Job Market Paper: Capital flows to emerging market economies: the role of financial development

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Abstract

Existing literature suggests empirically that financial development is of little importance in driving capital inflows to the emerging market economies (EMEs) in linear models. Based on a simple portfolio-balance model, however, I show that global financial conditions, especially global risk aversion, affect capital inflows to EMEs in a nonlinear way and the magnitude of the effect is conditional on the level of financial development in those EMEs. The intuition behind is that financial development substantially reduces information asymmetry and risk so that foreign investors would like to accept a lower interest differential and increase their investments in better developed financial markets when global risk aversion is low. To test the empirical validity of the findings, I conduct fixed effect estimations based on quarterly data of 25 EMEs for the period 1995-2016 and the results generally support the theoretical implications. They suggest the following: (1) Exchange rate regimes do positively affect the magnitude of capital inflows to EMEs, but the effect is limited to foreign direct investments; (2) A higher level of financial development is associated with a larger sensitivity of capital inflows to global financial conditions. This is especially true with credit and portfolio equity inflows; (3) Among different aspects of financial markets and institutions, their depth and efficiency are particularly important when investors make decisions on credit and portfolio equity investments, while better financial markets access makes investments in portfolio debt more attractive.

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1 Introduction

In the aftermath of the Great Recession, expansionary monetary policy in the industrialized countries, especially the Quantitative Easing (QE) programs launched by the US central bank, triggered a wave of capital flows to emerging markets and developing countries. This has caused serious concerns of policymakers in those recipient countries. On the one hand, massive inflows increase the risk of financial market instability and challenge the effectiveness of domestic policy tools against the impact. Gourinchas and Obstfeld (2012) and Schularick and Taylor (2012) found substantial increases in capital inflows and the resulting exchange rate appreciations are significant predictors of financial crises in both emerging and advanced economies. On the other hand, potential future outflows led by changing global financial conditions could provoke even severer and more far-reaching consequences on the domestic economy, especially for the emerging market economies (EMEs) with a relatively fragile financial system.

Meanwhile, if we narrow down to the picture of capital inflows to EMEs, the inflows surged dramatically since the beginning of the 2000s and peaked right before the financial crisis. During the crisis, it even ran into negative in the third quarter of 2008 due to the massive evacuation of foreign investors for several reasons. As the US launched the QE programs, it surged again until the third quarter of 2014 when the FED announced to stop its asset purchases. Since then, the EMEs have experienced a sharp reduction in capital inflows. As documented in Calvo et al. (1996), global factors, such as a cyclical component in interest rates, lead to the repeated booms and busts in capital inflows. Recent studies by Miranda-Agrippino and Rey (2015), Rey (2015) and Bruno and Shin (2015) suggest that the global risk aversion affected by the US monetary policy is among the main driving forces of the global financial cycle (GFC). As shown in Figure 1, it is obvious that capital inflows to the EMEs are strongly negatively correlated with the global risk aversion proxied by the volatility index of CBoE, VIX. As argued in Rey (2015), when global risk aversion is high (high VIX), investors are reluctant to invest in emerging markets; while their willingness to invest recovers when the risk and uncertainty decline. Although the strong negative correlation has weakened in the most recent years, it is still quite significant.

At the country level, the inflows aren't distributed evenly among EMEs, although the aggregate flows are massive (see Figure 2). Some countries attract far more capital inflows during the boom periods while also lose more during the bust periods than the other countries. In other words, capital inflows in some countries are more sensitive to changes in VIX than those in other countries. There seems to be a black box of domestic country-specific features that translate the global financial cycle into different magnitudes of capital inflows to individual emerging markets. Therefore, it is worthy of understanding what domestic factors lead to the heterogeneity in capital flow sensitivity to global financial conditions.

The research on the determinants of capital flows is not new and there have been already many studies, both empirically and theoretically, working on this topic since the 1990s. They characterize the global and domestic drivers as "pull" and "push" factors. A "pull" factor describes the domestic forces that attract foreign capital to flow into a country while a "push" factor refers to global forces that push foreign capital into a country. The seminal works done by Calvo et al.(1993,1996) and Fernandez-Arias (1996) find that the global factors, i.e. the "push" factors, are of great importance in determining capital inflows to the emerging markets since foreign investors are more sensitive to changes in the global conditions than to changes in domestic conditions. Based on a factor model, Fratzscher (2012) reconfirms that the "push" factors are the main drivers of high-frequency portfolio capital flows during crisis events and in the recovery while country-specific "pull" factors dominate the dynamics of global capital flows in 2009 and 2010, especially in the emerging markets. More recently, Forbes and Warnock (2012) shows that global factors, especially global risk, are significantly associated with extreme capital flows episodes. Bruno and Shin (2015) finds that through a risk-taking channel a tightening in US monetary policy forces the banking sector to deleverage and thus leads to a decrease in cross-border banking flows. Besides, they also highlight the value of the U.S. dollar as a bellwether for global financial conditions. In line with these, Miranda-Agrippiono and Rey (2015), Passari and Rey (2015) and Rey(2015) find that there exists a global factor that can explain a large share of variations in the returns of global risky assets and their co-movement with gross capital flows and banking leverages. They argue that such co-movement reflects the time-varying degree of global risk aversion which is indeed driven by changes in the U.S. monetary policy. Rey (2015), in particular, shows the monetary policy "trilemma" morphs into a "dilemma" and the global financial cycle constrains national monetary policy independence regardless of the exchange rate regime as long as capital is allowed to move freely across borders.

There are also studies support the importance of the domestic "pull" factors, or they are at least as important as the global "push" factors. The seminal work by Chuhan et al. (1998) analyses the large equity and bond flows to a number of developing countries in the 1990s and finds domestic factors are at least as important as the global factors, especially for Asian countries. Griffin et al. (2004) finds that equity flows are positively related to host-country stock returns as well as its market performance abroad and confirms the importance of both "push" and "pull" factors in cross-border equity flows. More recently, Ahmed and Zlate (2014) emphasizes the role of growth rate and policy rate differentials between EMEs and advanced economies as well as the global risk appetite as important drivers of net private capital inflows to the EMEs. Ghosh et al. (2014) analyses and differentiates the role of domestic and global factors in capital flows that the global forces act as a "gatekeeper" determining the occurrence of the surges while domestic factors affect the magnitude of these surges. In line with this idea, Obstfeld et al. (2019) reviews

the importance of the exchange rate regime in affecting the sensitivity of capital inflows to global risk and shows that the marginal effect of global risk aversion on capital inflows to the EMEs is dependent on the exchange rate regime. Under a fixed exchange rate regime, the inflows are more sensitive than under intermediate and floating regimes. Most recently, Cerutti et al. (2019) analyses the determinants of the sensitivity of capital inflows to global shocks and finds that EMEs relying more on global mutual funds are more sensitive in their gross equity and bond inflows. Besides, recipient market liquidity and inclusion in global market indices also increase the sensitivities. However, they find little robust evidence supporting the importance of institutional and macroeconomic fundamentals.

Based on the findings of existing literature, one can easily expect a non-linear effect of global shocks on capital flows. The domestic factors serve as filters that translate global capital inflow shocks into inflows to the EMEs with different magnitudes. This process is illustrated in Figure 3. Among the domestic factors, one under-explored is financial development. In existing studies on the determinants of capital flows, financial development is seldom in the spotlight of the research and serves rather as a control variable in a linear form (e.g. Ghosh et al. (2014) and Obstfeld et al. (2019)). This could lead to misleading results that financial development does not significantly matter to capital inflows, especially to the EMEs, since the effect could be non-linear[1]. Indeed, it could affect the sensitivity of capital inflows to global financial conditions by affecting the way foreign investors react to global financial shocks and thus affecting their resource allocation.

The paper addresses the question of whether financial development is important in explaining capital flows to EMEs and focuses on the non-linear effect of global financial conditions (proxied by VIX) on capital inflows to 25 EMEs with a heterogeneous level of financial development. To answer the question, I first look at the data and present a two-way scatter plot between financial development and the quarterly correlations of total capital inflows (in % of GDP) and log-VIX in Figure 4. The left panel is for the period 1995-2016 while the right panel for 2000-2016. The financial development is calculated as a simple average over the sample period. As we can see, there is a downward slope between these two variables (in both panels). This indicates that the higher the level of financial development is, the more negative is the correlation between capital inflows and VIX and the downward slope seems quite stable over time. Moreover, in both panels, there are some countries with positive correlations of capital inflows and VIX. This suggests there might exist a threshold level of financial development below which the correlations turn positive. To avoid the concern of potential outliers, I remove the points in the upper-left and lower-right

[1] In the conventional "push" vs."pull" framework, existing literature typically assume a linear effect of financial development on capital inflows and thus find insignificant effect of financial development, e.g. recent papers by Ghosh et al. (2014) and Obstfeld et al. (2017). Different than those, Nier et al. (2014) analyses the determinants of banking inflows by adding a bunch of interaction terms including that of VIX and financial development (proxied by private credit-to-GDP ratio) and finds that it's negatively significant.

corners. It turns out that even though the slope gets flatter, it remains to be downward.

Similarly, I do the same to different types of capital inflows to examine whether they exhibit different patterns. Figure 5 shows an evident and similar downward trend for credit and portfolio equity inflows. However, this is not the case for portfolio debt and FDI inflows. It is potentially because credit and portfolio equity investment requires a better functioning financial infrastructure that reduces information asymmetry and thus substantially lowers the costs and risk of these investments. To portfolio debt and foreign direct investments, factors other than financial development could be prevailing, such as firm-specific and sovereign risks, interest rates, real GDP growth, and exchange rate regimes. In addition, there exist potentially substitution effects among investments to different types of assets as the slopes for portfolio debt and FDI are slightly positive.

In sum, better financial development should be ultimately translated into lower information asymmetry and transaction costs so that both domestic and foreign investors would benefit from it and thus would be willing to accept a lower interest rate differential and invest more than in other countries. Therefore, with a better developed financial market, a country is expected to receive more investment in the boom periods. In the opposite scenario, i.e. in the burst periods, these countries probably also lose more capital inflows since foreign investors can easily escape to a considerable extent with the assets that they have built up before.

To motivate the empirical estimations, I exploit the portfolio balance model à la Blanchard et al. (2015) and extend it with financial development. The equilibrium results indicate that capital inflows tend to be larger for the EMEs with fixed exchange rate regimes and better developed financial markets in the face of a capital inflow shock triggered by lower global risk aversion. Then I test the model predictions empirically based on quarterly and annual data over 1995-2016 for 25 EMEs. The main findings are threefold: First, it generally supports the theoretical implication and suggests that capital inflows to EMEs with a fixed exchange rate regime and a better developed financial market are in general more sensitive to changes in global financial conditions, except for those countries with very barely developed financial markets.

Second, among different types of capital inflows, I find the importance of financial development on capital inflows is mainly driven by its importance on credit and portfolio equity inflows. This probably because these two types of investments require a well-functioning financial market with relatively lower information asymmetry and transaction costs. In addition, under a non-peg exchange rate regime, the sensitivity of credit inflows is found to be more than twice as large as that of portfolio equity inflows to global financial conditions. This is probably because credit is a state-contingent asset and is associated with relatively smaller risk than portfolio equity investments.

Third, among various aspects of the financial markets and institutions, I find that the signifi-

cance of financial development in explaining credit inflows is primarily contributed by the depth and efficiency of the financial markets (stock and bond markets). This is probably because stock and bond markets are nowadays strongly connected with banking sectors and the external credit demand is likely driven by the investment demand on domestic stock and bond markets. Besides, the significance of financial development on portfolio equity inflows comes from three sources– financial institutions depth, access, and financial markets depth. Notably, financial institutions' access has the opposite effect than the other aspects, i.e. countries with better access to financial institutions attract less portfolio equity inflows, even when global risk aversion is low. This might be driven by the substitution effect among financial products.

This paper contributes to the existing literature on the determinants of capital flows in two respects. First, it challenges the finding of the previous studies that financial development is of little importance in explaining capital inflows to the emerging markets. Second, existing literature generally uses conventional proxies for financial development and these variables give little qualitative information but only the size of the financial markets and institutions. We use both the aggregated financial development index and the sub-indexes constructed by the IMF which measure the depth, access, and efficiency of financial development. Based on these indicators we can analyze the financial market systemically by looking at different aspects of the development and examine in detail which aspect is more relevant to foreign investors.

This paper also closely relates to the recent "trilemma" vs. "dilemma" debate in international economics since monetary policy in the center country is transmitted globally primarily through international capital flows. The debate focuses on the importance of the exchange rate regime in maintaining monetary policy independence if a country allows free cross-border capital flows. Empirical researches, however, obtained so far discrepant results. The conventional "trilemma" view by Mundell (1963) and Fleming (1962) argues that flexible fluctuations in exchange rates help reduce foreign investors' incentives of arbitrage investments in the short run. This view is supported by a bunch of empirical studies such as Borenzstein (2001), Frankel et al. (2004), Shambaugh (2004), Bluedorn and Bowdler (2010), Ghosh et al. (2014), Magud et al.(2014), Klein and Shambaugh (2015), Georgiadis and Mehl (2015), Aizenmann et al. (2016), Caceres et al. (2016), Ricci and Shi (2016), Bekaert and Mehl (2017), Obstfeld et al. (2019). Obstfeld et al. (2019) reconfirms that flexible exchange rate regimes do play an important role in the sensitivity of capital inflows to the EMEs to VIX and in maintaining monetary policy independence. However, they don't find a significant difference between partially and fully flexible exchange rate regimes in explaining the magnitude of capital inflows.

The opposite opinion that exchange rate regimes don't matter for monetary policy independence is also supported by many empirical studies, e.g. Rey (2015, 2016), Edwards (2015), Hofmann and Takats (2015), Miranda-Agrippino and Rey (2015), Bruno and Shin (2015), Dedola

et al.(2015) and Anaya et al. (2017). Rey(2015), in particular, argues that it is a global factor that leads to a co-movement of capital flows, asset prices and leverage and the independence of monetary policies is possible if and only if capital mobility is controlled directly or indirectly. Therefore, their findings invalidate the conventional "trilemma" in reality and the policy "trilemma" morphs into a "dilemma".

As this paper includes exchange rate regimes in the analysis, the results tend to be in favor of the "trilemma" as I do find the importance of exchange rate regimes in explaining the magnitude of capital inflows to EMEs. However, further discussions on the "trilemma" vs. "dilemma" debate should be not only based on the estimations to inflows but also to outflows and net flows since the domestic financial conditions are affected by the net supply and demand of capital on the domestic market.

The rest of the paper is organized as follows: Section 2 presents a simple portfolio balance model extended with financial development and motivates the empirical analysis; Section 3 describes the empirical estimation methodology, data sources and presents the estimation results; Section 4 concludes.

2 A Simple Portfolio Balance Model

To motivate the empirical analysis on the effect of financial development on capital inflows to the EMEs, this section presents an extended version of the portfolio balance model suggested by Blanchard et al. (2015). The original model is aiming at analyzing the effectiveness of sterilized foreign exchange interventions. This model, however, focuses on financial development, especially how it affects capital inflows in the wake of global financial cycles. In our analysis, the specifications are explicitly made for emerging market economies since they are the main countries receiving large capital flows from advanced economies and have little impact on the financial conditions in the rest of the world. The balance of payment condition of a small open EME reads (BPM6):

$$CA_t = FA_t^{NR} + \Delta R_{t+1} \tag{1}$$

where CA_t and FA_t^{NR} represent the current accoun and the financial account without reserve assets in period t, respectively; ΔR_{t+1} denotes the changes in the reserve assets during period t. The capital account is assumed to be zero. The current account is a linear function of exchange rate fluctuations and is associated with a positive multiplier γ representing trade elasticity:

$$CA_t = \gamma e_t \tag{2}$$

The financial account without reserve assets is defined as the net incurrence of assets (A_t, outflows) minus the net incurrence of liabilities (L_t, inflows) during period t:

$$FA_t^{NR} = A_t - L_t \tag{3}$$

where A_t and L_t are assumed to be a linear function of deviations from the uncovered interest rate parity (UIP) and an exogenous capital inflow shock z_t driven by lower global risk aversions:

$$A_t = -\beta \left[i_t^H - i_t^F + e_t - e_{t+1}^e + \lambda |i_t^H - i_t^F| \right] - \rho z_t \tag{4}$$

$$L_t = \alpha \left[i_t^H - i_t^F + e_t - e_{t+1}^e + \lambda |i_t^H - i_t^F| \right] + z_t \tag{5}$$

where i_t^H and i_t^F are domestic and foreign interest rates in period t; e_t denotes the exchange rate at the beginning of period t; α and β measure the sensitivity of capital in- and outflows responding to deviations from UIP. Suppose domestic and foreign assets are imperfect substitutes so that α and β are positive and finite[2]. The parameter $\rho \in [-1, 1]$ reflects how reactive domestic investors are to the global inflow shock relatively to foreign investors (whose sensitivity is normalized to one). The sign of ρ depends on the relative behavior of domestic investors, i.e. ρ is negative if both domestic and foreign investors present "home bias" in their portfolio choice, while ρ is positive if both domestic and foreign investors move to the same destination. As it's found in Adler et al. (2015), domestic investors in EMEs do play an offsetting role in net capital flows. Therefore, ρ is very likely to be negative[3].

λ represents the level of financial development. It captures either financial frictions such as information asymmetry and transaction costs or the associated market risk that is hard to be diversified. Mendoza et al. (2009) argues that investors in financially developed countries are willing to invest more in risky assets as financial development allows for insurance against risk. In the face of a global inflow shock, an EME with a better developed financial market (higher λ) attracts more capital inflows than the other countries since investments are less costly and less risky. Therefore, foreign investors may request a lower interest rate differential given a higher level of financial development. In other words, financial development would either amplify a positive interest rate differential or make a negative one less negative. λ is assumed to lie in $[0, 1]$ so that a negative interest rate differential would not eventually turn positive as the level of financial development increases. In addition, the investment decision of domestic investors is also affected by the domestic level of financial development in the same manner. As the domestic

[2]In the case of infinite α and β, i.e. the domestic and foreign assets are perfect substitutes, then the UIP condition will hold.

[3]Note, this case might only apply to EMEs. Unlike the advanced economies, negative ρ may result from risk diversification incentives and the EMEs themselves are not a safe-haven. Although outflows are also observed in the data at the same time of inflows, they are less remarkable.

financial market develops further and allows for better risk diversification, domestic investors are also less motivated to invest abroad so that they would require a higher interest in foreign countries.

In response to the capital inflow shock, central banks in EMEs can adjust their policy rate and intervene on the foreign exchange (FX) market to curb the appreciation of the domestic currency:

$$i_t^H = i_t^F + \delta e_t \tag{6}$$

$$\Delta R_{t+1} = \theta(1+\rho)z_t \tag{7}$$

Equation (6) describes the response of domestic policy rate with $\delta > 0$. In response to a positive exchange rate appreciation ($e_t < 0$) driven by capital inflows, the central bank will lower its policy rate to mitigate its impact on the domestic economy. At the same time, the central bank can intervene on the FX market using its reserves ΔR_{t+1} (Equation (7)). θ measures the degree of central bank's intervention and it lies between 0 and 1, i.e. from zero to full intervention against the entire size of the shock $(1+\rho)z_t$ on net foreign asset position. For $\theta = 0$, the central bank doesn't intervene at all, it indicates the domestic economy under a flexible exchange rate regime. For $\theta = 1$, it intervenes on the FX market to the extent that the exchange rate is fully stabilized. In this case, the domestic economy runs under a fixed exchange rate regime.

Combining equation (1) - (7), the model yields the following solutions on exchange rate and capital inflow dynamics[4]:

$$e_t = -\frac{(1-\theta)(1+\rho)}{\gamma + (\alpha+\beta)[1+(1-\lambda)\delta - \phi]} z_t \tag{8}$$

$$L_t = \left[1 - \frac{\alpha(1-\theta)(1+\rho)[1+(1-\lambda)\delta - \phi]}{\gamma + (\alpha+\beta)[1+(1-\lambda)\delta - \phi]}\right] z_t \tag{9}$$

Equation (8) and (9) illustrate the dynamics of the exchange rate and capital inflows as a linear function of the exogenous capital inflow shock. Under a non-peg exchange rate regime ($\theta \neq 1$), the domestic currency will appreciate in the face of exogenous capital inflow shock. The central bank can then intervene on the FX market and fully stabilize the exchange rate by setting $\theta = 1$. In this case, capital inflow is maximized and equal to the size of the exogenous shock. Therefore, the exchange rate regime that a country implements does matter to the magnitude of capital inflows. Besides, it is also traceable that with a higher λ the domestic currency appreciates more if the domestic central bank doesn't fully intervene in the FX market $\theta < 1$. This implies that the level of financial development could amplify the extent of exchange rate fluctuations due to a more

[4]This model also predicts the dynamics of outflows and net flows. Since I only focus on inflows, the other solutions are not presented here.

sensitive response of capital inflows to the exogenous shock driven by lower global risk aversion. This point is shown in equation (9) that gross capital inflows increase with λ. The comparative statics are illustrated in Figure 6.

Notably, the sign of capital inflows is subject to the value of parameters. It can be shown that for $\rho < 0$, i.e. both domestic and foreign investors exhibit a "home bias" in their portfolio choice, the marginal effect of the exogenous shock on capital inflows is strictly positive, even when the central bank doesn't intervene on the FX market at all. And with a higher λ, the marginal effect is larger. However, if $\rho > 0$, i.e. both domestic and foreign investors are affected by the shock and move to the same destination, there potentially exists a threshold level of financial development above which the marginal effect of the shock on capital inflows is positive[5].

It's also worth noticing that the role of financial development and exchange interventions are symmetric in the face of a global shock. In the opposite scenario when there is a negative capital inflows shock driven by increasing global risk aversion, foreign investors would then evacuate the country to a considerable extent. As they have already built up a higher level of asset holdings in financially better developed EMEs in boom periods before, a large scale reduction in liabilities is more likely compared with that in less developed financial markets. In a word, capital inflows in EMEs with better developed financial markets are expected to be more sensitive to changes in the global risk aversion in both directions.

In sum, the message taken away from this simple portfolio balance model is that not only a fixed exchange rate regime increases capital inflow sensitivity to global shocks in EMEs, also financial development significantly matters to the extent of capital inflows to EMEs since foreign investors would likely accept a lower interest differential in better developed financial markets due to fewer financial frictions and lower risk.

3 Empirical Analysis

Based on the implications of the theoretical model presented above, this section tests empirically whether there exists a non-linear effect of global shocks on the capital inflows to the emerging markets and whether the marginal effect depends on financial development and the exchange rate regime. To test the hypothesis, a standard capital flow regression is considered in line with previous studies including a bunch of classical determinants as control variables. Besides, an interaction term between the global risk aversion (VIX) and financial development/exchange rate regimes is added to capture the non-linear effect and test whether financial development matters upon the effect of exchange rate regimes.

[5] It can be shown, whether such a threshold $\bar{\lambda}$ exists depends on the value of ρ. If $\rho \geq \frac{\theta\alpha+\beta}{\alpha(1-\theta)} > 0$, then $\bar{\lambda} = \frac{(1+\delta-\phi)[\alpha(1-\theta)(1+\rho)-(\alpha+\beta)]-\gamma}{\alpha\delta(1-\theta)(1+\rho)-\delta(\alpha+\beta)}$ and for sufficiently small γ, $\bar{\lambda}$ could be positive.

3.1 Data and Methodology

As a standard way to analyze the heterogeneity of capital flows in the literature, panel fixed effect estimations are implemented based on quarterly data for the period 1995Q1 – 2016Q4 due to data availability. Both country and time fixed effects are considered since the global variables in the model may capture the effect of other global factors that are correlated with them. Clustered standard errors at the country level are used in consideration of serial correlations among the error terms. The sample contains 25 emerging market economies from Central and Latin America, Eastern Europe and East and South East Asia and is listed in Table 4 in Appendix. Methodologically, I combine the specifications used in Ahmed and Zlate (2014) and Obstfeld et al. (2019) and the following model is estimated:

$$\begin{aligned} CIF_{it} =& \beta_0 + c_i + \beta_1 FD_{i,t-1} + \beta_2 \ln(VIX_t) + \beta_3 FD_{i,t-1} * \ln(VIX_t) \\ &+ \beta_4 FIX_{it} + \beta_5 FIX_{it} * \ln(VIX_t) + \gamma' Z + \delta_t + \varepsilon_{it} \end{aligned} \tag{10}$$

where CIF_{it} is the private capital inflows to GDP ratio (total, credit, portfolio equity, portfolio debt and FDI from the Balance of Payments); c_i denotes the country-specific and time-invariant factor; FD is a measure of financial development. To mitigate the endogeneity issue, sufficient lags are used. VIX is the volatility index of CBoE, a proxy of the global risk aversions and global financial shocks; FIX is a dummy variable and equal to 1 if a country has a fixed exchange rate regime. It is assumed to be exogenous to capital inflows since it is persistent over time while capital inflows are quite volatile at a quarterly frequency; Z denotes a set of control variables; δ_t captures the time fixed effect and ε_{it} is a random error term. In this case, the marginal effect of the global risk aversions reads:

$$\frac{\partial CIF_{it}}{\partial \ln(VIX)_t} = \beta_2 + \beta_3 FD_{i,t-1} + \beta_5 FIX_{it} \tag{11}$$

As the theoretical model implies, the marginal effect of lower global risk aversions on capital inflows is increasing with the central bank's FX intervention and the level of financial development. Therefore, β_3 and β_5 are expected to be negative. However, it's not obvious whether β_2 is positive or negative. If there exists a threshold level of financial development above which the marginal effect of VIX is negative, then β_2 has to be positive.

In the existing literature, the conventional proxies for financial development are the stock market capitalization-to-GDP ratio and private credit-to-GDP ratio. These indicators tell little of the qualitative development but the size of the financial markets and institutions in terms of GDP. They are not sufficiently informative and often fluctuate with cross-border capital flows endogenously. In this paper, I use the Financial Development Indexes from the IMF[6]. Table

[6]For more details, see IMF(2016)

1 shows a detailed structure of the indexes and their data sources. One of the most obvious advantages of these indexes is that they not only provide an aggregate index of the overall level of financial development but also a separate index for each aspect of the financial markets and institutions that are used to generate the aggregate one. Therefore, the aggregate index does not measure one single aspect of financial development as the conventional measures but gives more comprehensive information for cross-country comparison.

Moreover, the sub-indexes allow us to examine how different aspects (depth, access, and efficiency) of the financial markets' and institutions' development affect total capital flows and which aspects are more important in attracting which types of flows. Furthermore, there could also be potential "crowding-out" effect of capital flows from one type to another due to marginal changes in a certain aspect of financial development. Therefore, a closer look at different aspects of financial market development is necessary.

To control for other fundamental characteristics of a country's economic environment, a set of control variables is chosen containing the classical determinants such as real GDP growth rate and interest rate differentials à la Ahmed and Zlate (2014), de-facto exchange rate regime dummy and institutional quality à la Obstfeld et al.(2019). In addition, several other variables are added to the analysis, such as financial openness, sovereign risk and a dummy of financial structure and the US real effective exchange rate. A higher degree of financial openness indicates a country with fewer restrictions on capital flows and thus it is expected to receive more capital inflows in boom periods. Besides, a higher level of sovereign risk indicates investments in a country are riskier, thus less capital would probably flow into this country unless it promises a sufficiently high return. Besides, a dummy of financial system structure is added to capture the non-linearity among countries. A country with a bank-based financial system is expected to receive more banking flows such as credit inflows, while a stock-market-based financial system probably receives more portfolio investments. Last but not least, the real US effective exchange rate is to capture the balance-sheet effect of the EMEs' borrowers as well as global financial conditions[7]. A detailed data description and sources are listed in Table 3 and the summary statistics in Table 4.

3.2 Core Results

This section focuses on the overall level of financial development and how it affects total capital inflows. The aggregated index of financial development from the IMF is adopted and the results are presented in Table 5. As shown in Figure 1 that gross capital inflows to EMEs are strongly negatively correlated with the global risk aversion, the coefficient on VIX in col. (1) comes with the expected negative sign and is statistically significant if only a linear effect is considered. Rey (2015) argues that there is a negative correlation between cross-border capital flows and the

[7]Bruno and Shin (2015) finds the value of US dollar a very well indicator of global financial conditions.

global risk aversion as investors have a higher willingness to invest when the market risk is low. Besides, neither financial development nor exchange rate regime is statistically significant in a linear model. However, if the effects of VIX, financial development and exchange rate regimes are assumed to be nonlinear, i.e. interaction terms are added (col. (2)-(3)), financial development and exchange rate regimes turn to have a positive and significant direct effect on capital inflows. Moreover, for both periods, 1995-2016 and 2000-2016, the interaction terms are significant and come with the expected negative sign. However, the coefficient of VIX turns positive, although it's not significant anymore. Therefore, whether the marginal effect of VIX on capital inflows is positive or negative is jointly determined by the level of financial development and the exchange rate regime.

According to the results, the total marginal effect of VIX is significantly conditioned on the exchange rate regime and the level of financial development. Under a floating exchange rate regime ($FIX = 0$), there exists a threshold level of financial development (≈ 0.045) above which the absolute marginal effect of VIX increases with financial development. However, if we look at the summary statistics, the minimum level of FD used in the estimation is approx. 0.116 which is strictly larger than this threshold. This implies that for all the countries in the sample, the marginal effect of global risk aversion on capital inflow should be strictly negative and the magnitude of the impact is increasing with the level of financial development. In contrast, under an exchange rate peg, the marginal effect of global risk aversion is strictly negative, regardless of the level of financial development.

Quantitatively, the results predict that with an improvement of the financial development index by one standard deviation (≈ 0.12), the capital inflows to GDP ratio is likely to increase marginally by 1.296 percentage points for 1995-2016 (col. (2)) and by 1.3584 percentage points for 2000-2016 (col. (3)). Moreover, a pegged exchange rate regime also contributes to a higher absolute marginal effect by 7.056 and 6.866 percentage points for the period 1995-2016 and 2000-2016, respectively, than a floating regime.

Beyond country-fixed effects, time-fixed effects are considered since the VIX may capture the effect of other global factors. The results with time-fixed effects are presented in col. (4) and (5). As we see, the coefficients of the two interaction terms are similar to those without time-fixed effects in col. (2)-(3). Quantitatively, a higher level of financial development by one standard deviation leads to a marginal increase of capital inflows by 1.4844 and 1.5192 percentage points in response to a lower global risk aversion in the period 1995-2016 and 2000-2016, respectively. In addition, in the face of lower global risk aversions capital inflows increase marginally more under a fixed change rate by about 5.689 and 5.435 percentage points than under a floating regime in the period 1995-2016 and 2000-2016, respectively.

These results support our findings from the portfolio balance model that better financial de-

velopment in the EMEs increases the sensitivity of capital inflows to changes in global risk aversions. Moreover, the results also show that the sensitivity contributed by financial development is stronger in the new century than in the 1990s which is probably because global financial markets are nowadays more interconnected than in the 1990s and especially the EMEs are more connected to the advanced economies through trade and financial channels.

Regarding the other explanatory variables, public debt to GDP ratio, a proxy for sovereign risk, also matters through all the settings and is significantly negatively correlated with capital inflows. This suggests that higher sovereign risk is associated with a lower total investment from abroad. The coefficient of the GDP growth rate differential is significantly positive if we only consider country-fixed effects (col. (1)-(3)). Concerning the policy rate differential, the coefficient is negative and slightly significant in col. (1)-(3). Together with a time-fixed effect, both coefficients turn insignificant. This is consistent with the conclusions in Ahmed and Zlate (2014) that faster-growing economies tend to receive more capital inflows and the fixed effects may partly capture the effect of long-run growth rate and interest rate differentials between EMEs and AEs. Moreover, the sign of financial openness is negative throughout the settings, although it's not always significant. This result questions the effectiveness of capital controls in curbing capital flow volatility and is in line with the findings in Forbes and Warnock (2012).

3.3 Capital Inflows by Types

Besides the analysis on the total capital inflows, estimations are also conducted to examine the behavior of different types of flows, i.e. credit, portfolio equity, portfolio debt, and FDI inflows, since the marginal effect of global risk aversion on total capital flows could be affected by diverse "pull" factors. To make a comparison, we use the same model as in the base estimation and both country- and time-fixed effects are examined. Our focus is again on the interaction terms, i.e. the marginal effect of changes in global risk aversion and the results are presented in Table 6.

As shown in the table, both interaction terms are significant at the same time only for total capital inflows. The interaction term with financial development is significantly negative for credit and portfolio equity inflows while the interaction term with a fixed exchange rate regime dummy only for FDI inflows. The results reveal several points:

First, the significance of financial development in total capital inflows is mainly contributed by its significance in credit and portfolio equity inflows. It is probably because these two types of investment require well-functioning financial infrastructure and improvement of financial development reduces the costs, effort, and risk of the investments, and therefore leads to larger inflows in response to lower global risk aversion.

Second, the coefficient of the interaction term in the credit inflows equation (col. (2)) is more than twice as large as that in the portfolio equity equation (col. (3)). This implies that credit

inflows are much more sensitive than portfolio equity to changes in global risk aversion. It's quite reasonable that costs and risks are generally lower for credit investors through financial institutions such as multinational banks than for equity investors. Besides, arbitrage investors are more likely to grant credits to the EMEs rather than invest in their stocks since credits are state-contingent associated with relatively lower risk and their returns are more directly affected by monetary policy.

Third, the significance of exchange rate regimes in total capital inflows is dominated by its significance in FDI inflows to the EMEs (col. (5)). It shows that countries under a fixed exchange rate regime tend to receive 5.271 percentage points (of GDP) more FDI inflows than under intermediate and floating regimes when facing marginally lower global risk aversion. This suggests that foreign investors prefer more direct investment in countries with a fixed exchange rate regime amid lower exchange rate risk and potentially higher returns[8].

Last but not least, the sensitivity of portfolio debt inflows to VIX is not affected either by financial development or by exchange rate regimes. Other factors such as firm-specific risk are probably more powerful in determining the magnitude of portfolio debt investments.

3.4 The Financial Development Indicators

In this section, we closely examine different aspects of the financial markets and financial institutions in terms of depth, access, and efficiency. We don't expect a homogenous effect of them on the evolution of capital inflows since they tell different stories about the financial market. For example, the "depth" indicator of financial markets and institutions measures their size relative to GDP, "access" reflects the availability and concentration of capital on the markets, while "efficiency" reports their liquidity and performance. Methodologically, we use the same model as in the base estimation to cross-compare how these indexes affect the sensitivity of different types of inflows to global risk aversion.

Table 7-11 present the results for all types of inflows, i.e. total, credit, portfolio equity, portfolio debt and FDI inflows using the sub-indexes. From Table 7 it's traceable that the importance of financial development in the sensitivity of total inflows to VIX is dominated by financial institutions depth and efficiency as well as the financial markets depth and efficiency. This implies countries with larger and better performing financial sectors tend to attract more capital inflows in the face of lower global risk aversion.

When we split the total capital inflows, it can be easily seen from Table 8 that the significant direct and indirect effect of financial development on credit inflows comes from financial insti-

[8]This is not surprising that FDI is also affected by short-term changes in global financial conditions, since FDI contains not only long-term investments but also short-term investments such as intra-corporate loans and transfers of investment earnings. These short-term investments can be easily affected by global financial shocks and exchange rate fluctuations.

tutions efficiency, financial market depth and efficiency. The former is straightforward that more efficient financial institutions in the EMEs, such as multinational banks, are better at allocating resources from abroad to the domestic economy. Interestingly, financial market depth and efficiency also matter. This is probably because both domestic and foreign investors are likely to take credits from banks and reinvest in the stock and bond markets when the financial markets are in a boom. Therefore, higher financial markets depth and efficiency contribute to a higher investment incentive and thus lead to higher external financing needs from banks.

Similar to credits, Table 9 shows that the sensitivity of portfolio equity inflows to VIX is also positively affected by the depth of financial institutions and markets in the same way. It reflects that countries with larger financial institutions and stock markets tend to receive more portfolio equity investment in response to lower global risk. However, financial institutions access (FIA) is found to negatively affect the sensitivity (col. (3)). This means, in response to lower global risk, less portfolio equity investment is flowing into countries with better access to financial institutions. This is probably either driven by the fact that external financing demand for equity investment is better fulfilled in the EMEs with better access to financial institutions and therefore the marginal demand is relatively lower, or by the so-called "crowding-out" effect on portfolio equity investment due to an insignificant increase in credit inflows (Table 8, col.(3)).

The remaining two types of capital inflows that are expected to be less dependent on financial development are portfolio debt and FDI inflows. Although it is shown in Table 10 that portfolio debt inflow is not significantly affected by the overall level of financial development (col. (1)), its sensitivity to global risk depends positively on financial markets access proxied by the number of issuers of debt and the percent of market capitalization outside of top 10 largest companies. With better access to the financial markets, countries tend to attract more portfolio debt investment when the global risk is lowered.

Regarding FDI inflows, Table 11 shows that FDI is not subject to changes in financial development at all if we control for other "pull" factors such as exchange rate regimes, sovereign risk proxied by public-debt-to-GDP ratio. This is reasonable given the fact that FDI inflows are often long-term projects and are quite stable over time in the EMEs. Besides, FDI investors from the advanced economies are more likely to finance their investment from the home country and therefore financial development in the destination countries doesn't matter as much as that in the source country. Moreover, for long-term projects, political stability, sovereign risk, institutional risk as well as the exchange rate risk matter more. This argument is supported by the results with positively significant coefficients for fixed exchange rate regimes, institutional quality, and public-debt-to GPD ratio. Finally, the coefficient on the interaction term of fixed exchange rate regime and VIX is negatively significant and robust through all the settings. This implies a higher sensitivity of FDI inflows to global risk under fixed exchange rate regimes than under intermediate

and free-floating regimes.

4 Conclusion

After the Great Recession, expansionary monetary policy in the industrialized countries triggered a wave of capital flows to emerging market economies (EMEs). However, the magnitude of such inflows is heterogeneous across countries. Existing literature confirms that both global and domestic factors are important in explaining capital flows. The global factors act as a "gatekeeper" and determine when capital flows take place, while the domestic factors act as an absorber and determine the magnitude of capital inflows that a country can attract (Ghosh et al., 2014). However, most of the existing literature focuses on the linear effects of these variables and conclude therewith that financial development doesn't matter much in the capital inflow dynamics.

This paper contributes to the literature of capital flow determinants by exploring the nonlinear effect of the global risk aversion on capital inflows and in particular, focusing on the role of financial development in the sensitivity of capital inflows to EMEs to global risk. This is so far under-explored in the existing studies. Besides, by including exchange rate regimes in the analysis, the paper also touches upon the current "trilemma" vs. "dilemma" debate on whether exchange rate regimes matter in international monetary policy transmission if capital is allowed to move freely across borders.

I first extend the portfolio balance model à la Blanchard et al. (2015) by adding financial development to the model. I show that the sensitivity of exchange rates, capital inflows and outflows to external financial shocks is increasing in the domestic level of financial development. Since the primary interest of this paper lies in capital inflows to the EMEs, we only focus on the evolution and the behavior of capital inflows in response to global financial shocks, although the implications from the model are rich. The findings can be explained that investors from the advanced economies are likely to accept a lower interest rate differential and invest more in the EMEs with better developed financial markets since the associated information asymmetry and costs are lower and the market risk is easier to be diversified. To examine the validity of the arguments, empirical analyses are conducted based on the quarterly date of 25 EMEs from 1995 to 2016. The main findings are threefold:

First, financial development indeed significantly and positively affects the sensitivity of capital inflows to the EMEs, especially that of credit and portfolio equity inflows, in response to global shocks. During periods with low global risk aversion, foreign investors, especially those from advanced economies, prefer investing in the EMEs with better developed financial markets due to lower information asymmetry and lower transaction costs, while they are reluctant to invest and resell their existing assets when market risk regains. Hence, better financial development is likely

to raise the sensitivity of capital inflows to changes in global risk and thus magnify the volatility of such inflows overtime.

Second, total capital inflows of the EMEs under a fixed exchange regime tend to be larger than those of the other countries and are associated with a higher sensitivity to global risk. However, when we look at different types of inflows, it's only found to be significant for FDI inflows. This means a country with a fixed exchange rate regime receives more FDI inflows than the other countries during the risk-off period. This result is consistent with the findings in several existing literature that confirm the role of exchange rate regimes in determining the magnitude of capital inflows to EMEs, and it sheds light on its role in international monetary policy transmission.

Third, apart from the aggregate level of financial development, I find the depth and efficiency of financial institutions and markets are particularly important to foreign investors to make decisions. With larger and better performing financial institutions and markets, the sensitivity of credit and portfolio equity inflows to global shocks increases. However, the opposite effect is found with financial institutions access. Better access to financial institutions is associated with significantly lower portfolio equity inflows. Hence, the role of financial development in the sensitivity of capital inflows to global risk is not homogenous and thus one has to distinguish the different aspects of the financial markets to make any conclusion.

In sum, our analysis challenges the findings in the existing literature on the role fo financial development in capital inflows to the EMEs and shows that the sensitivity of capital inflows to changes in global risk is enhanced in the EMEs with better developed financial markets. It could raise serious concerns about their financial stability and the policymakers would then be forced to face a trade-off between financial development and financial stability if extreme capital controls are not considered. Besides, the effectiveness of the free-floating exchange rate regime in curbing capital inflows seems to be limited and it is found to be effective only for FDI flows. This casts doubt on the traditional "trilemma" and shows that a fixed exchange rate regime alone may not be able to insulate a country from external financial shocks by hampering capital inflows in the short run. To answer the question of whether the synchronization of monetary policies between the center and periphery countries differ across different exchange rate regimes, looking only at capital inflows to the EMEs is not sufficient. Further analyses, especially on the dynamics of net flows in these countries, are needed since the magnitude of net flows is crucial in assessing the impact on the financial conditions in the EMEs.

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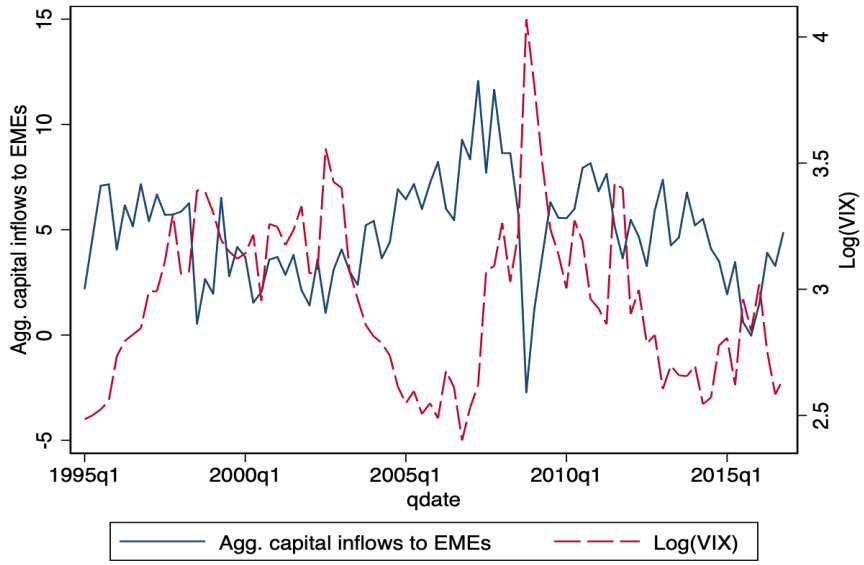
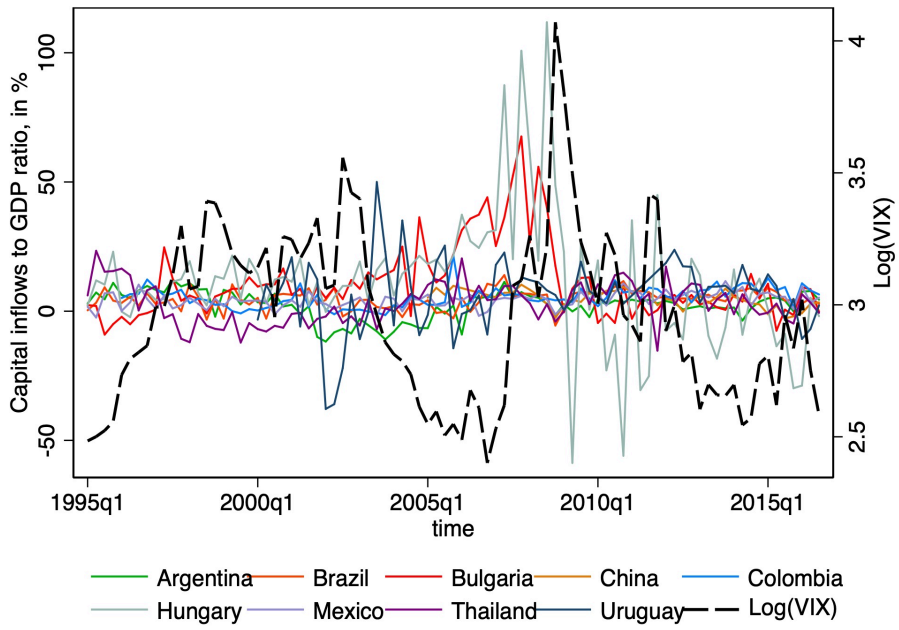
Appendix

Figure 1: **Strong negative correlation between aggregate capital inflows (25 EMEs) and VIX;**



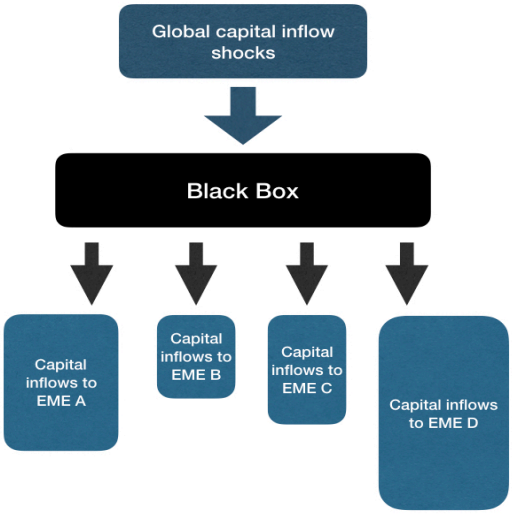
Source: IMF and FED, selected EMEs;

Figure 2: **Strong heterogeneity in capital inflows across countries;**



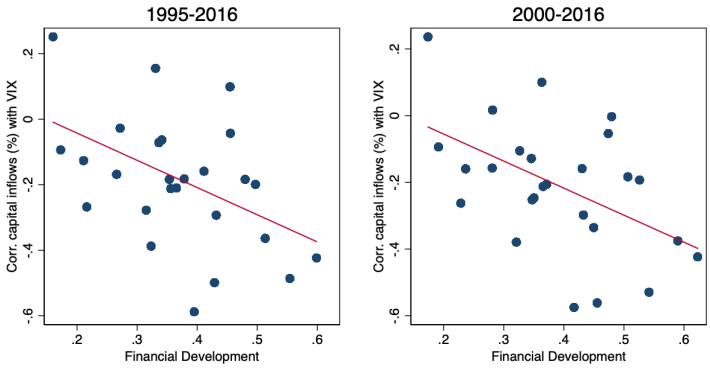
Source: IMF, self-calculation

Figure 3: **Domestic factors as a filter of global capital inflow shocks**



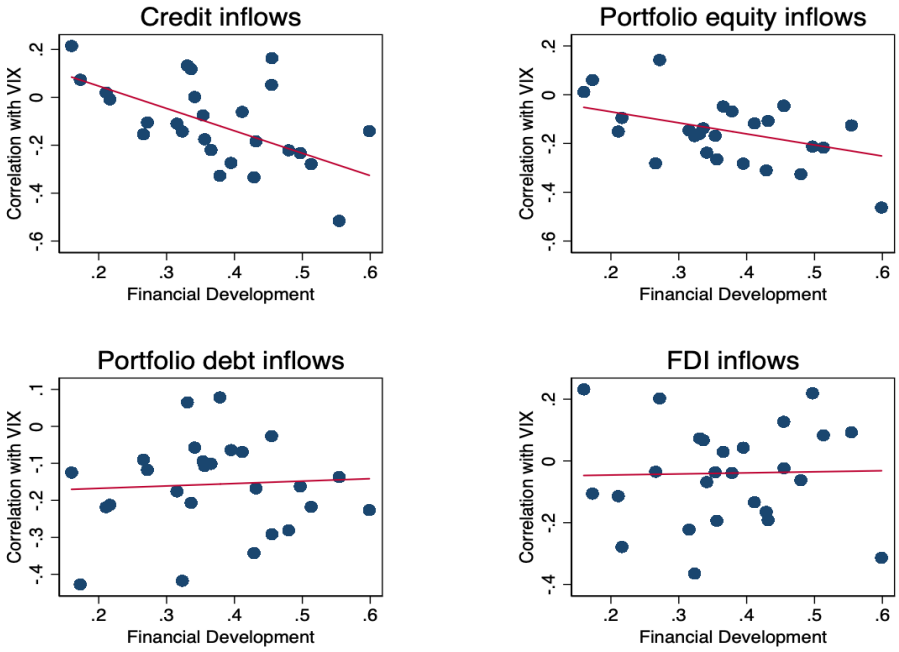
Source: IMF, self-calculation

Figure 4: **Financial development and the correlations of VIX and capital inflows over time**



Source: IMF Financial development indicators, correlations by author's calculation

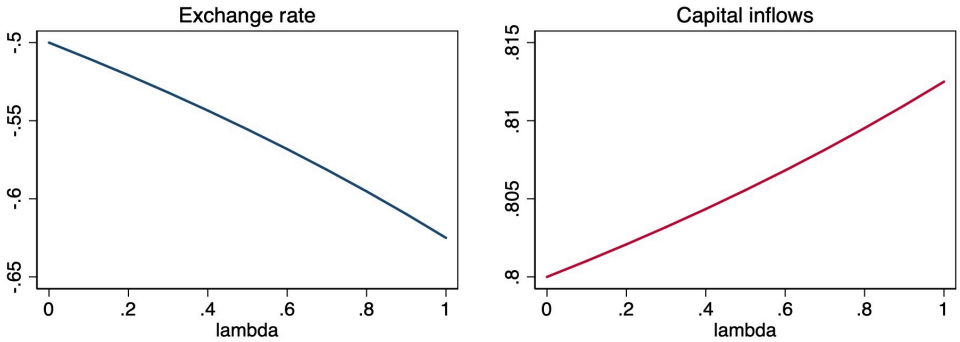
Figure 5: **Financial development and the correlations of VIX and different types of capital inflows (1995-2016 averages)**



Source: IMF Financial development indicators, correlations by author's calculation

Figure 6: **Comparative statics of the portfolio balance model**

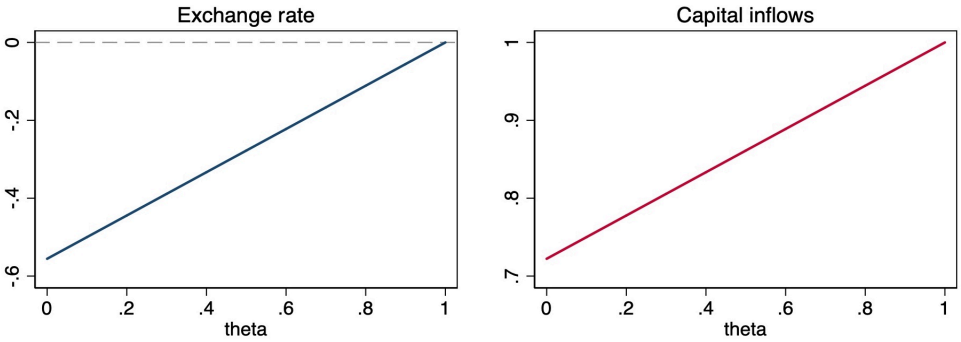
Panel (1): financial development (lambda)



Note: comparative statics with parameterization:

$$\theta = 0, \alpha = \beta = 0.5, \delta = 0.2, \rho = -0.5, \gamma = 0.2, \phi = 0.4$$

Panel (2): foreign exchange interventions (theta)



Note: comparative statics with parameterization:

$$\lambda = 0.5, \alpha = \beta = 0.5, \delta = 0.2, \rho = -0.5, \gamma = 0.2, \phi = 0.4$$

Table 1: **Structure and sources of IMF's financial development indexes**

CATEGORY	INDICATOR	DATA SOURCE
Financial Institutions		
Depth	Private-sector credit to GDP	FinStats 2015
	Pension fund assets to GDP	FinStats 2015
	Mutual fund assets to GDP	FinStats 2015
	Insurance premiums, life and non-life to GDP	FinStats 2015
Access	Bank branches per 100,000 adults	FinStats 2015
	ATMs per 100,000 adults	IMF Financial Access Survey
Efficiency	Net interest margin	FinStats 2015
	Lending-deposits spread	FinStats 2015
	Non-interest income to total income	FinStats 2015
	Overhead costs to total assets	FinStats 2015
	Return on assets	FinStats 2015
	Return on equity	FinStats 2015
Financial Markets		
Depth	Stock market capitalization to GDP	FinStats 2015
	Stocks traded to GDP	FinStats 2015
	International debt securities of government to GDP	BIS debt securities database
	Total debt securities of financial corporations to GDP	Dealogic corporate debt database
	Total debt securities of nonfinancial corporations to GDP	Dealogic corporate debt database
Access	Percent of market capitalization outside of top 10 largest companies	FinStats 2015
	Total number of issuers of debt (domestic and external, nonfinancial and financial corporations)	FinStats 2015
Efficiency	Stock market turnover ratio (stocks traded to capitalization)	FinStats 2015

Source: IMF

Table 2: **List of 25 Emerging Countries**

Asia	Africa	Europe	Central and Latin America
Armenia	South Africa	Bulgaria	Argentina
China		Croatia	Brazil
India		Czech Republic	Chile
Indonesia		Hungary	Colombia
Jordan		Poland	Costa Rica
Malaysia		Russia	Mexico
Philippines		Slovak Republic	Peru
Thailand		Turkey	Uruguay

Table 3: **Data Description and Source**

Variable	Unit	Description	Source
Capital inflows:	per. of GDP	Total liability flows of reporting country, including FDI, Other investment, Portfolio equity and Portfolio debt liability flows, excluding government other investment liabilities, three-quarter moving average;	IFS, BoP; WEO
"Push":			
VIX	Index	Log of S&P 500 implied volatility index, period average	CBoE
REER US	Index	Log of US real effective exchange rate, period average	FED
"Pull":			
Financial development	Index	7 indexes: FD, FID, FIA, FIE, FMD, FMA, FME;	IMF
Growth rate differentials	percent	Real GDP growth rate differentials minus average real GDP growth rate of 10 advanced economies	WEO, self calculation
Policy rate differentials	percent	End-of-period monetary policy rate minus eff. federal funds rate	IFS, BIS, merged; FED
Fix	Dummy	Fixed exchange rate regimes (fine), 1 if exchange rate regimes equal to 1 and 2, otherwise 0	Ilzetzki, Reinhart and Rogoff (2017)
Institutional quality	Index	ICRG indexes, average of 12 indicators	PRS Group
Sovereign risk	percent	Public debt to GDP ratio	WEO
Financial openness	Index	De-jure capital account openness	Chinn and Ito (2006)
Financial structure	Dummy	1 for bank-based financial system, otherwise 0;	World Bank; Beck et al.(2000)
Global financial crisis	Dummy	1 for 2008Q4/2009Q1, 0 otherwise;	

Table 4: **Summary Statatistics**

	Obs.	Mean	Std.	Min	Max
Total capital inflows	1392	7.157544	8.106582	-29.30112	78.78816
Credit inflows	1392	1.593115	3.564849	-10.25985	24.31973
Portfolio equity inflows	1392	.3163328	.9904878	-5.307282	6.204929
Portfolio debt inflows	1392	.8318432	2.029248	-10.87708	9.38272
FDI inflows	1392	4.416253	5.638657	-24.18323	81.66511
Lagged FD	1392	.3893088	.1185556	.1165801	.7055599
Lagged FID	1392	.2814983	.1904939	.0163766	.8951356
Lagged FIA	1392	.36519	.197855	.0648562	.9305928
Lagged FIE	1392	.6463814	.1277321	.2538891	.875704
Lagged FMD	1392	.2810858	.1908901	.010565	.8367725
Lagged FMA	1392	.3582836	.2064613	.0053351	1
Lagged FME	1392	.3655247	.3156537	.0005035	1
Log(VIX)	1392	2.980636	.3469746	2.401065	4.070665
Fixed	1392	.066092	.2485321	0	1
Lagged FD * log(VIX)	1392	1.15926	.3765867	.2799163	2.735606
Fixed*log(VIX)	1392	.2020142	.7639489	0	4.070665
Lagged real GDP growth differential	1392	2.700514	4.229161	-23.02109	26.26499
Lagged policy rate differentials	1392	5.908656	8.607949	-5.04	177.22
Log(US REER)	1392	4.677536	.0865165	4.536661	4.857542
Lagged institutional quality	1392	5.667316	.679294	3.704861	7.180555
Lagged public debt-to-GDP Ratio	1392	43.0495	21.22646	3.9	152.2
Lagged financial openness	1392	.5382261	.3069701	0	1
Bank-based financial system	1392	.6896552	.462801	0	1

Figure 7: **Distribution of the financial development index in the sample;**

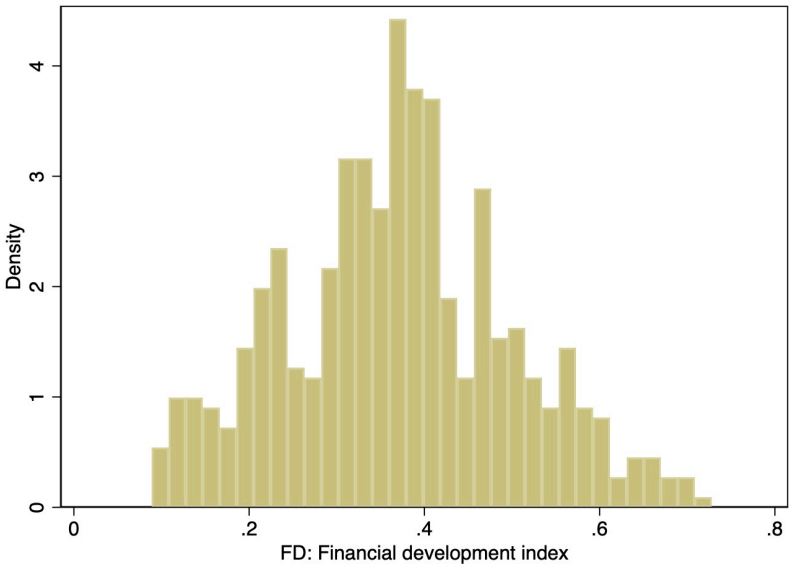


Table 5: **Total capital inflows and financial development**

	(1) 1995-2016	(2) 1995-2016	(3) 2000-2016	(4) 1995-2016	(5) 2000-2016
Lagged FD	11.78	44.03**	47.29**	53.16**	52.04**
	(8.325)	(18.98)	(19.67)	(20.49)	(20.13)
Log(VIX)	-4.104***	0.503	0.508		
	(1.208)	(2.873)	(2.869)		
Fixed	0.619	22.05***	23.29***	22.26***	22.95***
	(2.947)	(5.758)	(4.760)	(5.539)	(4.597)
Lagged FD * log(VIX)		-10.80*	-11.32*	-12.37*	-12.66*
		(6.293)	(6.235)	(6.744)	(6.635)
Fixed*log(VIX)		-7.056***	-6.866***	-5.689***	-5.435***
		(1.915)	(1.728)	(1.685)	(1.576)
Lagged real GDP growth differential	0.236*	0.246**	0.240*	0.150	0.141
	(0.124)	(0.119)	(0.130)	(0.122)	(0.131)
Lagged policy rate differential	-0.0367*	-0.0376*	-0.0345*	-0.00375	-0.00331
	(0.0204)	(0.0208)	(0.0181)	(0.0213)	(0.0231)
Lagged institutional quality	1.540	1.678	1.818	0.871	1.140
	(0.994)	(1.072)	(1.082)	(0.831)	(0.886)
Lagged financial openness	-1.851	-1.323	-3.085**	-4.872***	-6.659***
	(1.828)	(1.689)	(1.291)	(1.567)	(1.397)
Lagged public debt to GDP ratio	-0.113***	-0.111***	-0.115***	-0.112***	-0.109***
	(0.0278)	(0.0271)	(0.0280)	(0.0285)	(0.0285)
Bank-based financial system	-1.432*	-1.505*	-1.094	0.0471	0.488
	(0.789)	(0.778)	(0.798)	(0.913)	(1.002)
Log(US REER)	-11.50***	-11.12***	-15.47***		
	(3.071)	(3.223)	(4.616)		
Linear trend	-0.103**	-0.103**	-0.129**		
	(0.0374)	(0.0375)	(0.0526)		
Global financial crisis	-0.391	-0.201	0.126		
	(1.854)	(1.858)	(2.039)		
Country-fixed effect	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	No	No	No	Yes	Yes
Observations	1392	1392	1303	1392	1303
Adjusted R^2	0.330	0.337	0.341	0.370	0.379

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of the total capital inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD denotes overall financial development.

Table 6: **Capital inflows by types**

	(1) Total	(2) Credit	(3) Portfolio equity	(4) Portfolio debt	(5) FDI
Lagged FD	53.16**	30.71**	8.548*	13.79	0.107
	(20.49)	(13.08)	(4.878)	(10.65)	(12.64)
Fixed	22.26***	3.502	3.170	-1.843	17.44***
	(5.539)	(5.262)	(2.403)	(3.634)	(5.360)
Lagged FD * log(VIX)	-12.37*	-7.608*	-3.710**	-3.472	2.419
	(6.744)	(4.144)	(1.761)	(2.928)	(3.841)
Fixed*log(VIX)	-5.689***	-0.402	-0.851	0.780	-5.217***
	(1.685)	(1.632)	(0.616)	(1.159)	(1.667)
Lagged real GDP growth differential	0.150	0.0839	0.0185*	0.0307	0.0166
	(0.122)	(0.0660)	(0.00925)	(0.0295)	(0.0655)
Lagged policy rate differential	-0.00375	0.00195	0.00820	-0.00959	-0.00430
	(0.0213)	(0.0125)	(0.00622)	(0.00864)	(0.0156)
Lagged institutional quality	0.871	-0.600	0.408*	0.204	0.859*
	(0.831)	(0.679)	(0.217)	(0.250)	(0.479)
Lagged public debt to GDP ratio	-0.112***	-0.0690***	0.00503*	-0.0264**	-0.0218*
	(0.0285)	(0.0206)	(0.00272)	(0.0115)	(0.0109)
Lagged financial openness	-4.872***	-3.464***	-0.333	-0.103	-0.973
	(1.567)	(1.172)	(0.415)	(0.568)	(0.710)
Bank-based financial system	0.0471	-0.0159	0.0280	0.145	-0.110
	(0.913)	(0.507)	(0.105)	(0.304)	(0.672)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392	1392
Adjusted R^2	0.370	0.387	0.236	0.246	0.299

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of the corresponding variables (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD denotes overall financial development.

Table 7: **Total inflows and financial development indicators, 1995Q1-2016Q4**

	(1) FD	(2) FID	(3) FIA	(4) FIE	(5) FMD	(6) FMA	(7) FME
Fixed	22.26***	20.60***	25.68***	20.52***	23.11***	25.50***	23.33***
	(5.539)	(5.873)	(5.190)	(5.007)	(6.096)	(5.279)	(5.045)
Fixed*log(VIX)	-5.689***	-5.206***	-6.668***	-4.935***	-6.028***	-6.506***	-6.094***
	(1.685)	(1.681)	(1.506)	(1.640)	(1.912)	(1.587)	(1.522)
Lagged real GDP growth differential	0.150	0.165	0.132	0.157	0.137	0.139	0.129
	(0.122)	(0.125)	(0.118)	(0.120)	(0.123)	(0.125)	(0.125)
Lagged policy rate differential	-0.00375	-0.0157	-0.00889	-0.0206	-0.0140	-0.00769	-0.00131
	(0.0213)	(0.0170)	(0.0187)	(0.0238)	(0.0235)	(0.0197)	(0.0205)
Lagged institutional quality	0.871	1.267	1.292	1.460	0.984	1.220	0.956
	(0.831)	(1.030)	(1.045)	(1.093)	(0.879)	(1.071)	(0.941)
Lagged financial openness	-4.872***	-4.859***	-3.419*	-3.576*	-4.307**	-3.687*	-4.025**
	(1.567)	(1.560)	(1.828)	(1.843)	(1.762)	(1.842)	(1.758)
Lagged public debt to GDP ratio	-0.112***	-0.121***	-0.107***	-0.109***	-0.110***	-0.108***	-0.110***
	(0.0285)	(0.0339)	(0.0289)	(0.0315)	(0.0282)	(0.0291)	(0.0301)
Bank-based financial system	0.0471	0.130	0.152	0.269	0.534	0.0822	-0.0188
	(0.913)	(0.956)	(0.974)	(1.013)	(1.098)	(1.004)	(0.944)
Lagged FD	53.16**						
	(20.49)						
Lagged FD * log(VIX)	-12.37*						
	(6.744)						
Lagged FID		37.28***					
		(13.37)					
Lagged FID * log(VIX)		-5.644*					
		(3.076)					
Lagged FIA			-9.405				
			(8.947)				
Lagged FIA * log(VIX)			2.833				
			(2.496)				
Lagged FIE				33.37*			
				(18.46)			
Lagged FIE * log(VIX)				-12.21*			
				(7.062)			
Lagged FMD					38.81**		
					(14.28)		
Lagged FMD * log(VIX)					-8.418**		
					(3.432)		
Lagged FMA)						10.15	
						(10.92)	
Lagged FMA * log(VIX)						-2.750	
						(3.306)	
Lagged FME							12.09*
							(6.119)
Lagged FME * log(VIX)							-2.958
							(2.084)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392	1392	1392	1392
Adjusted R^2	0.370	0.370	0.361	0.366	0.376	0.362	0.365

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of total capital inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD: Overall financial development; FID: financial institutions depth; FIA: financial institutions access; FIE: financial institutions efficiency; FMD: financial markets depth; FMA: financial markets access; FME: financial markets efficiency.

Table 8: **Credit inflows and financial development indicators, 1995Q1-2016Q4**

	(1) FD	(2) FID	(3) FIA	(4) FIE	(5) FMD	(6) FMA	(7) FME
Fixed	3.502	3.340	3.589	2.783	4.210	4.176	4.383
	(5.262)	(5.277)	(4.388)	(4.308)	(5.685)	(4.921)	(4.848)
Fixed*log(VIX)	-0.402	-0.328	-0.359	-0.166	-0.662	-0.509	-0.736
	(1.632)	(1.599)	(1.411)	(1.348)	(1.790)	(1.527)	(1.522)
Lagged real GDP growth differential	0.0839	0.0843	0.0620	0.0735	0.0767	0.0772	0.0724
	(0.0660)	(0.0694)	(0.0650)	(0.0655)	(0.0666)	(0.0681)	(0.0657)
Lagged policy rate differential	0.00195	-0.00247	-0.00228	0.000344	-0.00295	-0.000379	0.00487
	(0.0125)	(0.0110)	(0.0105)	(0.0122)	(0.0131)	(0.0119)	(0.0115)
Lagged institutional quality	-0.600	-0.407	-0.449	-0.381	-0.532	-0.435	-0.579
	(0.679)	(0.720)	(0.766)	(0.765)	(0.683)	(0.763)	(0.708)
Lagged financial openness	-3.464***	-3.123**	-2.432*	-2.897**	-3.117**	-2.852**	-3.084**
	(1.172)	(1.159)	(1.331)	(1.229)	(1.154)	(1.213)	(1.158)
Lagged public debt to GDP ratio	-0.0690***	-0.0701***	-0.0671***	-0.0655***	-0.0679***	-0.0665***	-0.0673***
	(0.0206)	(0.0227)	(0.0200)	(0.0213)	(0.0206)	(0.0209)	(0.0206)
Bank-based financial system	-0.0159	0.0164	0.0721	0.126	0.196	-0.0131	-0.0667
	(0.507)	(0.507)	(0.481)	(0.476)	(0.501)	(0.496)	(0.482)
Lagged FD	30.71**						
	(13.08)						
Lagged FD * log(VIX)	-7.608*						
	(4.144)						
Lagged FID		11.74					
		(8.092)					
Lagged FID * log(VIX)		-2.395					
		(2.173)					
Lagged FIA			-2.647				
			(7.496)				
Lagged FIA * log(VIX)			-0.335				
			(2.045)				
Lagged FIE				21.14*			
				(10.44)			
Lagged FIE * log(VIX)				-5.457			
				(3.848)			
Lagged FMD					20.64**		
					(7.424)		
Lagged FMD * log(VIX)					-4.990**		
					(2.350)		
Lagged FMA						1.167	
						(7.914)	
Lagged FMA * log(VIX)						-0.0635	
						(2.335)	
Lagged FME							10.57**
							(4.048)
Lagged FME * log(VIX)							-2.891**
							(1.384)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392	1392	1392	1392
Adjusted R^2	0.387	0.377	0.377	0.384	0.391	0.373	0.384

Standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of credit inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD: Overall financial development; FID: financial institutions depth; FIA: financial institutions access; FIE: financial institutions efficiency; FMD: financial markets depth; FMA: financial markets access; FME: financial markets efficiency.

Table 9: **Portfolio equity inflows and financial development, 1995Q1-2016Q4**

	(1) FD	(2) FID	(3) FIA	(4) FIE	(5) FMD	(6) FMA	(7) FME
Fixed	3.170	3.092	4.944*	2.815	3.949*	3.733	3.281
	(2.403)	(1.950)	(2.600)	(2.647)	(2.009)	(2.894)	(2.861)
Fixed*log(VIX)	-0.851	-0.836*	-1.435**	-0.749	-1.131**	-1.065	-0.878
	(0.616)	(0.458)	(0.636)	(0.695)	(0.473)	(0.733)	(0.755)
Lagged real GDP growth rate differential	0.0185*	0.0181*	0.0144	0.0185*	0.0179*	0.0178*	0.0183*
	(0.00925)	(0.00877)	(0.0102)	(0.00993)	(0.00950)	(0.00969)	(0.00971)
Lagged policy rate differential	0.00820	0.00731	0.00895	0.00839	0.00907	0.00985	0.00900
	(0.00622)	(0.00706)	(0.00737)	(0.00696)	(0.00581)	(0.00741)	(0.00733)
Lagged institutional quality	0.408*	0.300	0.342*	0.357*	0.353*	0.370	0.377*
	(0.217)	(0.216)	(0.184)	(0.201)	(0.197)	(0.218)	(0.196)
Lagged financial openness	-0.333	-0.501	-0.352	-0.470	-0.373	-0.439	-0.421
	(0.415)	(0.485)	(0.456)	(0.388)	(0.376)	(0.394)	(0.344)
Lagged public debt to GDP ratio	0.00503*	0.00434	0.00553**	0.00509*	0.00448*	0.00465*	0.00535*
	(0.00272)	(0.00369)	(0.00264)	(0.00269)	(0.00259)	(0.00262)	(0.00274)
Bank-based financial system	0.0280	0.0222	0.0506	0.0446	-0.0277	0.0246	0.0174
	(0.105)	(0.0964)	(0.111)	(0.108)	(0.0985)	(0.106)	(0.100)
Lagged FD	8.548*						
	(4.878)						
Lagged FD * log(VIX)	-3.710**						
	(1.761)						
Lagged FID		9.012*					
		(4.405)					
Lagged FID * log(VIX)		-3.277***					
		(1.085)					
Lagged FIA			-6.088*				
			(3.126)				
Lagged FIA * log(VIX)			1.851*				
			(0.901)				
Lagged FIE				6.234			
				(4.247)			
Lagged FIE * log(VIX)				-1.911			
				(1.358)			
Lagged FMD					7.485**		
					(2.787)		
Lagged FMD * log(VIX)					-3.137***		
					(0.965)		
Lagged FMA						1.989	
						(2.412)	
Lagged FMA * log(VIX)						-0.872	
						(0.773)	
Lagged FME							0.0507
							(1.037)
Lagged FME * log(VIX)							-0.121
							(0.287)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1392	1436	1392	1392	1392	1392	1392
Adjusted R^2	0.236	0.269	0.219	0.212	0.267	0.211	0.207

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of portfolio equity inflows inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD: Overall financial development; FID: financial institutions depth; FIA: financial institutions access; FIE: financial institutions efficiency; FMD: financial markets depth; FMA: financial markets access; FME: financial markets efficiency.

Table 10: **Portfolio debt inflows and financial development indicators, 1995Q1-2016Q4**

	(1) FD	(2) FID	(3) FIA	(4) FIE	(5) FMD	(6) FMA	(7) FME
Fixed	-1.843	-1.754	-1.369	-1.600	-1.523	1.058	-1.491
	(3.634)	(3.793)	(4.320)	(4.267)	(3.942)	(3.743)	(3.833)
Fixed*log(VIX)	0.780	0.772	0.655	0.702	0.697	-0.00146	0.663
	(1.159)	(1.212)	(1.386)	(1.386)	(1.276)	(1.179)	(1.238)
Lagged real GDP growth rate differential	0.0307	0.0295	0.0295	0.0235	0.0277	0.0297	0.0264
	(0.0295)	(0.0279)	(0.0279)	(0.0281)	(0.0302)	(0.0274)	(0.0295)
Lagged policy rate differential	-0.00959	-0.0114	-0.0102	-0.00831	-0.0107	-0.0100	-0.00895
	(0.00864)	(0.00863)	(0.00778)	(0.00895)	(0.00835)	(0.00932)	(0.00808)
Lagged institutional quality	0.204	0.281	0.300	0.268	0.285	0.196	0.242
	(0.250)	(0.283)	(0.282)	(0.300)	(0.293)	(0.260)	(0.286)
Lagged financial openness	-0.103	0.120	0.138	0.151	0.174	0.0567	0.102
	(0.568)	(0.534)	(0.535)	(0.539)	(0.550)	(0.578)	(0.565)
Lagged public debt to GDP ratio	-0.0264**	-0.0260**	-0.0252**	-0.0248**	-0.0255**	-0.0252**	-0.0254**
	(0.0115)	(0.0121)	(0.0111)	(0.0107)	(0.0112)	(0.0113)	(0.0110)
Bank-based financial system	0.145	0.160	0.147	0.161	0.158	0.140	0.133
	(0.304)	(0.314)	(0.310)	(0.312)	(0.311)	(0.288)	(0.309)
Lagged FD	13.79						
	(10.65)						
Lagged FD * log(VIX)	-3.472						
	(2.928)						
Lagged FID		4.772					
		(5.161)					
Lagged FID * log(VIX)		-1.443					
		(1.391)					
Lagged FIA			-0.449				
			(4.911)				
Lagged FIA * log(VIX)			0.305				
			(1.070)				
Lagged FIE				1.068			
				(7.216)			
Lagged FIE * log(VIX)				0.308			
				(1.991)			
Lagged FMD					2.481		
					(5.744)		
Lagged FMD * log(VIX)					-0.808		
					(1.622)		
Lagged FMA						11.23**	
						(4.878)	
Lagged FMA * log(VIX)						-2.905**	
						(1.239)	
Lagged FME							3.393
							(3.356)
Lagged FME * log(VIX)							-0.957
							(1.060)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392	1392	1392	1392
Adjusted R^2	0.246	0.240	0.238	0.241	0.238	0.254	0.241

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of portfolio debt inflows inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD: Overall financial development; FID: financial institutions depth; FIA: financial institutions access; FIE: financial institutions efficiency; FMD: financial markets depth; FMA: financial markets access; FME: financial markets efficiency.

Table 11: **FDI inflows and financial development indicators, 1995Q1-2016Q4**

	(1) FD	(2) FID	(3) FIA	(4) FIE	(5) FMD	(6) FMA	(7) FME
Fixed	17.44***	15.82***	18.52***	16.53**	16.47***	16.53***	17.16***
	(5.360)	(5.142)	(6.613)	(6.375)	(5.384)	(5.008)	(5.664)
Fixed*log(VIX)	-5.217***	-4.777***	-5.529**	-4.721**	-4.933***	-4.932***	-5.143***
	(1.667)	(1.557)	(2.011)	(2.057)	(1.703)	(1.587)	(1.780)
Lagged real GDP growth rate differential	0.0166	0.0318	0.0265	0.0413	0.0141	0.0145	0.0123
	(0.0655)	(0.0603)	(0.0628)	(0.0541)	(0.0645)	(0.0665)	(0.0665)
Lagged policy rate differential	-0.00430	-0.00955	-0.00535	-0.0210	-0.00948	-0.00714	-0.00623
	(0.0156)	(0.0150)	(0.0160)	(0.0199)	(0.0142)	(0.0167)	(0.0164)
Lagged institutional quality	0.859*	1.078*	1.098**	1.217*	0.878	1.088**	0.916**
	(0.479)	(0.541)	(0.476)	(0.602)	(0.533)	(0.441)	(0.429)
Lagged financial openness	-0.973	-1.368	-0.773	-0.360	-0.990	-0.453	-0.623
	(0.710)	(0.902)	(0.712)	(0.749)	(0.773)	(0.790)	(0.736)
Lagged public debt to GDP ratio	-0.0218*	-0.0295***	-0.0202*	-0.0235*	-0.0211*	-0.0208*	-0.0224*
	(0.0109)	(0.00974)	(0.0106)	(0.0136)	(0.0103)	(0.0114)	(0.0119)
Bank-based financial system	-0.110	-0.0742	-0.117	-0.0622	0.207	-0.0695	-0.102
	(0.672)	(0.669)	(0.716)	(0.714)	(0.752)	(0.713)	(0.697)
Lagged FD	0.107						
	(12.64)						
Lagged FD * log(VIX)	2.419						
	(3.841)						
Lagged FID		11.81					
		(7.965)					
Lagged FID * log(VIX)		1.469					
		(1.277)					
Lagged FIA			-0.221				
			(4.603)				
Lagged FIA * log(VIX)			1.012				
			(1.712)				
Lagged FIE				4.931			
				(8.043)			
Lagged FIE * log(VIX)				-5.151			
				(3.577)			
Lagged FMD					8.205		
					(8.032)		
Lagged FMD * log(VIX)					0.517		
					(1.923)		
Lagged FMA						-4.232	
						(5.438)	
Lagged FMA * log(VIX)						1.090	
						(1.414)	
Lagged FME							-1.924
							(4.287)
Lagged FME * log(VIX)							1.012
							(1.435)
Country-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Time-fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	1392	1392	1392	1392	1392	1392	1392
Adjusted R^2	0.299	0.306	0.298	0.312	0.308	0.297	0.298

Clustered standard errors in parentheses

* $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Note: Dependent variables are three-quarter moving averages of FDI inflows (in % GDP) to eliminate the seasonality. Quarterly variables are lagged two periods while annual variables are lagged five periods to mitigate the endogeneity problem. FD: Overall financial development; FID: financial institutions depth; FIA: financial institutions access; FIE: financial institutions efficiency; FMD: financial markets depth; FMA: financial markets access; FME: financial markets efficiency.