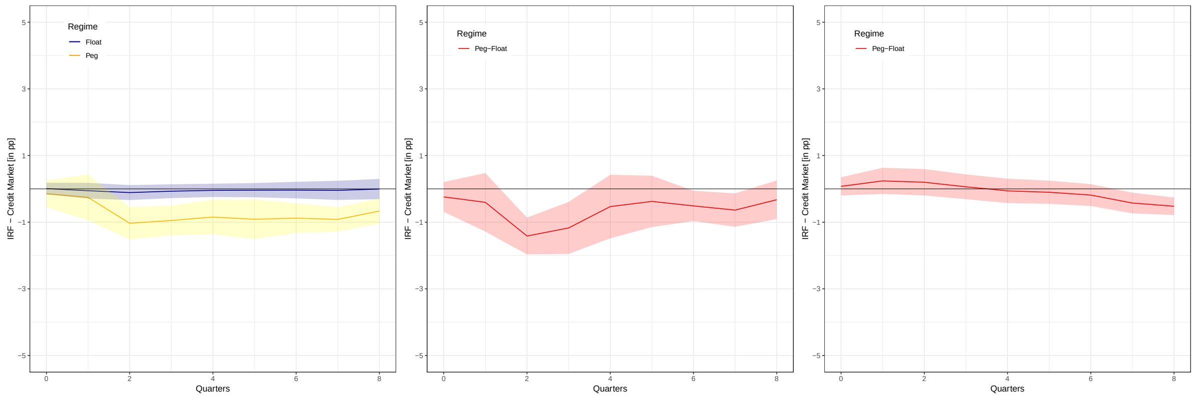
***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real housing market returns in EMEs with 90% confidence bands. The sample is restricted to countries with a peg (Subfigures (a) and (b)) or floating economies (Subfigure (c)).

however, the effectiveness is greatly enhanced for countries with open capital markets. Since we control for domestic financial and real conditions as well as country fixed effects it seems unlikely that the different results are merely a result of country specific characteristics among the two samples. To the extent that we control for domestic macroeconomic conditions, the only difference between the two samples relates to the stance of capital controls. It appears that a second layer via floating exchange rates matters, but to a lesser extent compared to equity markets. Put differently, the synergies between exchange rates and capital controls are weak as stabilization benefits of a floating exchange rate are much lower if a country already imposes capital controls. As with previous results, we provide a more detailed description of the regression outputs as well as robustness checks in Table A9.

We repeat the same analysis with different capital control regimes, conditioning on countries with fixed or floating exchange rates in Figure 13.

Subfigures (a) and (b) focus on countries with tight exchange rate arrangements. The response for countries with strong and weak capital controls is negative, but global financial shocks exert a significantly more negative impact on countries with only minor capital restrictions. The peak response corresponds to almost 2 percentage points after three or four quarters and then slowly returns to zero. The gap between different capital control regimes is highly significant during the entire impulse response path, even when we add the usual set of control variables.

Once we examine developing countries with floating exchange rates in Subfigure (c), the difference between capital control regimes vanishes. Once again, we control for domestic macroeconomic conditions as well as country fixed effects. Hence the only systematic difference between the subsamples is the exchange rate arrangement. Countries with a fixed exchange rate benefit from capital controls, while this is not the case for countries with a floating exchange rate. The additional layer with capital controls does not synergize with a floating exchange rate. Additional results are available in Table A10.




(a) Open Economies (b) Open Economies (c) Closed Economies

Figure 14: IRF: One standard deviation shock to ln(VIX) - peg vs. float

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real credit growth in EMEs with 90% confidence bands. The sample is restricted to open economies (Subfigures (a) and (b)) or closed economies (Subfigure (c)).

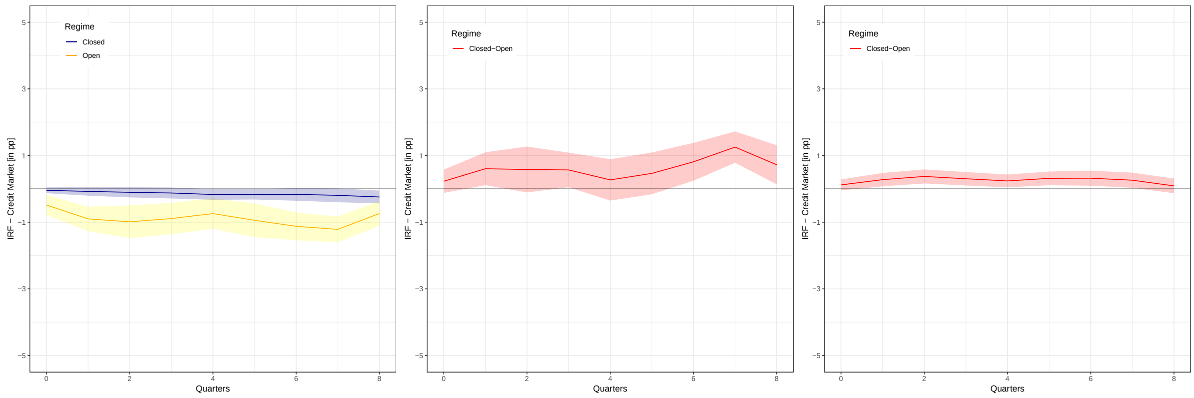
### 6.3.3 Credit Markets

The overall picture that emerges from credit markets is quite similar to the housing market, which is reassuring given that credit conditions and the housing market performance are closely related to each other.

Figure 14 displays the impulse response functions for a one standard deviation shock to ln(VIX) on domestic credit conditions based on their exchange rate regime for countries with no or minor capital controls (Subfigures (a) and (b)) or serious controls (Subfigure (c)). Among open EMEs, a floating exchange rate is essentially able to fully buffer the impact of international financial shocks according to Subfigure (a). Conversely, tight exchange rate regimes coincide with a persistent and highly significant drop in credit of 1 percentage point two quarters after the initial shock against an average credit growth rate of 1.59% for the subsample of open EMEs. This difference between exchange rate arrangement persists once we add control variables, even though the significance diminishes slightly in Subfigure (b). Once we condition on countries with tight capital controls, the gap between different exchange rate regimes vanishes. Table A11 provides further details.

We continue with the effect of different levels of capital controls in buffering the consequences of global financial shocks on domestic credit conditions in Figure 15. More details are available in Table A12. Subfigures (a) and (b) condition on countries with a fixed exchange rate and Subfigure (c) on countries with floating exchange rates.

A negative global financial shock reduces credit creation in countries with few capital controls and a fixed exchange rate by about 1 percentage point according to Subfigure (a). The effect is significant and persistent over two years. Countries with tight capital controls and a fixed exchange rate arrangement experience no significant change in domestic credit conditions. Thus, capital controls provide a buffer, which is confirmed in Subfigure (b), even though the gap turns out to be less significant during most periods. The difference




(a) Pegging Economies (b) Pegging Economies (c) Floating Economies

Figure 15: IRF: One standard deviation shock to ln(VIX) - closed vs. open

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real credit growth in EMEs with 90% confidence bands. The sample is restricted to countries with a peg (Subfigures (a) and (b)) or floating economies (Subfigure (c)).

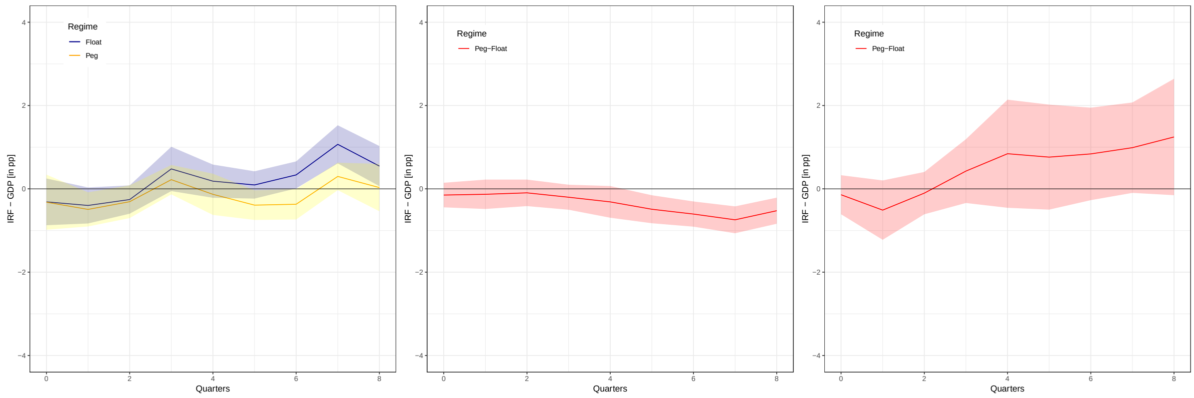
between capital control regimes almost vanishes once we focus on countries with a floating exchange rate in Subfigure (c). Capital controls still seem to offer some insulation but the effect drops from about 1 to 0.25 percentage points. Thus capital control regimes tend to matter for domestic credit conditions independent of the stance of the exchange rate regime, but the dampening effect of capital controls becomes substantial only if it is accompanied by a fixed exchange rate. Since we control for country characteristics, one could argue that one of the two layers is sufficient and synergy effects are small.

### 6.3.4 Real Economy

The analysis so far suggests that exchange rate and capital control choices are crucial in dampening the effect of foreign induced financial shocks onto domestic financial variables. However, a second layer of insulation, i.e. a floating exchange rate when capital controls are in place, or capital controls in countries with a floating exchange rate, offers limited synergies for housing and credit markets. We conclude this Section by examining this issue for the real economy which might be of primary relevance for policymakers.

Figure 16 depicts impulse response functions for different exchange rate classifications on GDP growth if EMEs face minor capital controls (Subfigures (a) and (b)) and when countries are subject to tight capital controls (Subfigure (c)). A detailed analysis is also available in Table A13.

Subfigure (a) suggests only minor differences between floating and fixed exchange rate rate regimes. The response is negative but barely significant during the first two quarters. Financial shocks lead to a modest reduction in GDP growth of about -0.3 percentage points. However we do not observe any notable differences between floating and fixed exchange rates. The economy recovers after about half a year and subsequently floating exchange rates seem to perform superior. Thus exchange rate choices tend to be irrelevant during the recession itself, but foster growth during the recovery. This view is




(a) Open Economies (b) Open Economies (c) Closed Economies

Figure 16: IRF: One standard deviation shock to ln(VIX) - peg vs. float

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real GDP growth in EMEs with 90% confidence bands. The sample is restricted to open economies (Subfigures (a) and (b)) or closed economies (Subfigure (c)).

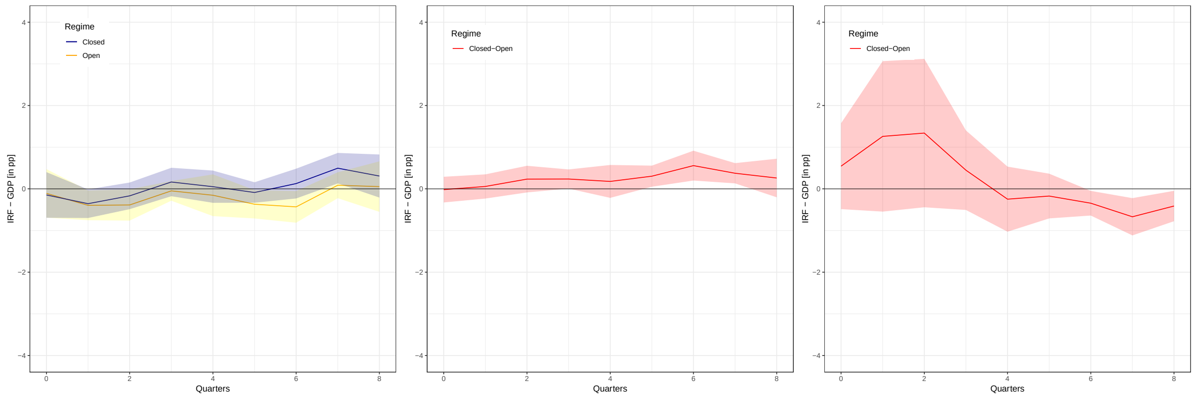
supported in Subfigure (b) which is based on additional control variables.The difference between exchange rate regimes is insignificant initially, but subsequently turns significant even though the overall gap is rather modest. Subfigure (c) displays the gap between pegging and floating economies conditioning on a sample of countries with relatively strong capital controls. The difference between exchange rate regimes turns insignificant over the entire horizon and has a “wrong” sign for most periods. Thus, we conclude that floating exchange rates do not provide additional buffering properties on real GDP if countries already implemented capital controls.

Last but not least, Figure 17 and Table A14 examine the response of domestic GDP growth based on a global financial shock for EMEs with closed or open capital markets conditioning on fixed (Subfigures (a) and (b)) or floating exchange rates (Subfigure (c)).

Subfigure (a) suggests a reduction in GDP growth for all countries in the subsample independent of the degree of capital controls. However, similarly to floating exchange rates, capital controls tend to help during the recovery process. This conclusion is supported in Subfigure (b). Capital restrictions tend to help vis-à-vis open capital market, however the effect does not turn significant until about 2 quarters after the initial shock. The peak difference between different capital control regimes equals around 0.5 percentage points. Turning to Subfigure (c), the significant difference between the regimes vanishes. Hence, once again capital controls seem to primarily matter if implemented in countries with a tight exchange rate arrangement and not otherwise. Thus, two layers of insulation do not provide any significant synergies.

# 7 Conclusion

Recently, a series of papers, initiated by Rey (2015), highlighted the existence of a global financial cycle which spreads across countries regardless of the exchange rate regime.




(a) Pegging Economies (b) Pegging Economies (c) Floating Economies

Figure 17: IRF: One standard deviation shock to ln(VIX) - closed vs. open

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real GDP growth in EMEs with 90% confidence bands. The sample is restricted to countries with a peg (Subfigures (a) and (b)) or floating economies (Subfigure (c)).

This empirical observation suggests that insulating properties of floating regimes may have been overestimated.

In this analysis we focus primarily on EMEs and analyze if exchange rate choices as well as the degree of capital controls matter for the transmission of global financial shocks onto the domestic financial and real sector. Emerging economies have generally little power to affect global financial conditions and recent research has emphasized the role of capital controls particularly for small open economies in reducing extensive volatility in domestic macroeconomic variables (Bianchi, 2011,Korinek, 2018, Mendoza, 2018).

Our findings provide several new insights: First, we show that exchange rate regimes matter. A floating exchange rate reduces the propagation on domestic financial variables and output. While this has been verified in Obstfeld et al. (2017) as well, our dynamic approach via impulse response functions reveals that stabilization gains are in fact substantially larger than previously perceived due to the high persistence in macroeconomic variables. As such gains from a floating exchange rate do not fully materialize in the initial period.

Subsequently, we turn attention to capital controls. This paper is to our knowledge the first paper that analyzed insulation properties of capital controls onto domestic financial and real variables for a broad set of emerging markets. Overall we find similar results as for the choice of the exchange rate regime. Hence floating exchange rates and capital controls are about equally effective. Capital controls reduce negative spillovers of global financial shocks, but once again the gains unfold over multiple periods, which strongly supports our dynamic approach. This may induce a trade-off for policymakers, who have to give up the benefits of fixed exchange rates or open capital markets while gains from floating exchange rates and capital controls are small at first.

We would like to stress that our classification into the different regimes is continuous. As such, middle ground exchange rate or capital control choices are not excluded from the sample. The results are thus conservative.

Given the relevance of capital control choices and exchange regimes, it is suggestive to analyze potential synergies. For the first time, this paper analyzes whether a second layer of insulation, i.e. a floating exchange rates with existing capital controls, or capital controls conditioning on a floating exchange rate, provide additional stabilization benefits for EMEs subject to global financial shocks. We find evidence against pronounced synergies. One layer seems sufficient. Countries with floating exchange rates do not benefit greatly from additional capital controls and countries with capital controls do not have to abandon their peg to further stabilize the domestic financial and real economy. Results are somewhat different for stock markets where we observe synergies between policy choices.

It remains an interesting avenue for future research to explain the reasoning behind the weak impact of a second layer. In this paper, we argue that the stance of monetary autonomy matters only to a certain degree. Some monetary independence via either channel is consistent with the dampening response of the domestic economy. More independence via a second layer has a small effect which suggests a pivotal point for the relevance of monetary independence in stabilizing the economy. Thus policy makers can chose between either a floating exchange rate or sufficient capital controls and maintain open capital markets or a peg.

# A Appendix

## List of Countries

**Table A1:** Country Classification

| | | | | | |
|---|---|---|---|---|---|
| **Developing countries** | | | | | |
| Argentina | Costa Rica | Kuwait | Oman | Romania | Uganda |
| Bahrain | Egypt | Lebanon | Pakistan | Russia | Ukraine |
| Brazil | Hungary | Malaysia | Panama | Saudi Arabia | United Arab Emirates |
| Bulgaria | India | Mauritius | Peru | South Africa | Venezuela |
| Chile | Indonesia | Mexico | Philippines | Sri Lanka | Zambia |
| China | Jamaica | Morocco | Poland | Thailand | |
| Colombia | Kazakhstan | Nigeria | Qatar | Turkey | |
| **Developed countries** | | | | | |
| Australia | Denmark | Iceland | Malta | Slovenia | United States |
| Austria | Finland | Ireland | Netherlands | South Korea | |
| Belgium | France | Israel | New Zealand | Spain | |
| Canada | Germany | Italy | Norway | Sweden | |
| Cyprus | Greece | Japan | Portugal | Switzerland | |
| Czech Republic | Hong Kong | Latvia | Singapore | United Kingdom | |

## Variables and Data Sources

*Stock market indices:* Daily quotes from Bloomberg. The daily quotes are averaged over each quarter and deflated by the quarterly domestic CPI. We compute quarter-on-quarter growth rates (returns) of the deflated series. The variable is smoothed by taking the three-month moving average.

*Housing price indices:* Monthly and quarterly series from BIS. BIS reports multiple series per country. We chose quarterly series with the highest coverage and combine them with monthly data if quarterly series are not available. Monthly series are averaged over each quarter. The series are deflated by the quarterly domestic CPI. We compute quarter-on-quarter growth rates (returns) of the deflated series. The variable is smoothed by taking the three-month moving average.

*Total credit to the non-financial sector:* Nominal (local currency) quarterly series from BIS. The variable is deflated by the quarterly domestic CPI. We compute quarter-on-quarter growth rates of the deflated series. The variable is smoothed by taking the three-month moving average.

*VIX, VSTOXX, Nikkei 225 VI, VFTSE:* Daily quotes from Bloomberg. The daily quotes are averaged over each quarter.

*Exchange rate classification:* Monthly data obtained from Carmen Reinhart's website. We use the classification at the end of each quarter and reclassify the original scheme according to the criteria presented in Table A2. The last two categories are excluded due to the low number of occurrences. On-off alignments with a duration of less or equal to a year are treated as if the previous regime prevailed. All observations with a regime change in the last or next 2 years are dropped.

**Table A2:** Exchange Rate Regime Classification

| This Paper | Ilzetzki et al. (2017) Classification |
|---|---|
| 1 | No separate legal tender |
| 1 | Pre announced peg or currency board arrangement |
| 1 | Pre announced horizontal band that is narrower than or equal to +/-2% |
| 1 | De facto peg |
| 1 | Pre announced crawling peg |
| 1 | Pre announced crawling band that is narrower than or equal to +/-2% |
| 1 | De facto crawling peg |
| 1 | De facto crawling band that is narrower than or equal to +/-2% |
| 2 | Pre announced crawling band that is wider than or equal to +/-2% |
| 2 | De facto crawling band that is narrower than or equal to +/-5% |
| 2 | Moving band that is narrower than or equal to +/-2% |
| 2 | Managed floating |
| 2 | Freely floating |
| - | Freely falling |
| - | Dual market in which parallel market data is missing |

*Capital Controls:* Annual data from Fernández et al. (2015). The average over all asset classes is split into two categories. We classify an observation as an closed economy if it is above the median (pooled over EMEs and time), otherwise the observation is treated as a open economy. The annual data is transformed into quarterly data by assuming no regime change within a year. All observations with a regime change in the last or next 2 years are dropped.

*GDP:* Quarterly series in national currency from the IMF's International Financial Statistics and OECD. The series are deflated by domestic CPI. We compute quarter-on-quarter growth rates of the deflated series. The variable is smoothed by taking the three-month moving average.

*CPI:* Quarterly series from the IMF's International Financial Statistics (IFS). The consumer price index for Argentina is downloaded from the Argentinian Statistical Office (INDEC).

*Federal Funds Rate and Shadow Rate:* Monthly series from Wu and Xia (2016). We compute quarterly averages and replace the federal funds rate with the shadow rate if the funds rate is constrained by the zero lower bound.

*Country Classification:* The classification into AEs and EMEs follows the convention in the International Monetary Funds World Economic Outlook database.

## Regression Tables

**Table A3:** Float vs. Peg: Full Set of Control Variables

| | Stock | Housing | Credit | GDP |
|---|---|---|---|---|
| h=0 | -0.82 | -0.39** | 0.12 | -0.26 |
| | 0.52 | 0.15 | 0.18 | 0.18 |
| | df=549 | df=303 | df=675 | df=674 |
| h=4 | -3.98*** | -1.05*** | 0.03 | 0.39 |
| | 0.74 | 0.40 | 0.18 | 0.46 |
| | df=501 | df=256 | df=615 | df=610 |
| h=8 | -2.09** | -1.36*** | -0.24 | 0.66 |
| | 1.01 | 0.51 | 0.20 | 0.57 |
| | df=457 | df=214 | df=562 | df=553 |
| FE | Yes | Yes | Yes | Yes |
| Quarter-Year FE | Yes | Yes | Yes | Yes |
| FFR | Yes | Yes | Yes | Yes |
| GDP | Yes | Yes | Yes | Yes |
| Credit | Yes | Yes | Yes | Yes |
| No. of Countries | 14 | 14 | 16 | 16 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock index return, real housing index return, real credit growth and GDP growth between floating and pegging countries. The sample is restricted to EMEs. Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A4:** Float vs. Peg: Wide Country Coverage

| | Stock | Housing | Credit | GDP |
|---|---|---|---|---|
| h=0 | -0.46 | -0.53*** | 0.06 | -0.13 |
| | 0.33 | 0.17 | 0.11 | 0.18 |
| | df=2066 | df=590 | df=900 | df=1451 |
| h=4 | -0.82** | -1.36*** | -0.02 | 0.44 |
| | 0.38 | 0.33 | 0.11 | 0.59 |
| | df=1918 | df=519 | df=836 | df=1319 |
| h=8 | 0.05 | -0.53** | -0.14 | 0.63 |
| | 0.53 | 0.25 | 0.15 | 0.58 |
| | df=1773 | df=456 | df=779 | df=1196 |
| FE | Yes | Yes | Yes | Yes |
| Quarter-Year No | No | No | No | No |
| FFR | No | No | No | No |
| GDP | No | No | No | No |
| Credit | No | No | No | No |
| No. of Countries | 37 | 19 | 16 | 31 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock index return, real housing index return, real credit growth and GDP growth between floating and pegging countries. The sample is restricted to EMEs. Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A5:** Closed vs. Open: Full Set of Control Variables

| | Stock | Housing | Credit | GDP |
|---|---|---|---|---|
| h=0 | 0.29 | 0.10 | 0.10 | 0.58** |
| | 0.36 | 0.20 | 0.10 | 0.29 |
| | df=532 | df=291 | df=628 | df=627 |
| h=4 | -0.74 | 0.46** | 0.14 | 0.08 |
| | 0.65 | 0.22 | 0.12 | 0.35 |
| | df=481 | df=240 | df=567 | df=562 |
| h=8 | -0.70 | 0.21 | 0.27* | 0.18 |
| | 0.74 | 0.30 | 0.15 | 0.17 |
| | df=434 | df=192 | df=508 | df=499 |
| FE | Yes | Yes | Yes | Yes |
| Quarter-Year FE | Yes | Yes | Yes | Yes |
| FFR | Yes | Yes | Yes | Yes |
| GDP | Yes | Yes | Yes | Yes |
| Credit | Yes | Yes | Yes | Yes |
| No. of Countries | 14 | 14 | 16 | 16 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock index return, real housing index return, real credit growth and GDP growth between closed and open countries. The sample is restricted to EMEs. Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A6:** Closed vs. Open: Wide Country Coverage

| | Stock | Housing | Credit | GDP |
|---|---|---|---|---|
| h=0 | 0.46 | 0.35 | 0.01 | 0.12 |
| | 0.49 | 0.22 | 0.12 | 0.17 |
| | df=2093 | df=610 | df=853 | df=1456 |
| h=4 | 0.98** | 0.65*** | 0.05 | -0.07 |
| | 0.47 | 0.25 | 0.11 | 0.32 |
| | df=1930 | df=535 | df=788 | df=1311 |
| h=8 | 0.29 | 0.50*** | 0.21 | 0.14 |
| | 0.69 | 0.25 | 0.14 | 0.18 |
| | df=1790 | df=463 | df=725 | df=1187 |
| FE | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | No | No |
| FFR | No | No | No | No |
| GDP | No | No | No | No |
| Credit | No | No | No | No |
| No. of Countries | 37 | 19 | 16 | 31 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock index return, real housing index return, real credit growth and GDP growth between closed and open countries. The sample is restricted to EMEs. Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A7:** Stock - Peg vs. Float: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | closed | all countries |
| h=0 | 0.24 | -0.87 | -0.49 | -0.07 | -1.17*** | -0.23 |
| | 0.60 | 0.74 | 0.57 | 0.11 | 0.38 | 0.21 |
| | df=1060 | df=162 | df=505 | df=478 | df=615 | df=2306 |
| h=4 | 0.49 | -0.33 | -0.67 | -0.08 | -2.60*** | -0.44* |
| | 0.89 | 1.04 | 0.75 | 0.15 | 0.76 | 0.24 |
| | df=953 | df=131 | df=434 | df=411 | df=532 | df=2131 |
| h=8 | -0.09 | -4.66*** | -0.10 | -0.07 | -1.54* | 0.09 |
| | 0.67 | 1.32 | 0.76 | 0.13 | 0.85 | 0.36 |
| | df=857 | df=108 | df=373 | df=351 | df=460 | df=1966 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 25 | 7 | 18 | 18 | 20 | 45 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock market return between pegging and floating economies. The sample is restricted to EMEs (except column 6) and to either open or closed economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A8:** Stock - Closed vs. Open: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | float | all countries |
| h=0 | 0.18 | -1.01 | -0.08 | -0.02 | 0.57** | -0.13 |
| | 0.55 | 1.54 | 0.70 | 0.15 | 0.25 | 0.52 |
| | df=1458 | df=250 | df=761 | df=654 | df=362 | df=1883 |
| h=4 | 0.61 | -2.81** | -1.27 | -0.21 | 0.12 | -0.67 |
| | 0.67 | 1.36 | 0.88 | 0.18 | 0.43 | 0.65 |
| | df=1315 | df=210 | df=660 | df=576 | df=299 | df=1705 |
| h=8 | -0.00 | 0.35 | -2.08* | -0.37* | -0.19 | -1.32* |
| | 0.74 | 1.37 | 1.08 | 0.22 | 0.60 | 0.79 |
| | df=1186 | df=174 | df=567 | df=495 | df=247 | df=1535 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 31 | 8 | 24 | 24 | 14 | 43 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real stock index return between closed and open economies. The sample is restricted to EMEs (except column 6) and to either pegging or floating economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A9:** Housing - Peg vs. Float: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | closed | all countries |
| h=0 | -0.81*** | 0.43 | -1.11*** | -0.25*** | -0.23 | -0.18*** |
| | 0.29 | 0.35 | 0.27 | 0.05 | 0.15 | 0.06 |
| | df=243 | df=112 | df=148 | df=148 | df=213 | df=1540 |
| h=4 | -2.23*** | -2.17*** | -2.43*** | -0.50*** | -0.25 | -0.59*** |
| | 0.46 | 0.45 | 0.49 | 0.12 | 0.23 | 0.08 |
| | df=204 | df=89 | df=117 | df=117 | df=167 | df=1390 |
| h=8 | -0.49 | -0.74* | -0.70* | -0.14 | -0.58* | -0.22* |
| | 0.40 | 0.43 | 0.39 | 0.09 | 0.31 | 0.13 |
| | df=172 | df=70 | df=94 | df=94 | df=126 | df=1250 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 11 | 7 | 10 | 10 | 13 | 40 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real housing index return between pegging and floating economies. The sample is restricted to EMEs (except column 6) and to either open or closed economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A10:** Housing - Closed vs. Open: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | float | all countries |
| h=0 | 0.73* | -0.28 | 0.88** | 0.19** | 0.12 | 0.13 |
| | 0.41 | 0.38 | 0.44 | 0.09 | 0.25 | 0.16 |
| | df=260 | df=99 | df=159 | df=159 | df=221 | df=915 |
| h=4 | 1.56*** | 0.99 | 1.65*** | 0.32*** | -0.34** | -0.11 |
| | 0.44 | 0.70 | 0.49 | 0.11 | 0.17 | 0.30 |
| | df=216 | df=79 | df=125 | df=125 | df=167 | df=805 |
| h=8 | 0.41 | 0.37 | 0.25 | 0.04 | -0.16 | -0.49 |
| | 0.48 | 0.47 | 0.30 | 0.06 | 0.15 | 0.36 |
| | df=172 | df=59 | df=92 | df=92 | df=125 | df=691 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 11 | 6 | 10 | 10 | 14 | 32 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real housing index return between closed and open economies. The sample is restricted to EMEs (except column 6) and to either pegging or floating economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A11:** Credit - Peg vs. Float: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | closed | all countries |
| h=0 | -0.15 | -0.11 | -0.24 | -0.10 | 0.08 | 0.03 |
| | 0.22 | 0.22 | 0.27 | 0.06 | 0.17 | 0.05 |
| | df=219 | df=216 | df=139 | df=139 | df=443 | df=1815 |
| h=4 | -0.80** | -0.83*** | -0.53 | -0.08 | -0.06 | 0.04 |
| | 0.34 | 0.27 | 0.57 | 0.11 | 0.22 | 0.05 |
| | df=176 | df=173 | df=102 | df=103 | df=371 | df=1676 |
| h=8 | -0.66** | -0.60* | -0.33 | -0.08 | -0.52*** | -0.11** |
| | 0.30 | 0.31 | 0.35 | 0.09 | 0.16 | 0.05 |
| | df=145 | df=142 | df=79 | df=80 | df=317 | df=1549 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 9 | 9 | 9 | 9 | 16 | 35 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real credit growth between pegging and floating economies. The sample is restricted to EMEs (except column 6) and to either open or closed economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A12:** Credit - Closed vs. Open: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | float | all countries |
| h=0 | 0.44** | 0.46** | 0.23 | 0.10 | 0.12 | -0.02 |
| | 0.19 | 0.24 | 0.21 | 0.08 | 0.10 | 0.08 |
| | df=366 | df=286 | df=209 | df=161 | df=329 | df=1184 |
| h=4 | 0.57* | 0.52* | 0.27 | -0.09 | 0.24** | -0.16 |
| | 0.30 | 0.31 | 0.37 | 0.10 | 0.12 | 0.13 |
| | df=320 | df=240 | df=167 | df=129 | df=274 | df=1078 |
| h=8 | 0.50** | 0.15 | 0.72** | 0.09 | 0.09 | -0.31 |
| | 0.25 | 0.29 | 0.35 | 0.10 | 0.13 | 0.21 |
| | df=276 | df=196 | df=127 | df=97 | df=230 | df=972 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 10 | 10 | 10 | 10 | 13 | 28 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real credit growth between closed and open economies. The sample is restricted to EMEs (except column 6) and to either pegging or floating economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A13:** GDP - Peg vs. Float: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | closed | all countries |
| h=0 | -0.01 | -0.76 | -0.15 | -0.01 | -0.14 | -0.04 |
| | 0.24 | 0.53 | 0.18 | 0.04 | 0.28 | 0.08 |
| | df=672 | df=216 | df=593 | df=536 | df=684 | df=2642 |
| h=4 | -0.32 | -0.77 | -0.31 | -0.05 | 0.84 | -0.21** |
| | 0.29 | 0.57 | 0.23 | 0.05 | 0.79 | 0.10 |
| | df=577 | df=173 | df=502 | df=452 | df=581 | df=2428 |
| h=8 | -0.52* | -0.07 | -0.52*** | -0.11 | 1.25 | -0.18** |
| | 0.28 | 0.60 | 0.19 | 0.03 | 0.85 | 0.09 |
| | df=500 | df=142 | df=429 | df=384 | df=496 | df=2235 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 21 | 9 | 21 | 21 | 23 | 52 |

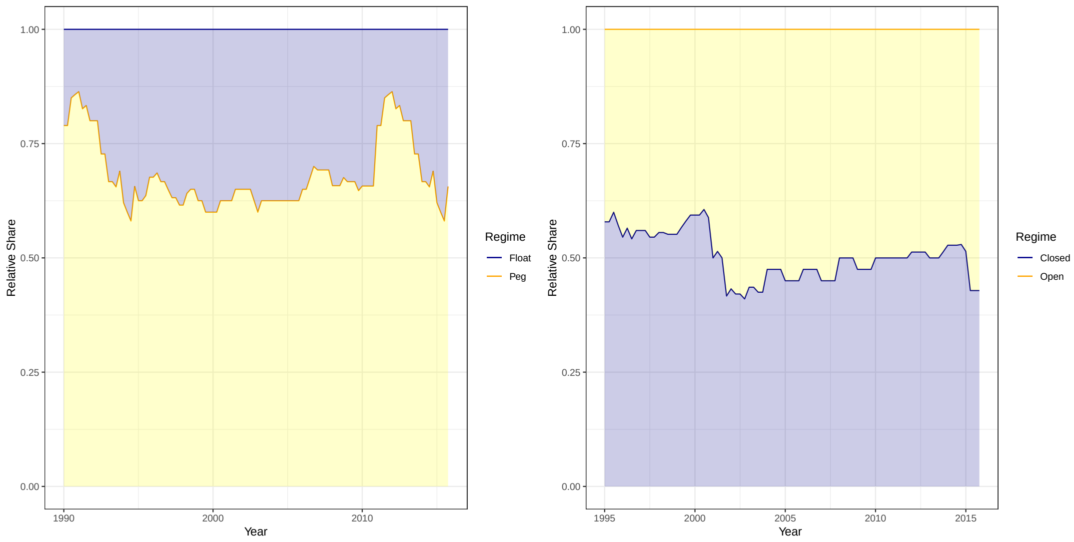
***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real GDP growth between pegging and floating economies. The sample is restricted to EMEs (except column 6) and to either open or closed economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

**Table A14:** GDP - Closed vs. Open: Subsample Analysis

| | Model 1 | Model 2 | Model 3 | | | |
|---|---|---|---|---|---|---|
| | | | baseline | PC | float | all countries |
| h=0 | -0.04 | 0.54 | -0.02 | -0.02 | 0.54 | 0.06 |
| | 0.22 | 0.53 | 0.19 | 0.04 | 0.62 | 0.17 |
| | df=903 | df=286 | df=824 | df=687 | df=458 | df=2097 |
| h=4 | 0.21 | 0.52 | 0.18 | 0.02 | -0.25 | 0.19 |
| | 0.24 | 0.47 | 0.24 | 0.05 | 0.47 | 0.16 |
| | df=778 | df=240 | df=703 | df=591 | df=379 | df=1895 |
| h=8 | 0.25 | 0.21 | 0.26 | 0.03 | -0.41* | 0.26 |
| | 0.27 | 0.52 | 0.28 | 0.06 | 0.22 | 0.20 |
| | df=662 | df=196 | df=591 | df=495 | df=315 | df=1702 |
| FE | Yes | Yes | Yes | Yes | Yes | Yes |
| Quarter-Year FE | No | No | Yes | Yes | Yes | Yes |
| FFR | No | Yes | Yes | Yes | Yes | Yes |
| GDP | No | Yes | Yes | Yes | Yes | Yes |
| Credit | No | Yes | No | No | No | No |
| No. of Countries | 26 | 9 | 26 | 26 | 17 | 49 |

***Notes:*** This table shows the results for the difference in the impulse response function of a one standard deviation shock to ln(VIX) on the real GDP growth between closed and open economies. The sample is restricted to EMEs (except column 6) and to either pegging or floating economies (column 5 only). Standard errors are reported in parenthesis and account for serial as well as cross-sectional correlation (Driscoll-Kraay standard errors). Stars indicate significance levels (*10%, **5%, ***1%) and df represents degrees of freedom.

# Figures

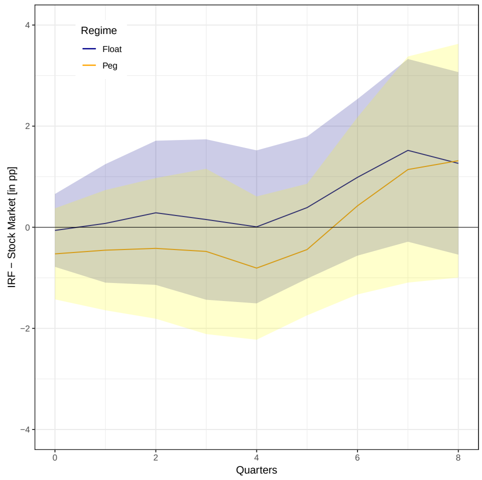



(a) Exchange Rate Classification

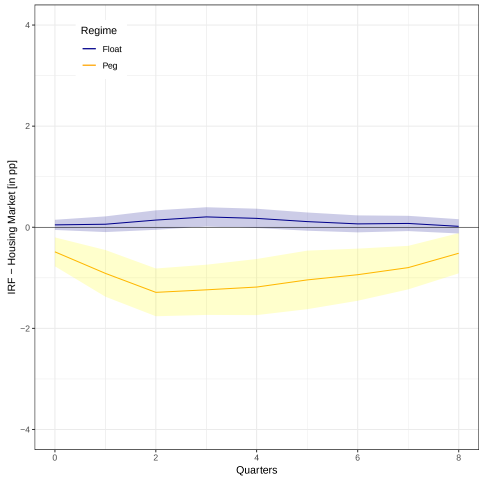
(b) Capital Control Classification

Figure A1: Share of exchange rate and capital control regimes among EMEs

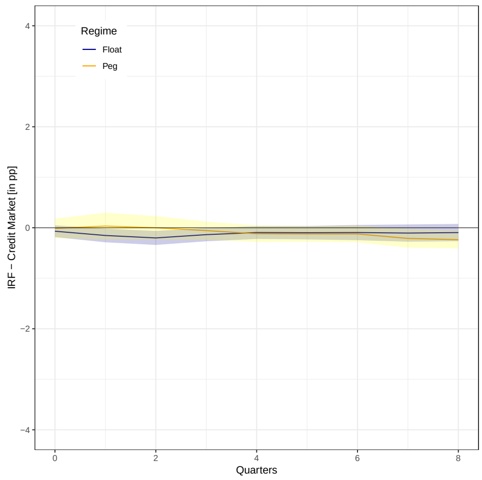
***Notes:*** Classification as described in the text.



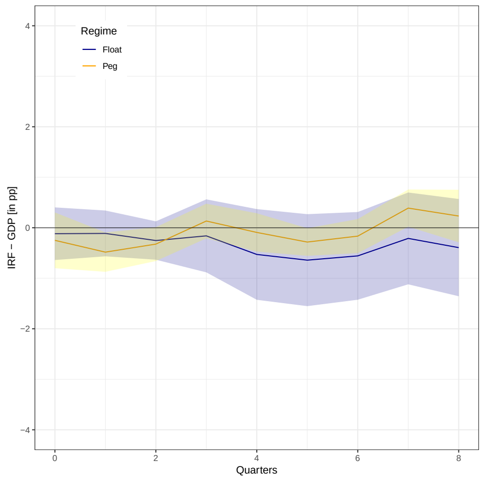

(a) Stock




(b) Housing



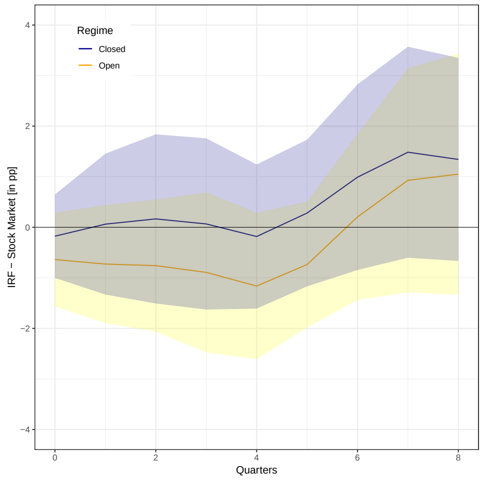

(c) Credit



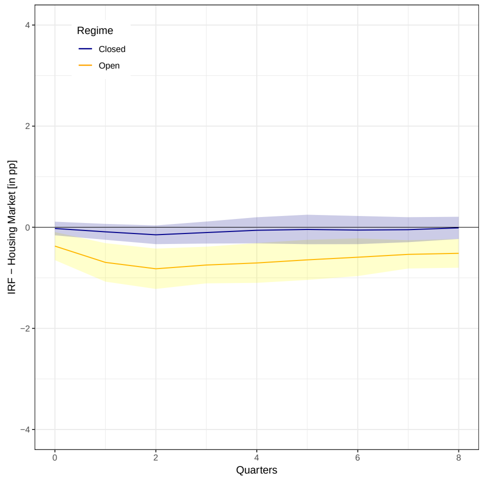

(d) GDP

Figure A2: IRF: One standard deviation shock to ln(VIX) - peg vs. float

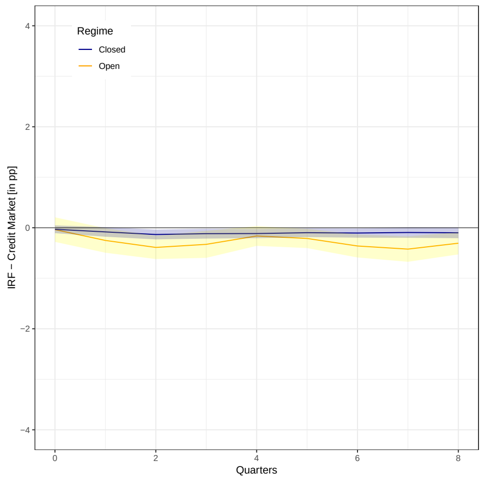
***Notes:*** Impulse response functions of a one standard deviation shock to ln(VIX) on real stock market returns, real housing market returns, real credit growth and GDP growth in EMEs with 90% confidence bands. The impulse response functions depict the impact on floating and pegging countries. The model specification is available in Table A4.



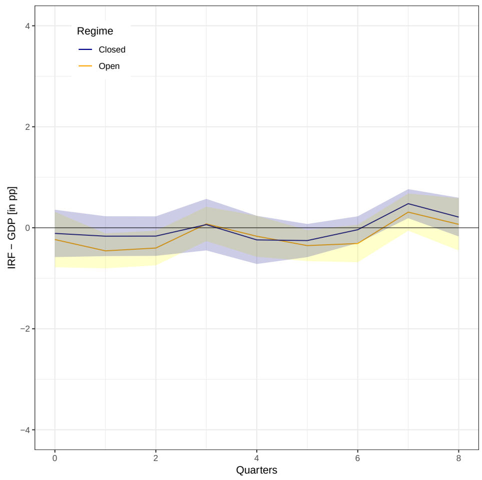

(a) Stock




(b) Housing




(c) Credit




(d) GDP

Figure A3: IRF: One standard deviation shock to ln(VIX) - closed vs. open

***Notes:*** Impulse response function of a one standard deviation shock to ln(VIX) on real stock market returns, real housing market returns, real credit growth and GDP growth in EMEs with 90% confidence bands. The impulse response functions depict the impact on countries with and without capital controls.The model specification is available in Table A6.

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