

Supply Shocks and Monetary Policy Responses in Emerging Economies*

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Abstract

Supply shocks bring about important dilemmas for monetary policy in emerging economies. We compute monetary policy responses to identified supply shocks using quarterly data and a Bayesian panel VAR for 24 emerging economies during the period 2004-2019. This is an alternative approach to evaluate the monetary policy dilemma within a dynamic framework with policy identification. In this framework, we identify supply shocks as unexpected and temporary total factor productivity innovations which are orthogonal to demand related shocks. We highlight three results from this econometric exercise. First, monetary policy is, in average, procyclical in emerging economies after temporary supply shocks. Second, monetary policy is more procyclical in fixed than in flexible exchange-rate regimes. Third, monetary policy is more procyclical in economies with a higher degree of financial openness. The latter result is related to the monetary policy dilemma in emerging economies on the event of supply shocks due to the trade-off between exchange rate versus income volatility.

JEL codes: F41, E52, F36

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1. Introduction

The emerging market monetary policy dilemma, as identified by Vegh et al (2017), is more evident when central banks should decide between stimulating the economy or stabilizing inflation in response to negative shocks. If the central bank decides to reduce inflation, it will implement a procyclical monetary policy that will likely worsen the effect of the shock on economic activity. Supply shocks, as opposed to demand shocks, are those most likely associated to this dilemma since they usually induce opposite-sign effects on inflation and economic activity. Examples of these kinds of shocks are climate-related temporary events which imply negative productivity effects, mainly in agriculture, and at the same time lead to price increases, (Brainard, 2019).

We compute monetary policy responses to temporary and unexpected supply shocks using quarterly data for 24 emerging economies during the period 2004-2019. Our main goal is to better understand the determinants of procyclical monetary-policy responses in emerging economies. We estimate supply shocks by computing transitory Total Factor Productivity (TFP) innovations which are not driven by aggregate demand. Examples of such supply shocks are transitory developments of terms of trade, climate shocks, and foreign policy events, among others. It is important to note that supply shocks in this paper can be temporary in character and are not defined by their permanent effects on economic activity, in contrast to the approach by Blanchard and Quah (1989).

We estimate impulse-response functions from a Bayesian Panel VAR that identifies both monetary policy and supply shocks. For the identification of monetary policy, we follow Kim (2003) and Anzuini et al (2013), by constructing interest rates reactions which are lagged with respect to macroeconomic shocks including innovations in the real quantity of money (M2). These assumptions are convenient for our estimations since they recognize that central banks take time to evaluate the macroeconomic environment and make monetary policy decisions. On the other hand, these assumptions allow TFP shocks being unrelated to real interest rate movements.

This framework brings about an alternative approach to analyze the cyclicity of monetary policy, including a dynamic framework, policy identification, and supply shocks which are unexpected and temporary. The literature on this topic originates on the contribution by Kaminsky et al (2005) who detect procyclical monetary and fiscal policies in emerging economies. Our approach is a contribution to this literature by focusing on temporary supply shocks within a panel VAR framework and by identifying a new institutional driver of procyclical monetary policy across emerging economies, the degree of financial openness.

Our econometric exercises show first that monetary policy tends to be more procyclical in emerging than in developed economies after temporary supply shocks. This result is in line with the original findings by Kaminsky et al (2005) and more recently confirmed by Végh et al (2017), about the monetary policy dilemma in developing economies. Second, monetary policy is more procyclical in economies with fixed exchange-rate regimes. This is partial evidence of the traditional trilemma in which more flexible regimes allow more independent monetary policy without imposing tight restrictions on international capital flows, (Obstfeld et al, 2005, 2019).

The third result is that monetary-policy responses to supply shocks tend to be less procyclical in economies with low financial openness. This result holds under two alternative definitions of financial openness and it is compatible with the monetary policy dilemma in emerging economies as described by Végh et al (2017). In this dilemma, central banks face a difficult choice between defending the currency or smoothing fluctuations in economic activity, especially during negative supply shocks. The third result is also coherent with the hypothesis about balance-of-payment dominance in emerging economies (Ocampo, 2016) in which financially open economies are vulnerable to external shocks with important implications for their policy-making process. Finally, our main result is also consistent with recent empirical evidence about how capital-account regulations improve monetary policy independence in emerging economies, see Erten et al (2021) for a literature review.

This paper is organized in the following way. After this introduction, Section 2 describes a brief review of related literature. Section 3 looks at the data. Section 4 explains the econometric methodology. Section 5 describes the empirical results and finally, the last section makes some concluding comments.

2. Related Literature

The article by Kaminsky et al (2005) is pivotal for the analysis of this topic by describing the relationship between macroeconomic policy and the economic cycle of 104 economies. Its main finding is about monetary and fiscal policies being either countercyclical or acyclical in developed countries, while they are procyclical in developing economies. This finding is partially revised by Frankel et al (2013) and by Vegh and Vuletin (2013, 2014) who describe the so-called policy graduation which occurs when previous procyclical economic policies become countercyclical in certain emerging economies. Their results show that, starting in 2000, a sizeable portion of these economies have graduated in both monetary and fiscal policies. McGettigan et al. (2013) as well as Thornton and Vasilakis (2016) show that the implementation of inflation targeting has helped in this process by reducing output volatility and inflation.

Kaminsky et al (2005) also analyze the relation between the external sector and macroeconomic policymaking. They find that capital flows in the developing world are positively correlated with expansive fiscal and monetary policies, thus exacerbating such procyclical behavior. Araujo et al. (2016) find that capital inflows are highly procyclical and persistent for low income economies and get even more procyclical as these countries become wealthier. Such behavior imposes an important constraint for the implementation of countercyclical macroeconomic policies. Similarly, Ocampo (2016) identifies the prevalence of balance-of-payments dominance in the process of policymaking in developing economies due to the strong effect of external shocks on interest rate spreads and exchange rates. One of the reasons for this dominance is the dismantling of several external-sector policy instruments during economic liberalization reforms adopted over the past decades.

The behavior of the exchange rate is also important since it translates external shocks to the domestic economic cycle. Cordella and Gupta (2015) find evidence that procyclical monetary policies are correlated with procyclical exchange rate reactions, implying real appreciations during good times. This result resembles the evidence of fear of floating in developing

economies as described by Calvo and Reinhart (2002). In such cases, the monetary authority capacity to perform countercyclical policy can be hindered by exchange-rate devaluations in times of massive capital outflows. In view of this result, Frankel (2017) proposes a semi-fixed exchange rate regime for countries where commodity exports are a crucial part of its income. Such regime would imply that currencies would be pegged to their most relevant external currencies and to the price of their main commodity exports. Finally, Végh et al (2017) study monetary policy responses to terms of trade shocks and analyze the institutional features that determine procyclical monetary policy reactions in emerging economies.

Our paper contributes to this literature by computing monetary-policy responses to identified temporary supply shocks in emerging economies. These kinds of shocks potentially bring about important policy trade-offs related to controlling the volatility of the exchange rate versus economic activity. Our econometric approach consists of panel VAR estimations which simultaneously identify supply shocks and monetary policy reactions. We apply this framework to compute monetary policy responses for alternative exchange-rate regimes and financial openness degrees in emerging economies. We analyze these results in detail to learn more about the determinants of the cyclical of monetary policy.

3. Data Description

We use quarterly data for 24 emerging economies with good availability of macroeconomic data. For each country, we collect six macroeconomic variables from 2004Q1 to 2019Q2: Total factor productivity (TFP), public consumption, household consumption, real money balances (M2), real effective exchange rate and real monetary policy rate¹. The selection of countries in our sample follows Ilzetki et al (2013) and it is driven by the availability of quarterly GDP and consumption data during the period of analysis. Table A4 in the appendix shows the list of emerging economies included in the estimation and their classification. We also use data for 21 developed economies (Table A3) to perform an initial estimation and compare results with emerging economies.

TFP data are computed country by country using quarterly GDP and total employment growth rates as reported by the International Monetary Fund (IMF) and by national offices of statistics². Data for public and household consumption are retrieved from the real National Accounts in each country. The quantity of money in the economy (M2) is deflated with the consumer price index. For the Real Effective Exchange Rate (REER) we retrieve the indicator computed with the International Monetary Fund's (IMF) methodology in which an increase implies a real appreciation of each currency vis-a-vis its main trading partners. Finally, our real interest rate indicator is computed using the nominal policy rate and the observed consumer inflation rate. These data have good quality and easy access since they are retrieved from International Financial Statistics (IFS), OECD, Eurostat, national statistical agencies, and central banks. To correct for non-stationarity, we compute quarterly growth rates for all variables except real

¹ There are high volatility events between 2000 and 2003 for a significant number of emerging economies. We also use a dataset of 21 developed economies during the same period, to perform an initial comparative analysis.

² Since the estimation period is relatively short, we assume a constant rate of capital growth which is recovered with the intercept of the regression, assuming a Cobb-Douglas production function.

interest rates. In the Appendix, we show results about panel unit root tests for all six variables (Tables A1 and A2).

The set of emerging economies is divided into flexible and fixed exchange rate regimes using the classification by Reinhart and Rogoff (2004) and updated with the information from the International Monetary Fund (IMF) until 2019. Fixed-rate episodes are defined by legal tenders, hard pegs, crawling pegs, bands, and monetary unions. All other cases are classified as flexible regimes. In this sense, all economies in our sample have a well-defined exchange rate regime during the period of analysis, see classification in Table A4 of the Appendix.

We use two alternative indicators about the degree of financial openness in each economy to split our set of economies into high and low openness. First, the indicator developed by Chinn and Ito (2006) which is defined as the principal component of several measurements about the intensity of restrictions on international transactions in each economy. Second, we use the sum of external assets and liabilities in each economy, as percentage of GDP, as an indicator of the accumulated importance of international financial integration in each economy. Similar indicators are used by Lane and Milesi-Ferreti (2008) among others, to study the determinants of financial globalization. We use the median of each financial openness indicator, during the period of analysis, to divide the set of emerging economies into two subsets: high and low financial openness, see classification in Table A4 of the Appendix.

4. Econometric Methodology

An important challenge in this study is the proper simultaneous identification of the supply shocks and monetary policy responses within the Bayesian Panel Vector Auto Regression (PVAR). Following Blanchard and Perotti (2002), a key identification assumption is that policy decisions take time (a quarter) to respond to innovations in other macroeconomic variables, including GDP. Additionally, following Kim (2003) and Anzuini et al (2013), we control for money demand shocks by allowing the quantity of money to contemporaneously react to TFP shocks. Monetary policy rates instead, take at least one quarter to react to these supply shocks due to the time that monetary authorities need to evaluate the macroeconomic data and confirm the nature of the shock.

We use the Cholesky decomposition to perform such identification. The variables are included in the following order: government consumption, monetary policy rate, TFP, household consumption, real money balances (M2), and real exchange rate. This ordering implies that the real exchange rate reacts contemporaneously to shocks from the remaining variables of the system. In addition, fiscal and monetary policy indicators are those with the most sluggish reaction to macroeconomic shocks.

We estimate the following Panel VAR system:

$$Y_{it} = A_1 Y_{it-1} + A_2 Y_{it-2} + \dots + A_p Y_{it-p} + u_i + e_{it} \quad i = 1, \dots, N \quad t = 1, \dots, T \quad (1)$$

This is a homogeneous panel VAR of order p , with k dependent variables and with panel-specific fixed effects. The vector Y_{it} contains the six variables for country i at quarter t . Country-specific

fixed effects are shown in the k-vector u_i . Idiosyncratic errors for each country and quarter, are contained in the k-vector e_{it} . We want to estimate the $(k \times k)$ matrices of coefficients A_1, A_2, \dots, A_p . The errors are assumed to be zero-mean and serially uncorrelated.

We use the Bayesian Estimation, Analysis and Regression (BEAR) toolbox (Version 4.2) to perform these estimations. This toolbox was developed by the European Central Bank and it is fully described by Dieppe et al (2016). We choose to use the pooled estimator to draw inferences with alternative groups of economies and compare their results. In this case, a normal-Wishart estimation strategy is adopted in which the prior for the matrices of coefficients is multivariate normal. Previously to the estimation, we normalize all the data country-by-country to control for heterogeneities in the dispersion of the variables. Therefore, all our results are expressed in standard deviation units.

5. Empirical Results

Our empirical results consist mostly of the analysis of impulse-response functions (IRF) to temporary and unexpected supply shocks for alternative groups of economies. In every figure we show the IRF of the following variables: real interest rates, government consumption and real exchange rates. We interpret the IRF for the real interest rate as the monetary-policy response to positive supply shocks assuming symmetric responses in case of negative shocks. The response of government consumption is an imperfect indicator of fiscal policy since it does not include the reaction of public investment due to data limitations. The IRF of the real exchange rate is an indicator of the external vulnerability to supply shocks. Figures A1 to A8, the Appendix, show the responses of all the variables of the system, including the TFP shock itself. Since data are quarterly, we use 4 lags for all panels ($p=4$) to appropriately capture the autocorrelation structure of all the variables in the system.

5.1 Advanced versus Emerging Economies

Once the panel VAR is estimated, it is possible to compute the implied responses to supply shocks. Figure 1 shows monetary-policy responses to a 1 standard-deviation TFP shock. We perform this estimation with data from 21 developed economies and 24 emerging economies as described in Section 3. Our key indicator of monetary policy is the real policy rate since it shows changes in the monetary policy rate in excess of the movements in inflation. Following Kaminsky et al (2005), we also compare the reactions of public consumption and the real exchange rate since they are helpful to better understand the overall macroeconomic implications of the supply shock.

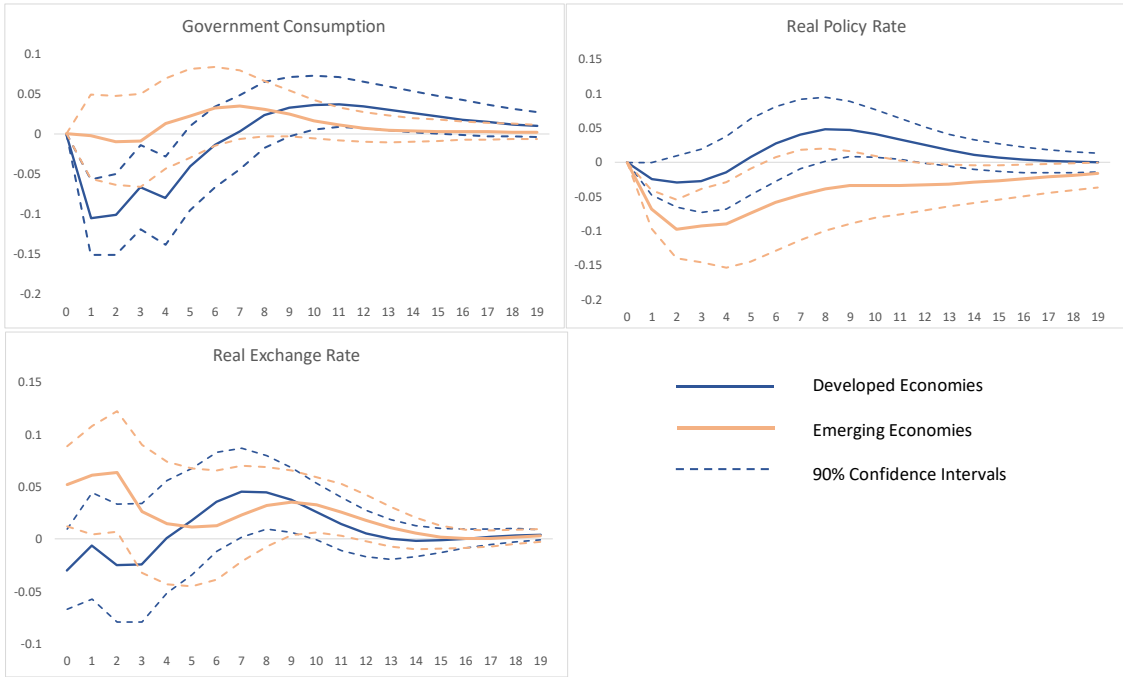
Figure 1 shows a procyclical monetary-policy reaction in the average emerging economy during the period of analysis (2004-2019). Since the supply shock is positive, a reduction of the real interest rate reinforces the effect of the initial shock on economic activity³. This result is in line with the monetary policy dilemma in emerging economies described by Végh et al (2017). The estimated reduction of real interest rates remains significantly different from zero for about six

³ In this econometric model the interpretation of policy reactions is symmetric. That is, in the case of a negative supply shock a procyclical monetary policy implies increases of the real interest rate.

quarters and then gradually returns to zero. Understanding some of the reasons for this procyclical reaction is an important goal of this paper. Figure 1 also shows that in the average developed economy, the reaction of monetary policy is slightly procyclical but not significantly different from zero. The lack of countercyclical reaction in developed economies is likely related to the already low interest rates predominant in several advanced economies before the Global Financial Crisis (GFC).

Another result in Figure 1 is the countercyclical reaction of government consumption in developed economies, versus an acyclical reaction of the same variable in emerging economies. This result is also in line with related literature, especially, with Kaminsky et al (2005). Additionally, this figure shows that while the Real Exchange Rate (RER) tends to appreciate in the short run in emerging economies, this reaction is not statistically significant in developed economies⁴. This result is consistent with the hypothesis of balance-of-payment dominance in emerging economies, described by Ocampo (2016), in which the external sector of emerging economies is especially vulnerable to external shocks. The corresponding impulse-response figures for all variables in the system are presented in Figures A1 and A2 in the Appendix and they include confidence intervals.

Figure 1. Macroeconomic Responses to a 1 Standard-Deviation Supply Shock – Developed versus Emerging Economies



Source: Authors' Computations

⁴ An increase of the real exchange rate, in this database, denotes an appreciation of the domestic currency vis-à-vis its main trade partners.

5.2 Fixed versus Flexible Exchange-Rate Regimes in Emerging Economies

In this sub-section, we study whether monetary-policy responses in emerging economies depend on the exchange-rate regime. The classification of regimes is described in Section 2 and in Table A4 in the Appendix. Figure 2 shows that while the monetary-policy response is highly procyclical in fixed-regime economies, it is acyclical in flexible regimes. This result is consistent with the monetary-policy trilemma in which fixed regimes lose monetary-policy maneuver as they are committed to maintaining nominal or real exchange-rate targets (Obstfeld et al, 2019). As expected, there is a short-run RER appreciation in flexible regimes due to the supply shock. In contrast, the initial RER response is non-significant in fixed-regime economies due to the procyclical monetary policy response. This result is consistent with McGettigan et al. (2013) as well as with Thornton and Vasilakis (2016) who show that adopting inflation-targeting, implying flexible exchange rates, leads to more countercyclical monetary policies.

Another interesting result in Figure 2 is that the reaction of government consumption is procyclical in fixed regimes and acyclical in flexible regimes. The corresponding impulse-response figures for all variables in the system are presented in Figures A3 and A4 in the Appendix and they include confidence intervals.

Figure 2. Macroeconomic Responses to a 1 standard-deviation Supply Shock – Fixed versus Flexible regimes in Emerging Economies



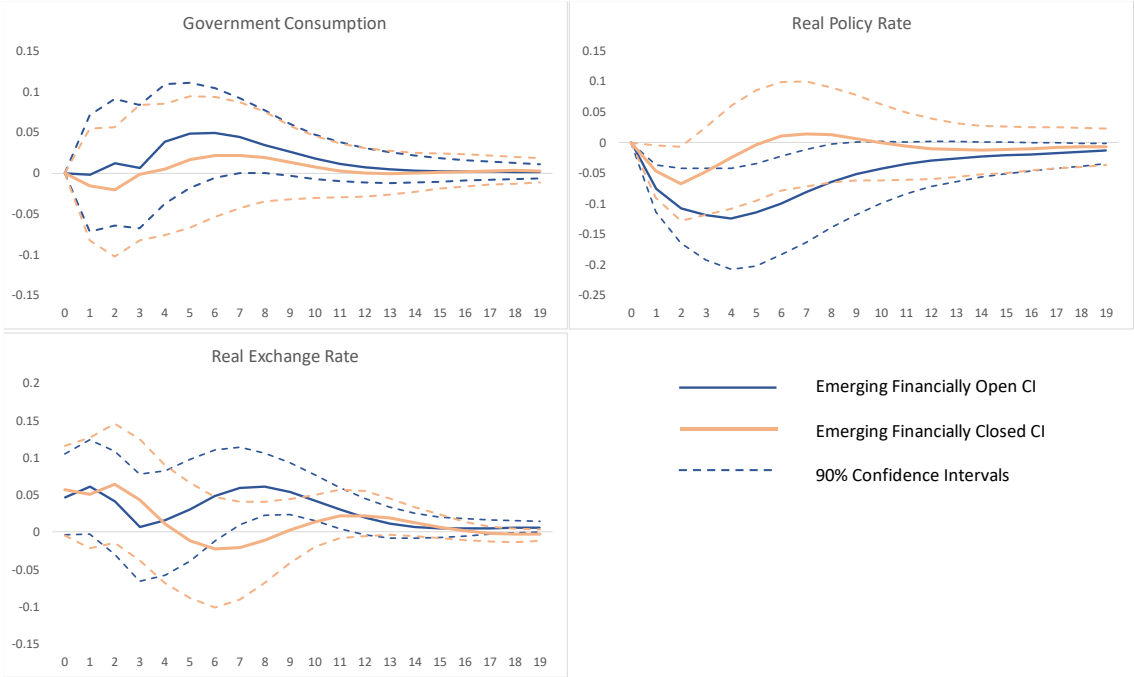
Source: Authors' Computations

5.3 High versus Low Financial Openness

Figure 2 shows that the presence of fixed exchange-rate regimes is an important determinant of procyclical monetary policy responses to supply shocks. In this sub-section, we analyze whether different degrees of financial openness can also partially explain the cyclicity of monetary

politicu. As mentioned above in Section 3, we use two alternative approaches to measuring financial openness: the index developed by Chinn and Ito (2006) and the indicator used by Lane and Milesi-Ferreti (2008). We use these indicators to split our set of emerging economies between financially open and closed. This classification is presented on Table A4 in the Appendix

Figure 3. Macroeconomic Responses to a 1 standard-deviation Supply Shock – Financially Open versus Closed Emerging Economies according to index by Chinn and Ito (2006)



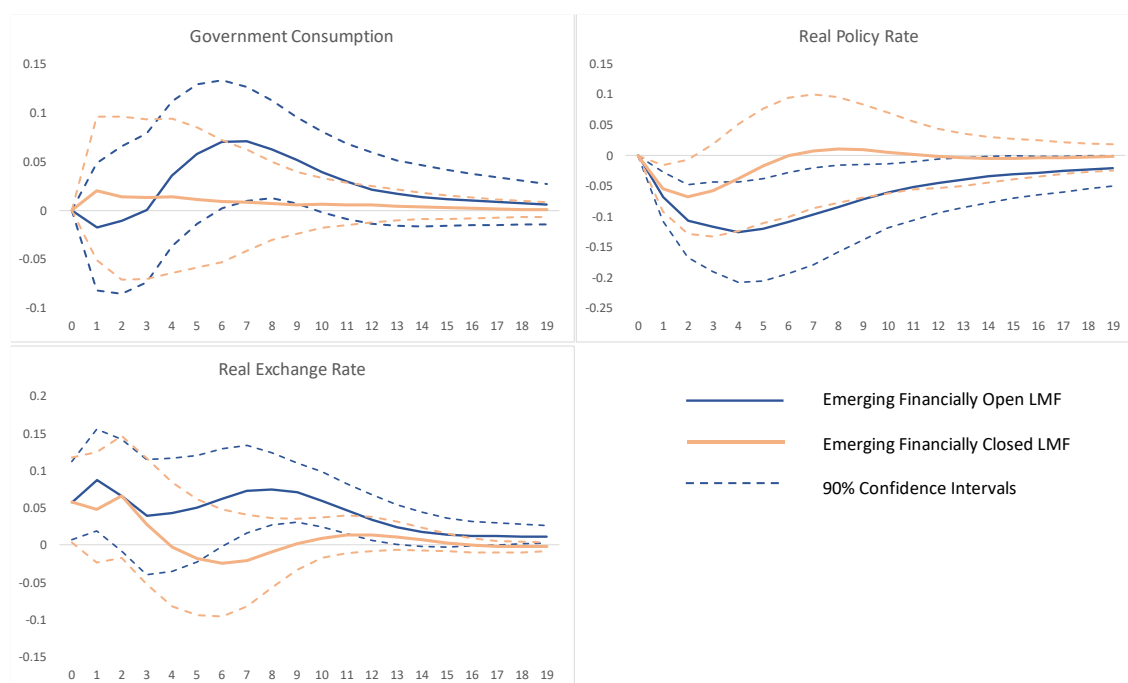
Source: Authors' Computations

Figure 3 shows results for financial openness according to the indicator by Chinn and Ito (2006). The impulse-response graphs show that monetary policy reactions are more procyclical in financially open economies than in closed ones. In open economies, the real interest reaction remains significantly below zero for 10 quarters. In contrast, this reaction is notably less pronounced in financially closed economies. However, these responses are not significantly different from each other because their confidence intervals overlap. Still, this result is consistent with literature on the greater vulnerability of the external sector in financially open emerging economies (Ocampo, 2016). In these economies, central banks have a more difficult choice between a volatile exchange rate or economic activity after the supply shock.

Figure 3 also shows that the effect of the shock on the exchange rate is more persistent in financially open economies. In addition, the reaction of government consumption to the supply shock does not vary much with the financial openness degree. The corresponding impulse-response figures for all variables in the system are presented in Figures A5 and A6 in the Appendix and they include confidence intervals.

Figure 4 shows results for financial openness according to the indicator suggested by Lane and Milesi-Ferreti (2008). The results are like those in Figure 3. The estimated monetary policy reaction in financially open economies is procyclical. Meanwhile, the reaction in closed economies is also procyclical, but with lower magnitude and less statistically significant. Therefore, these results are robust to the definition of financial openness. The corresponding impulse-response figures for all variables in the system are presented in Figures A7 and A8 in the Appendix and they include confidence intervals.

Figure 4. Macroeconomic Responses to a 1 Standard-Deviation Supply Shock – Financially Open versus Closed Emerging Economies according to the Indicator by Lane and Milesi-Ferreti (2008)



Source: Authors' Computations

5.5 Quantitative Analysis of Monetary Policy Reactions

Table 1 describes the size of the monetary policy responses to a one standard-deviation temporary supply shock in each group of countries. We express these responses in units of standard deviations of the real interest rate and compare them across country groups and along different horizons after the shock. We use this unit of measurement for all countries to control for heterogeneous volatility across economies.

Five quarters after the shock, the group of emerging economies with fixed exchange-rate regimes has the most procyclical monetary-policy response with 19% of a standard deviation, in average. Ten quarters after the shock, the most procyclical response belongs to the group of financially open emerging economies according to the indicator by Lane and Milesi-Ferreti (2008). This response amounts to 6% of a standard deviation. This same group has the most procyclical response 15 quarters after the shock. Meanwhile, the only countercyclical response is found for

the group of developed economies, 10 quarters after the shock. Therefore, Table 1 shows that while procyclical responses are stronger in fixed regimes, they have a shorter duration. In contrast, these procyclical responses in financially open economies are less intense but with a longer duration. Meanwhile, monetary policy responses in financially closed economies are procyclical but non-significant. This result shows again the importance of the degree of financial openness for the cyclicity of monetary policy responses in emerging economies.

Table 1. Monetary Policy Reactions on Different Horizons
Real Interest Rate Responses to a 1 Standard-Deviation Supply Shock

Group	5th Quarter	10th quarter	15th quarter
1. Developed	0.007	0.042**	0.007
2. Emerging	-0.074**	-0.034	-0.027**
3.Fixed Regime	-0.188**	-0.050	-0.034
4. Flexible Regime	0.034	-0.004	-0.007
5. Open (C&I) ¹	-0.115**	-0.042	-0.021
6. Closed (C&I) ¹	-0.003	-0.001	-0.011
7. Open (LMF) ²	-0.120**	-0.061**	-0.031**
8. Closed (LMF) ²	-0.017	0.006	-0.005

** Indicates 90% significance

1/ Financial openness indicator according to Chinn and Ito (2006)

2/ Financial openness indicator according to Lane and Milesi-Ferreti (2008)

Notes: All responses are expressed in standard deviations. Rows 3-8
correspond to emerging economies

Source: Authors' calculations

Table 2 describes the variance decomposition of the real interest rate 16 quarters after the supply shock. This exercise is performed with the Forecast Error Variance Decomposition (FEVD) approach as described in Lütkepohl (2006). We compute the cumulative contribution of all the shocks in the system, during 16 quarters, to the variance of the real interest rate. This horizon is long enough for all the transmission mechanisms in the system to work out. Table 2 shows that the most important determinants of interest-rate fluctuations in developed economies are household consumption shocks. In contrast, for all emerging economies (rows 2 to 8), the most important determinants are real money shocks. This result follows from the higher observed macroeconomic volatility in emerging economies which seemingly leads to more volatile money-demand shocks. Table 2 also shows that the second most important determinant of interest rates in emerging economies are government consumption shocks. This result is likely related to the typically procyclical government responses which trigger additional monetary-policy reactions by central banks.

If we compare emerging economies with different degrees of financial openness in Table 2, it is interesting to note that supply shocks (TFP) explain a larger proportion of interest rate fluctuations in financially open economies. This result is in line with the hypothesis of balance-

of-payment dominance in emerging economies as external vulnerability affects monetary policymaking.

Table 2. Variance Decomposition of Real Policy Rate Fluctuations
16 Quarters after the Supply Shock

Group	Government Consumption	Total Factor Productivity	Household Consumption	Real Money Balances	Real Exchange Rate
1. Developed	1.02	0.81	2.15	1.89	0.81
2. Emerging	1.96	1.25	0.38	5.62	0.47
3. Fixed Regime	4.84	4.93	1.57	7.28	0.51
4. Flexible Regime	1.03	0.46	0.72	2.38	0.89
5. Open (C&I) ¹	2.17	3.04	0.57	6.26	0.66
6. Closed (C&I) ¹	1.22	0.64	0.61	4.60	1.19
7. Open (LMF) ²	4.29	3.29	0.55	7.25	1.12
8. Closed (LMF) ²	2.23	0.78	0.58	5.85	0.41

1/ Financial openness indicator according to Chinn and Ito (2006)

2/ Financial openness indicator according to Lane and Milesi-Ferreti (2008)

Notes: All responses are expressed percentage points. Rows 2-8 correspond to emerging economies.

Source: Authors' calculations

6. Concluding Comments

In this document, we use an alternative methodology to analyze monetary-policy responses to unexpected and temporary supply shocks. We perform Panel VAR estimations that allow identifying these supply shocks by controlling for demand-related variables. Then, we identify and compute the implied monetary-policy responses using the Cholesky ordering and controlling for money demand and real exchange rate shocks. This framework is applied to study monetary-policy reactions across levels of development, exchange-rate regimes, and financial openness degrees. Our results show that monetary-policy is more procyclical in emerging economies with fixed exchange-rate regimes, and to a lower extent, in financially open emerging economies.

While our results should be interpreted as average outcomes for groups of emerging economies, they detect a concern about the design of monetary policy in financially open economies in line with related literature. These results are consistent with the hypothesis of balance-of-payment dominance due to the external-sector effects of supply shocks in economies with a relatively high degree of financial openness. In this case, the high degree of pass-through of external shocks to the real exchange rate, leads to procyclical monetary policies (Ocampo, 2016). Some scholars have proposed the development of multilateral cooperation institutions that support emerging economies, to improve the cyclicity of their monetary-policy responses (Ocampo, 2017, p. 269). In addition, Rey (2015) and related papers, have proposed the adoption of macroprudential measures that help to smooth the potential domestic effects of external financial shocks.

Finally, future research should focus on detecting non-linearities on the relation between financial openness degree and monetary policy. In addition, the use of macroeconomic modelling is essential to make welfare analyses and analyze the optimality of alternative monetary-policy responses under imperfect financial markets.

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Appendix

Table A1: Panel Unit Root Tests – Developed Economies
Test by Im, Pesaran and Shin (2003)

Null: All panels contain unit roots

Panel	W-t-bar	P-value
Gov. Consumption	-8.64	0.00
Real Policy Rate	-3.79	0.00
Total Factor Productivity	-11.87	0.00
Household Consumption	-7.96	0.00
Real Money Balances	-3.02	0.00
Real Exchange Rate	-9.64	0.00

Note: All Variables in log difference, except for real policy rate. Bayesian information criterion is used to select the optimal number of lags.
Source: Authors' calculations

Table A2: Panel Unit Root Tests – Emerging Economies
Test by Im, Pesaran and Shin (2003)

Null: All panels contain unit roots

Panel	W-t-bar	P-value
Gov. Consumption	-14.10	0.00
Real Policy Rate	-8.90	0.00
Total Factor Productivity	-10.88	0.00
Household Consumption	-7.59	0.00
Real Money Balances	-5.57	0.00
Real Exchange Rate	-8.94	0.00

Note: All Variables in log difference, except for real policy rate. Bayesian information criterion is used to select the optimal number of lags.
Source: Authors' calculations

Table A3: List of Developed Economies

Australia	Germany	Norway
Austria	Greece	Portugal
Belgium	Iceland	Slovenia
Canada	Ireland	Spain
Denmark	Israel	Sweden
Finland	Italy	United Kingdom
France	Netherlands	United States

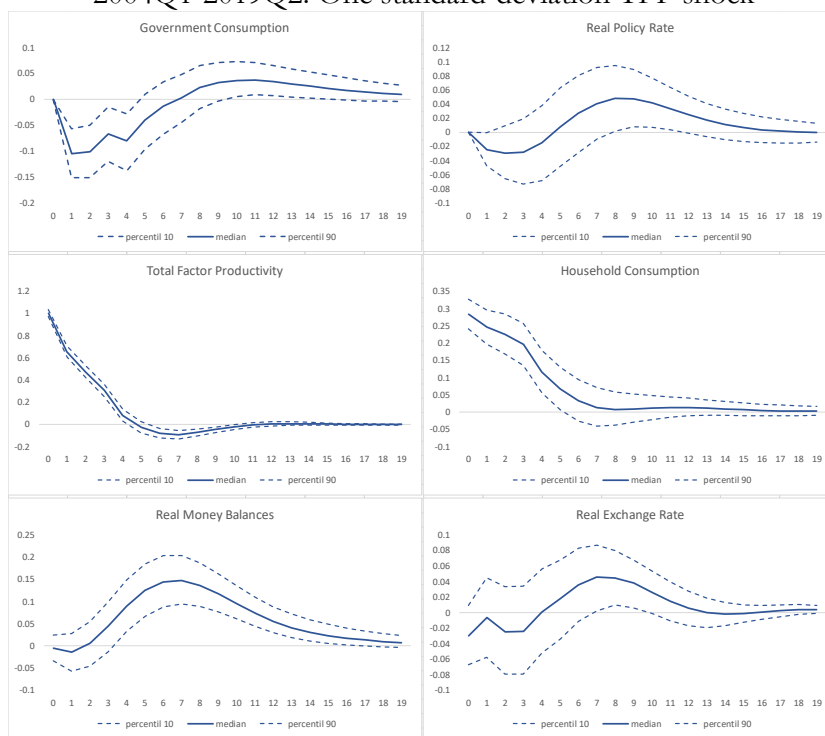
Source: Data Description (Section 2)

Table A4: Classification Table for Emerging Economies

#	Country	Fixed	Flexible	Fin. Open C&I	Fin. Open LMF
1	Argentina	1	0	0	0
2	Brazil	0	1	0	0
3	Botswana	0	1	1	0
4	Bulgaria	1	0	1	1
5	Chile	0	1	1	1
6	Colombia	0	1	0	0
7	Croatia	1	0	0	1
8	Czech Republic	0	1	1	1
9	Ecuador	1	0	0	0
10	Estonia	1	0	1	1
11	El Salvador	1	0	1	0
12	Hungary	0	1	1	1
13	Latvia	1	0	1	1
14	Lithuania	1	0	1	0
15	Malaysia	1	0	0	1
16	Mexico	0	1	0	0
17	Peru	1	0	1	0
18	Poland	0	1	0	0
19	Romania	0	1	1	0
20	South Africa	0	1	0	1
21	Slovakia	1	0	0	1
22	Thailand	0	1	0	1
23	Turkey	0	1	0	0
24	Uruguay	0	1	1	1
	Number	11	13	12	12

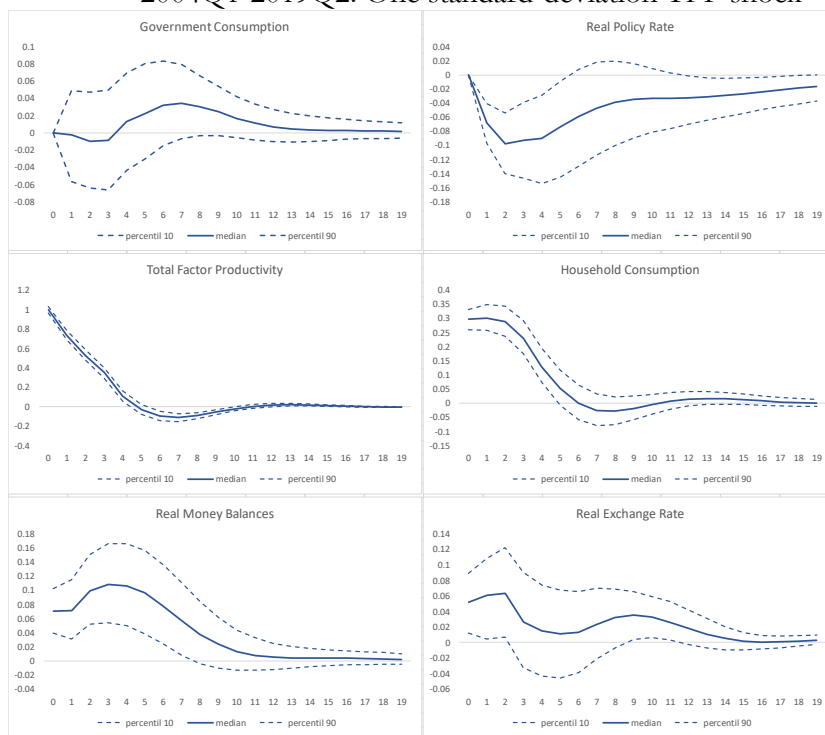
Source: Data Description (Section 2)

Figure A1. Impulse-response functions in developed economies 2004Q1-2019Q2. One standard-deviation TFP shock



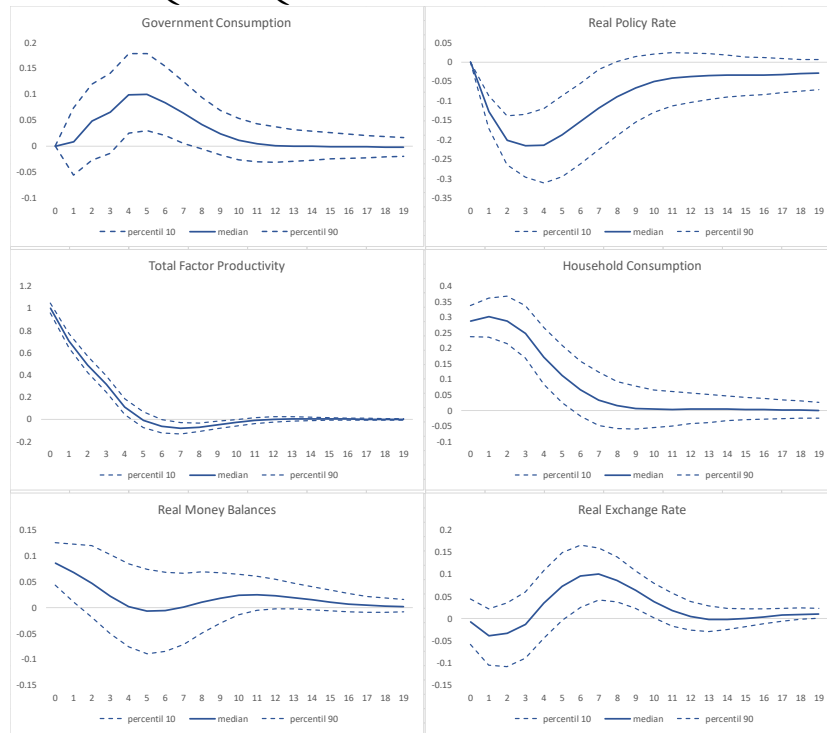
Note: 90% confidence intervals. Source: Authors' Computations

Figure A2. Impulse-response functions in emerging economies 2004Q1-2019Q2. One standard-deviation TFP shock



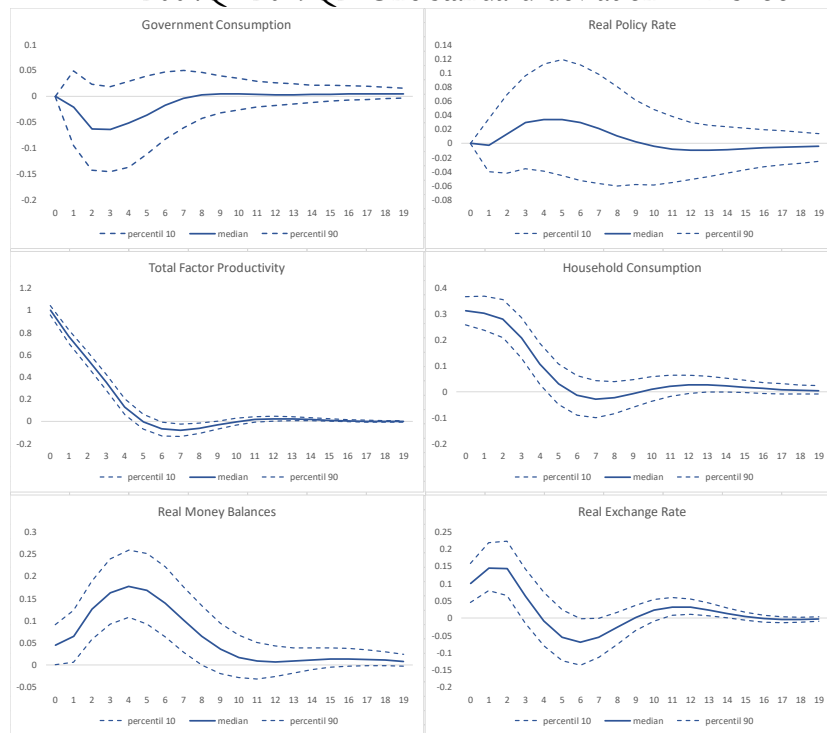
Note: 90% confidence intervals. Source: Authors' Computations

Figure A3. Impulse-response functions in emerging economies with fixed exchange rates 2004Q1-2019Q2. One standard-deviation TFP shock



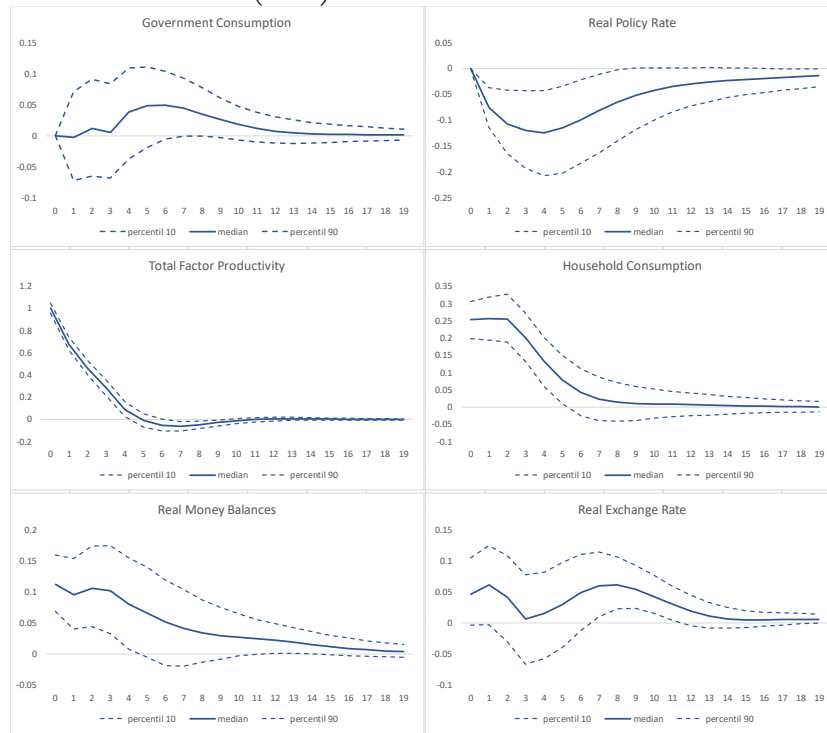
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Figure A4. Impulse-response functions in emerging economies with flexible exchange rates 2004Q1-2019Q2. One standard-deviation TFP shock



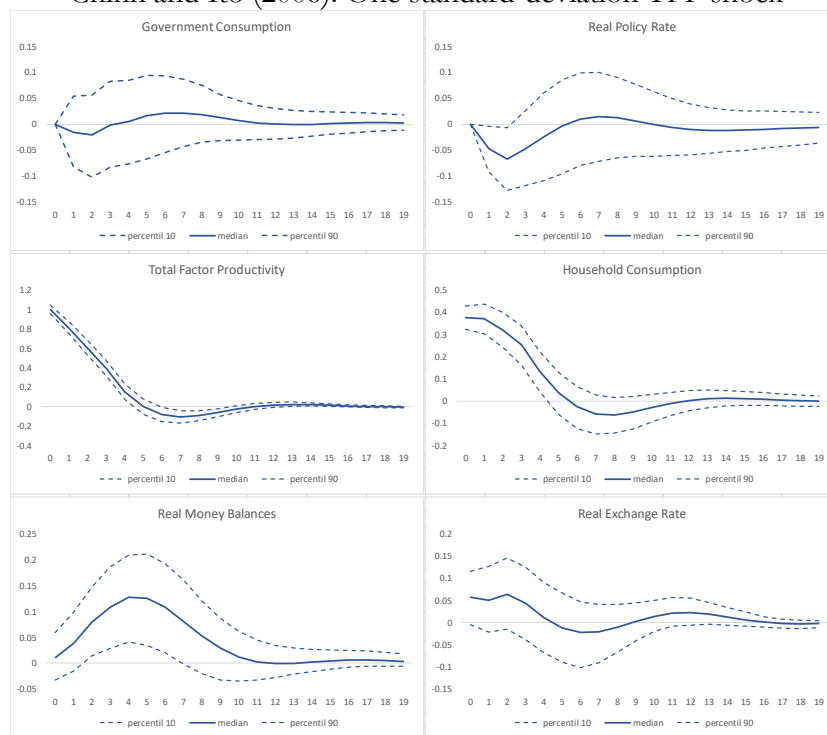
Note: 90% confidence intervals. Source: Authors' Computations

Figure A5. Impulse-response functions in financially open emerging economies according to Chinn and Ito (2006). One standard-deviation TFP shock



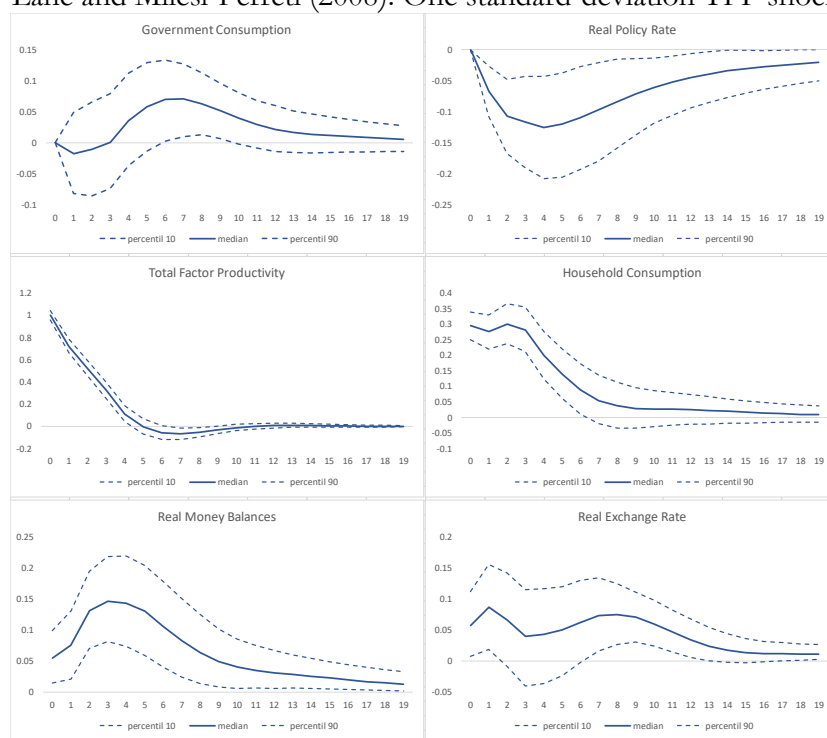
Note: 90% confidence intervals. Source: Authors' Computations

Figure A6. Impulse-response functions in financially closed emerging economies according to Chinn and Ito (2006). One standard-deviation TFP shock



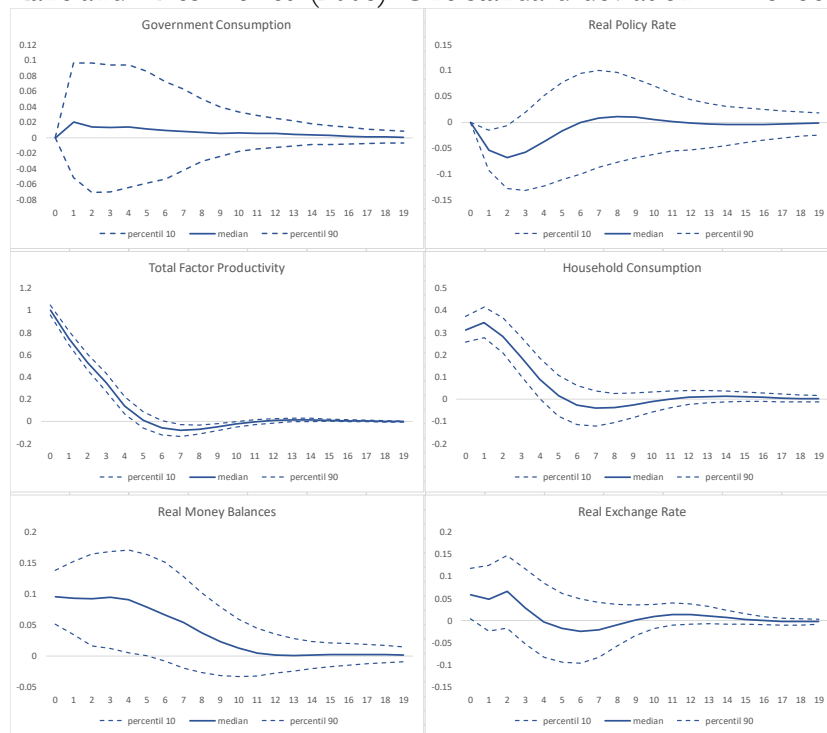
Note: 90% confidence intervals. Source: Authors' Computations

Figure A7. Impulse-response functions in financially open emerging economies according to Lane and Milesi-Ferreti (2008). One standard-deviation TFP shock



Note: 90% confidence intervals. Source: Authors' Computations

Figure A8. Impulse-response functions in financially closed emerging economies according to Lane and Milesi-Ferreti (2008). One standard-deviation TFP shock



Source: Authors' Computations