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External Vulnerabilities and Exchange Rate Pass-Through: The Case of Emerging Markets

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Abstract

This study investigates the differentiation of exchange rate-inflation nexus in emerging markets (EM) in the context of external vulnerabilities for the period 2010-2018. In the empirical setting, EM countries are classified into two subgroups as "more vulnerable" and "less vulnerable" according to vulnerability indicators to identify how exchange rate pass-through (ERPT) dynamics change when the vulnerability is amplified by utilizing the interacted panel vector autoregression (IPVAR) model. Empirical results show that more resilient EM countries are experiencing a lower degree of ERPT during the sample period. Countries facing more prominent dollarization and current account deficit are subject to stronger ERPT, while higher inflation, higher risk premium and higher FX debt levels are associated with increasing ERPT as well. On the other hand, countries with higher reserve adequacy or higher foreign direct investment show lower ERPT compared to lower EM groups.

Özet

Bu çalışma, gelişmekte olan ülkelerde (GOÜ) yakın dönemde yapısal kırılganlık faktörlerinin döviz kuru ile enflasyon arasındaki ilişki üzerindeki etkisini incelemektedir. Ampirik olarak, etkileşimli panel vektör öz bağlanım modeli kullanılarak kırılganlık seviyesi yükseldiğinde döviz kuru geçişkenliğinin nasıl değiştiğini anlamak amacıyla gelişmekte olan ülkeler her bir kategorizasyon için "yüksek hassasiyetli" ve "düşük hassasiyetli" olarak iki alt gruba ayrılmaktadır. Sonuçlar, görece daha dirençli ülkelerin daha düşük kur geçişkenliğine sahip olduğunu göstermektedir. Yüksek dolarizasyon seviyesine sahip veya yüksek cari açık veren ülkeler daha yüksek kur geçişkenliği göstermekte, aynı zamanda yüksek enflasyon seviyesi, yüksek risk primi ve yüksek reel sektör yabancı para borçluluğu da artan geçişkenlik seviyesi ile ilişkilendirilebilmektedir. Öte yandan, yüksek rezerv yeterliliği seviyesine sahip veya doğrudan yabancı yatırım paylarında daha yüksek olan ülkeler düşük ülke grubuna kıyasla daha düşük kur geçişkenliği göstermektedir.

JEL Classification: C23, E31, F31

Keyword: Exchange Rate Pass-through, External Vulnerabilities, Interacted Panel VAR Model

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Non-Technical Summary

This study aims to analyze how structural economic issues relevant to external vulnerabilities shape the course of exchange rate-inflation nexus in emerging markets (EM) for the period 2010-2018. Taking heterogeneities in EMs into consideration, the role of structural vulnerabilities affecting the exchange rate pass-through (ERPT) is examined by implementing the Interacted Panel Vector Autoregression (IPVAR) approach.

The empirical results mainly indicate that higher ERPT levels are observed in countries with intense dollarization tendencies. When countries are grouped based on current account deficit (CAD), it is found that countries with higher CAD show stronger ERPT compared to countries with less external deficits. Furthermore, results support the argument that financing of CAD with foreign direct investment (FDI) seems to matter in terms of ERPT as well. We further determine that ERPT among EM countries with higher external financing requirements is significantly more profound than the countries with lower external financing needs. From macroeconomic perspective, import content of total demand also emerges as a significant indicator for which countries depending on heavier importation to produce economic value added are found to experience higher ERPT.

In the context of other structural weaknesses, when we consider the FX debt of non-financial corporates as a separation criterion, ERPT is found to be relatively lower in the countries with subdued FX debt. This finding is intuitive especially when firms in EMs are known to face difficulties to service their FX denominated debts without deeper financial markets embodying appropriate low-cost financial hedging instruments. Our approach also entails the analyses based on financial market indicators representing the country-level vulnerability to global shocks. In that case, countries having higher risk premia and operating with lower reserve buffers tend to experience stronger ERPT.

Overall, empirical results of this study provide valuable insights on policymaking process by presenting emphasis on the role of structural vulnerabilities in inflation dynamics. It can be argued that for EM countries including Turkey, a plausible way of achieving sustainable price stability is to improve economic performance on structural dimensions.

I. Introduction and Literature Review

Exchange rate movements and channels through which they influence macroeconomic and financial environment are closely followed by policymakers in emerging markets (EM) considering the small open economy structures. In recent times, there existed a dramatic dispersion in inflation rates of EM countries (Figure 1 and 2). For these countries, exchange rate emerges as one of the main determinants of pricing decisions and inflation realizations. This phenomenon is conceptualized as the exchange rate pass-through (ERPT) which is defined as the degree to which exchange rate changes are transmitted into domestic prices (Campa and Goldberg, 2005; Gagnon and Ihrig, 2004; Marazzi et al., 2005). From a theoretical perspective, ERPT mainly stems from the deficiencies of "Law of One Price Theory" so that when local currency fluctuates, domestic prices cannot adjust immediately and completely (Menon, 1995; Goldberg and Knetter, 1997). It is asserted that prices in the domestic economy are expected to react to currency shock with some lag and sacrifice ratio resulting in the incomplete ERPT. Depending on the content of price indices, ERPT typically functions over two stages in which "first stage ERPT" is attributed to the sensitivity of import to changes in the exchange rate and the "second stage ERPT" refers to the sensitivities of consumer prices.

Insert Figure 1 and 2

Given that EM currencies are more volatile with an exposition to large and frequent depreciation, its influence on price changes is examined theoretically and empirically by academics, policymakers and practitioners in a detailed manner. Considering the fact that almost all of the inflation-targeting EMs also have a floating exchange rate regime, the concept of ERPT becomes an integral component of economic policy formulation as well as macroeconomic stability. In this context, the external vulnerability indicators have important implications on exchange rate-inflation nexus through various channels. More vulnerable countries are exposed to frequent and large external shocks, which decrease the resilience of the country. Under such circumstances, due to the increase in uncertainty and exposure to swings in global risk appetite, local financial conditions might be tightened, ultimately distorting the expectations and pricing behavior of local economic agents. Local financial tightening characterized by the depreciation of local currencies accompanied by increased volatility also lead to amplified cost pressures in EMs. Therefore, the analysis regarding the exchange rate-inflation link with specific emphasis on structural vulnerabilities might have important implications for policymakers and practitioners.

In the context of vulnerability indicators, the dollarization tendencies in the economy might affect the degree of ERPT. The previous works have shown that in highly dollarized economies the pass-through from the exchange rate to domestic prices is significant

compared to countries with less dollarization tendencies (Leiderman et al., 2006; Reinhart et al., 2014 and Sadeghi et. al., 2015). Janaya (2000) argues high dollarization might exacerbate the speed of ERPT, while the magnitude is not changed. The possible channels through which dollarization influences ERPT can be listed as direct cost channel, balance sheet channel and indexation channel. Dollarization might have direct effects on the pricing mechanism of tradable goods, but it can also have indirect implications regarding indexation for wages, non-tradable goods, and expectations in EM countries, particularly during high uncertainty periods (Bayramoglu and Allen, 2017). From the balance sheet perspective, FX mismatches might occur between firms' assets and liabilities in highly dollarized economies which can result in the transaction and economic types of FX risk (Alper, 2008). In the times of local currency depreciation, financing costs of firms will inevitably be elevated if FX mismatches are carried in the balance sheet. Therefore, when price pressures are encountered, to protect their markups and profit margins, firms tend to inflate prices and reflect the extra cost they incurred to the customers. In high dollarization countries, there exists a common approach to index the expected returns to hard currencies contributing to the ERPT.

The degree of trade openness is another structural determinant of ERPT, but its effect on ERPT is found to be controversial in the literature. Some studies argue that exchange rate movements can be easily reflected in domestic prices in more open economies which means more prominent ERPT (Campa and Goldberg, 2005 and Ghosh, 2013). However, more liberal trade policies and rising trade volume may force companies to operate in a more competitive environment and hence one can witness declining ERPT.

The composition of imports stands as another major factor influencing the pace and degree of ERPT. Campa and Goldberg (2002) found that ERPT can be subject to variations depending on the substitutability between imported and domestically-produced goods. If the degree of substitutability is low, then the price-setting ability of the importing firms will be higher and they are less concerned about market share losses. However, if there exist closely resembling substitutes, then the competitiveness and market share considerations will be evident, so importing firms are not able to boost their prices as much as the level implied by the currency depreciation.

Current account deficit (CAD) and its long/short term financing have also important implications for EM countries in terms of inflation. These vulnerabilities regarding external balance might put pressure on exchange rates, the confidence of economic agents and pricing behavior. In this respect, the detailed analysis may raise the question that apart from the direct effect coming through exchange rate fluctuations; CAD and its financing sources might have indirect implications on the pricing behavior of the firms in EMs. It should be

noted here that the price increases in such countries tend to be larger than what is implied by exchange rate shocks, probably due to distortion in pricing mechanism arisen from sizeable ERPT caused by external balance vulnerabilities (Kılınç et. al., 2016).

It might be argued that structural vulnerability stemming from FX debt of corporates in EMs stand as a potential catalyzer of ERPT, due to increased sensitivity to currency fluctuations. Firms will face difficulties to service their FX-denominated debt if this exposure is not hedged properly. Thus, the mechanism through which exchange rate fluctuations affect domestic prices is more visible, due to sensitivities against currency shocks coming from the existence of FX corporate debt. Micro-dynamics and heterogeneity across sectors in terms of FX sensitivities might also play a crucial role in pricing behavior. If the majority of FX debt is accumulated in the sectors which are not export-oriented (or in other words, without any natural hedge) and if such sectors do not utilize financial hedging instruments extensively, ERPT effect might be amplified. By working on a micro-level data from Turkey, Fendoğlu et al. (2020) showed that manufacturing sectors with higher net FX liabilities experience larger price swings following currency depreciation.

Another type of structural vulnerability which has a considerable effect on financial stability and price stability is relevant to foreign ownership of domestic financial assets, in particular, debt securities. Previous studies have shown that higher foreign investors' participation rate in local bond markets may increase the maturities and lower the cost of funding (Sienaert, 2012). However, in case of a sudden shift in global risk appetite, considerable withdrawal of foreign funds might create fragilities in these markets inflating the cost of financing (Turner, 2012). Therefore, when the domestic currency is hit by an external shock and local currency depreciates, a higher participation rate of foreign investors might exacerbate the exposure and create considerable effects in terms of macroeconomic aggregates.

Country risk premium has long been considered as an indicator of investor perception regarding the countries' overall riskiness compared to peer groups. In addition to this, the country risk premium is one of the main components of external financing costs for sovereign entities. Therefore, it may have implications in terms of financial stability as well as price stability, especially in the EM group (Korkmaz & Onay, 2018). For example, Gagnon and Ihrig, 2004 and Vonnak, 2010 argue that risk premium shocks have a significant effect on domestic prices.

The level of imported content of the final demand can also be added to the abovementioned list of structural vulnerabilities potentially influencing the course and degree of ERPT. In the case of higher dependence of consumption tendencies on imported goods and the composition of imports shaped by consumption goods might mean that

external shocks can have significant effects on domestic prices through direct and indirect channels (Gopinath, 2015 and Carriere-Swallow et. al., 2016).

Lastly, the level of inflation can also be considered as an indicator representing the soundness of the macroeconomic environment which might have effects on exchange rate-inflation nexus. In a macroeconomic outlook characterized by higher inflationary pressures, the credibility of policies might be a question and the persistency of external shocks increases (Taylor, 2000). Moreover, the transmission of these shocks to domestic macroeconomic indicators occurs rapidly at a larger amount. One of such mechanism can work through the exchange rate shocks and pricing behavior. As stated by Taylor (2000) and Lopez-Villavicencio and Mignon (2016), firms increase their prices if they perceive exchange rate changes as permanent. Otherwise, if their expectations are aligned with the fact that the shock is temporary, then they would not adjust their prices immediately and to a larger extent. Thus, when the level of inflation is high, the persistency of the shocks increases. In such cases, firms tend to reflect increasing costs on their prices easily. Jasova et al. (2016) analyze the evolvement of ERPT in both developed and developing countries. They particularly argue that declining ERPT in EMs is closely associated with the declining inflation level. In addition to this, Mihaljek and Klau (2008) show that declining trends in both level and variability of inflation paved the way for lower ERPT in EMs.

The main contributions of this study to existing empirical literature are threefold. First of all, the focus of this study is on a relatively recent time period covering mostly the post-crisis era. Hence, it aims to shed light on the contemporary dynamics of inflation developments and the role of currency movements. Secondly, we employ a unique methodology in a cross-country setting embodying the implementation of the Interacted Panel Vector Autoregression (IPVAR) model, which is introduced by Towbin and Weber (2013), to better examine the response of domestic prices to exchange rate shocks. More importantly, how ERPT differs based on country characteristics called as “vulnerability sources” are investigated, which are underwhelmingly covered in the case of Turkey. The rest of the paper is organized as follows. Section II briefly mentions utilized data while Section III provides detailed information about methodological aspects of the study. Section IV discusses the main empirical results and the last section concludes the paper.

II. Data

In this study, the selected sample of EMs comprises 14 countries, which are classified as emerging and developing by major worldwide economic institutions including IMF, OECD and the World Bank[2]. In particular, selected countries are Brazil, Chile, Colombia, Czech

[2] When the sample of EM countries is chosen, the availability of reliable data in monthly frequency is considered as well.

Republic (Czechia), India, Indonesia, Israel, Mexico, Peru, Philippines, Romania, Russia, South Africa and Turkey. These countries are chosen to reflect different geographical, market-based and macroeconomic outlook characteristics. Moreover, all of the selected EMs in this study are inflation-targeting countries so one of the main policy interests is price stability and its determinants (Table 1). As a sample period, we choose to examine the time interval after GFC, therefore the analysis covers the period between January 2010 and October 2018[3]. When determining the sample period, apart from data availability, exclusion of structural break during the GFC period and examination of contemporary dynamics of inflation developments become influential. Additionally, the heterogeneous nature of EMs in terms of structural vulnerability indicators plays a crucial role especially after the GFC period when strong capital inflows directed towards EMs.

Insert Table 1

Before proceeding to the empirical analysis, it would be informative to provide a brief introduction to external vulnerability indicators (Table 2). In line with the literature, we proxy the dollarization level in EMs as the portion of total loans in the banking system denominated in FX, which is provided by IMF International Financial Statistics (IFS) database. CAD and its financing sources should be considered seriously when the soundness of EMs are taken into account. More clearly, CAD and long/short term financing of it have important implications for EM in terms of output growth and inflation. FDI ratio (FDI/GDP) in the economy can be seen as a structural soundness indicator when external balance and financing considered. In addition to CAD, broader external financing need measure which is defined by Institute of International Finance (IIF) as the sum of the current account balance, amortization on medium to long-term external debt and short term external debt can be controlled while assessing the EM vulnerabilities. Countries exceeding the benchmark level in terms of external financing requirements might be considered as high-risk countries.

It might be further argued that structural vulnerability coming from huge FX debt of corporates in emerging markets revives as a potential catalyzer of ERPT, due to increased sensitivity to currency fluctuations. When we look at the foreign currency debt of non-financial corporates (NFC) relative to gross domestic product data (collected from IIF database), there exists a significant rise over the sample period, albeit some decline in recent years. Another type of structural vulnerability which has a considerable effect on financial stability and price stability is relevant to foreign ownership of local currency

[3] All the variables used in the study are converted into monthly frequency except for interaction dummies. To be able to satisfy stationarity condition, the required transformation of the variables are made. Possible seasonalities are controlled via TRAMO/SEATS procedure of Demetra program which is developed by Eurostat.

financial markets, in particular, debt securities. The data regarding foreign ownership of local debt markets is retrieved from IIF database as well. In this study, we measure the foreign ownership with the proxy of non-resident's share in the local currency sovereign bond market.

Within this framework, country risk premium can be followed through Credit Default Swap (CDS) spread. CDS spread data is compiled from the Bloomberg database. As another component of external/structural vulnerabilities, the import content of demand conditions is followed by total value added in final demand statistics, which is provided in OECD database. In relation to the abovementioned structural vulnerability factors such as higher external financing needs, reliance on short-term capital flows and NFC FX exposure; the level of international reserves holds importance as well. Although there is no consensus among academics and practitioners regarding the best indicator of the adequacy of reserves, alternative measures constituted by IMF are broadly accepted and used in the empirical analysis. Among these measures, the ratio of reserves to short-term debt metric compiled from IMF is preferred in our framework. Lastly, inflation data referring to the averages of the year on year changes in headline inflation is compiled from IMF IFS database.

Insert Table 2

As it is mentioned before, there seems to be no previous profound and comprehensive study in the empirical literature investigating the effects of considered structural fragilities on ERPT. Here, possible linkages between such vulnerabilities and price stability (as well as financial stability) will be briefly discussed. Additionally, the current outlook and recent trends in such indicators in EMs can also be tracked via graphical analysis (see the Appendix).

On top of these data series, we also employ additional data in forming the ERPT mechanism through interacted panel VAR model, which is covered in detail in the following methodology section. As an inflation indicator, headline consumer price indices for all countries are taken from IMF IFS database and monthly logarithmic differences of that series are taken. Although some country-specific studies use different core inflation measures, to be able to have a consistent estimator across sample countries, using headline inflation would be intuitive. Moreover, there are some limitations to retrieve uniform core inflation data for all countries during the whole sample period.

Currency movements are tracked by monthly averages of nominal bilateral exchange rates against the US dollar collected from Bloomberg. Similar to price indicators, series are transformed into logarithmic changes. Again, previous studies are utilizing different exchange rate measures like nominal or real effective exchange rates. However, the central interest of many agents including households, firms and policymakers in our ERPT setting is

thought to be associated with nominal exchange rate fluctuations. Thus, we proceed with nominal currency movements.

One of the most controversial variables is definitely the output gap controlling for demand-side inflationary pressures. As it is widely known that the output gap measure, referring to the difference between actual and potential growth of a country, represents to what extent economic activity deviates from its long-term trend. However, creating a monthly indicator to track the course of economic activity requires further statistical analysis. To obtain monthly output gap series, we are in need of an economic activity indicator in monthly frequency and mostly preferred candidate is Industrial Production Index (IPI) because the Gross Domestic Product (GDP) can be retrieved only at a quarterly frequency for sample countries. In this context, the widely preferred methodology is using the Hodrick-Prescott (HP) filter[4] to differentiate the trend and cycle of the IPI series[5]. Although there are some caveats of using HP filter such as end-point bias, it is the most convenient and standard way to construct the output gap and it is easy to interpret.

To proxy for the monetary policy stance, in our panel VAR specifications, we have used the short-term market interest rates (i.e. yields on government bonds with 2-year maturities). Simple monthly averages are taken from the data retrieved from Bloomberg Terminal. Apart from that, to be able to control for supply shocks and global commodity prices, monthly logarithmic changes of Brent oil futures are included. Summary statistics based on panel structure including the cross-sectional and longitudinal variations as well as the panel unit root test results are given in Table 2. In order to have reliable results from panel VAR, the variables should be stationary. To check that, we have utilized Im-Peseran-Shin (1997) first-generation panel unit root test. All the considered variables are found to be panel stationary. Lag length is chosen as 1 month according to Schwarz Information Criteria.[6]

Insert Table 3

Apart from these, the interaction dummies regarding structural determinants are created for the IPVAR analysis. For all of the variables, we take the country averages with respect to vulnerability indicators as an initial step, and then, the specific median values are calculated for each indicator. In the following step, we divide the countries into two sub-samples as "above the median average" and "below the median average" to create dummy variables taking the value of "1" for more vulnerable countries and "0" for the ones with low

[4] Method was firstly used by Hodrick and Prescott (1997) to estimate US business cycles.

[5] We also perform de-trending procedure by using quarterly time dummies, results seem to be indifferent to the method of obtaining the output gap.

[6] Robustness of IPVAR estimations are evaluated by using alternative models with 3-month lag structure.

vulnerability. We entitle such groups as “more vulnerable” and “less vulnerable” countries depending on the direction of the indicator.

III. Methodology

In the empirical literature, three groups of the statistical approaches are employed to estimate ERPT mainly. These can be listed as single equation methods, vector autoregressive (VAR) models and the others. Closer examination of these methods reveals that each group has its own advantages and disadvantages (Tunç, 2017). In order to exploit the variations among country characteristics, to account for unobserved heterogeneities across countries, to support the inference process with more number of observations and to cope with omitted variables problem efficiently; longitudinal version of VAR model is employed in this study. This type of framework is also suitable in understanding the dynamic lead/lag relations among the variables in addition to the pace, duration and size of the ERPT.

Furthermore, the chosen methodology should incorporate countries’ relative performances with respect to vulnerability indicators. Although there are several studies directly adding interaction terms into a single equation model, their use in VAR setup is a relatively new technique. In this study, Interacted Panel Vector Autoregression (IPVAR) model which is introduced by Towbin and Weber (2013) is used to analyze the effects of structural characteristics on ERPT. In other words, a structural panel VAR model with interaction terms is designed to identify potential structural determinants of transmission from exchange rate fluctuations to domestic prices in EMs. The use of interaction terms in panel VAR models enables us to get varying coefficients over time and across countries deterministically. It can be seen as an alternative to Bayesian time-varying parameters (TVP) models with a distinct feature such that, in this approach, the change in the coefficients are derived deterministically instead of exploiting stochastic processes (Wieladek, 2016). As a further distinction from the standard VAR models, IPVAR adds the cross-sectional dimension of data by accounting for the heterogeneous information in country panel. It also increases the sample size and degree of freedom to reduce the risk of over-fitting and to eliminate idiosyncratic effects (Gavin and Theodorou; 2005).

In this context, IPVAR model enables us to obtain VAR coefficients varying with dummy variables representing the structural/external vulnerabilities such as dollarization, current account deficit and its financing source, FX debt of corporates and others as well. To differentiate the impact of structural characteristics (dollarization, CAD, long-term financing of CAD, NFC FX Debt, etc.) on ERPT (as stated in the previous section), for each vulnerability indicator, we have divided the sample countries into two sub-groups separately as high and low categories. “More vulnerable category” refers to the countries whose average is higher than the median level (of all countries throughout the sample). On the other hand, “less

vulnerable category" countries have values lower than median levels in such categories. With this categorization, we run separate IPVAR estimations with respect to the abovementioned categorization for each structural variable. The differences in the impact of structural determinants have been extracted by comparing and contrasting standardized impulse-response functions generated from IPVAR estimation.

Similar to ordinary VAR models, shocks are identified in chain-like causality among variables via Cholesky decomposition. In this methodology, variables are ordered from the most exogenous to the most endogenous variable based on economic intuition. Utilizing a lower triangular restriction matrix for residuals (in line with Cholesky ordering), our ordering implies that the variable is not affected by the contemporaneous shocks stemming from the variables placed latter than it is. Considering the small open economy nature of the emerging markets, in line with the previous studies in the literature (McCarthy, 2007; Ogunc et. al., 2018), ordering of the selected variables is specified as follows:

$$Oil_t \rightarrow \quad FX_{it} \rightarrow \quad X_{it} \rightarrow \quad \Delta i_{it} \rightarrow \quad \pi_{\mathrm{it}} \tag{1}$$

In this specification, Oil_t represents monthly changes in Brent oil prices. FX_{it} demonstrates the monthly appreciation or depreciation of local currencies against USD, whereas Δi_{it} stands for changes in interest rate. Moreover, X_{it} and π_{it} denote the output gap and monthly inflation of Ems, respectively.

The selection of the variables employed in the model is mainly in line with the existing literature. The selected variables capture supply and demand-side factors which are influential on inflationary movements in EMs. More specifically, the oil price is ordered first and identified as a supply-side and cost-based shock. Therefore, it is not expected to be affected by other variables contemporaneously. After that, the exchange rate is ordered as a second variable because exchange rate fluctuations are exogenous for small EMs, which are heavily affected by external shocks like global liquidity conditions and investor risk appetite. On the other hand, exchange rate fluctuations can affect output and prices contemporaneously. Then, the rest of the variables are included to be able to capture mainly demand-side factors on inflation and ordered as output gap, interest rates, respectively. Finally, the domestic price is ordered as the most endogenous variable. Such ordering implies that shocks coming from output gap have contemporaneous effects on interest rate settings. Then, the interest rate shocks are transmitted to domestic prices through demand and cost channels.

After that, related impulse-response functions are calculated and the difference between the two categories is examined for each vulnerability indicator. In addition to the graphical representation of the cumulative impulse response function (IRF) differences between high and low regimes in each interaction variable are demonstrated. In short, thanks to IPVAR

methodology, we can easily observe the drastic changes in responses of ERPT to different structural characteristics. Therefore, we will be able to understand and quantify changes in the degree of ERPT given policy implementations regarding such structural vulnerabilities.

As covered in the works of Tobwin and Weber (2011, 2013), the IPVAR model has the following representation:

$$J_{i,t}Y_{i,t} = \widetilde{C}_i + \sum_{k=1}^{L} \tilde{A}_{i,k}\, Y_{i,t-k} + \tilde{C}^1 X_{i,t} + \sum_{k=1}^{L} \tilde{A}_k^1\, X_{i,t} Y_{i,t-k} + \tilde{u}_{i,t} \qquad (2)$$

$$\tilde{u}_{i,t} \sim N(0, \widetilde{\sum} i, t)$$

where

$Y_{i,t}$ is a vector of explanatory variables,

$\widetilde{C}_i$ is a vector of country-specific intercepts,

$\tilde{A}_{i,k}$ is a matrix of autoregressive coefficients up to lag L and

$\tilde{u}_{i,t}$ is a vector of one step ahead prediction errors, normally distributed with a covariance matrix $\widetilde{\sum}$.

$X_{i,t}$ is the interaction term that influences the dynamic relationship between the endogenous variables.

$J_{i,t}$ is a lower triangular matrix with ones on the main diagonal,

t (1, …, T) refers to time and i (1, …, N) refers to country.

By estimating the model in a recursive form we allow for variation in the contemporaneous correlation of variables across countries. One can note that, in this model, coefficient-variation is parameterized as a function of structural determinants in contrast to other studies that use single-country VARs with stochastically time-varying coefficients.

$$\begin{pmatrix} \pi_{it} \\ X_{it} \\ \Delta i_{it} \\ FX_{it} \\ Oil_{it} \end{pmatrix} = \mu_{i,t} + \sum_{i=}^{L} \begin{pmatrix} {a_{i,t}}^{11} & {a_{i,t}}^{12} & {a_{i,t}}^{13} & {a_{i,t}}^{14} & {a_{i,t}}^{15} \\ {a_{i,t}}^{21} & {a_{i,t}}^{22} & {a_{i,t}}^{23} & {a_{i,t}}^{24} & {a_{i,t}}^{25} \\ {a_{i,t}}^{31} & {a_{i,t}}^{32} & {a_{i,t}}^{33} & {a_{i,t}}^{34} & {a_{i,t}}^{35} \\ {a_{i,t}}^{41} & {a_{i,t}}^{42} & {a_{i,t}}^{43} & {a_{i,t}}^{44} & {a_{i,t}}^{45} \\ {a_{i,t}}^{51} & {a_{i,t}}^{52} & {a_{i,t}}^{53} & {a_{i,t}}^{54} & {a_{i,t}}^{55} \end{pmatrix} \begin{pmatrix} \pi_{i,t-1} \\ X_{i,t-1} \\ \Delta i_{i,t-1} \\ FX_{i,t-1} \\ Oil_{i,t-1} \end{pmatrix} + u_{i,t} \qquad (3)$$

$$\begin{pmatrix} {u_{i,t}}^{\pi} \\ {u_{i,t}}^{X} \\ {u_{i,t}}^{\Delta i} \\ {u_{i,t}}^{FX} \\ {u_{i,t}}^{Oil} \end{pmatrix} = \begin{pmatrix} 1 & 0 & 0 & 0 & 0 \\ \gamma_{2,1} & 1 & 0 & 0 & 0 \\ \gamma_{3,1} & \gamma_{3,2} & 1 & 0 & 0 \\ \gamma_{4,1} & \gamma_{4,2} & \gamma_{4,3} & 1 & 0 \\ \gamma_{5,1} & \gamma_{5,2} & \gamma_{5,3} & \gamma_{5,4} & 1 \end{pmatrix} \begin{pmatrix} {\varepsilon_{i,t}}^{\pi} \\ {\varepsilon_{i,t}}^{X} \\ {\varepsilon_{i,t}}^{\Delta i} \\ {\varepsilon_{i,t}}^{FX} \\ {\varepsilon_{i,t}}^{Oil} \end{pmatrix} \qquad (4)$$

IV. Empirical Results

For each of the interaction variable, cumulative impulse response functions (IRFs) are computed as the response of CPI to the exchange rate shock. Figures 3 to 6 indicate that how the cumulative impulse-response functions (representing the reaction of CPI changes to one standard deviation shock to exchange rate movements) vary with different vulnerability characteristics in separate specifications. The chart in the left-hand-side in each figure demonstrates the impulse-response function for the group of countries with high vulnerabilities, while the middle chart indicates the IRF for less vulnerable ones. The charts in the far-right panel of these figures depict the IRF as well as the statistical significance of the difference between two groups categorized based on vulnerability indicators. Here, red lines represent median estimates and the dashed blue lines correspond to bootstrapped 90% confidence bands. While the vertical axis shows the ERPT as a share of the cumulative shock, the horizontal axis presents the time interval passed after the occurrence of exchange rate shock.

Insert Figure 3 to 6

First of all, when we categorize EMs based on their dollarization tendencies and examine the IRFs, we find that in high dollarization countries for the recent period, the cumulative response of CPI to exchange rate shock (ERPT) over 24 months is almost 12%, while, it is 7% for the low dollarization countries, which create 5% differential with preserved statistical significance. Simply, higher ERPT levels are observed in EM countries experiencing higher dollarization levels with economic and statistical significance. Secondly, the repetition of the same analysis for the categories identified through the level of CAD, it is found that countries with higher CAD display higher ERPT tendency compared to countries with lower CAD. It can be understood that pricing tendencies in countries with higher external deficits are more vulnerable to exchange rate movements in terms of inflation dynamics. In addition to these, there exists statistical evidence for the role of CAD financing regarding ERPT, particularly relevant to external financing obtained from FDI inflows. Our IRF analysis yields a clear distinction in ERPT process between countries categories based on FDI financing. As expected, countries with a lower level of FDI financing vastly depending on short-term portfolio flows are also determined to have stronger ERPT.

Instead of focusing only on CAD, a broader concept which is called external financing need of a country can also be taken into consideration while assessing the structural vulnerabilities stemming from the balance of payments. Empirical results indicate that ERPT in the EMs with higher external financing requirement is significantly higher than the countries with lower external financing need. The difference is almost 5% in 24-months interval with statistical significance. Thus, fragilities due to higher external financing needs

might exacerbate the sensitivity of domestic prices to external shocks. Considering the FX debt of non-financial corporates in EMs as an alternative structural vulnerability category, the degree of ERPT is also altered between high and low FX-indebted countries. Although ERPT is found relatively lower in the countries with lower FX debt, it is almost 13% in the sample country group with high FX debt. This finding is quite intuitive as firms face difficulties to service their FX-denominated debt, especially when they do not utilize adequate natural and financial hedging. In such cases, any shift in global financial conditions will definitely be transmitted into increased funding costs and decreased roll-over trend. Consequently, raising cost pressures would be reflected into producer and ultimately domestic consumer prices compounding the phase and extent of ERPT.

As stated before, one might argue that if foreign ownership in local debt markets is high, it will become more sensitive to adverse capital outflows and such countries are more exposed to external shocks. Within this framework, ERPT should be higher in countries with higher foreign ownership. However, as it can be seen in Figure 4, empirical evidence in our analysis shows conflicting results. This might be because of the fact that foreigners are searching for investment opportunities in more sound and resilient countries. Therefore, a higher share of foreigners' participation might be a macroeconomic healthiness signal instead of vulnerability.

As an important determinant of external financing cost, CDS premium demonstrates investor perception about the riskiness of a country. When we divide our sample EM countries into two groups based on CDS premium level and analyze the ERPT in such subgroups. Results indicate that there is a statistically significant difference between high and low CDS countries. In countries with higher CDS, ERPT is almost 10%, but in lower CDS countries ERPT is only 3% in the 24-months period. Therefore, CDS has significant implications in terms of financial stability as well as price stability.

After categorizing EMs according to the level of import content of the final demand into two subgroups as high and low, considerable heterogeneity is observed in terms of ERPT. ERPT in structurally vulnerable (high import content) group is nearly 13%, but for the robust group (low import content) this ratio is almost 5% lower with statistical significance. Additionally, the level of international reserves can play an important role in this framework, because it can be considered as a buffer against external shocks and is subject to increasing the resilience of a country. As it can be seen from Figure 4, our empirical analysis indicates that when reserve coverage of a country is low (more vulnerable) ERPT is almost 5 % higher compared to countries having more reserve buffer. Last but not least, the level of inflation can be attributed as a source of fragility and vulnerability which has a considerable impact on ERPT in EMs given the credibility issues. For instance, in EM countries experiencing

relatively higher inflation levels, transmission from exchange rates to prices is also stronger compared to EM countries with a relatively lower level of inflation.

Overall, results are mostly robust to the choice of lag length in IPVAR estimations. The finding referring to the stronger ERPT in countries with highly dollarized financial systems is also evident when a 3-month lag structure is chosen. Although IRF realizations do not display stable results for the balance of payments indicators including CAD and FDI financing, the notion that countries with larger FX debt experience stronger ERPT is preserved, even lag structure is altered. Furthermore, IRF results relevant to financial vulnerability indicators such as foreign ownership in domestic financial markets and country risk premium do not deviate from the baseline results in the expanded specification of the IPVAR model. In fact, unlike baseline estimations, the ERPT differential regarding the adequacy of reserves is determined to carry statistical significance, especially for the first 5 months, compared to the baseline framework. Lastly, we observe no significant fluctuation in ERPT differentials based on macroeconomic indicators potentially leading to external vulnerabilities, including import content of demand and inflation outlook, in alternative specification with revised lag structure.

V. Conclusion

In this study, the exchange rate pass-through to consumer prices is analyzed in the context of Emerging Markets. Considering the heterogeneity among EMs in terms of ERPT, structural vulnerability sources affecting the response of domestic prices to exchange rate shocks are examined through the Interacted Panel Vector Autoregression (IPVAR) approach, which is introduced by Towbin and Weber (2011, 2013). In this methodology, shocks are identified in chain-like causality among variables via Cholesky decomposition. After that, related impulse response functions are calculated and the difference between the two regimes in each structural variable is examined. In short, thanks to IPVAR methodology, we analyze the changing responses of ERPT to different structural characteristics of the EM countries. Therefore, we are able to understand and quantify changes in the degree of ERPT given policy implementations regarding such structural vulnerabilities.

The results mainly indicate that higher ERPT levels are observed in the countries with higher dollarization level. When countries are separated according to the level of CAD, it is found that countries with higher CAD show higher ERPT tendency compared to countries with lower CAD. In addition to this, statistical evidence showing that financing of CAD with FDI matters in terms of ERPT as well. If a country is financing its deficit through FDI compared to short-term resources, the sensitivity of domestic prices to exchange rate shocks decreases considerably. The results of the empirical analysis indicate that ERPT in the group of EM countries with higher external financing requirements is significantly higher than the

countries with lower external financing need. The higher level of foreign ownership in local debt markets decreases ERPT due to the fact that foreigners might be selective and investing in more sound and resilient countries. Therefore, a higher share of foreigners might be a healthiness signal instead of vulnerability.

Considering the FX debt of non-financial corporates in EMs, ERPT is found relatively lower in the countries with lower FX Debt. This finding is quite intuitive while taking firms facing difficulties to service their FX denominated debts without enough hedge instruments. ERPT in structurally vulnerable (high import content) group is significantly higher than the robust group (low import content). Results indicate that there is a statistically significant difference between high and low CDS countries. In countries with higher CDS, ERPT is considerably higher compared to lower CDS countries. Therefore, CDS has significant implications in terms of financial stability as well as price stability especially. Our empirical analysis indicates that when reserve coverage of a country is low (more vulnerable) ERPT is higher compared to countries having more reserve buffer.

Given the finding that dollarization is one of the key determinants of ERPT, policies should address achieving de-dollarization in EMs. It should be noted that apart from many other macroprudential measures, macroeconomic stability especially price stability is quite necessary for de-dollarization. Vulnerabilities from the external imbalances require policies to address the current account deficit. On the one hand, policies should aim at controlling imports (especially domestic demand), on the other hand, increasing high value-added exports via improving competitiveness and diversifying destination countries. Additionally, macroprudential policies will help improve the quality of external financing and lower risks from FX exposure in the economy. Large external financing needs and a high share of short-term and portfolio inflows might make EMs more vulnerable to sudden capital flights. Strategies focusing on the share of imported inputs are of critical importance to be able to decrease CAD as well as to enhance financial stability and price stability. Taking the role of external financing and reserve adequacy on ERPT into consideration, EMs should increase their international reserves to become more resilient against external shocks. Considering the EMs with low reserve coverage of external financing need and lower international reserves, reserve accumulation should be addressed by policy-makers with prioritized attention.

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Graphs and Tables

Figure 1. Dispersion in EM Inflation Rates (Month-on-Month Change, Seasonally Adjusted, Coefficient of Variation)

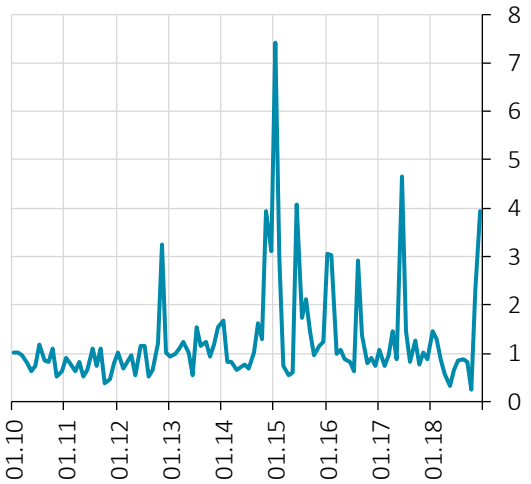


Figure 2. Dispersion in EM Inflation Rates (Year-on-Year Change, Coefficient of Variation)

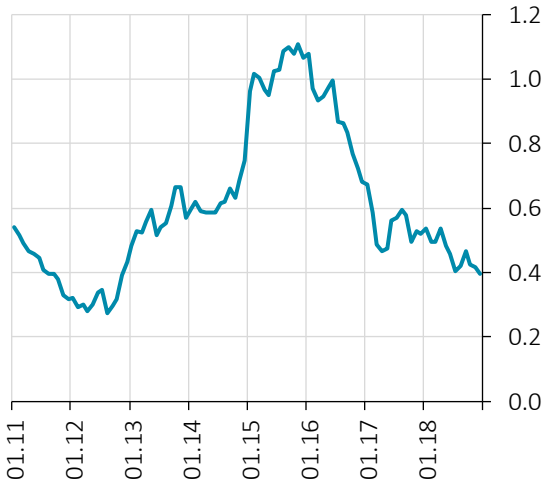


Table 1. Inflation Targeting (IT) Countries and IT Strategy Adoption Years

Countries	Year of Adoption
New Zealand	1989
United Kingdom	1992
Israel & Czech Republic	1997
South Korea & Poland	1998
Colombia, Chile & Brazil	1999
Thailand & **South Africa**	2000
Hungary & **Mexico**	2001
Philippines & Peru	2002
Romania & Indonesia	2005
Turkey	2006
United States	2012
Japan	2013
Russia	2014
India	2015
Argentina	2016

Source: Retreived from Agenor and Pereira da Silva (2019)

Table 2. Interaction Variables Formulas and Sources

Variable Name	Formula	Source
Dollarization	Portion of total loans in the banking system denominated in FX	IMF IFS Database
CAD	Current Account Deficit (% of GDP)	World Bank
FDI	Foreign Direct Investment (% of GDP)	World Bank
Foreign Ownership	Foreign Ownership of Local Currency Government Securities (% of GDP)	IIF
External Financing Need	CAB + Amortization on Medium to Long-term External Debt + Short term External Debt	IIF
NFC FX Debt	Non-Financial Corporates FX Denominated Debt (% of GDP)	IIF
Import Content of Final Demand	Import Content of Final Demand (% of GDP)	OECD
Country Risk Premium	Credit Default Swap Spread	Bloomberg
Reserve Adequacy	Reserves/Short-Term Debt	IMF
Inflation Level	Average Headline Inflation (Year-on-Year)	IMF IFS Database

Table 3. Summary Statistics of the Variables

Variable	Variable Name	Data Transformation	Data Source	Number of Observation	Panel Unit Root Results (Im-Peseran-Shin Test Statistic)
π	Inflation	Log Difference	IMF IFS Database	N=1484 n=14 T=106	-20.06***
FX	Exchange Rate	Log Difference	Bloomberg	N=1484 n=14 T=106	-20.85***
X	Output Gap	Level	IMF IFS Database, Author's own calculations	N=1484 n=14 T=106	-18.85***
Δi	Interest Rate	Level Difference	Bloomberg	N=1484 n=14 T=106	-21.45***
Oil	Brent	Log Difference	Bloomberg	N=1484 n=14 T=106	

Figure 3. Impulse Response Functions (1 Month Lag Structure)

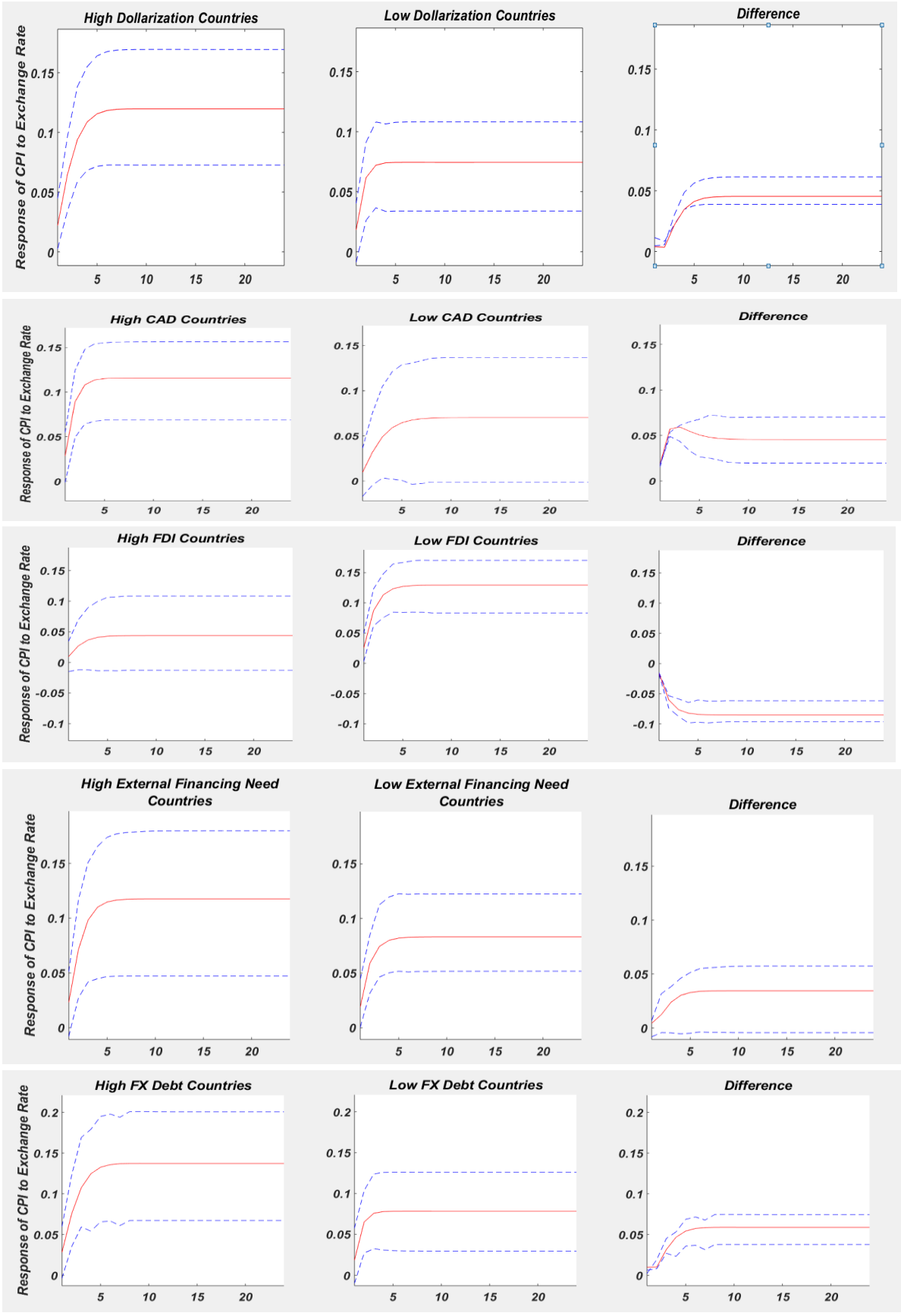


Figure 4. Impulse Response Functions (1 Month Lag Structure)

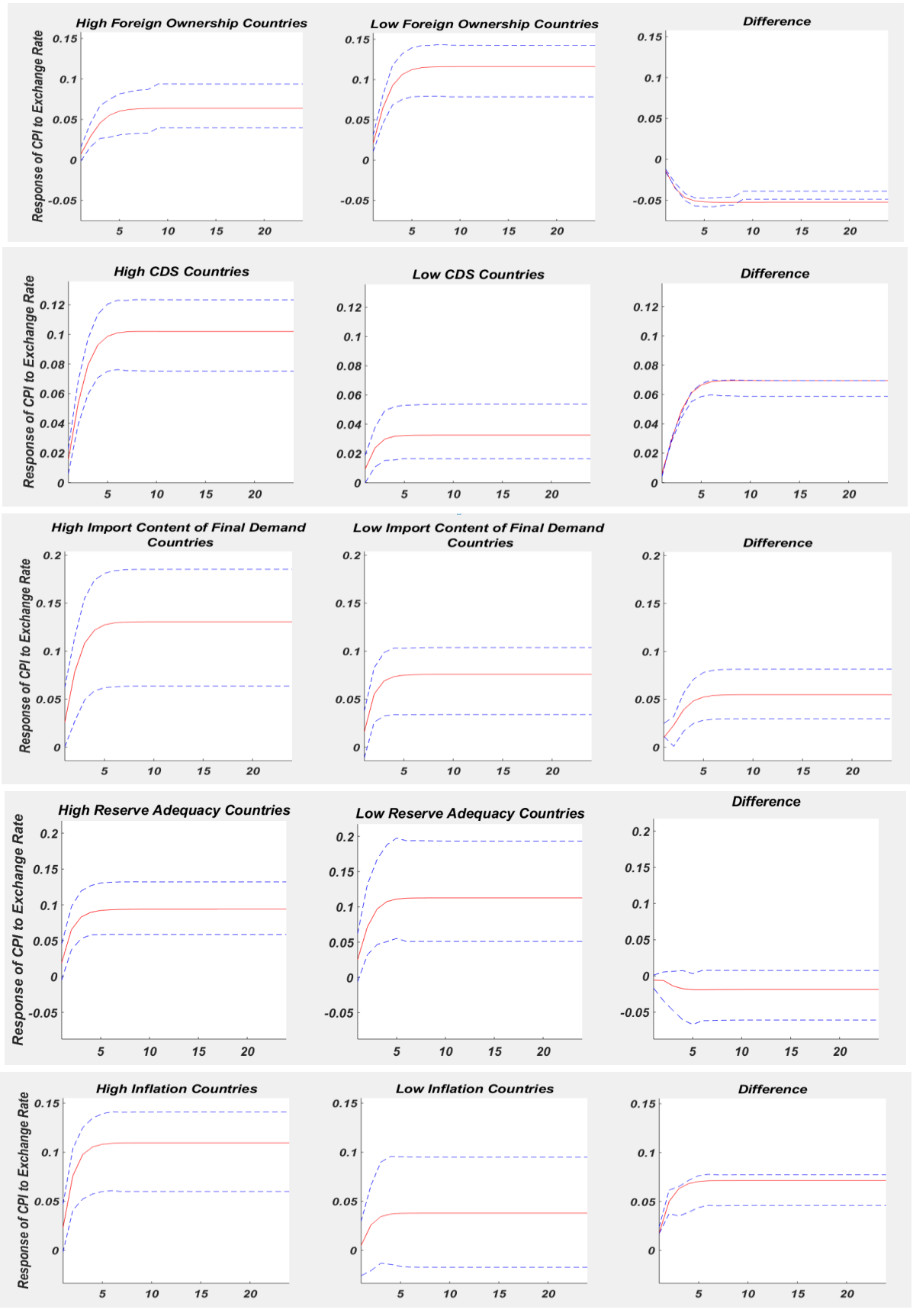


Figure 5. Impulse Response Functions (3 Month Lag Structure)

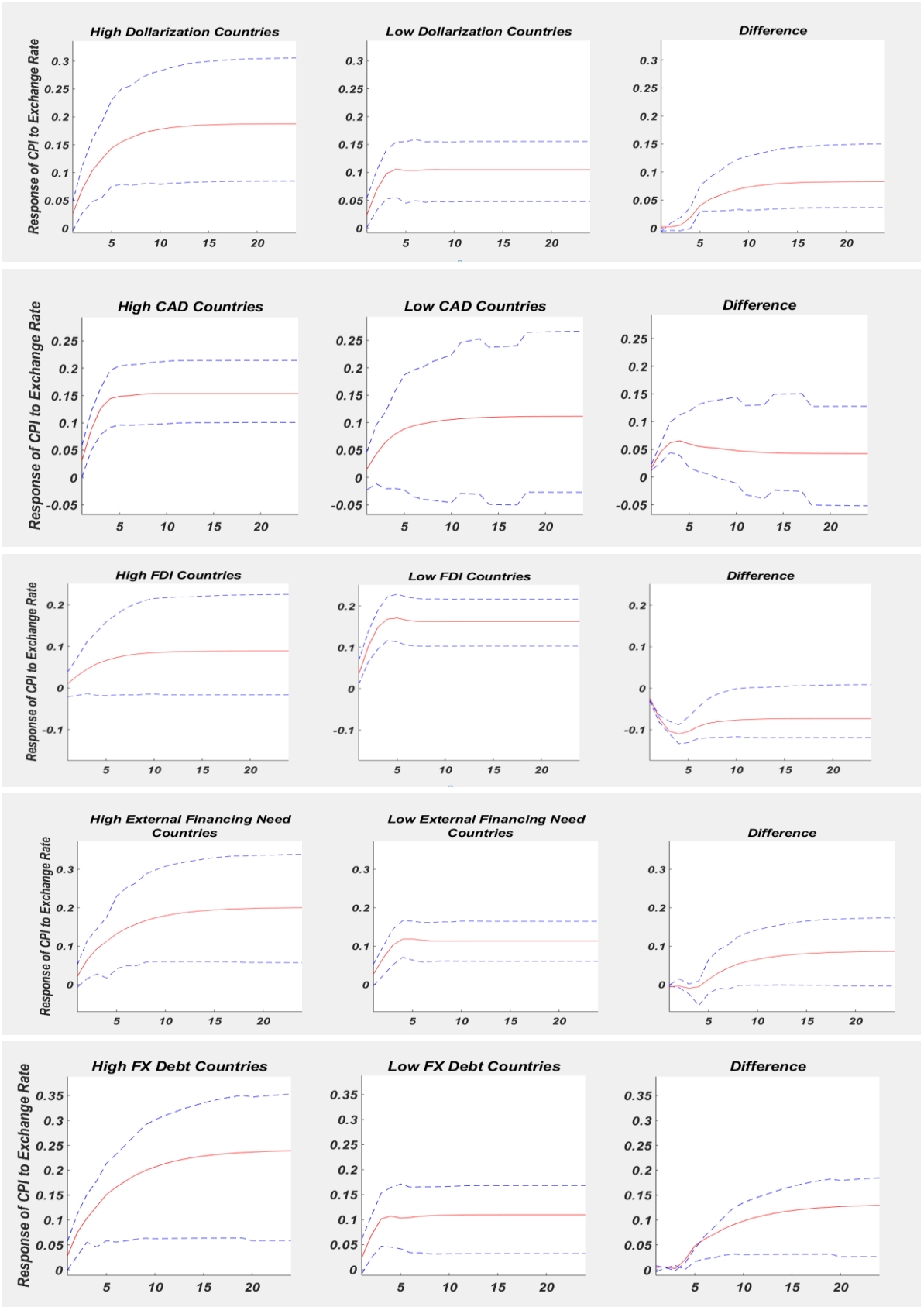
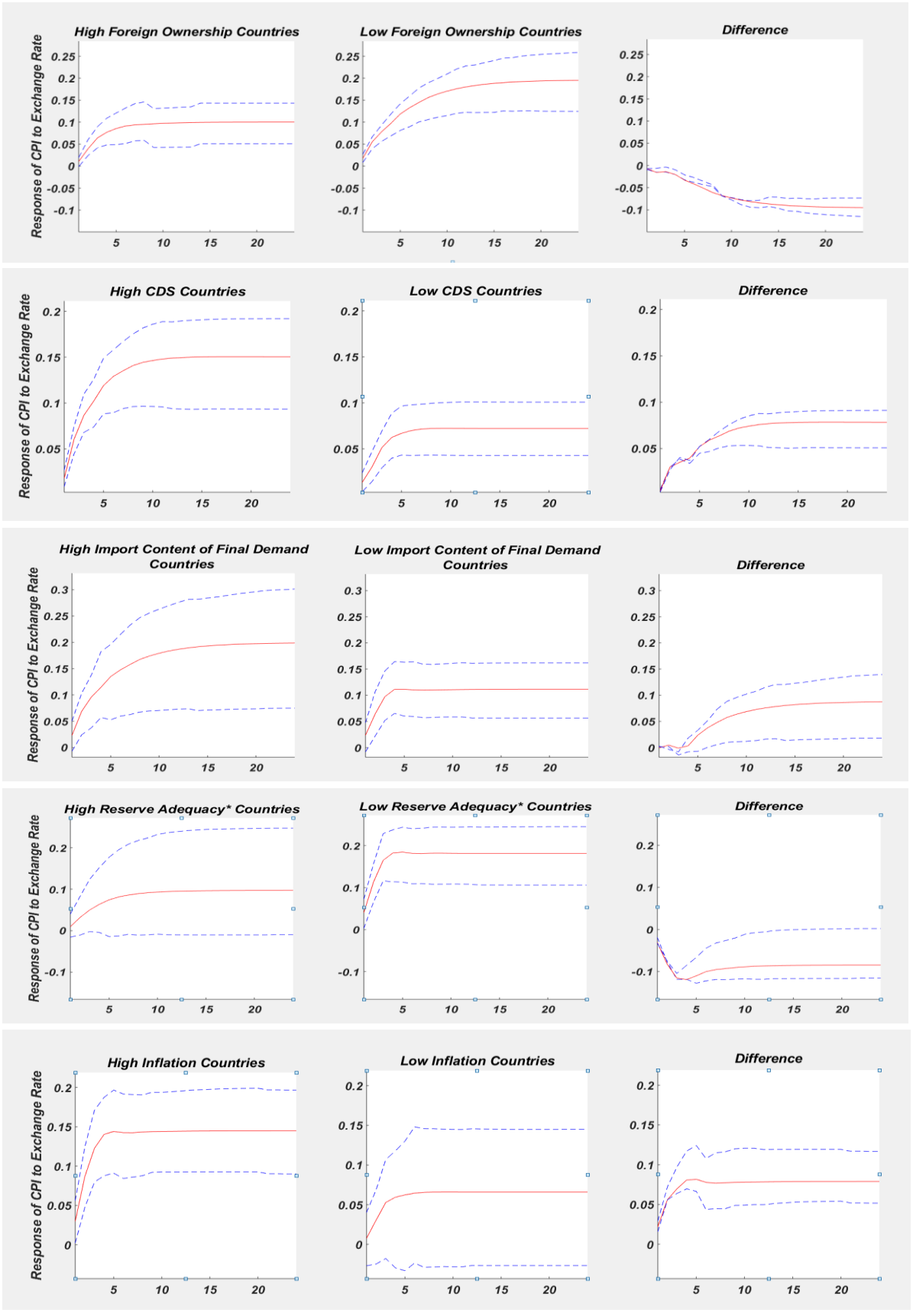


Figure 6. Impulse Response Functions (3 Month Lag Structure)



APPENDICES

Table A1. Dollarization Level Summary Statistics (FX Loans to Total Loans, Percentage)

Countries	Mean	Std. Dev.	Min	Max
Brazil	15.4	2.5	11.7	19.3
Chile	16.6	3.0	11.2	20.0
Colombia	7.4	0.8	6.1	8.4
Czechia	23.4	3.8	20.9	29.1
India	9.8	2.1	7.3	12.2
Indonesia	15.7	0.8	14.8	17.0
Israel	13.5	2.2	10.3	16.6
Mexico	12.2	1.3	10.3	13.9
Peru	37.8	7.5	28.7	46.5
Philippines	11.9	0.8	10.6	13.1
Romania	54.4	10.2	37.2	63.4
Russia	26.6	4.6	21.3	35.3
South Africa	9.1	1.4	6.7	11.2
Turkey	28.8	3.0	25.0	33.7

Figure A1. FX Loans to Total Loans- Highly Dollarized Countries

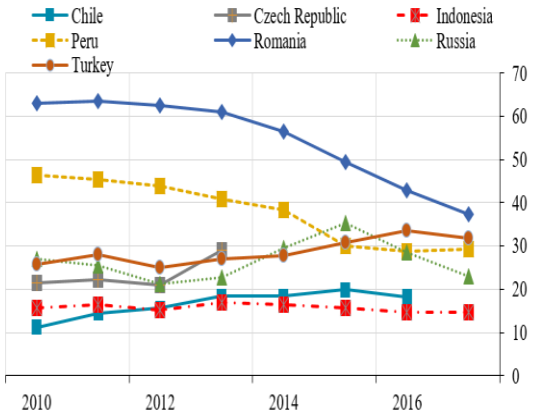


Figure A2. FX Loans to Total Loans- Low Dollarized Countries

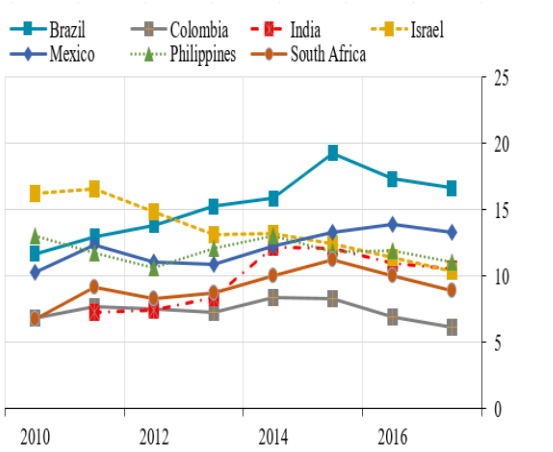


Table A2. Current Account Balance (CAB) Summary Statistics (As a Percentage of GDP)

Countries	Mean	Std. Dev.	Min	Max
Brazil	-2.7	1.2	-4.2	-0.5
Chile	-1.9	1.7	-4.0	1.4
Colombia	-3.9	1.2	-6.3	-2.9
Czechia	-0.6	1.7	-3.5	1.5
India	-2.3	1.5	-5.0	-0.5
Indonesia	-1.7	1.4	-3.2	0.7
Israel	3.2	1.5	0.5	5.3
Mexico	-1.7	0.7	-2.6	-0.5
Peru	-3.1	1.4	-4.8	-1.3
Philippines	2.3	1.8	-0.7	4.2
Romania	-2.9	1.9	-5.1	-0.7
Russia	3.2	1.4	1.5	5.0
South Africa	-3.7	1.6	-5.8	-1.5
Turkey	-5.6	1.7	-8.9	-3.7

Figure A3. Current Account Balance - High Deficit Countries

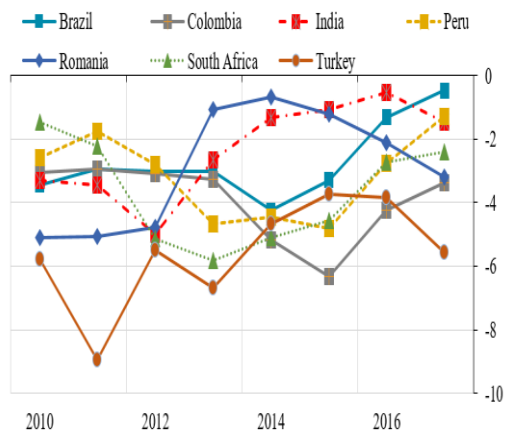


Figure A4. Current Account Balance - Low Deficit/Surplus Countries

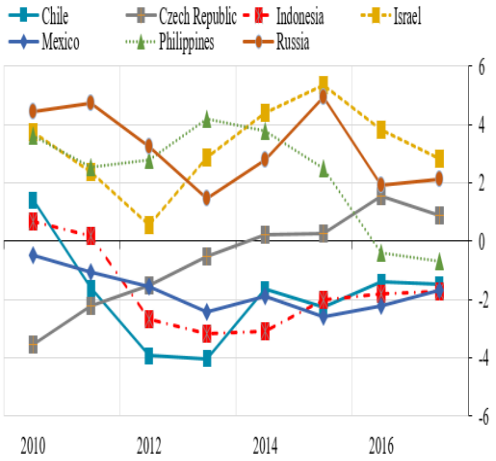


Table A3. Financing of Current Account Deficit Summary Statistics (FDI s a Percentage of GDP)

Countries	Mean	Std. Dev.	Min	Max
Brazil	3.8	0.5	2.8	4.3
Chile	7.6	2.8	2.3	11.3
Colombia	4.1	0.8	2.2	4.9
Czechia	3.7	1.6	0.9	5.6
India	1.7	0.3	1.3	2.1
Indonesia	2.1	0.7	0.5	2.8
Israel	3.6	0.9	2.0	5.2
Mexico	2.6	0.8	1.5	3.7
Peru	4.3	1.3	2.2	6.1
Philippines	1.7	0.9	0.5	3.2
Romania	2.2	0.6	1.3	3.3
Russia	2.1	0.9	0.5	3.0
South Africa	1.1	0.6	0.4	2.2
Turkey	1.6	0.3	1.2	2.1

Figure A5. High FDI Financing Countries

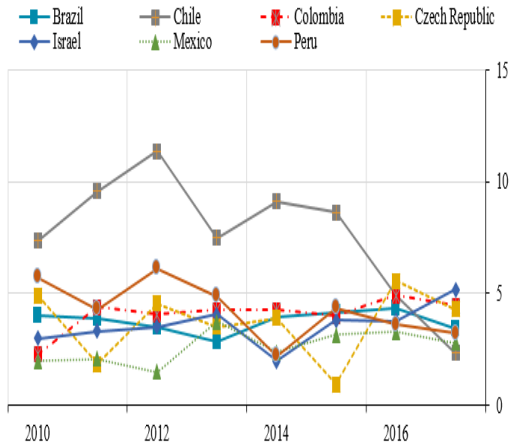


Figure A6. Low FDI Financing Countries

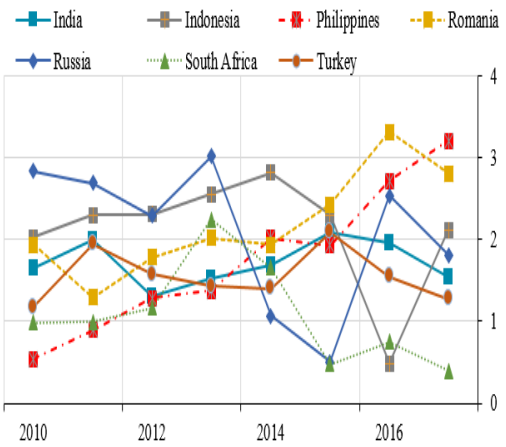


Table A4. External Financing Needs Summary Statistics (FDI As a Percentage of GDP)

Countries	Mean	St. Dev.	Min	Max
Brazil	8.5	1.7	6.6	11.0
Chile	16.0	1.8	13.4	18.5
Colombia	12.0	3.1	8.9	16.6
Czechia	37.3	11.0	27.8	61.7
India	9.1	1.5	7.5	11.8
Indonesia	11.7	2.7	7.6	15.1
Israel				
Mexico	11.8	2.2	7.9	14.7
Peru	10.4	1.2	7.8	11.4
Philippines	6.5	1.7	4.1	8.6
Romania	28.3	3.6	23.0	33.0
Russia	5.1	2.5	1.3	9.2
South Africa	14.7	3.6	8.9	17.4
Turkey	24.7	2.4	21.8	29.3

Figure A7. High External Financing Need Countries

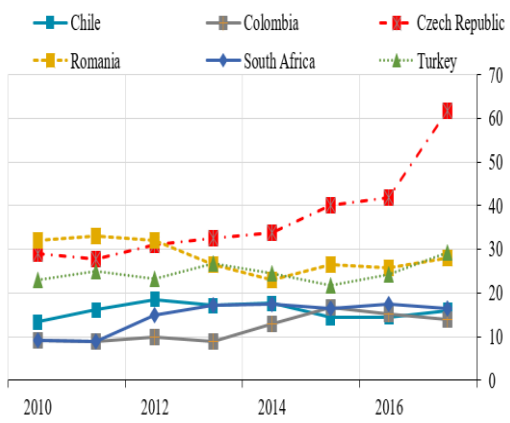


Figure A8. Low External Financing Need Countries

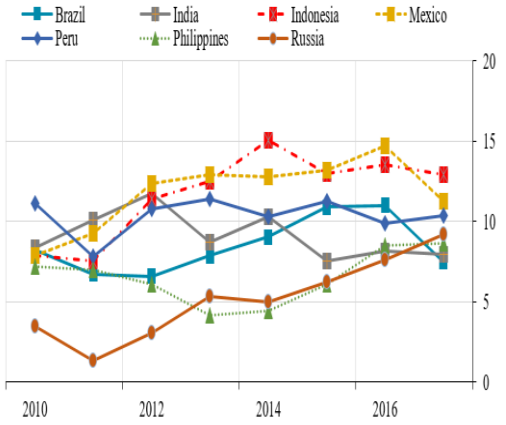


Table A5. FX Denominated Debt of NFC Summary Statistics (FX Debt As a Percentage of GDP)

Countries	Mean	Std. Dev.	Min	Max
Brazil	14.7	3.5	10.2	20.1
Chile	30.9	5.2	24.0	38.1
Colombia	9.9	3.6	5.4	14.8
Czechia	19.4	2.5	16.3	22.8
India	10.4	0.7	9.1	11.3
Indonesia	9.3	1.9	6.5	11.6
Israel	23.8	1.4	21.9	25.6
Mexico	17.5	1.5	15.9	19.9
Peru				
Philippines				
Romania				
Russia	20.2	2.8	17.1	25.2
South Africa	13.4	3.0	9.2	17.3
Turkey	28.9	6.5	19.5	37.0

Figure A9. High NFC FX Debt Countries

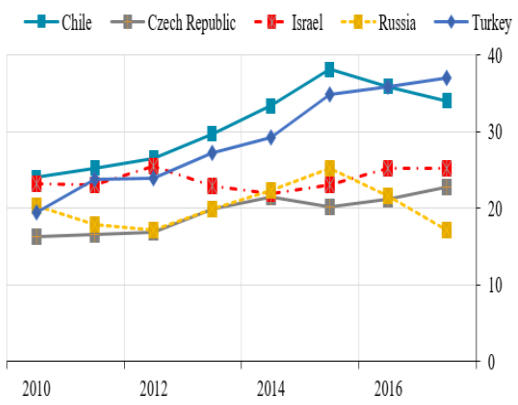


Figure A10. Low NFC FX Debt Countries

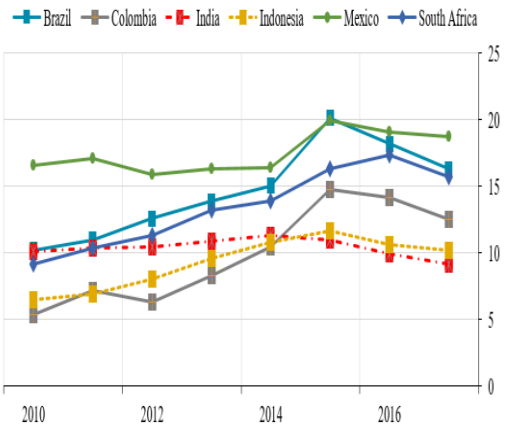


Table A6. Foreign Ownership of Local Currency Government Securities Summary Statistics
(As a Percentage of GDP)

Countries	Mean	Std. Dev.	Min	Max
Brazil	14.6	3.2	10.9	19.5
Chile				
Colombia	11.2	9.3	1.7	25.9
Czechia	21.3	12.5	12.7	47
India	3.5	0.8	2.3	4.3
Indonesia	34.2	4.6	26.8	39.4
Israel				
Mexico	31.3	7.5	15.8	36.9
Peru	45.0	9.0	25.3	54.7
Philippines				
Romania	18.2	2.4	14.2	21.5
Russia	22.3	7.0	9.9	30.5
South Africa	33.8	3.9	26.7	37.1
Turkey	18.4	3.9	11.2	23.4

Figure A11. High Foreign Ownership Countries

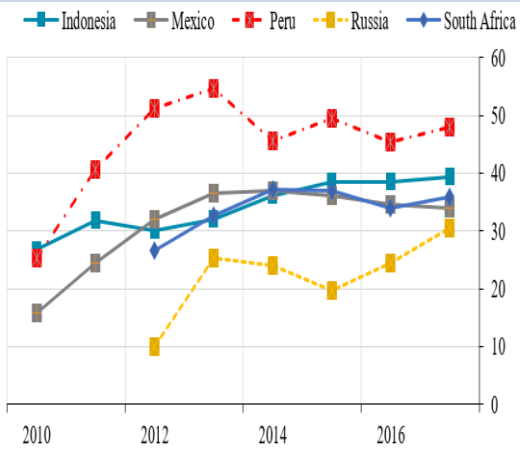


Figure A12. Low Foreign Ownership Countries

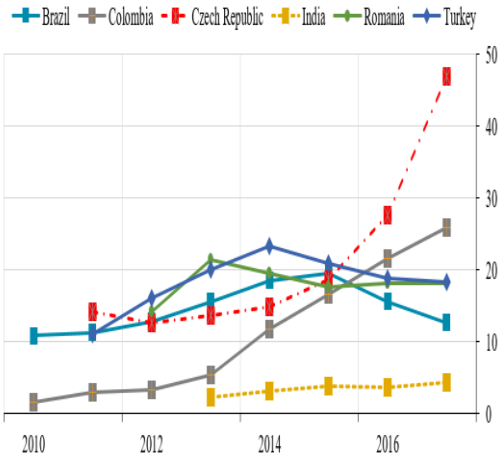


Table A7. Country Risk Premium Summary Statistics (CDS Spread, Basis Points)

Countries	Mean	Std. Dev.	Min	Max
Brazil	196.5	85.8	122.0	339.0
Chile	87.0	13.4	66.0	105.3
Colombia	140.6	37.7	101.1	211.9
Czechia	56.2	18.3	44.3	91.3
India				
Indonesia	170.1	24.6	116.9	196.7
Israel				
Mexico	123.1	23.5	84.1	166.1
Peru	125.3	21.6	88.2	151.1
Philippines	119.5	31.4	75.5	158.9
Romania	174.4	67.9	124.8	302.1
Russia	215.7	75.4	156.5	376.5
South Africa	192.6	47.4	142.7	286.1
Turkey	207.8	32.3	166.6	266.7

Figure A13. High CDS Risk Premium Countries

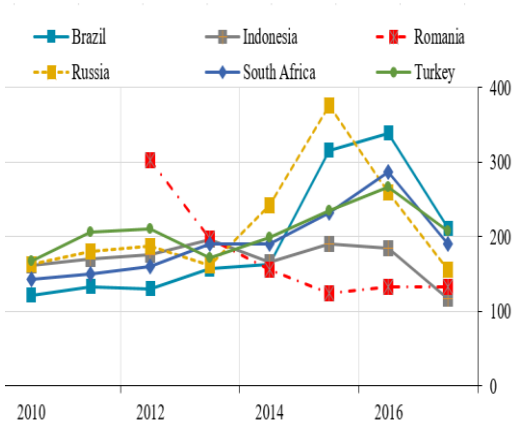


Figure A14. Low CDS Risk Premium Countries

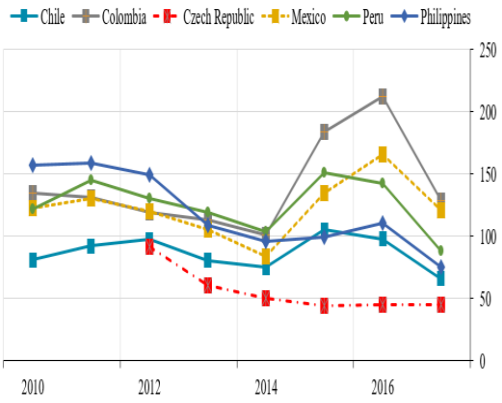


Table A8. Import Content of Final Demand Summary Statistics (As a Percentage of GDP)

Countries	Mean	Std. Dev.	Min	Max
Brazil	12.8	0.8	11.6	13.7
Chile	28.6	1.5	26.0	30.3
Colombia	18.6	1.3	16.4	20.4
Czechia	38.4	1.5	36.0	40.2
India	22.0	1.9	19.1	24.3
Indonesia	20.3	1.2	18.1	21.4
Israel	22.5	1.4	20.6	24.6
Mexico	21.8	1.1	20.4	23.6
Peru	22.5	0.8	21.7	23.6
Philippines	25.6	0.8	24.8	27.1
Romania	28.6	0.7	27.4	29.5
Russia	19.3	0.3	18.9	19.6
South Africa	24.7	1.2	22.7	26.0
Turkey	23.1	1.2	21.8	25.1

Figure A15. High Import Content Countries

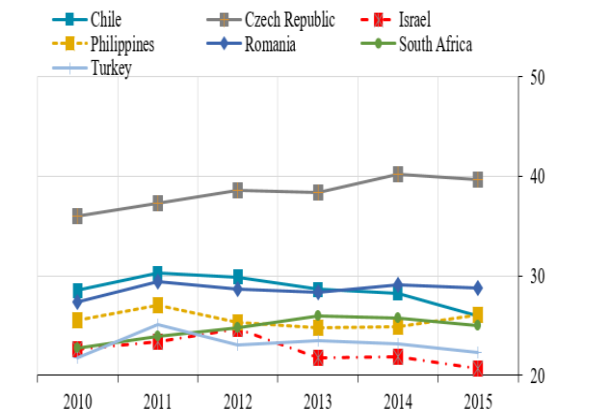


Figure A16. Low Import Content Countries

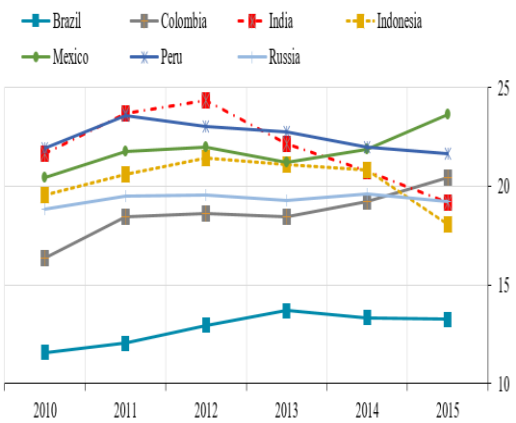


Table A9. Reserve Adequacy Summary Statistics (Reserves to Short-term Debt Ratio, Percentage)

Countries	Mean	Std. Dev.	Min	Max
Brazil	3.3	0.7	2.3	4.2
Chile	1.1	0.2	0.9	1.4
Colombia	2.1	0.4	1.6	2.7
Czechia				
India	2.1	0.4	1.6	3.0
Indonesia	2.3	0.4	1.8	3.0
Israel				
Mexico	1.9	0.4	1.5	2.6
Peru	4.9	1.0	3.3	6.2
Philippines	4.5	0.6	3.9	5.5
Romania	1.0	0.2	0.8	1.2
Russia	3.4	1.0	1.9	4.8
South Africa	1.2	0.2	0.9	1.5
Turkey	0.8	0.1	0.6	0.9

Figure A17. High Reserve Adequacy Countries

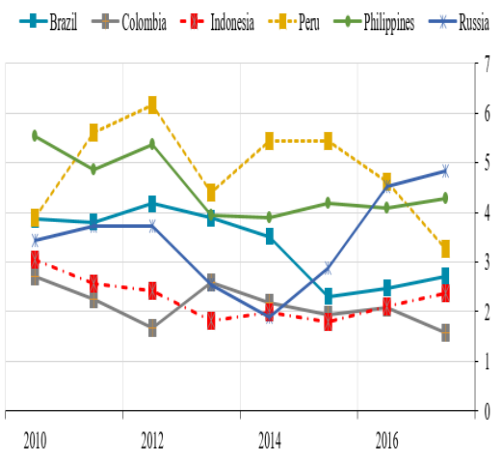


Figure A18. Low Reserve Adequacy Countries

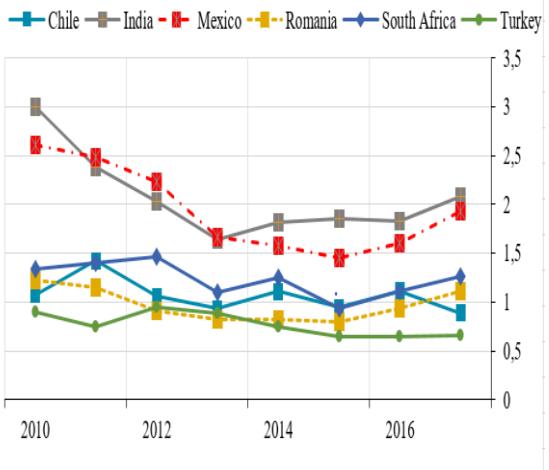


Table A10. Inflation Level Summary Statistics (Percentage)

Countries	Mean	Std. Dev.	Min	Max
Brazil	6.4	1.9	3.4	9.0
Chile	3.1	1.2	1.4	4.7
Colombia	3.8	1.8	2.0	7.5
Czechia	1.5	1.0	0.3	3.3
India	7.6	3.2	2.5	12.0
Indonesia	5.2	1.2	3.5	6.4
Israel	1.1	1.5	-0.6	3.5
Mexico	3.9	1.0	2.7	6.0
Peru	3.1	0.7	1.5	3.7
Philippines	2.8	1.3	0.7	4.7
Romania	2.4	2.8	-1.5	6.1
Russia	7.6	3.5	3.7	15.5
South Africa	5.4	0.8	4.1	6.6
Turkey	8.4	1.4	6.5	11.1

Figure A19. High Inflation Countries

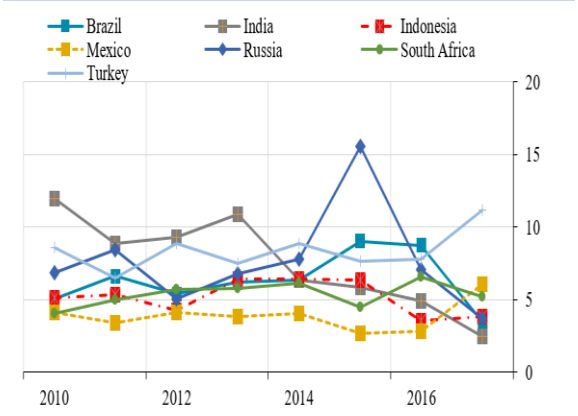


Figure A20. Low Inflation Countries

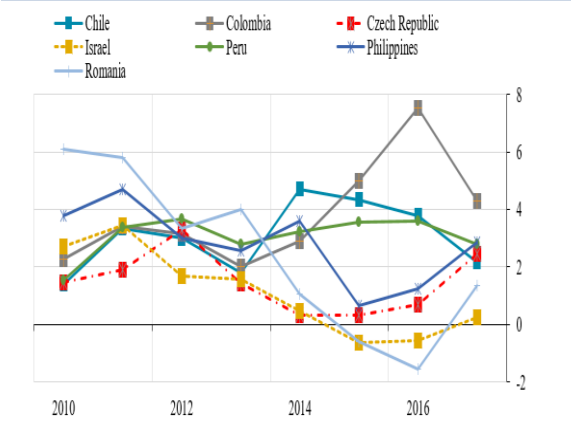


Table A11. Interaction Variables Categorization

Variable	BR	CH	CO	CZ	IND	IDZ	ISR	MX	PR	PH	RO	RU	SA	TR
Dollar.	0	1	0	1	0	1	0	0	1	0	1	1	0	1
CAD	1	0	1	0	1	0	0	0	1	0	1	0	1	1
FDI	0	0	0	0	1	1	0	0	0	1	1	1	1	1
Ext. Fin. Need	0	1	1	1	0	0	NA	0	0	0	1	0	1	1
NFC FX Debt	0	1	0	1	0	0	1	1	NA	NA	NA	1	0	1
Foreign Owner.	0	NA	0	0	NA	1	NA	1	1	NA	0	1	1	0
CDS	1	0	0	0	NA	1	NA	0	0	0	1	1	1	1
Import Content	0	1	0	1	0	0	1	0	0	1	1	0	1	1
Reserve Adeq.	0	1	0	NA	1	0	NA	1	0	0	1	0	1	1
Inflation Level	1	0	0	0	1	1	0	1	0	0	0	1	1	1
Average	0.4	0.5	0.2	0.4	0.5	0.5	0.3	0.4	0.3	0.2	0.8	0.6	0.8	0.9

Table A12. Vulnerability Indicators Intersection*

	Dollar.	CAD	FDI	Ext. Fin. Need	NFC FX Debt	Foreign Owner.	CDS	Import Content	Reserve Adeq.	Inflation Level
Dollar.		6	8	8	8	5	7	8	6	6
CAD			8	8	2	3	8	6	7	8
FDI				6	4	6	10	8	7	10
Ext. Fin. Need					6	2	6	11	9	4
NFC FX Debt						4	3	8	6	4
Foreign Owner.							5	3	4	7
CDS								6	6	10
Import Content									9	4
Reserve Adeq.										7
Inflation Level										

*Number of countries in the same categorization (high/low)

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