DISCUSSION PAPER SERIES

DP15931
(v. 2)

Monetary Policy Transmission in Emerging Markets and Developing Economies

Luis Brandão-Marques, Gaston Gelos, Thomas Harjes, Ratna Sahay and Yi Xue

INTERNATIONAL MACROECONOMICS AND FINANCE

MONETARY ECONOMICS AND FLUCTUATIONS

ISSN 0265-8003

Monetary Policy Transmission in Emerging Markets and Developing Economies

Luis Brandão-Marques, Gaston Gelos, Thomas Harjes, Ratna Sahay and Yi Xue

Discussion Paper DP15931
First Published 16 March 2021
This Revision 21 March 2021

Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
www.cepr.org

This Discussion Paper is issued under the auspices of the Centre's research programmes:

- International Macroeconomics and Finance
- Monetary Economics and Fluctuations

Any opinions expressed here are those of the author(s) and not those of the Centre for Economic Policy Research. Research disseminated by CEPR may include views on policy, but the Centre itself takes no institutional policy positions.

The Centre for Economic Policy Research was established in 1983 as an educational charity, to promote independent analysis and public discussion of open economies and the relations among them. It is pluralist and non-partisan, bringing economic research to bear on the analysis of medium- and long-run policy questions.

These Discussion Papers often represent preliminary or incomplete work, circulated to encourage discussion and comment. Citation and use of such a paper should take account of its provisional character.

Copyright: Luis Brandão-Marques, Gaston Gelos, Thomas Harjes, Ratna Sahay and Yi Xue

Monetary Policy Transmission in Emerging Markets and Developing Economies

Abstract

The effectiveness of monetary policy transmission in emerging markets and developing countries (EMDEs) remains subject to considerable debate in academia and among policymakers. Can EMDEs effectively steer inflation and output by controlling short-term interest rates? Or do structural features of these economies, in particular a lack of financial market depth, hinder such transmission? We conduct a novel empirical analysis using Jordà's (2005) approach for 39 EMDEs to answer these questions. We find that interest rate hikes do reduce output growth and inflation, if the exchange rate is allowed to adjust. Inflation targeting frameworks adopted by independent and transparent central banks matter more than structural features, such as financial development.

JEL Classification: E3, E4, E5, F4, G1

Keywords: monetary policy, emerging markets, Exchange rate channel, Inflation targeting, Financial structure

Luis Brandão-Marques - lmarques@imf.org
International Monetary Fund

Gaston Gelos - ggelos@imf.org
International Monetary Fund and CEPR

Thomas Harjes - tharjes@imf.org
International Monetary Fund

Ratna Sahay - rsahay@imf.org
International Monetary Fund

Yi Xue - yxue@imf.org
Bank of America Merrill Lynch

Acknowledgements
A previous version of this paper appeared as IMF WP 20/35. Wenyue Yang provided excellent research assistance. The authors thank Marco Casiraghi, Romain Duval, Hendre Garbers, Mariam El Hamiani Khatat, Andrew Filardo, Gunes Kamber, Tommaso Mancini-Griffoli, Chris Papageorgiou, Jiri Podpiera, Andrea Presbitero, Pau Rabanal, Filiz Unsal, Tim Willems, and IMF seminar participants for helpful comments, and Christine Luttmer for editorial assistance.

I. INTRODUCTION

Many central banks in emerging markets and other developing economies (EMDEs) have been modernizing their monetary policy frameworks. In particular, many large emerging markets have moved to using interest rates as the primary operational targets, often in an inflation targeting (IT) regime with flexible exchange rates.

However, some central banks remain reluctant to transition to a price-based approach to monetary policy because of their concern that changes in short-term policy rates may not be sufficient to influence output and inflation. Some of the key factors cited include underdeveloped financial systems, dollarized economies and low central bank credibility (Frankel, 2010). A few studies have found that transmission is indeed weak due to thin financial markets (e.g., Mishra, Montiel, and Spilimbergo, 2012, and the literature surveyed by Mishra and Montiel, 2013), while others (Berg et al., 2013) have argued that failure to detect transmission in these economies is often driven by data and methodological problems.

As a matter of fact, EMDEs are generally characterized by lower financial market development than advanced economies. Differences in the liquidity, the structure of interbank money markets, and overall financial development are likely to matter for the transmission of policy rates to the economy through the interest rate channel. Similarly, market segmentation, credit rationing, dollarization, or the presence of dominant state banks may reduce transmission of policy rates to lending rates. The bank lending (or narrow credit) channel may be more important in less developed economies because firms rely heavily on bank lending if they have access to credit at all.

Moreover, despite considerable progress in many EMDEs over the past year, monetary policy frameworks in these countries are often less-well established, and monetary policy credibility and transparency is typically lower in these countries than in advanced economies (Ha, Kose, and Ohnsorge, Dincer and Eichengreen 2014). This may also hinder the effective transmission from changes in short-term rates to longer-term ones (Frankel 2010). Weaker credibility may also result in a larger exchange-rate pass through (Taylor 2000).

The exchange rate channel typically plays a key role in small open economies (Mishkin 2000).[1] In many EMDEs, currency mismatches are prevalent. This implies that, in addition to the standard effects of the exchange rate channel, a countervailing effect may be important: an appreciating currency may strengthen borrowers' and lenders' balance sheets, increasing their ability to borrow and extend credit, and thereby stimulate the economy, and the converse is true for depreciations (see, for example, Céspedes, Chang, and Velasco, 2004, or Avdjiev et al. 2019, among many others). Other nonstandard, contractionary effects of depreciations (stemming from higher costs of capital- and intermediate goods) may also be present (Frankel, 2010).

[1] A BIS survey conducted in 2008 showed that most emerging market central banks considered the interest and exchange rate channels to be the most dominant transmission mechanisms (BIS 2008).

Conceivably, the interactions between exchange-rate and interest-rate effects are nonlinear, requiring special attention when assessing the effectiveness of monetary policy.

To the best of our knowledge, the quantitative relevance of these factors in shaping monetary transmission in EMDEs has not yet been comprehensively and rigorously explored. We try to fill this gap, systematically analyzing the strength of monetary transmission following changes in short-term rates in EMDEs. Controlling for the exchange rate channel, we explore the extent to which the strength of the transmission mechanism depends on monetary policy frameworks, the level of financial development, and other structural characteristics, such as financial dollarization.[2]

In our econometric approach, we begin by addressing endogeneity problems that are inherent to the analysis of such relationships. Specifically, we identify monetary policy (i.e., interest-rate-) shocks by removing the influence of current macroeconomic conditions and expected future GDP growth and inflation. We then estimate the responses of output and prices to such shocks for a sample of 39 EMDEs using Jordà's (2005) local projections method.

Two key results add to the existing literature. Our first key result is that transmission of domestic monetary policy is, indeed, effective in EMDEs, provided the exchange rate is allowed to adjust. The second key result is that monetary policy frameworks matter more than other structural country characteristics, including financial development, for the transmission of interest rate shocks to output.

With regard to the first result, we find that the impact of monetary policy shocks resembles those for advanced economies once we account for the exchange rate channel. On average, output falls by 1.1 percent in response to a 100 basis points increase in policy rate shock. Furthermore, once we condition the exchange rate response (de facto imposing a sign restriction), the estimated response is in line with what is expected in theory. That is, Sims's (1992) and Eichenbaum's (1992) price puzzle disappears. Although more muted than the estimated response of output, following a contractionary monetary policy shock, prices decline by around 0.3 percent if the nominal exchange rate appreciates at the same time. The finding on the effectiveness of monetary policy is consistent with results in Abuka et al (2019), Berg et al (2013) and Willems (2020), which report evidence of monetary transmission in developing countries following large monetary contractions.

With regard to the country characteristics, our estimates show that the response of output to such shocks is stronger in countries that have adopted IT, and where the central bank is more

---

[2] Previous studies on the transmission in developed economies have emphasized the role of central bank independence and central bank objectives in changing the intensity of the transmission of monetary policy shocks to output (Boivin, Kiley, and Mishkin 2011). Other studies have stressed the role of financial intermediaries and financial structures in amplifying or dampening monetary transmission (Bernanke and Gertler 1995, Cecchetti 1999, and Calza, Monacelli, and Stracca 2013).

independent or more transparent. This finding is robust to controlling for competing explanations (such as overall quality of country governance) and the endogeneity of IT adoption.[3] To our knowledge, this is a novel result which has not yet been documented systematically for EMDEs. Transmission to output appears to be somewhat stronger in more financially developed economies, but the opposite is true for the transmission to prices. Other country characteristics, such as capital account and trade openness or bank competition, do not seem to have significant effects on the transmission mechanism, either. Interestingly, and rather surprisingly, we also find that monetary transmission is effective in countries with high levels of financial dollarization.

The rest of the paper is organized as follows. In Section II, we describe the data and empirical approach. We discuss the results and their robustness in Section III. Section IV concludes.

II. Empirical Methods and Data

A. Data

We study a sample of 40 emerging and developing economies. All data used in the benchmark analyses are monthly. The countries and data sources are described in Appendix I. Summary statistics of the dependent and explanatory variables are provided in Tables 1 and 2.

Our main variables of interest are industrial production, the all-items consumer price index (CPI), and a monetary-policy or other short-term interest rate. We take special care in choosing the appropriate interest rate. All countries in the sample have some form of interbank market and report interbank rates. Many central banks, including all inflation targeters, use open market operations to closely align a specific short-term money market rate (the operating target) with their policy rate. However, in countries where "policy rates" are not market clearing or may not present arbitrage opportunities with other short-term interest rates, they sometimes contain little, if any, information on short-term funding costs. In these cases, we pick a short-term interest rate for each country that represents a relatively liquid money market and appears representative of broader funding costs, after a cross-checking with other short-term rates, such as T-bills. We only include those EMDEs in our sample where we could identify such a rate. In most cases, these rates are also well aligned with the respective policy rate.

We use several variables to capture a range of relevant country characteristics that could be important for the transmission of policy/interest rate shocks. We focus in particular on the level of financial development and the type of monetary policy framework.

[3] The adoption of IT possibly happens in response to changes in the macroeconomic environment and may, therefore, be endogenous to macroeconomic outcomes such as output growth and inflation (Ball and Sheridan, 2004). This complicates inference of causal effects of IT adoption.

We consider three main measures of financial development. First, we use Sahay et al.'s (2015) index of overall financial development. Second, we employ total private credit by banks and nonbank financial intermediaries as a percentage of GDP to measure the depth of credit markets. Finally, we use the number of ATM's per 100,000 inhabitants to gauge financial inclusion.

We differentiate across three key dimensions according to which monetary policy frameworks can differ: whether the country has adopted inflation targeting (IT) or not, the level of central bank independence, and its level of transparency. Specifically, we use data from the IMF's AREAER database to build a dummy variable indicating the adoption of IT. We also use indices of central bank independence (Garriga, 2016), and an index of augmented central bank transparency (Dincer and Eichengreen, 2014). In our sample, the first and the third measures are significantly correlated, while the second one is not correlated with the others.

We also explore other country characteristics such as the quality of country governance, the degrees of financial dollarization, capital account openness, openness to trade, the importance of food in the consumption basket, the degree of bank competition, and the importance of foreign banks. Most of these characteristics are captured by fairly standard measures sourced from the literature and public data sources. An exception is the degree of financial dollarization, which is captured by a new index of deposit and credit dollarization based on confidential IMF data. Appendix Table A.1 describes the data sources.

B. Statistical Methods

The empirical assessment of the impact of monetary policy on economic activity and prices requires exogenous (controlled) variation in the policy variables. Another difficulty is that the results on the propagation of macroeconomic shocks to output and prices can be sensitive to the modelling of the transmission mechanism. In this paper, we model the transmission mechanism using Jordà's (2005) local projection method and identify monetary policy (interest rate-) shocks with the help of a Taylor rule in the spirit of Romer and Romer (2004). High-frequency identification, a popular alternative method, is only possible for a smaller set of countries in our sample but is nevertheless explored in the robustness section below.

We use a simple Taylor-rule model to identify monetary policy (interest rate-) shocks for each country in our sample because this, relative to other approaches to identification (e.g., Kuttner's, 2001, high-frequency identification) allows us to use a larger sample. The specification is as follows:

$$\Delta r_{it} = \alpha_{0i} + \alpha_{1i} E_t \Delta y_{it+12} + \alpha_{2i} E_t \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta y_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta p_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta neer_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} r_{it-j} + \varepsilon_{it}, \tag{1}$$

where the variables y, p, r, and *neer* denote output, prices, a short-term interest rate, and the nominal effective exchange rate (in logs), respectively. The indices i and t signify country and month, respectively.

Specification (1) assumes the central bank has a forward-looking behavior captured by $E_t\Delta y_{t+12}$ and $E_t\Delta p_{t+12}$ which are the 12-month-ahead market forecasts of GDP growth and inflation, as measured by Consensus Forecasts. Ideally, we would use central bank forecasts as in Romer and Romer (2004), but these are generally not available. Hence, we implicitly assume that central banks and markets have the same information set. In support of this assumption, Coibion and Gorodnichenko (2012) find no significant differences in the rate of information acquisition and processing across agents, including central banks, consumers, firms, and professional forecasters. Others have also found that that private consensus forecasts have the same accuracy and the same implications for monetary policy as central bank staff forecasts for FOMC meetings (e.g., Gavin and Mandal, 2001, and Chun, 2010).

The monetary policy (interest rate) shock is captured by the residual ε, except for countries that have a currency board (Bulgaria) or are officially dollarized (Ecuador), for which we use the monthly change in the policy interest rate of the reference currency (euro and dollar, respectively).[4] In other words, deviations from the Taylor-type rules are intended to capture the non-systematic and unexpected part of monetary policy actions.[5] Since the overall magnitude of the shocks varies considerably across countries, we standardize the residuals on a country-by-country basis. Therefore, a unit monetary policy shock signifies a one standard deviation shock.

Still, the Taylor rule residual may not always capture true monetary policy shocks, especially if the country does not use an interest rate as its main monetary policy tool. For those countries in our sample where central banks do not yet actively target a short-term interest rate and/or do not systematically adjust their policy rate to changes in their output/inflation forecasts, the residual ε simply measures exogenous interest rate variation (purged from any impact of lagged variation in output, prices and the exchange rate). This variation could reflect adjustments in other monetary policy instruments, such as reserve requirements or unsterilized foreign exchange interventions, but potentially also other exogenous factors.

---

[4] See Auerbach and Gorodnichenko (2012) for a similar example of country-specific policy shocks used with panel local projections. Specifically, Auerbach and Gorodnichenko use the (transformed) residuals of a regression of forecast errors of government spending on lagged macroeconomic variables. Equivalently, identification can be achieved by replacing ε by Δi and adding the variables in the left-hand side of (1) to the left-hand side of (2)—see the discussion of *identification through controls* in Barnichon and Brownlees (2019) and references therein.

[5] Since we are using the specification of the Taylor rule (1) for every country, the estimated shocks are not necessarily serially uncorrelated. In practice, assuming an AR(1) structure for the errors, of the 40 countries in the sample, only six show evidence of having autocorrelated shocks at the 5 percent significance level, as per Ljung and Box's (1978) portmanteau Q statistic.

Overall, the estimated Taylor rules display coefficients with the expected signs for inflation and output growth expectations (Table 3). The estimated coefficients on inflation expectations tend to be larger than those of expected output growth and are more often statistically significant, but monetary policy seems to be reacting similarly to both in many countries. About a quarter of the countries in the sample tighten monetary policy in response to a currency depreciation. Finally, the fit of estimated Taylor rules shows significant variation across the EMDEs in our sample, and is usually (but not always), better for IT countries (e.g., Brazil, Colombia, Mexico, and Turkey) than for other countries that have used multiple policy instruments and that are less focused on inflation and output forecasts when setting their policy instruments.

We then estimate the responses of output and prices to monetary policy shocks using local projections (Jordà, 2005). The local projections method directly estimates the response of macroeconomic variables to properly identified policy shocks. In doing that, it does not require the specification and estimation of the unknown true multivariate dynamic data-generating process and is therefore more robust to misspecification than vector autoregression (VAR) models, even if it entails some loss of efficiency. Furthermore, local projections are more amenable to highly non-linear and flexible specifications—such as the interactive effects with specific country characteristics which we are interested in—than VARs.

Since virtually all the countries in our sample are small open economies, the quantification of policy/interest rate transmission—especially to prices—in EMDEs benefits from explicitly accounting for the exchange rate channel. In line with this notion, previous studies have highlighted the importance of accounting for monetary policy transmission through exchange rates in small open economies as a form of avoiding "puzzling dynamic responses" (Cushman and Zha, 1997, Bjørnland, 2008).[6]

Moreover, a priori it seems important to allow for potential nonlinearities in the specification that may be associated with the exchange rate channel. For example, if FX mismatches are low, the traditional interest- and exchange rate channels reinforce each other in a particularly strong manner in small open economies. Exports may be boosted not only through price effects, but also through cheaper access to trade credit. On the other hand, import compression effects may be strengthened through effects on intermediate imports. Similarly, in the presence of FX mismatches at the borrower- or lender level, it is far from clear that balance-sheet effects of exchange rate movements counteract traditional effects in linear ways. We therefore make the response of output or prices to a monetary policy shock also dependent on the contemporaneous change in the NEER by interacting the policy/interest rate shock with the change in the exchange rate. The specification is as follows:

[6] Because the Taylor rule includes only lagged values of the exchange rate, our identification procedure preserves exogeneity of the regressors with respect to policy shocks but rules out any influence of contemporaneous variations in the exchange rate on monetary policy and interest rates. Grilli and Roubini (1996) show that this assumption can lead to an exchange rate puzzle, i.e., a tightening of the policy instrument leads to a depreciation of the exchange rate.

$$y_{it+h} = \mu_i^h + \sum_{j=0}^{2} \gamma_j^h \hat{\varepsilon}_{it-j} + \delta_0^h \Delta neer_{it} * \hat{\varepsilon}_{it} + \sum_{j=0}^{2} \beta_{1j}^h Z_{it-j} + \sum_{j=1}^{2} \beta_{2j}^h r_{it-j} + \mathbf{x}_{it} \boldsymbol{\lambda}^h + \omega_{it}^h, \qquad (2)$$

where μ_i^h is a country fixed effect, $\hat{\varepsilon}$ is the estimated (and standardized) country-specific policy shock, the vector Z includes contemporaneous and lagged values for y, p, and *neer*. The vector $\boldsymbol{x}$ contains global and country-specific controls, including the VIX, a commodity price index, the first principle component of the United States', euro area's, and Japan's shadow policy rates, and country-level monthly temperature and precipitation anomalies.[7] A separate regression is estimated for each horizon (h) The impulse response function for prices is obtained in the same fashion.

In (2), the coefficient associated with the contemporaneous shock (γ_0^h) is the response of output (or prices) when the exchange rate channel is shut down, and $\gamma_0^h + \sigma\delta_0^h$ is the total output (or price) response when we also consider the amplifying effect of exchange rates. For the latter we assume that a one standard-deviation change in the NEER (σ) occurs simultaneously with the policy/interest rate shock, which is comparable to a sign restriction assumption in VARs (Uhlig 2005). In addition, (2) imposes a recursiveness assumption as it assumes that Z and $\Delta NEER$ are predetermined and that the shock has no contemporaneous effect on output or prices.[8] In Appendix III, we explore simpler versions of (2), where the monetary policy shock enters without interactions with the exchange rate change.

We estimate equation (1) with country-by-country OLS and equation (2) with the fixed-effects within estimator (FE), and calculate standard errors using the Newey and West (1987) estimator where the bandwidth expands with the horizon h of the impulse response.[9]

III. Results

A. Benchmark Regressions

Output strongly declines after a contractionary monetary policy shock (Figure 2.1). The estimated impulse response function shows output falling by about 0.4 percent following a contractionary one-standard deviation shock to monetary policy, regardless of the behavior of the exchange rate (Table 5). The responses are statistically significant at the 1 percent significance level, peak after about 7 months when the exchange-rate channel is active, and at 10 months

---

[7] Weather- and associated food price fluctuations can be important drivers of variations in the CPI of developing economies.

[8] We also include two lags of the policy/interest rate shock in the regression; however, this does not affect the definition of the IRFs.

[9] We do this because these equations are predictive regressions and by design generate autocorrelation in the disturbances (Hansen and Hoddrick 1980).

when it is not. Since the shocks are standardized at the country level, a one-standard deviation shock does not mean the same across countries in terms of basis points. For the median country in our sample in terms of shock volatility, a 100-basis point rise in interest rates lowers output by 1.15 percent when considering the contemporaneous effect of the exchange rate and 1.05 when not.[10] These dynamics are broadly in line with Ramey's (2016) results for the U.S. using similar identification methods.[11]

The effects on prices of a contractionary monetary policy shock are more muted, and only significant when we account for the exchange-rate channel (Figure 2.2).[12] A one-standard-deviation hike in the policy shock accompanied by a one-standard-deviation appreciation in the NEER (about 2.2 percent increase) is associated with a 0.12 percent decline in prices after 11 months. This effect is statistically significant, but only at the 10 percent significance level. The equivalent effect of a 100-basis point interest-rate hike is roughly 0.33 percent. There is no measurable effect of tighter monetary policy when holding the exchange rate constant.

The results from these benchmark regressions suggest that the behavior of the exchange rate could be a major reason behind countries' heterogenous responses to monetary policy shocks (e.g., Ehrmann 2000, and Kim and Roubini 2000), and potentially accounts for the price puzzle (see also Appendix III for a discussion of the price puzzle and dynamic heterogeneity). Most individual regressions of output and prices up to 20 months ahead show statistically significant estimates of the individual coefficients of the policy shock, the change in the NEER, and their interaction (Table 4). Importantly, the transmission of a monetary policy shock to output and prices is statistically different from estimates obtained when excluding the amplification mechanism through exchange rates (Figure 2).

[10] The increase in interest rates is orthogonal to macroeconomic forecasts and past macroeconomic conditions.

[11] For the U.S., estimates for the trough effect of a 100-basis point rate hike tend to lie in a range of -0.5 percent to -2.5 percent, (Ramey 2016). For a large sample of advanced and emerging/developing countries, Willems (2020) estimates the trough impact on GDP at -0.3 percent for EMDEs and at -1.1 percent for advanced economies.

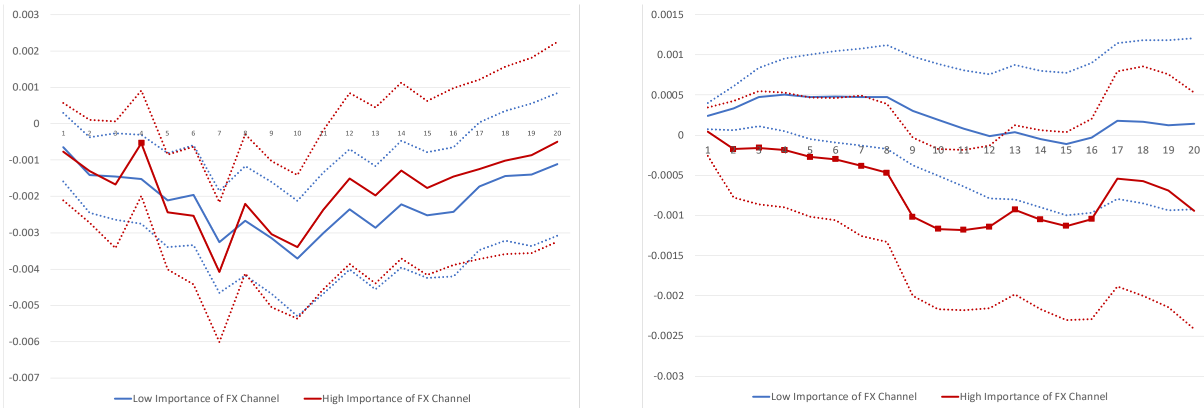
[12] We also tried our benchmark regressions with core CPI but the results were similar.

Figure 2. Impulse Responses of Output and Prices to A Monetary Policy Shock

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level (panels 5 and 6 only). Standard errors are robust to heteroscedasticity and autocorrelation.

1. Output responses by magnitude of exchange rate channel

2. Price responses by magnitude of exchange rate channel



B. Financial Development, Monetary Policy Frameworks, and Other Country Characteristics

We now test if country characteristics affect the transmission of monetary policy, assuming the exchange rate amplification channel is active. We do this by interacting of the policy shock with variables which capture financial development, policy frameworks, and other structural characteristics. The generic specification is as follows:

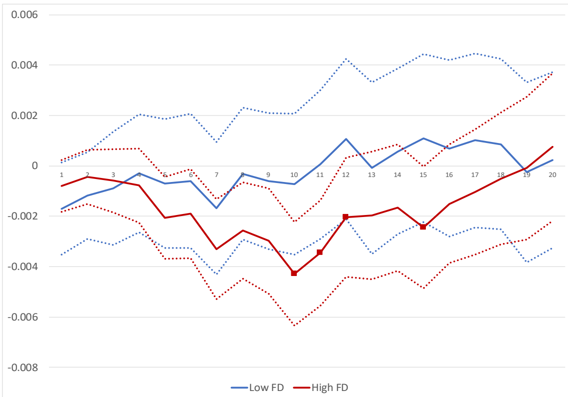
$$
\begin{aligned}
y_{it+h} = \mu_i^h + \sum_{j=0}^{2} \gamma_j^h \hat{\varepsilon}_{it-j} + \delta_0^h \Delta neer_{it} * \hat{\varepsilon}_{it} + \delta_1^h W_{it} + \delta_2^h \hat{\varepsilon}_{i,t} \times W_{it} \\
+ \sum_{j=0}^{2} \beta_{1j}^h Z_{it-j} + \sum_{j=1}^{2} \beta_{2j}^h r_{it-j} + \mathbf{x}_{it} \boldsymbol{\lambda}^h + \omega_{it}^h ,
\end{aligned}
\tag{3}
$$

where W is a variable representing financial sector development or some other country characteristic.

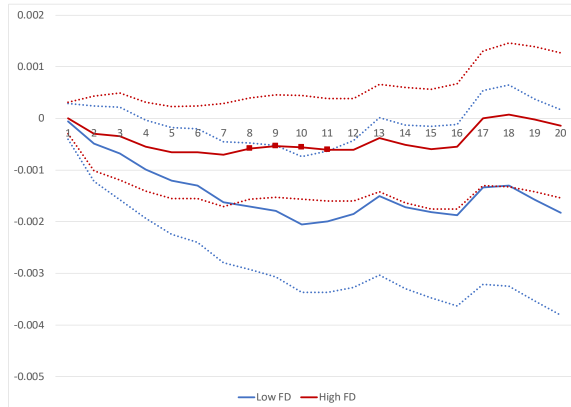
Figure 3. Transmission of Monetary Policy and Financial Sector Development

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

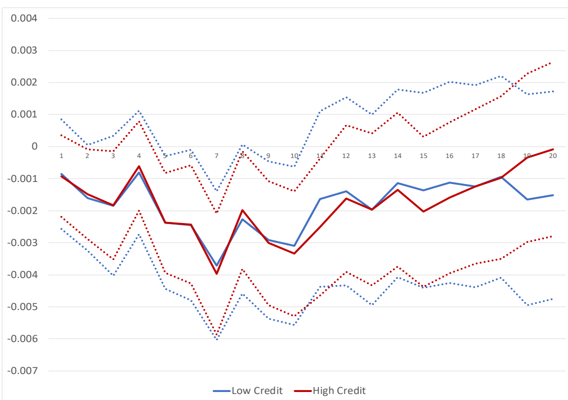
1. Output responses by FD Index



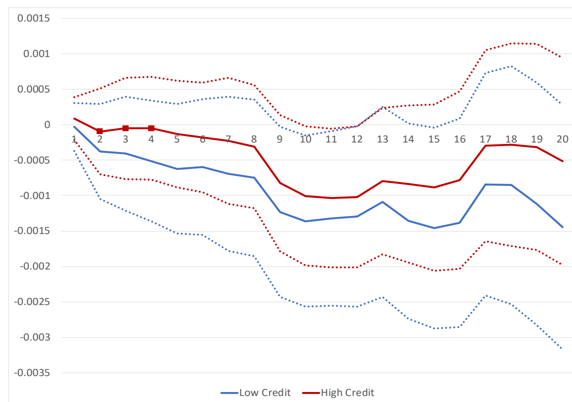
2. Price level responses by FD Index



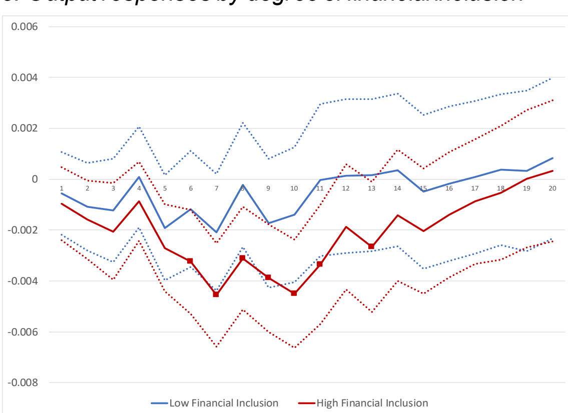
3. Output responses by size of credit market



4. Price level responses by size of credit market



5. Output responses by degree of financial inclusion



6. Price level responses by degree of financial inclusion

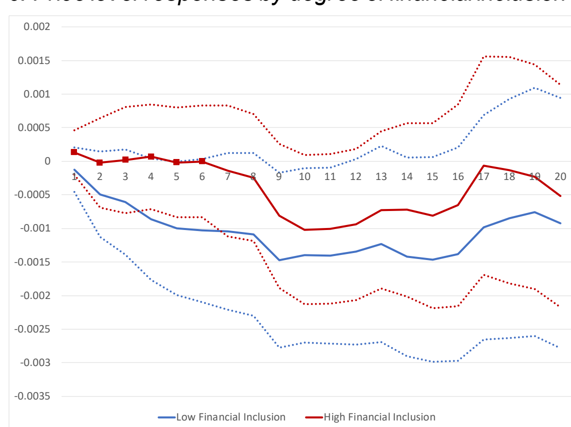
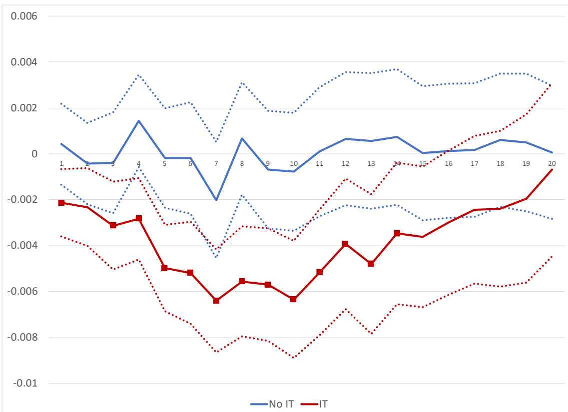


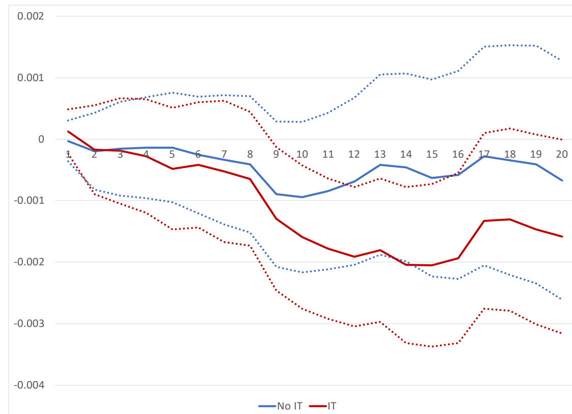
Figure 4. Transmission of Monetary Policy Frameworks

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

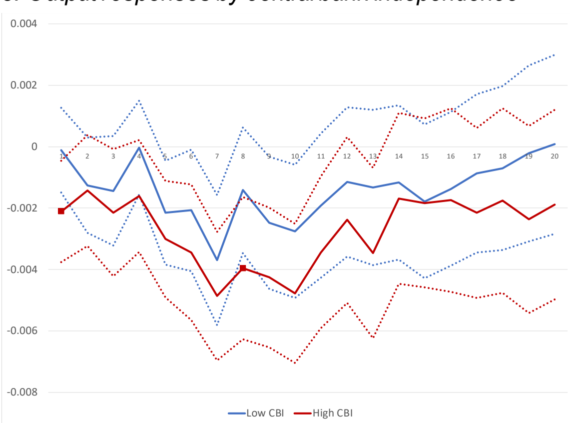
1. Output responses by monetary policy regime



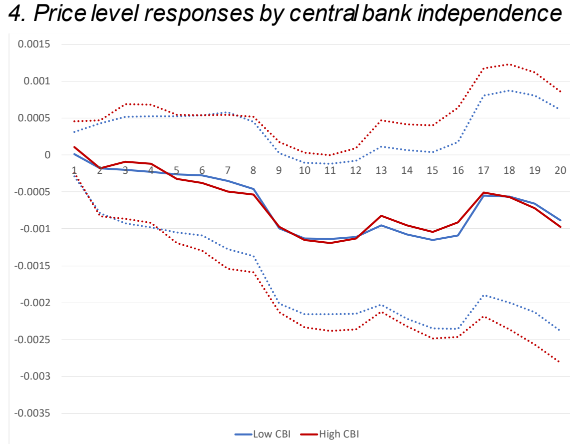
2. Price level responses by monetary policy regime



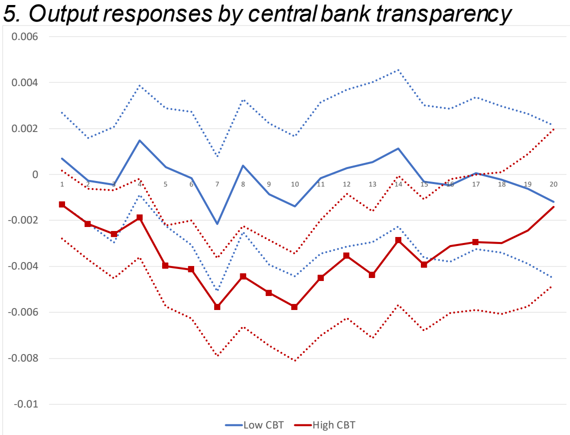
3. Output responses by central bank independence



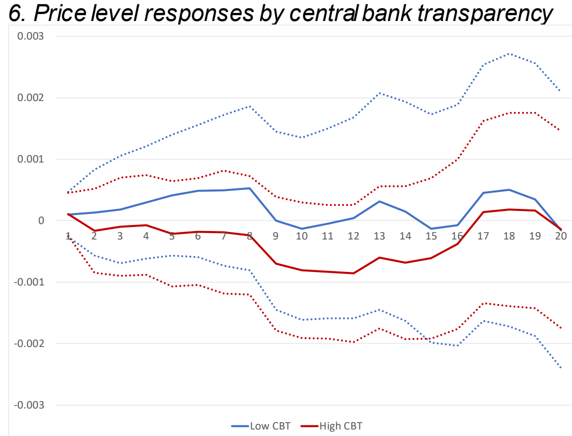
4. Price level responses by central bank independence



5. Output responses by central bank transparency



6. Price level responses by central bank transparency



Our results show that the transmission of monetary policy to output is somewhat stronger with higher levels of financial development. The impulse responses of output to a monetary policy shock of an emerging market economy at the top 25th percentile of Sahay et al.'s (2015) broad index financial development or of financial inclusion is significantly different than that of one of an emerging market economy at the bottom 25th percentile (Figure 3).[13] However, there is no difference when we use the size of the credit market instead. Surprisingly, regarding the price response, at least in the near term, prices in emerging market economies at the top 25th percentile of financial development respond significantly *less* than in less financially developed economies (at the bottom 25th percentile). Overall, the results are somewhat sensitive to the choice of variable representing financial development.

The presence of inflation targeting, the degree of central bank independence, and the extent of central bank transparency seem to matter a great deal for the transmission of interest rate shocks to output. The estimated impact of shocks is significantly stronger in economies that have adopted IT, have independent central banks, and that implement policy in a transparent manner (Figure 4). We also find that only in IT countries do prices show a significant decline in response to a tightening monetary policy shock, although the difference between IT and non-IT countries is not statistically significant (Figure 4.2). We also find weaker results when it comes to central bank transparency.

Given these findings, which matters most: financial development or the monetary policy framework (IT)? We try to answer this question by considering a specification that includes an interaction of a measure of financial development (W_1) with a variable representing a policy framework characteristic, such as the adoption of IT (W_2), and another interaction with the policy shock. The expanded specification is as follows:

$$\begin{aligned} y_{it+h} = {} & \mu_i^h + \sum_{j=0}^{2} \gamma_j^h \hat{\varepsilon}_{it-j} + \delta_0^h \Delta neer_{it} * \hat{\varepsilon}_{it} + \delta_1^h W_{1it} + \delta_2^h W_{2it} + \delta_3^h \hat{\varepsilon}_{i,t} \times W_{it} + \delta_4^h \hat{\varepsilon}_{i,t} \times W_{it} \\ & + \delta_5^h W_{1it} W_{2it} + \delta_6^h W_{1it} W_{2it} \hat{\varepsilon}_{it} + \sum_{j=0}^{2} \beta_{1j}^h Z_{it-i} + \sum_{j=1}^{2} \beta_{2j}^h r_{it-j} + \mathbf{x}_{it} \boldsymbol{\lambda}^h + \omega_{it}^h . \end{aligned} \tag{4}$$

Overall, we find that the total effect of IT adoption does not seem to depend on the level of financial development, the depth of credit markets, or the degree of financial inclusion (Figure 5). For example, for a given level of financial development measured by the FD index, countries that have adopted IT show a statistically significantly stronger transmission of monetary policy shocks to output regardless of financial development or inclusion (Figures 5.1 and 5.3). In fact, IT is even more important for an effective transmission of monetary policy

[13] Sahay et al.'s (2015) index has two subcomponents which measure the development of financial markets and of financial institutions. The results (available from the authors) with either sub-index are not qualitatively different from the ones that use the broad financial development index.

shocks to prices in countries with low financial development (Figures 5.2, 5.4, and 5.6). Therefore, having an IT framework seems more important for transmission than financial development.[14] Although a few studies have found evidence for the role of IT in enhancing monetary transmission for selected advanced economies (e.g., Siklos and Weymark, 2009), to our knowledge our finding is novel for EMDEs.

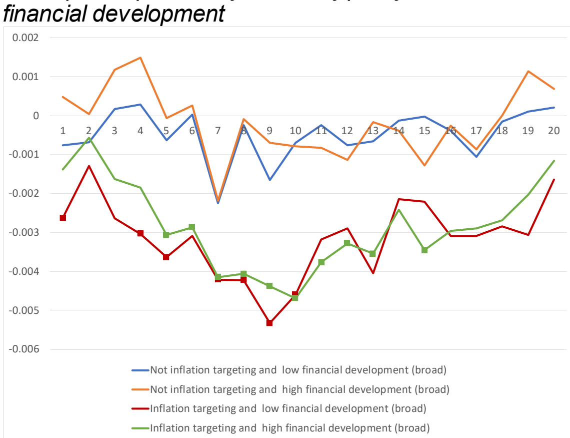
Finally, other country characteristics also seem to matter, but less so than monetary policy frameworks. For example, monetary policy appears to affect output more strongly in jurisdictions with more robust governance frameworks (i.e., more accountable political systems, more effective governments, and better regulation) but we can measure no discernible difference when it comes to the transmission to prices (Figure A.2.1). However, in many countries, the modernization of monetary policy frameworks is often concurrent with (or the result of) overall governance reforms and, in the data, the two dimensions—monetary policy frameworks and country governance—are correlated. Therefore, it is important to check whether our previous results on IT hold once we control for country governance. For this reason, we compare the effect of monetary policy frameworks to that of overall country governance using equation (5). We find that, regardless of the quality of country governance, the transmission of monetary policy to output and prices seems to be stronger in countries that have adopted IT (Figure A.2.2).

[14] Overall, financial development and monetary policy frameworks are not highly correlated. In the sample, the correlation between IT and the FD index is only 0.28. Also, there is significant variation in financial development among IT and non-IT countries: the standard deviation of FD is 0.17 for IT=0 and 0.15 for IT=1. Still, the weak findings on financial development could be the result of attenuation bias caused by measurement error.

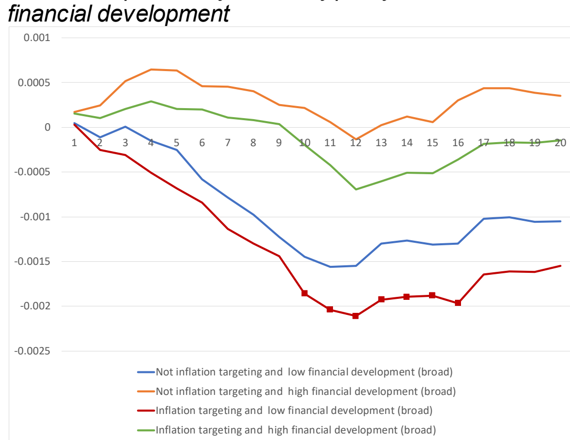
Figure 5. Monetary Policy Frameworks vs. Financial Development

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. Each solid line represents the total effect on prices or output of a monetary policy shock, conditional on the country being an inflation targeter or not and conditional on the level of financial development. Square markers indicate that the total effect is statistically significant at least the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

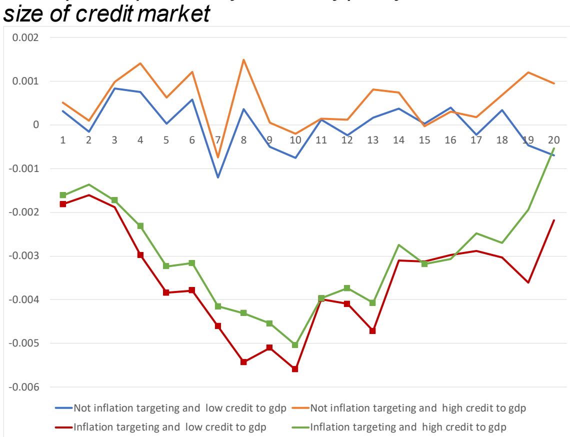
1. Output responses by monetary policy framework and financial development



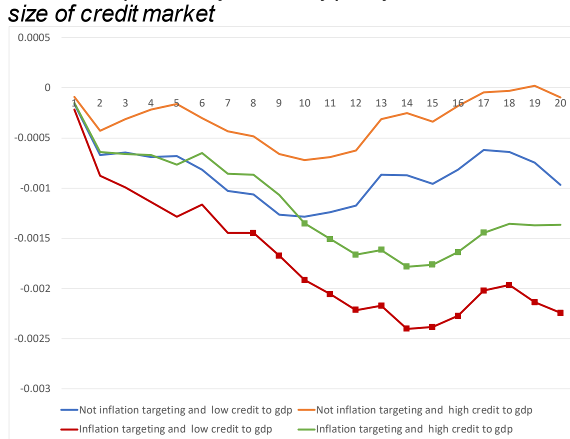
2. Price responses by monetary policy framework and financial development



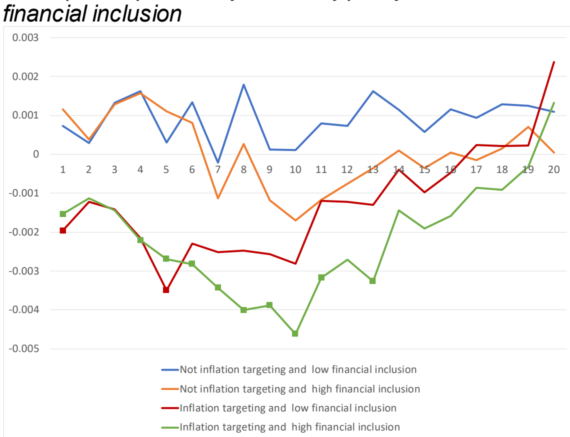
3. Output responses by monetary policy framework and size of credit market



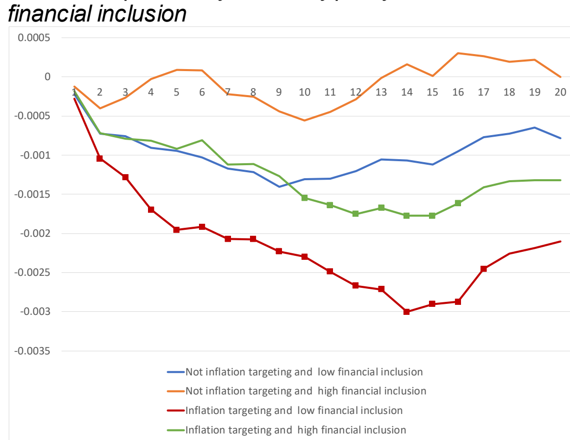
4. Price responses by monetary policy framework and size of credit market



5. Output responses by monetary policy framework and financial inclusion



6. Price responses by monetary policy framework and financial inclusion



We fail to find statistically significantly different responses of output or prices to interest rate shocks according to the degree of capital account openness, trade openness, the degree of dollarization, the importance of food in the consumption basket, the degree of bank competition, and the importance of foreign banks (Figures A.2.3 and A.2.4).[15] For some of these variables, the lack of a significant effect on the transmission of monetary policy is in line with the literature. For example, Erceg et al. (2007) suggest that trade openness may not have an important effect on the interest-rate sensitivity of the economy. And, in line with Canova (2005), our results suggest that monetary policy affects real economic activity and prices even in economies with significant levels of asset- and liability dollarization. However, other results are at odds with the literature. Namely, Gelos and Ustyugova (2017) find that food shocks are more likely to have persistent effects in emerging markets where food accounts for a sizable portion of the CPI, and De Graeve et al. (2007) report that interest rates are more responsive to monetary policy shocks in countries with more competitive banking sectors.

C. Robustness

Endogeneity in the Adoption of IT

The first test of the robustness of our results considers the possibility that countries adopt IT in response to macroeconomic conditions and to perceived effectiveness of monetary policy (i.e., IT is endogenous). For example, countries where transmission is strongest may also be more likely to adopt inflation targeting (Samaryna and de Haan, 2011). Under this hypothesis, our estimates would be biased since they would reflect reverse causality, and should not be used to support policy reform. To address this problem, we estimate the empirical model represented by equation (3) using an instrumental variables approach.[16] First, we estimate a logit model for the adoption of IT using the following excluded instruments: the ratio of output volatility in the past three years relative to that in the preceding three years, and likewise ratios for the volatilities of inflation and NEER; the level of accountability of the political system, and the cumulative number of sovereign defaults since 1960.[17] We then predict the probability of IT adoption and create a dummy variable (fitted IT) which takes value one whenever the fitted probability is greater than 0.5. Finally, we estimate equation (3) using fitted IT instead of IT and use the bootstrap to obtain correct standard errors.

---

[15] There are two exceptions. First, countries with greater capital account openness have more transmission to prices (Figure A.2.3, panel 2). Second, having more foreign banks is associated with stronger transmission to output (Figure A.2.4, panel 5). We also tried the exchange rate regime—floating vs. non-floating—but the results are difficult to interpret if we assume the exchange rate channel is working.

[16] Lin and Ye (2007, 2009) use propensity score matching to estimate the effect of IT on the level of inflation while addressing the endogeneity of its adoption. However, this method is not useful in our setting because we are interested in estimating the effect of IT on the transmission of policy shocks to inflation, not on the level of inflation.

[17] We use a pooled logit in the first stage because the dummy-variable approach (valid when T is large and N small) often does not converge. A conditional logit approach is not appropriate because it removes the fixed effects and intercept, which are important to predict the adoption of inflation targeting. In addition, this two-step approach does not require a consistent estimator of the coefficients of the first stage (see Woodridge 2002).

Our results support the hypothesis that IT has a causal effect on the transmission of monetary policy. Adopting IT strengthens the transmission of interest rate shocks to output even when we control for the endogenous adoption of monetary policy frameworks (Figure A.2.5). The effect of the policy shock on output in IT countries is significantly larger than in countries that have not adopted this framework. In fact, for countries that have not adopted inflation targeting, we find no transmission of monetary policy shocks to output. For prices, we find no effect when we shut down the exchange rate channel, regardless of IT adoption. However, when the exchange rate channel is active, prices fall more under IT, and the peak response is statistically different than zero.

Alternative Identification of Monetary Policy

A second set of robustness checks deals with the appropriateness of our monetary policy shocks. The residual of the Taylor rule in (1) may not necessarily always capture true monetary policy shocks, especially if the country does not use an interest rate as the main monetary policy tool. For those countries in our sample where central banks do not yet actively target a short-term interest rate and/or do not systematically adjust their policy rate to changes in their output/inflation forecasts, the residual ε simply measures exogenous interest rate variation (purged from any impact of lagged variation in output, prices and the exchange rate). Hence, when we find that transmission works better in countries with IT, we could be simply picking up a less-than-adequate measure of monetary policy for non-IT countries. Therefore, we check whether our results hold for the subsample of countries that have an interest-rate-based monetary policy (see Appendix II for details). Although somewhat less precise (because of the smaller sample and lower cross-country heterogeneity), the results in Figure A.2.6 are broadly in line with the ones from the larger sample. We also analyzed the impact of our policy shocks on the exchange rate with the same local projections methodology applied to output and prices, but could not find any significant relationship.

We then check the robustness of our results to using alternative strategies to identify the monetary policy shocks. First, we test the robustness of our findings using the same Taylor-rule approach but with different recursiveness assumptions regarding the exchange rate. Specifically, we add to the right-hand side of (1) the contemporaneous change of the nominal effective exchange rate. We find qualitatively similar results (not reported).[18] Second, we use a high-frequency identification (HFI) approach instead of the Taylor rule. There is a growing literature that uses high-frequency data on asset prices to identify monetary policy shocks (e.g., Kuttner 2001, Cochrane and Piazzesi 2002, Gertler and Karadi 2015, Gilchrist, López-Salido,

[18] The above specification rules out any influence of contemporaneous variations in the exchange rate on monetary policy/interest rates. Grilli and Roubini (1996) have shown that in open economies this assumption can lead to an exchange rate puzzle, i.e., a tightening of the policy instrument leads to a depreciation of the exchange rate. Of course, our specification also rules out any contemporaneous impact of output or prices which is the equivalent of the "recursiveness assumption" often used in VARs to identify monetary policy shocks and implies that both output and prices respond to policy/interest rate shocks with some lag.

and Zakrajšek 2015, and Nakamura and Steinsson 2018) which, like our Taylor-rule approach, disregards the central bank's private information. Typically, under the HFI approach, policy shocks are derived from daily or intra-daily changes in bond yields on monetary policy announcement dates. We follow Gilchrist et al. (2015) and use the change in two-year government bond interest rates on announcements days as the policy shock (see Appendix V for details). The estimated impulse response functions (IRFs)—also not reported here but available upon request—show, for the most part, no significant response of output and prices to monetary policy shocks, and often with the wrong sign. For this reason, we do not pursue either approach further.

Time-Varying Monetary Policy

Since central banks' monetary policy reaction functions may change over time, we also explore whether our results are robust to time variation in the Taylor rule used to build the policy shock. We do this by modifying the Taylor rule used to extract the policy shock. Hence, we estimate equation (1) with a 5-year rolling window and use the resulting residuals for equations (3)-(4). The flavor or our results remains, but we lose statistical significance when it comes to the importance of having an IT framework (Figure A.2.7).

We further investigate whether our results hold in a longer sample. For the benchmark regressions, our sample covers only 15 years (2003–17) to avoid that the institutional changes observed in the conduct of monetary policy in many countries generate systematic behavior in the estimated policy shocks. Furthermore, many emerging economies went through significant turbulence and crises towards the end of the 1990s and early 2000s, which could confound results. However, adding more years to the sample (especially years with large shocks) could help with identification, assuming that structural changes are negligible or accounted for (e.g., with time-varying parameters in the policy rule (1)). Therefore, also using time-varying Taylor rules, we extend our sample backwards to 1995, conditional on data availability. Overall, the responses of output to a monetary policy shock are not very different from those found previously (Figure A.2.7). For example, only IT countries show a statistically significant transmission of interest-rate shocks to output and prices. Still, the IRFs are less smooth, the price puzzle reemerges, and we fail to find any statistical significance when testing the effects of monetary policy frameworks or financial development. It is likely that structural changes and crises also affected the transmission itself, not just the reaction function of the central bank. Could this, in turn, explain the anomalous results of Figure A.2.7? We leave this question for future research.

Other Robustness Exercises

Another robustness check addresses potential concerns about the appropriateness of our measure of the contemporaneous change in the exchange rate. There are two potential concerns. First, since we use the NEER, it could be that we are mostly capturing the effects of the exchange rate through trade and disregarding balance sheet effects. Therefore, we check whether our results change if we use the bilateral exchange rate against the U.S. dollar instead of the NEER (see Avdjiev et al. 2019) and find that they do not. Second, our results could change if central banks intervened in the foreign exchange market at the same time as they changed policy rates. This could bias our results if such interventions were systematic. Hence, we redo our benchmark regressions as in specification (2) using the change in the NEER *purged from the effect of FX interventions* interacted with the policy shock. In order to do this, we build a dataset of actual interventions based on public data, and, when such data are not available, we complement them with a proxy based on monthly changes in central banks' net foreign assets adjusted for valuation changes (Adler, Lisack, and Mano 2019). Then, we use the residuals of country-by-country regressions of the change in the NEER on the size of FX interventions as a percent of GDP to estimate specification (2). The results are very similar to those shown in Figure 2 and Table 4. Both sets of results are available from the authors.

Finally, we check whether our results may be contaminated by the 2007–09 financial crisis. Specifically, we run our benchmark regressions (2) and (3)—using IT and FD as interactions—controlling for systemic crises through dummy variables based on Laeven and Valencia's (2018) systemic crises dates. The results (available from the authors) are very similar to the ones in Figures 2, 3, and 4.

IV. Conclusion

This paper sheds light on the debate about whether monetary policy transmissions from interest rates to output and prices is weaker in EMDEs, which often feature less developed financial markets, financial dollarization, and lower central bank credibility.

We found that, once the role of exchange rates in amplifying the transmission of monetary policy shocks is considered, there is significant transmission to output and prices. Importantly, having a modern monetary policy framework (i.e., IT, an independent central bank, and transparent monetary policy) is associated with stronger transmission, and more so than financial development or other characteristics. These results are robust to several specifications, including accounting for the possibility that the adoption of IT may be endogenous.

Still, two caveats are in order. First, a causal interpretation of our findings is conditional on our monetary policy shocks being correctly identified. It is possible that despite our efforts, our policy shocks still contain an important systematic component and are not fully exogenous. Second, except for IT (where we model potential endogeneity), we assume the structural factors under study to be predetermined. However, financial development and financial dollarization are likely to respond to monetary policy, albeit slowly. Further research may explore ways of addressing the selection problems associated with potentially endogenous structural characteristics.

With these caveats in mind, the results suggest that less-than-fully developed financial markets, deficiencies in institutional development, and financial dollarization are likely to present less important obstacles to the adoption of modern, interest-rate based monetary policy frameworks than sometimes argued—provided the exchange rate is allowed to play its role in monetary policy transmission.

REFERENCES

Abuka, Charles, Ronnie K. Alinda, Camelia Minoiu, José-Luis Peydró, and Andrea F. Presbitero. 2019. "Monetary Policy and Bank Lending in Developing Countries: Loan Applications, Rates, and Real Effects." *Journal of Development Economics* 139: 185–202.

Adler, Gustavo, Noemie Lisack, and Rui Mano. 2019. "Unveiling the Effects of Foreign Exchange Intervention: A Panel Approach." *Emerging Markets Review*, Vol. 40: 100620.

Auerbach, Alan J., and Yuriy Gorodnichenko. 2012. "Measuring the Output Responses to Fiscal Policy." *American Economic Journal: Economic Policy* 4, No. 2: 1–27.Avdjiev, Stefan, Valentina Bruno, Catherine Koch, and Hyun Song Shin. 2019. "The Dollar Exchange Rate as a Global Risk Factor: Evidence from Investment." *IMF Economic Review* 67, No. 1: 151–173.

Ball, Laurence M., and Niamh Sheridan. 2004. "Does Inflation Targeting Matter?" Chapter 6 in *The Inflation-Targeting Debate*, pp. 249–282. Chicago: University of Chicago Press.

Bank for International Settlements, BIS. 2008. "Transmission Mechanisms for Monetary Policy in Emerging Market Economies," BIS Papers No. 35.

Barajas, Adolfo, Ralph Chami, Christian Ebeke, and Anne Oeking. 2018. "What's Different about Monetary Policy Transmission in Remittance-dependent Countries?" *Journal of Development Economics* 134: 272–288.

Barnichon, Régis, and Christian Brownlees. 2019. "Impulse Response Estimation by Smooth Local Projections." *Review of Economics and Statistics* 101, No. 3: 522–530.

Berg, Andrew, Luisa Charry, Rafael A. Portillo, and Jan Vlcek. 2013. "The Monetary Transmission Mechanism in The Tropics: A Narrative Approach." IMF Working Paper No. 13–197. (Washington: International Monetary Fund).

Bernanke, B. S., and M. Gertler. 1995. "Inside the Black Box: The Credit Channel of Monetary Policy Transmission." *Journal of Economic Perspectives* 9, No. 4: 27–48.

Bjørnland, Hilde C. 2008. "Monetary Policy and Exchange Rate Interactions in a Small Open Economy," *Scandinavian Journal of Economics* 110(1), 197–221.

Boivin, Jean, Michael T. Kiley, and Frederic S. Mishkin. 2011. "How Has the Monetary Transmission Mechanism Evolved Over Time?" Chap. 8 in *Handbook of Monetary Economics*, Vol. 3, edited by Benjamin M. Friedman and Michael Woodford, 369–422. Amsterdam: Elsevier.

Calza, Alessandro, Tommaso Monacelli, and Livio Stracca. 2013. "Housing Finance and Monetary Policy." *Journal of the European Economic Association* 11, No. suppl_1 (2013): 101–122.

Canova, Fabio. 2005. "The Transmission of U.S. Shocks to Latin America." *Journal of Applied Econometrics* 20, no. 2: 229–251.

Cecchetti, Stephen G. 1999. “Legal Structure, Financial Structure, and the Monetary Policy Transmission Mechanism.” *Federal Reserve Bank of New York Economic Policy Review* 5, no. 2: 9-28.

Céspedes, Luis Felipe, Roberto Chang, and Andres Velasco. 2004. “Balance Sheets and Exchange Rate Policy.” *American Economic Review* 94, no. 4: 1183–1193.

Chen, M., P. Xie, J. E. Janowiak, and P. A. Arkin. 2002. “Global Land Precipitation: A 50-yr Monthly Analysis Based on Gauge Observations,” *Journal of Hydrometeorology*, 3: 249–266.

Chen, M., P. Xie, J.E. Janowiak, and P.A. Arkin. 2004. “Verifying the reanalysis and climate models outputs using a 56-year data set of reconstructed global precipitation.” 14th AMS Conf. Appl. Meteor., 11–15 January 2004, Seattle, WA.

Chen, M., P. Xie, J. E. Janowiak, P. A. Arkin, and T. M. Smith. 2003. “Reconstruction of the Oceanic Precipitation from 1948 to the Present.” The AMS 14th Symposium on Global Change and Climate Variations, Long Beach, CA, 2003.

Chinn, Menzie D. and Hiro Ito. 2006. "What Matters for Financial Development? Capital Controls, Institutions, and Interactions," *Journal of Development Economics*, Volume 81, Issue 1, Pages 163–192.

Christiano, L., M. Eichenbaum, and C. Evans. 1996. The Effects of Monetary Policy Shocks: Evidence from the Flow of Funds. *The Review of Economics and Statistics, 78*(1), 16–34. doi:10.2307/2109845

Chun, Albert Lee. 2010. “Expectations, Bond Yields, and Monetary Policy.” *The Review of Financial Studies* 24, No. 1: 208–247.

Cochrane, John H., and Monika Piazzesi. 2002. “The Fed and Interest Rates—A High-frequency Identification." *American Economic Review* 92, No. 2: 90–95.

Coibion, Olivier, and Yuriy Gorodnichenko. 2012. "What can Survey Forecasts tell us about Information Rigidities?" *Journal of Political Economy* 120, No. 1: 116–159.

Cukierman, Alex, Steven B.Webb, and Bilin Neyapti. 1992. “Measuring the Independence of Central Banks and its Effect on Policy Outcomes.” *The World Bank Economic Review* 6, No. 3: 353–398.

Cushman, David O., and Tao Zha, 1997. "Identifying Monetary Policy in a Small Open Economy Under Flexible Exchange Rates," *Journal of Monetary Economics*, Vol. 39(3): 433–448.

De Graeve, Ferre, Olivier De Jonghe, and Rudi Vander Vennet, 2007. “Competition, Transmission and Bank Pricing Policies: Evidence from Belgian loan and Deposit Markets? *Journal of Banking and Finance* 31, No. 1: 259–278.

Dincer, N. Nergiz and Barry Eichengreen. 2014, "Central Bank Transparency and Independence: Updates and New Measures." *International Journal of Central Banking* 10, no. 1: 189–259.

Ehrmann, Michael. 2000. “Comparing Monetary Policy Transmission Across European Countries”. Re*view of World Economics (Weltwirtschaftliches Archiv),* Vol. 136, Issue 1, 58–83

Eichenbaum, Martin. 1992. "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy by Christopher Sims," *European Economic Review*, Elsevier, Vol. 36(5), Pages 1001–1011, June.

Erceg, Christopher, Christopher Gust, and David López-Salido. 2007. “The Transmission of Domestic Shocks in Open Economies.” In *International Dimensions of Monetary Policy*, Jordi Gali and Mark J. Gertler, Editors: 89–148. University of Chicago Press.

Filardo, Andrew, Hans Genberg, and Boris Hofmann. 2016. “Monetary Analysis and the Global Financial Cycle: An Asian Central Bank Perspective.” *Journal of Asian Economics* 46: 1–16.

Frankel, J.A. 2010. “Monetary Policy in Emerging Markets: A Survey.” *NBER Working Paper,* No. 16125. Issued June 2020

Garriga, Ana Carolina. 2016. "Central Bank Independence in the World: A new data set." *International Interactions* 42, No. 5: 849–868.

Gavin, William T. and Rachel J. Mandal. 2001. “Forecasting Inflation and Growth: Do Private Forecasts Match those of Policymakers?” *Business Economics* 36, No. 1: 13–20.

Gelos, Gaston and Yulia Ustyuova. 2017. “Inflation Responses to Commodity Price Shocks – How and Why Do Countries Differ?” *Journal of International Money and Finance,* 72: 28–47.

Gertler, Mark and Peter Karadi. 2015. “Monetary Policy Surprises, Credit Costs, and Economic Activity.” *American Economic Journal: Macroeconomics* 7, No. 1: 44–76.

Gilchrist, Simon, David López-Salido, and Egon Zakrajšek. 2015. “Monetary Policy and Real Borrowing Costs at the Zero Lower Bound.” *American Economic Journal: Macroeconomics* 7, No. 1: 77–109.

GISTEMP Team, 2019: GISS Surface Temperature Analysis (GISTEMP). NASA Goddard Institute for Space Studies. Dataset accessed 2018-1-15 at data.giss.nasa.gov/gistemp/.

Grilli, Vittorio, and Nouriel Roubini, 1996. “Liquidity Models in Open Economies: Theory and Empirical Evidence." *European Economic Review* 40, No. 3–5: 847–859.

Ha, Jongrim, M. Ayhan Kose, and Franziska Ohnsorge (eds). 2019. “Inflation in Emerging and Developing Economies: Evolution, Drivers, and Policies.” (Washington: World Bank)

Hansen, Lars Peter and Robert J. Hodrick. 1980. "Forward Exchange Rates as Optimal Predictors of Future Spot Rates: An Econometric Analysis." *Journal of Political Economy* 88, No. 5: 829–853.

Jordà, Òscar. 2005. "Estimation and Inference of Impulse Responses by Local Projections." *American Economic Review* 95 (1): 161–82.

Jordà, Òscar, Moritz Schularick, and Alan M. Taylor. Forthcoming. "The Effects of Quasi-Random Monetary Experiments." *Journal of Monetary Economics*.

Kaufmann, Daniel, Aart Kraay and Massimo Mastruzzi. 2010. "The Worldwide Governance Indicators: A Summary of Methodology, Data and Analytical Issues." World Bank Policy Research Working Paper No. 5430.

Kim, Soyoung and Nouriel Roubini. 2000. "Exchange rate anomalies in the industrial countries: A solution with a structural VAR approach," *Journal of Monetary Economics,* Vol. 45(3): 561–586.

Krippner, Leo. 2015. "Zero Lower Bound Term Structure Modeling: A Practitioner's Guide." New York: Palgrave-Macmillan.

Kuttner, Kenneth N. 2001. "Monetary Policy Surprises and Interest Rates: Evidence from the Fed Funds Futures Market." *Journal of Monetary Economics*, 47(3): 523–44.

Laeven, Luc, and Fabian Valencia. 2018. "Systemic Banking Crises Revisited." IMF Working Paper No. 18/206. (Washington: International Monetary Fund).

Lenssen, N., G. Schmidt, J. Hansen, M. Menne, A. Persin, R. Ruedy, and D. Zyss, 2019. "Improvements in the GISTEMP Uncertainty Model." *Journal of Geophysical Research: Atmospheres*, 124(12): 6307–6326.

Lin, Shu and Haichun Ye. 2007. Does Inflation Targeting Really Make a Difference? Evaluating the Treatment Effect of Inflation Targeting in Seven Industrial Countries." *Journal of Monetary Economics* 54(8): 2521–2533.

Lin, Shu and Haichun Ye. 2009. "Does Inflation Targeting Make a Difference in Developing Countries?" *Journal of Development Economics* 89(1): 118–123.

Ljung, Greta M., and George E.P. Box. 1978. "On a Measure of lack of fit in Time Series Models." *Biometrika* 65, No. 2: 297–303.

Mishra, P. and P. Montiel. 2013. "How Effective is Monetary Transmission in Low-income Countries? A Survey of the Empirical Evidence." *Economic Systems* 37: 187–216.

Mishra, Prachi, Peter J Montiel, and Antonio Spilimbergo. 2012. "Monetary Transmission in Low-Income Countries: Effectiveness and Policy Implications." *IMF Economic Review*, Vol. 60 (2): 270–302.

Nakamura, Emi, and Jón Steinsson. 2018. "High-frequency Identification of Monetary Non-neutrality: The Information Effect." *The Quarterly Journal of Economics* 133, No. 3: 1283–1330.

Newey, Whitney and Kenneth West. 1987. "A Simple, Positive Semi-definite, Heteroskedasticity and Autocorrelation Consistent Covariance Matrix." *Econometrica.* Vol. 55, Issue 3. 703–08

Pesaran, M. Hashem, Yongcheol Shin, and Ron P. Smith. 1999. "Pooled Mean Group Estimation of Dynamic Heterogeneous Panels." *Journal of the American Statistical Association* 94, No. 446: 621–634.

Ramey, Valerie A. 2016. "Macroeconomic Shocks and Their Propagation." In *Handbook of Macroeconomics*, Vol. 2, pp. 71–162. Elsevier.

Romer, Christina D., and David H. Romer. 1989. "Does Monetary Policy Matter? A new test in the spirit of Friedman and Schwartz." *NBER Macroeconomics Annual* 4: 121–170.

Romer, Christina D., and David H. Romer. 2004. "A new Measure of Monetary Shocks: Derivation and Implications." *American Economic Review* 94, No. 4: 1055–1084.

Sahay, Ratna, Martin Čihák, Papa N'Diaye, Adolfo Barajas, Ran Bi, Diana Ayala, Yuan Gao, Annette Kyobe, Lam Nguyen, Christian Saborowski, Katsiaryna Svirydzenka, and Seyed Reza Yousefi. 2015. "Rethinking Financial Deepening: Stability and Growth in Emerging Markets." IMF Staff Discussion Notes No. 15/08. International Monetary Fund, Washington.

Samaryna, Hanna and Jakob de Haan, 2011. "Right on Target: Exploring the Determinants of Inflation Targeting Adoption," *DNB Working Papers 321*, Netherlands Central Bank, Research Department.

Siklos, Pierre, and Diana N. Weymark. 2009. "Has Inflation Targeting Improved Monetary Policy? Evaluating Policy Effectiveness in Australia, Canada, and New Zealand." Department of Economics at Vanderbilt University Working Paper No. 09-W06

Sims, Christopher, 2012. "Interpreting the Macroeconomic Time Series Facts: The Effects of Monetary Policy." *European Economic Review*, Vol 36(5): 975–1000.

Sims, Christopher and Tao Zha. 1999. "Error Bands for Impulse Responses." *Econometrica* 67 (5): 1113–55.

Stock, James H., and Mark W. Watson. 2001. "Vector Autoregressions." *Journal of Economic Perspectives* 15, No. 4: 101–115.

Svensson, Lars EO, 1999. "Inflation Targeting as a Monetary Policy Rule." *Journal of Monetary Economics* 43, No. 3: 607–654.

Taylor, John B., 2000. "Low Inflation, Pass-Through, and the Pricing Power of Firms," *European Economic Review* 44(7): 1389-1408

Uhlig, Harald, 2005. "What Are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure," *Journal of Monetary Economics* 52, 381–419.

Willems, Tim. 2020. "What Do Monetary Contractions Do? Evidence from Large, Unanticipated Tightenings," *Review of Economic Dynamics* 38, 41-58.

Wooldridge, J. 2002. Econometric Analysis of Cross Section and Panel Data, *MIT Press.*

Table 1. Summary Statistics

The table shows summary statistics for all the variables used in the regressions presented in the paper. 1PC stands for the first principal component obtained from a principal component decomposition of a set variable. See Table A.1.1 for details.

	N	Mean	Standard deviation	Minimum	Median	Maximum
Consumer Price Index (log)	6,030	4.602	0.279	3.225	4.63	6.066
Industrial Production Index (log)	6,030	4.667	0.255	3.597	4.638	5.682
Nominal Effective Exchange Rate (log)	6,030	3.861	2.294	-5.902	4.581	5.187
Policy Rate	6,030	0.064	0.045	-0.001	0.058	0.453
Inflation Targeting Dummy	6,030	0.442	0.497	0	0	1
Financial Development Index	4,295	0.395	0.164	0.04	0.383	0.745
Financial Development Index (Institutions)	5,859	0.471	0.139	0.068	0.45	0.757
Financial Development Index (Markets)	5,859	0.314	0.25	0.003	0.317	0.895
Private Credit by Deposit Banks	5,185	48.694	32.404	9.27	39.42	150.21
ATMs per 100,000 Adults	4,821	43.265	30.814	0.5	37.19	185.17
Inflation Forecast	6,030	5.506	3.518	-0.538	4.948	37.167
GDP Growth Forecast	6,030	4.074	2.327	-7.201	4.102	22.867
CBOE VIX Index	6,030	2.885	0.354	2.328	2.811	4.093
Commodity Price Index	6,030	8.417	0.358	7.609	8.486	9.265
Global Monetary Policy (1PC)	6,030	-0.811	1.458	-3.3	-0.786	1.851
Temperature Anomaly	6,030	0.91	1.342	-7.612	0.844	9.093
Precipitation Anomaly	6,030	-0.009	1.153	-6.51	-0.07	11.33
Change in 2Y yield on Announcement Dates	5,801	-0.003	0.061	-0.264	0	0.185
Central Bank Independence Index	6,030	0.483	0.167	0.149	0.489	0.784
Central Bank Transparency	3,763	6.252	2.568	1.5	6	13.5
Voice and Accountability	5,801	-0.035	0.737	-1.749	0.006	1.293
Government Effectiveness	5,801	-0.004	0.545	-0.96	-0.058	1.396
Regulatory Quality	5,801	0.066	0.588	-1.296	0.031	1.539
Chinn-Ito Index	5,095	0.347	1.356	-1.904	0.018	2.374
Floating Exchange rate Dummy	6,030	0.612	0.487	0	1	1
Dollarization Index	4,884	67.61	50.422	0.123	62.572	224.264
Food Weight in CPI Basket	3,948	31.443	9.608	17.24	30.2	58.84
Bank Concentration (%)	5,281	53.773	14.537	20.48	52.3	100
Foreign Banks Among Total Banks (%)	4,422	39.117	23.25	0	36	88
Sovereign or Bank Crisis Dummy	6,030	0.037	0.189	0	0	1

Table 2. Summary Statistics by Country

The table shows summary statistics by country for some of the variables used to capture country characteristics influencing the transmission of monetary policy. Panel A shows statistics for variables representing financial sector development: Sahay et al.' (2015) index of financial development, the credit-to-GDP ratio from the World Bank's Global Financial Development Database, and a measure of financial inclusion (number of ATMs per 10,000 people), also from the World Bank's Global Financial Development Database. Panel B shows statistics for the variables representing monetary policy frameworks: the adoption of inflation targeting, Garriga's (2016) index of central bank independence, and Dincer and Eichengreen's (2014) index of central bank transparency. S.D. stands for standard deviation. 25 percent and 75 percent are the 25th and 75th percentiles, respectively.

Panel A. Financial Sector Development

	Financial Development				**Credit-to-GDP**				**Financial Inclusion**			
Country	Mean	S.D.	25th %	75th %	Mean	S.D.	25th %	75th %	Mean	S.D.	25th %	75th %
Argentina	0.42	0.05	0.37	0.46	11.67	1.46	10.67	12.26	40.35	13.75	26.96	53.57
Armenia	0.22	0.03	0.21	0.25	30.32	10.80	22.09	39.12	41.25	13.63	29.83	51.79
Azerbaijan	0.23	0.01	0.23	0.24	19.96	7.23	15.86	21.75	29.08	5.09	24.61	33.01
Bangladesh	0.33	0.02	0.30	0.35	36.33	3.45	32.84	39.39	2.84	1.57	1.25	3.94
Bolivia	0.20	0.02	0.18	0.22	40.10	6.19	35.59	42.83	24.68	8.60	16.96	31.57
Brazil	0.61	0.08	0.55	0.68	52.19	16.95	34.37	69.95	111.88	4.24	107.91	115.09
Bulgaria	0.38	0.03	0.38	0.40	53.25	15.60	39.09	65.81	77.45	25.92	60.83	93.38
Chile	0.52	0.02	0.51	0.54	88.21	13.56	71.20	99.67	53.91	10.22	46.13	62.65
China	0.70	0.06	0.71	0.73	116.51	11.64	109.71	121.23	32.53	20.31	15.45	46.24
Colombia	0.36	0.06	0.33	0.41	35.04	9.92	25.75	45.57	32.21	5.31	26.42	35.16
Costa Rica	0.21	0.02	0.20	0.22	35.04	9.92	25.75	45.57	32.21	5.31	26.42	35.16
Croatia	0.33	0.03	0.33	0.35	61.25	9.57	53.28	69.35	97.82	19.45	79.80	114.19
Dominican Republic	0.16	0.02	0.15	0.19	61.25	9.57	53.28	69.35	30.59	3.27	27.57	33.06
Ecuador	0.22	0.01	0.22	0.22	24.62	1.81	23.26	26.26	33.40	6.79	27.26	40.78
Egypt	0.36	0.04	0.33	0.40	35.66	9.33	26.19	43.05	8.15	3.30	5.41	10.99
Guatemala	0.29	0.01	0.29	0.30	27.83	3.75	23.81	31.77	28.36	4.76	23.72	33.83
Honduras	0.21	0.01	0.21	0.22	50.89	3.08	48.45	54.34	22.46	3.28	17.56	24.91
Hungary	0.57	0.06	0.54	0.63	52.01	9.05	43.79	59.34	52.31	6.62	47.46	57.22
India	0.61	0.03	0.59	0.63	43.10	6.42	38.44	48.70	8.68	5.78	3.38	12.87
Indonesia	0.39	0.03	0.37	0.40	26.57	5.07	22.66	30.41	23.13	16.27	10.99	39.03
Kazakhstan	0.35	0.05	0.30	0.38	36.53	8.82	33.02	41.22	49.99	22.52	28.39	69.67
Macedonia	0.33	0.01	0.32	0.33	43.80	4.94	42.55	47.02	51.19	6.36	49.60	54.28
Malaysia	0.68	0.03	0.67	0.70	106.32	7.53	101.69	114.13	44.31	10.78	33.41	53.20
Mexico	0.48	0.04	0.48	0.51	21.68	5.02	16.79	24.64	41.06	6.89	35.86	46.97
Pakistan	0.33	0.08	0.24	0.40	21.60	4.87	16.93	26.71	4.31	2.40	2.34	6.00
Paraguay	0.09	0.04	0.06	0.11	28.25	13.47	14.81	40.38	20.57	3.98	18.81	24.09
Peru	0.34	0.06	0.31	0.39	24.08	5.29	18.71	26.81	33.82	28.85	14.98	39.32
Philippines	0.42	0.02	0.40	0.44	30.82	3.63	27.79	32.72	16.31	4.81	12.45	20.52
Poland	0.48	0.05	0.47	0.51	42.05	9.91	30.13	50.78	46.84	13.75	33.42	57.23
Romania	0.32	0.03	0.32	0.34	33.15	12.04	21.22	43.63	49.57	18.08	33.74	64.91
Russia	0.55	0.06	0.49	0.59	38.42	11.94	27.43	45.72	93.29	58.00	38.73	149.19
South Africa	0.61	0.03	0.60	0.63	42.40	5.13	40.60	45.00	48.24	15.30	30.65	58.85
Serbia	0.17	0.01	0.17	0.18	42.40	5.13	40.60	45.00	93.29	58.00	38.73	149.19
Sri Lanka	0.39	0.01	0.37	0.39	42.40	5.13	40.60	45.00	16.00	1.12	15.15	16.87
Taiwan	-	-	-	-	-	-	-	-	-	-	-	-
Thailand	0.62	0.05	0.57	0.67	117.42	18.32	97.72	130.71	72.55	30.80	44.01	99.23
Turkey	0.48	0.04	0.46	0.51	38.90	18.18	22.41	53.15	51.64	17.19	35.49	67.15
Ukraine	0.22	0.04	0.20	0.27	66.57	14.34	63.47	71.44	78.77	17.70	70.33	92.48
Uruguay	0.19	0.03	0.18	0.21	25.78	6.89	22.25	27.45	40.71	9.18	32.05	48.43
Vietnam	0.30	0.08	0.24	0.40	79.74	19.37	59.16	94.56	14.13	8.05	5.60	21.52

Table 2. Summary Statistics by Country (Continued)
Panel B. Monetary Policy Frameworks

	Inflation Targeting			Central Bank Independence	Central Bank Transparency			
Country	N	Mean	Adoption date	Mean	Mean	S.D.	25th %	75th %
Argentina	170	0.11	Jan-16	0.60	4.93	0.88	3.50	5.50
Armenia	119	1.00	-	0.76	8.17	0.47	7.50	8.50
Azerbaijan	124	0.00	-	0.38	4.50	-	4.50	4.50
Bangladesh	76	0.00	-	0.33	3.50	-	3.50	3.50
Bolivia	126	0.00	-	0.51	-	-	-	-
Brazil	169	1.00	Jun-99	0.21	5.75	1.03	4.50	6.00
Bulgaria	172	0.00	-	0.76	5.65	0.57	5.50	6.50
Chile	170	1.00	Sep-99	0.64	7.02	0.50	6.50	7.50
China	170	0.00	-	0.37	3.15	0.23	3.00	3.50
Colombia	138	1.00	Oct-99	0.48	7.06	1.22	5.50	8.00
Costa Rica	170	0.00	-	0.58	-	-	-	-
Croatia	168	0.00	-	0.68	3.22	0.25	3.00	3.50
Dominican Republic	120	0.54	Jan-12	0.64	-	-	-	-
Ecuador	112	0.00	-	0.78	-	-	-	-
Egypt	155	0.00	-	0.49	3.26	0.59	3.50	3.50
Guatemala	101	1.00	Jan-05	0.71	3.83	2.23	2.00	7.00
Honduras	101	0.00	-	0.49	-	-	-	-
Hungary	170	1.00	Jun-01	0.50	12.28	1.68	11.00	13.50
India	169	0.07	Aug-16	0.30	2.91	0.64	3.00	3.00
Indonesia	170	0.85	Jul-05	0.46	8.55	0.51	8.50	9.00
Kazakhstan	170	0.18	Aug-15	0.46	5.66	0.86	6.00	6.00
Macedonia	122	0.00	-	0.65	-	-	-	-
Malaysia	170	0.00	-	0.41	6.00	-	6.00	6.00
Mexico	170	1.00	Jan-01	0.49	5.95	0.22	6.00	6.00
Pakistan	168	0.00	-	0.27	4.16	0.78	4.00	4.50
Paraguay	166	0.43	May-11	0.48	-	-	-	-
Peru	169	1.00	Jan-02	0.61	8.02	0.50	7.50	8.50
Philippines	167	1.00	Jan-02	0.52	9.74	0.44	9.00	10.00
Poland	170	1.00	Jan-98	0.46	9.22	1.25	9.00	10.50
Romania	167	0.89	Aug-05	0.45	7.26	0.67	7.50	7.50
Russia	170	0.25	-	0.58	4.00	1.59	3.00	6.00
South Africa	170	1.00	Feb-00	0.29	9.00	-	9.00	9.00
Serbia	112	0.84	-	0.58	4.00	1.59	3.00	6.00
Sri Lanka	85	0.00	-	0.59	5.50	-	5.50	5.50
Taiwan	171	0.00	-	0.19	-	-	-	-
Thailand	170	1.00	May-00	0.16	7.41	0.87	6.50	8.50
Turkey	170	0.82	Jan-06	0.60	9.67	0.63	10.00	10.00
Ukraine	133	0.14	Mar-16	0.62	4.20	0.46	4.00	4.00
Uruguay	170	0.00	-	0.36	3.42	1.51	2.00	5.00
Vietnam	170	0.00	-	0.15	-	-	-	-

Table 3. Taylor Rule Regressions

The table shows the estimates of the country-by-country regressions of a Taylor rule with the following specification.

$$\Delta i_{it} = \alpha_{0i} + \alpha_{1i} E_t \Delta y_{it+12} + \alpha_{2i} E_t \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta IP_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta CPI_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta NEER_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} i_{it-j} + \varepsilon_{it},$$

where i is a short-term interest rate, $E_t\Delta y_{t+12}$ and $E_t\Delta p_{t+12}$ are the 12-month ahead market forecasts of GDP growth and inflation as measured by Consensus Forecasts, and IP, CPI, and $NEER$ are the logs of industrial production, a consumer price index, and the nominal effective exchange rate. Heteroscedasticity and autocorrelation-robust standard errors are in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively.

Panel A

Variables	(1) Argentina	(2) Armenia	(3) Azerbaijan	(4) Bangladesh	(5) Bolivia	(6) Brazil	(7) Bulgaria	(8) Chile	(9) China	(10) Colombia
CPI forecast	0.0006	0.0005	-0.0002	0.0132**	0.0009	-0.0000	-	0.0007**	0.0011**	0.0011***
	(0.0004)	(0.0008)	(0.0004)	(0.0062)	(0.0007)	(0.0002)	-	(0.0003)	(0.0005)	(0.0003)
GDP forecast	-0.0005	-0.0001	0.0001	0.0076	0.0006	0.0001	-	0.0004***	-0.0006	0.0011***
	(0.0008)	(0.0006)	(0.0002)	(0.0104)	(0.0019)	(0.0001)	-	(0.0001)	(0.0005)	(0.0002)
Policy rate (lagged once)	-0.3860***	0.2400***	0.1845**	-0.6162***	-0.6291***	0.7556***	-	0.5523***	-0.1684**	0.3739***
	(0.0738)	(0.0893)	(0.0897)	(0.1186)	(0.0782)	(0.0465)	-	(0.0576)	(0.0782)	(0.0797)
Policy rate (lagged twice)	0.2991***	-0.3965***	-0.1923**	0.0304	0.3472***	-0.7753***	-	-0.6092***	0.0471	-0.4229***
	(0.0730)	(0.0935)	(0.0926)	(0.1147)	(0.0792)	(0.0444)	-	(0.0544)	(0.0768)	(0.0759)
Δlog CPI (lagged once)	-0.0930	0.1490	-0.0221	-0.3423	0.3213	0.0692	-	0.0903*	-0.0525	0.0268
	(0.2340)	(0.1142)	(0.0912)	(0.4544)	(0.2943)	(0.0857)	-	(0.0464)	(0.0601)	(0.0516)
Δlog CPI (lagged twice)	0.2957	-0.0643	0.0040	0.1429	-0.1346	0.1782**	-	-0.0017	0.0852	0.0176
	(0.2337)	(0.1162)	(0.0913)	(0.4825)	(0.2957)	(0.0890)	-	(0.0467)	(0.0578)	(0.0518)
Δlog IP (lagged once)	0.0880	0.0180	0.0199**	0.0981	0.0187	0.0003	-	0.0021	0.0391	-0.0026
	(0.0850)	(0.0127)	(0.0100)	(0.1077)	(0.1242)	(0.0098)	-	(0.0038)	(0.0513)	(0.0081)
Δlog IP (lagged twice)	-0.0274	-0.0081	0.0218**	0.0604	-0.0617	0.0141	-	0.0082**	0.0528	-0.0039
	(0.0852)	(0.0139)	(0.0103)	(0.1060)	(0.1156)	(0.0097)	-	(0.0037)	(0.0536)	(0.0081)
Δlog NEER	0.0284	-0.1954***	-0.0211	-0.7797	0.1931*	-0.0023	-	-0.0083*	-0.0103	-0.0039
	(0.0621)	(0.0522)	(0.0292)	(0.5198)	(0.1021)	(0.0052)	-	(0.0050)	(0.0343)	(0.0050)
Δlog NEER (lagged once)	0.0567	0.1029*	-0.0234	-0.3614	-0.0061	0.0060	-	-0.0130**	0.1029***	0.0050
	(0.0736)	(0.0557)	(0.0295)	(0.5766)	(0.1105)	(0.0053)	-	(0.0052)	(0.0358)	(0.0052)
Δlog NEER (lagged twice)	-0.2122***	0.0271	-0.0400	-0.6203	0.1450	-0.0071	-	-0.0065	-0.0792**	-0.0014
	(0.0651)	(0.0517)	(0.0256)	(0.5819)	(0.1032)	(0.0053)	-	(0.0054)	(0.0344)	(0.0052)
Constant	0.0010	0.0103*	0.0011	-0.0967*	0.0060	0.0009	-	-0.0021**	0.0056	-0.0065***
	(0.0058)	(0.0060)	(0.0019)	(0.0545)	(0.0097)	(0.0010)	-	(0.0009)	(0.0037)	(0.0013)
Observations	173	123	126	80	130	171	173	173	173	142
R-squared	0.235	0.304	0.181	0.358	0.404	0.770	-	0.759	0.155	0.649

Table 3 Taylor Rule Regressions (Continued)

The table shows the estimates of the country-by-country regressions of a Taylor rule with the following specification.

$$\Delta i_{it} = \alpha_{0i} + \alpha_{1i} E_t \Delta y_{it+12} + \alpha_{2i} E_t \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta IP_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta CPI_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta NEER_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} i_{it-j} + \varepsilon_{it},$$

where i is a short-term interest rate, $E_t\Delta y_{t+12}$ and $E_t\Delta p_{t+12}$ are the 12-month ahead market forecasts of GDP growth and inflation as measured by Consensus Forecasts, and *IP*, *CPI*, and *NEER* are the logs of industrial production, a consumer price index, and the nominal effective exchange rate. Heteroscedasticity and autocorrelation-robust standard errors are in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively. In the table, *L1* and *L2* mean first and second lags of a given variable.

Panel B

	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
Variables	Costa Rica	Croatia	Dominican Republic	Ecuador	Egypt	Guatemala	Honduras	Hungary	India	Indonesia
CPI forecast	0.0011*	0.0007*	0.0008*	-	0.0003***	0.0005**	-0.0007	0.0009***	0.0008***	0.0011***
	(0.0006)	(0.0004)	(0.0005)	-	(0.0001)	(0.0002)	(0.0005)	(0.0003)	(0.0002)	(0.0004)
GDP forecast	-0.0011	0.0001	0.0010**	-	0.0002	0.0004**	-0.0001	0.0002	0.0009**	-0.0003
	(0.0011)	(0.0002)	(0.0004)	-	(0.0002)	(0.0002)	(0.0005)	(0.0002)	(0.0004)	(0.0006)
Policy rate (lagged once)	-0.3059***	-0.0402	0.2374**	-	0.0044	-0.1995*	0.0804	0.3370***	0.2457***	0.3367***
	(0.0762)	(0.0792)	(0.0908)	-	(0.0913)	(0.1039)	(0.1018)	(0.0759)	(0.0748)	(0.0729)
Policy rate (lagged twice)	0.1325*	0.0145	-0.3133***	-	0.0171	0.1572	-0.2072**	-0.3785***	-0.3307***	-0.4352***
	(0.0765)	(0.0791)	(0.0907)	-	(0.0927)	(0.1002)	(0.0978)	(0.0738)	(0.0740)	(0.0689)
Δlog CPI (lagged once)	0.4591*	-0.0373	-0.0667	-	0.0282	0.1185**	0.0126	0.0943	-0.0259	0.1212***
	(0.2568)	(0.0611)	(0.0852)	-	(0.0311)	(0.0473)	(0.1247)	(0.0598)	(0.0474)	(0.0376)
Δlog CPI (lagged twice)	-0.7073***	0.0120	0.2313***	-	0.0118	0.1453***	0.3107**	-0.0100	0.0057	-0.0295
	(0.2578)	(0.0629)	(0.0880)	-	(0.0314)	(0.0497)	(0.1232)	(0.0622)	(0.0488)	(0.0443)
Δlog IP (lagged once)	0.0523	-0.0072	-0.0010	-	0.0106**	0.0219	-0.0078	-0.0069	0.0143	0.0360
	(0.0834)	(0.0088)	(0.0280)	-	(0.0042)	(0.0185)	(0.0259)	(0.0111)	(0.0195)	(0.0272)
Δlog IP (lagged twice)	0.0619	-0.0041	0.0108	-	-0.0010	0.0187	-0.0389	-0.0069	-0.0050	-0.0132
	(0.0826)	(0.0088)	(0.0286)	-	(0.0043)	(0.0186)	(0.0256)	(0.0113)	(0.0203)	(0.0239)
Δlog NEER	0.1181	0.0116	0.0132	-	-0.0473***	0.0272	-0.3196	-0.0666***	-0.0597**	-0.0264*
	(0.0896)	(0.0425)	(0.0833)	-	(0.0061)	(0.0206)	(0.1933)	(0.0144)	(0.0239)	(0.0145)
Δlog NEER (lagged once)	-0.1418	0.0099	-0.1598*	-	0.0216***	-0.0191	-0.1299	-0.0342**	-0.0014	-0.0203
	(0.0991)	(0.0432)	(0.0809)	-	(0.0078)	(0.0214)	(0.2215)	(0.0148)	(0.0235)	(0.0149)
Δlog NEER (lagged twice)	-0.1185	-0.0322	0.0792	-	0.0022	-0.0014	0.0646	0.0097	-0.0029	0.0189
	(0.0929)	(0.0437)	(0.0790)	-	(0.0070)	(0.0198)	(0.1970)	(0.0148)	(0.0222)	(0.0148)
Constant	0.0066	-0.0004	-0.0039	-	-0.0059***	-0.0032***	0.0107***	-0.0017**	-0.0054	0.0018
	(0.0060)	(0.0009)	(0.0031)	-	(0.0021)	(0.0012)	(0.0040)	(0.0008)	(0.0033)	(0.0035)
Observations	173	172	122	113	159	103	104	173	172	173
R-squared	0.225	0.037	0.368	-	0.421	0.382	0.265	0.337	0.268	0.389

Table 3 Taylor Rule Regressions (Continued)

The table shows the estimates of the country-by-country regressions of a Taylor rule with the following specification.

$$\Delta i_{it} = \alpha_{0i} + \alpha_{1i} E_t \Delta y_{it+12} + \alpha_{2i} E_t \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta IP_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta CPI_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta NEER_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} i_{it-j} + \varepsilon_{it},$$

where i is a short-term interest rate, $E_t\Delta y_{t+12}$ and $E_t\Delta p_{t+12}$ are the 12-month ahead market forecasts of GDP growth and inflation as measured by Consensus Forecasts, and *IP*, *CPI*, and *NEER* are the logs of industrial production, a consumer price index, and the nominal effective exchange rate. Heteroscedasticity and autocorrelation-robust standard errors are in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively. In the table, *L1* and *L2* mean first and second lags of a given variable.

Panel C

	(21)	(22)	(23)	(24)	(25)	(26)	(27)	(28)	(29)	(30)
Variables	Kazakhstan	Macedonia	Malaysia	Mexico	Pakistan	Paraguay	Peru	Philippines	Poland	Romania
CPI forecast	-0.0010	0.0004	0.0002	0.0005	0.0025***	0.0025	0.0008**	0.0004***	0.0006***	0.0012***
	(0.0009)	(0.0003)	(0.0001)	(0.0005)	(0.0008)	(0.0017)	(0.0004)	(0.0001)	(0.0002)	(0.0004)
GDP forecast	0.0003	0.0001	0.0001**	0.0003	0.0018*	0.0009	0.0004***	0.0002	0.0004***	0.0005*
	(0.0006)	(0.0003)	(0.0000)	(0.0002)	(0.0010)	(0.0025)	(0.0002)	(0.0001)	(0.0001)	(0.0003)
Policy rate (lagged once)	-0.2912***	0.2401***	0.4739***	0.4710***	-0.4161***	-0.2401***	0.3925***	-0.0173	0.3396***	0.1274*
	(0.0784)	(0.0904)	(0.0718)	(0.0705)	(0.0800)	(0.0798)	(0.0686)	(0.0817)	(0.0702)	(0.0764)
Policy rate (lagged twice)	0.2114***	-0.2579***	-0.5266***	-0.4903***	0.2200***	-0.1783**	-0.4583***	0.0028	-0.3903***	-0.2049***
	(0.0801)	(0.0903)	(0.0663)	(0.0694)	(0.0771)	(0.0779)	(0.0650)	(0.0807)	(0.0660)	(0.0746)
Δlog CPI (lagged once)	0.0792	0.0149	0.0046	0.0840	0.0339	-0.5270	0.1059*	-0.0623	0.0683**	0.0193
	(0.2702)	(0.0546)	(0.0105)	(0.0636)	(0.1111)	(0.3949)	(0.0575)	(0.0452)	(0.0335)	(0.1133)
Δlog CPI (lagged twice)	0.4848*	0.0013	0.0232**	-0.0760	0.0853	-0.3348	0.0910	0.0433	0.0118	-0.1927*
	(0.2652)	(0.0532)	(0.0113)	(0.0625)	(0.1119)	(0.3938)	(0.0589)	(0.0488)	(0.0349)	(0.1147)
Δlog IP (lagged once)	0.0055	-0.0007	0.0008	0.0027	0.0299	-0.2057*	0.0128**	-0.0026	0.0104*	-0.0044
	(0.0597)	(0.0049)	(0.0021)	(0.0269)	(0.0224)	(0.1209)	(0.0051)	(0.0034)	(0.0058)	(0.0246)
Δlog IP (lagged twice)	-0.0031	-0.0003	0.0053***	0.0447	0.0170	-0.0971	0.0064	-0.0021	0.0146**	-0.0416*
	(0.0595)	(0.0050)	(0.0020)	(0.0276)	(0.0224)	(0.1242)	(0.0051)	(0.0035)	(0.0059)	(0.0248)
Δlog NEER	-0.1881***	0.0132	-0.0015	-0.0257***	0.0476	0.1502	0.0134	0.0101	0.0052	-0.0547
	(0.0469)	(0.0404)	(0.0036)	(0.0084)	(0.0666)	(0.1368)	(0.0153)	(0.0117)	(0.0052)	(0.0396)
Δlog NEER (lagged once)	-0.0428	0.0458	0.0006	0.0008	-0.0840	0.0952	-0.0364**	-0.0269**	0.0016	-0.1577***
	(0.0505)	(0.0416)	(0.0037)	(0.0088)	(0.0696)	(0.1375)	(0.0154)	(0.0113)	(0.0054)	(0.0422)
Δlog NEER (lagged twice)	0.0118	0.0318	0.0010	0.0035	-0.0358	-0.1146	0.0294*	-0.0169	0.0125**	-0.0116
	(0.0511)	(0.0424)	(0.0036)	(0.0085)	(0.0668)	(0.1356)	(0.0153)	(0.0112)	(0.0053)	(0.0423)
Constant	0.0057	-0.0007	0.0007**	-0.0018	-0.0116	0.0110	-0.0018	-0.0021*	-0.0010**	-0.0024**
	(0.0069)	(0.0012)	(0.0003)	(0.0021)	(0.0073)	(0.0165)	(0.0011)	(0.0011)	(0.0004)	(0.0012)
Observations	173	126	173	173	171	168	173	169	173	170
R-squared	0.194	0.134	0.540	0.366	0.222	0.236	0.489	0.139	0.534	0.300

Table 3 Taylor Rule Regressions (Concluded)

The table shows the estimates of the country-by-country regressions of a Taylor rule with the following specification.

$$\Delta i_{it} = \alpha_{0i} + \alpha_{1i} E_t \Delta y_{it+12} + \alpha_{2i} E_t \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta IP_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta CPI_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta NEER_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} i_{it-j} + \varepsilon_{it} \text{ ,}$$

where i is a short-term interest rate, $E_t\Delta y_{t+12}$ and $E_t\Delta p_{t+12}$ are the 12-month ahead market forecasts of GDP growth and inflation as measured by Consensus Forecasts, and *IP*, *CPI*, and *NEER* are the logs of industrial production, a consumer price index, and the nominal effective exchange rate. Heteroscedasticity and autocorrelation-robust standard errors are in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively. In the table, *L1* and *L2* mean first and second lags of a given variable.

Panel D

	(31)	(32)	(33)	(34)	(35)	(36)	(37)	(38)	(39)	(40)
Variables	Russia	South Africa	Serbia	Sri Lanka	Taiwan	Thailand	Turkey	Ukraine	Uruguay	Vietnam
CPI forecast	0.0027**	0.0010**	0.0006*	-0.0003	0.0001	0.0003**	-0.0004	0.0018**	-0.0022	0.0004
	(0.0012)	(0.0004)	(0.0003)	(0.0004)	(0.0001)	(0.0001)	(0.0003)	(0.0008)	(0.0019)	(0.0004)
GDP forecast	-0.0028**	0.0010***	0.0009***	-0.0001	0.0001**	0.0000	0.0007**	0.0000	-0.0015	-0.0003
	(0.0011)	(0.0003)	(0.0002)	(0.0006)	(0.0000)	(0.0001)	(0.0003)	(0.0014)	(0.0024)	(0.0007)
Policy rate (lagged once)	-0.0772	-0.0385	0.3642***	-0.0471	0.1839**	0.4740***	0.2492***	-0.1961**	-0.5109***	-0.0239
	(0.0845)	(0.0798)	(0.0821)	(0.1116)	(0.0788)	(0.0674)	(0.0735)	(0.0887)	(0.0778)	(0.0787)
Policy rate (lagged twice)	-0.2735***	-0.0077	-0.4136***	0.0212	-0.2053***	-0.5106***	-0.2705***	-0.1113	0.1916**	-0.0606
	(0.0924)	(0.0774)	(0.0816)	(0.1206)	(0.0778)	(0.0640)	(0.0715)	(0.0883)	(0.0771)	(0.0773)
Δlog CPI (lagged once)	0.0868	0.0808	0.0773	-0.0080	0.0330*	0.0058	-0.0600	-0.1121	0.7213	0.4125***
	(0.4813)	(0.0560)	(0.0582)	(0.0394)	(0.0183)	(0.0163)	(0.0700)	(0.3054)	(0.4779)	(0.0917)
Δlog CPI (lagged twice)	-0.4382	0.0029	0.0578	0.0786**	0.0068	0.0507***	-0.0501	0.0342	0.4071	0.0095
	(0.4769)	(0.0565)	(0.0579)	(0.0371)	(0.0186)	(0.0179)	(0.0698)	(0.3003)	(0.4817)	(0.0941)
Δlog IP (lagged once)	0.3850**	0.0089	0.0097	-0.0067	0.0109***	0.0022	-0.0152	-0.2913*	0.0698	0.0114
	(0.1666)	(0.0113)	(0.0131)	(0.0111)	(0.0021)	(0.0019)	(0.0246)	(0.1494)	(0.0533)	(0.0092)
Δlog IP (lagged twice)	-0.1730	0.0165	0.0245*	-0.0293***	0.0070***	0.0008	0.0105	-0.2256	0.0441	0.0070
	(0.1676)	(0.0113)	(0.0130)	(0.0105)	(0.0022)	(0.0019)	(0.0241)	(0.1562)	(0.0528)	(0.0083)
Δlog NEER	-0.0986	0.0032	-0.0526*	-0.0490*	0.0049	0.0271***	-0.0318	-0.0114	0.1453	-0.0504
	(0.0797)	(0.0073)	(0.0272)	(0.0259)	(0.0077)	(0.0082)	(0.0195)	(0.0753)	(0.1321)	(0.0393)
Δlog NEER (lagged once)	0.0267	-0.0200***	-0.0583**	0.0121	-0.0124	-0.0127	-0.0356*	-0.0363	-0.1818	0.0197
	(0.0874)	(0.0071)	(0.0285)	(0.0283)	(0.0083)	(0.0086)	(0.0202)	(0.0752)	(0.1380)	(0.0410)
Δlog NEER (lagged twice)	-0.0733	0.0043	-0.0517*	-0.0251	0.0051	-0.0066	-0.0308	-0.1996**	-0.0158	-0.0528
	(0.0821)	(0.0073)	(0.0284)	(0.0269)	(0.0077)	(0.0080)	(0.0201)	(0.0789)	(0.1363)	(0.0425)
Constant	0.0180*	-0.0057**	-0.0018	0.0047	-0.0005***	-0.0002	0.0021	0.0082	0.0365**	0.0025
	(0.0096)	(0.0026)	(0.0014)	(0.0048)	(0.0002)	(0.0003)	(0.0019)	(0.0107)	(0.0169)	(0.0053)
Observations	173	172	116	87	176	173	172	135	172	172
R-squared	0.238	0.256	0.487	0.258	0.401	0.558	0.415	0.223	0.305	0.281

Table 4. Estimates from Benchmark Regressions

The table shows the estimated coefficients of the monetary policy shock (ε), the change in the nominal effective exchange rate (neer), and their interaction obtained based on the following specifications for output (y) and prices (p), respectively, for each quarter ahead (h).

$$y_{it+h} = \sum_{j=0}^{2} \gamma^{h}_{1j} \hat{\varepsilon}_{it-j} + \gamma^{h}_{2} \Delta neer_{it} * \hat{\varepsilon}_{it} + \beta^{h}_{i} + \sum_{j=0}^{2} \beta^{h}_{1j} Z_{it-i} + \sum_{j=1}^{2} \beta^{h}_{4j} i_{it-j} + \mathbf{x}_{it} \boldsymbol{\lambda}^{h} + \omega^{h}_{it}, \text{ and}$$

$$p_{it+h} = \sum_{j=0}^{2} \theta^{h}_{1j} \hat{\varepsilon}_{it-j} + \theta^{h}_{2} \Delta neer_{it} * \hat{\varepsilon}_{it} + \varphi^{h}_{i} + \sum_{j=0}^{2} \varphi^{h}_{1j} Z_{it-i} + \sum_{j=1}^{2} \varphi^{h}_{4j} i_{it-j} + \mathbf{x}_{it} \boldsymbol{\pi}^{h} + \eta^{h}_{it}, \ \theta^{0}_{10} = 0.$$

where the vector Z includes contemporaneous and lagged values for y, p, and $neer$, and i is a short-term interest rate. The vector **x** contains global and country-specific controls, including the VIX, a commodity price index, the first principle component of the United States'-, euro area's-, and Japan's shadow policy rates, and country-level monthly temperature and precipitation anomalies. Heteroscedasticity and autocorrelation-robust standard errors are in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively.

	Output			Prices		
Lead (h)	Policy shock	Δ NEER	Policy shock x Δ NEER	Policy shock	Δ NEER	Policy shock x Δ NEER
1	-0.0006	0.0286	-0.0056	0.0002**	-0.0028	-0.0088
	(0.0006)	(0.0401)	(0.0215)	(0.0001)	(0.0172)	(0.0065)
2	-0.0014**	-0.0652	0.0047	0.0003**	-0.0378*	-0.0232*
	(0.0006)	(0.0424)	(0.0238)	(0.0002)	(0.0207)	(0.0133)
3	-0.0015**	-0.0538	-0.0101	0.0005**	-0.0419**	-0.0289*
	(0.0007)	(0.0575)	(0.0289)	(0.0002)	(0.0201)	(0.0152)
4	-0.0015**	0.0302	0.0452**	0.0005*	-0.0482**	-0.0313**
	(0.0007)	(0.0406)	(0.0193)	(0.0003)	(0.0203)	(0.0160)
5	-0.0021***	-0.0076	-0.0149	0.0005	-0.0567***	-0.0341**
	(0.0008)	(0.0389)	(0.0211)	(0.0003)	(0.0209)	(0.0162)
6	-0.0020**	0.0154	-0.0259	0.0005	-0.0445**	-0.0354**
	(0.0008)	(0.0396)	(0.0302)	(0.0003)	(0.0212)	(0.0160)
7	-0.0033***	0.0317	-0.0380	0.0005	-0.0416*	-0.0389**
	(0.0009)	(0.0378)	(0.0318)	(0.0004)	(0.0223)	(0.0182)
8	-0.0027***	-0.0555	0.0211	0.0005	-0.0386*	-0.0430***
	(0.0009)	(0.0402)	(0.0261)	(0.0004)	(0.0211)	(0.0159)
9	-0.0031***	-0.0260	0.0047	0.0003	-0.0449**	-0.0600***
	(0.0009)	(0.0452)	(0.0302)	(0.0004)	(0.0187)	(0.0199)
10	-0.0037***	-0.0172	0.0145	0.0002	-0.0487***	-0.0618***
	(0.0010)	(0.0370)	(0.0285)	(0.0004)	(0.0187)	(0.0200)
11	-0.0030***	0.0976**	0.0292	0.0001	-0.0550***	-0.0575***
	(0.0010)	(0.0484)	(0.0333)	(0.0004)	(0.0210)	(0.0199)
12	-0.0024**	0.0754*	0.0387	-0.0000	-0.0574***	-0.0512***
	(0.0010)	(0.0416)	(0.0340)	(0.0005)	(0.0208)	(0.0197)
13	-0.0029***	0.0225	0.0407	0.0000	-0.0711***	-0.0441**
	(0.0010)	(0.0460)	(0.0383)	(0.0005)	(0.0253)	(0.0198)
14	-0.0022**	0.0009	0.0422	-0.0000	-0.0922***	-0.0457**
	(0.0011)	(0.0476)	(0.0378)	(0.0005)	(0.0266)	(0.0217)
15	-0.0025**	0.0134	0.0342	-0.0001	-0.0984***	-0.0465**
	(0.0011)	(0.0449)	(0.0368)	(0.0005)	(0.0265)	(0.0228)
16	-0.0024**	0.0225	0.0444	-0.0000	-0.0946***	-0.0460*
	(0.0011)	(0.0404)	(0.0358)	(0.0006)	(0.0258)	(0.0251)
17	-0.0017	0.0183	0.0214	0.0002	-0.1019***	-0.0328
	(0.0011)	(0.0459)	(0.0381)	(0.0006)	(0.0269)	(0.0263)
18	-0.0014	0.0442	0.0192	0.0002	-0.0755***	-0.0338
	(0.0011)	(0.0384)	(0.0382)	(0.0006)	(0.0264)	(0.0284)
19	-0.0014	-0.0379	0.0243	0.0001	-0.0520**	-0.0371
	(0.0012)	(0.0462)	(0.0365)	(0.0006)	(0.0237)	(0.0308)
20	-0.0011	-0.0345	0.0281	0.0001	-0.0492**	-0.0494
	(0.0012)	(0.0404)	(0.0382)	(0.0006)	(0.0250)	(0.0307)

Table 5. Effect of Monetary Policy Tightening on Output and Prices

The table shows the estimated peak effect of a monetary policy tightening shock on output and prices, in percent. The results are based on the estimates of the following specifications for output and prices, respectively.

$$y_{it+h} = \sum_{j=0}^{2} \gamma_{1j}^{h} \hat{\varepsilon}_{it-j} + \gamma_{2}^{h} \Delta neer_{it} * \hat{\varepsilon}_{it} + \beta_{i}^{h} + \sum_{j=0}^{2} \beta_{1j}^{h} Z_{it-i} + \sum_{j=1}^{2} \beta_{4j}^{h} i_{it-j} + \mathbf{x}_{it} \boldsymbol{\lambda}^{h} + \omega_{it}^{h}, \text{ and}$$

$$p_{it+h} = \sum_{j=0}^{2} \theta_{1j}^{h} \hat{\varepsilon}_{it-j} + \theta_{2}^{h} \Delta neer_{it} * \hat{\varepsilon}_{it} + \varphi_{i}^{h} + \sum_{j=0}^{2} \varphi_{1j}^{h} Z_{it-i} + \sum_{j=1}^{2} \varphi_{4j}^{h} i_{it-j} + \mathbf{x}_{it} \boldsymbol{\pi}^{h} + \eta_{it}^{h}, \theta_{10}^{0} = 0.$$

where $\hat{\varepsilon}$ is the estimated (and standardized) country-specific policy shock the vector Z includes contemporaneous and lagged values for y, p, and *neer*, and i is a short-term interest rate. The vector **x** contains global and country-specific controls, including the VIX, a commodity price index, the first principle component of the United States'-, euro area's-, and Japan's shadow policy rates, and country-level monthly temperature and precipitation anomalies. The effect without exchange rate channel measures the effect assuming in the policy shock while the exchange rate does not change. Conversely, the effect with the exchange rate channel assumes an increase in the policy shock contemporaneous to a one standard-deviation appreciation in the exchange rate (about 2.2 percent). Column (1) shows the effect on output and prices of a one standard-deviation policy shock. Column (2) shows the effect of a 100-basis point increase in the policy rate which is equivalent to a one standard-deviation increase in the non-standardized policy shock for the median country (Serbia) ranked by the volatility of the residual of the country-by-country regressions with the following specification.

$$\Delta i_{it} = \alpha_{0i} + \alpha_{1i} E_{t} \Delta y_{it+12} + \alpha_{2i} E_{t} \pi_{it+12} + \sum_{j=1}^{2} \alpha_{3ij} \Delta y_{it-i} + \sum_{j=1}^{2} \alpha_{4ij} \Delta p_{it-j} + \sum_{j=1}^{2} \alpha_{5ij} \Delta neer_{it-j} + \sum_{j=1}^{2} \alpha_{6ij} i_{it-j} + \varepsilon_{it},$$

where $E_t \Delta y_{t+12}$ and $E_t \Delta p_{t+12}$ are the 12-month ahead market forecasts of GDP growth and inflation as measured by Consensus Forecasts. The volatility of the residual is 35 basis points for the median country, which implies that a 100-basis points increase in interest rates is equivalent to a 2.8-standard deviation policy shock. Column (3) shows the month after the policy shock when the largest decline in output or prices is experienced. Heteroscedasticity and autocorrelation-robust p-values in parentheses. *, **, *** signify statistical significance at the 10, 5, and 1 percent level, respectively. S.D. stands for standard deviation.

	Peak effect		
	1 S.D.	**100 bp-equivalent**	**Peak month**
	(1)	(2)	(3)
Output			
Without exchange rate channel	-0.3709 ***	-1.0450	10
	(0.0001)		
With exchange rate channel	-0.4087 ***	-1.1515	7
	(0.0005)		
Prices			
Without exchange rate channel	-0.0111	-0.0311	15
	(0.8374)		
With exchange rate channel	-0.1180 *	-0.3324	11
	(0.0513)		

Appendix I. Country List and Data Sources

The countries used in this study are: Argentina, Armenia, Azerbaijan, Bangladesh, Bolivia, Brazil, Bulgaria, Chile, China, Colombia, Costa Rica, Croatia, Dominican Republic, Ecuador, Egypt, Guatemala, Honduras, Hungary, India, Indonesia, Kazakhstan, Macedonia, Malaysia, Mexico, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russia, South Africa, Serbia, Sri Lanka, Taiwan, Thailand, Turkey, Ukraine, Uruguay, and Vietnam.

Table A.1 Variables Definition and Sources

Variable	Definition	Sources
Consumer Price Index (log)	Log of the all-items consumer price index	IMF International Financial Statistics
Industrial Production Index (log)	Log of total industrial production index	IMF International Financial Statistics
Nominal Effective Exchange Rate (log)	Log of a trade-weighted nominal exchange rate index	IMF International Financial Statistics
Policy Rate	A monetary policy interest rate or the short-term interbank rate	IMF International Financial Statistics
Inflation Targeting Dummy	Dummy variable which takes value 1 (0) when a country is (not) using inflation targeting as its monetary policy framework in a given month.	IMF AREAER database and central bank websites
Financial Development Index	Summary of how developed financial institutions and financial markets are in terms of depth, access, and efficiency at the annual frequency.	Sahay et al. (2015), available at https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B
Financial Development Index (Institutions)	Summary of how developed financial institutions are in terms of depth, access, and efficiency at the annual frequency.	Sahay et al. (2015), available at https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B
Financial Development Index (Markets)	Summary of how developed financial markets are in terms of depth, access, and efficiency at the annual frequency.	Sahay et al. (2015), available at https://data.imf.org/?sk=F8032E80-B36C-43B1-AC26-493C5B1CD33B
Private Credit by Deposit Banks	Funding provided to the private sector by domestic money banks as a share of GDP.	Global Financial Development Database (World Bank)

Variable	Definition	Sources
	Domestic money banks are commercial banks and other financial institutions that accept transferable deposits.	
ATMs per 100,000 Adults	Number of ATMs per 100,000 adults.	Global Financial Development Database (World Bank)
Inflation Forecast	The weighted average of current and next year's inflation consensus forecast. Weights of current (next) year's forecast decrease (increase) from 11/12 (1/12) to 1/12 (11/12) between January and December of each year.	Consensus Forecasts
GDP Growth Forecast	The weighted average of current and next year's GDP growth consensus forecast. Weights of current (next) year's forecast decrease (increase) from 11/12 (1/12) to 1/12 (11/12) between January and December of each year.	Consensus Forecasts
CBOE VIX Index	The Chicago Board of Exchange's S&P500 implicit volatility index.	Thomson Reuters Datastream
Commodity Price Index	Goldman Sachs Global Commodity Price Index.	Thomson Reuters Datastream
Global Monetary Policy (1PC)	The first principal component of Krippner's (2015) shadow policy rates for the euro area, Japan, United Kingdom, and the United States.	Krippner (2015), available at https://www.rbnz.govt.nz/research-and-publications/research-programme/additional-research/measures-of-the-stance-of-united-states-monetary-policy/comparison-of-international-monetary-policy-measures
Temperature Anomaly	GISTEMP air temperature anomaly smoothed over global 250km-spaced grid. Temperature anomaly is assigned to each country-year by finding the point in the grid	GISTEMP Team (2019) and Lenssen et al. (2019). GISTEMP data provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado, USA, from their Web site at

Variable	Definition	Sources
	(with data) closest to the country's capital using Robert Picard's `geonear` procedure for Stata.	https://www.esrl.noaa.gov/psd/ (accessed on 1/15/2018)
Precipitation Anomaly	NOAA's precipitation anomaly smoothed over global 2.5^{o}-latitude by 2.5^{o}-longitude grid. Precipitation anomaly is assigned to each country-year by finding the point in the grid (with data) closest to the country's capital using Robert Picard's `geonear` procedure for Stata.	Chen et al. (2002, 2004) and Chen et al. (2003). PREC Precipitation data provided by the NOAA/OAR/ESRL PSD, Boulder, Colorado, USA, from their Web site at https://www.esrl.noaa.gov/psd/.
Change in 2Y yield on Announcement Dates	See Appendix III.	Central bank websites, Bloomberg, and Thomson-Reuters Datastream
Central Bank Independence Index	Update to the Cukierman, Webb and Neyapty index. Definition in Cukierman, Webb, and Neyapti (1992).	Garriga (2016), available from https://sites.google.com/site/carogarriga/cbi-data-1. Since the data end in 2012, we use the average central bank independence in each country over the entire sample.
Central Bank Transparency	Dincer and Eichengreen's (2014) index of augmented central bank transparency	Dincer and Eichengreen (2014), available from https://eml.berkeley.edu/~eichengr/data.shtml. The dataset contains data from 1998 to 2014 and. For 2015-17 we assume central bank transparency to be the same as in 2014. Since the variable is slow moving, it is unlikely that this approximation causes significant biases.
Voice and Accountability	As defined in Kaufmann et al. (2010).	Worldwide Governance Indicators (World Bank)
Government Effectiveness	As defined in Kaufmann et al. (2010).	Worldwide Governance Indicators (World Bank)
Regulatory Quality	As defined in Kaufmann et al. (2010).	Worldwide Governance Indicators (World Bank)

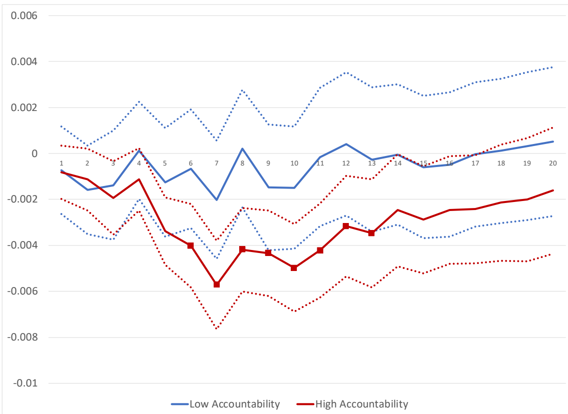
Variable	Definition	Sources
Chinn-Ito Index	Chinn and Ito's (2006) index of *de jure* financial openness	Chinn and Ito (2006), available from http://web.pdx.edu/~ito/Chinn-Ito_website.htm
Trade openness	Total exports and imports as a percentage of GDP (annual)	IMF World Economic Outlook
Floating Exchange rate Dummy	Dummy variable which takes value 1 when a country is judged by the IMF as having a *de facto* floating, freely floating, or other managed exchange rate regime (and 0 otherwise).	IMF AREAER database
Dollarization Index	The sum of deposit dollarization (share of foreign currency deposits in total bank deposits) and loan dollarization (share of foreign currency loans in total bank loans), at the monthly frequency.	IMF Monetary and Financial Statistics
Food Weight in CPI Basket	Food weights in CPI basket.	Haver and EMDE database
Bank Concentration (percent)	Top five banks' share of total bank assets in each country (annual).	Global Financial Development Database (World Bank)
Foreign Banks Among Total Banks (percent)	Number of foreign-owned banks (i.e., 50 percent or more of its shares are owned by foreigners) as a percentage of the total number of banks.	Global Financial Development Database (World Bank)
Sovereign or Bank Crisis Dummy	Dummy variable which takes value 1 if there were a systemic banking crisis or sovereign debt crisis in a given year. Definitions in Laeven and Valencia (2018).	Laeven and Valencia (2018)

Appendix II. Additional Results

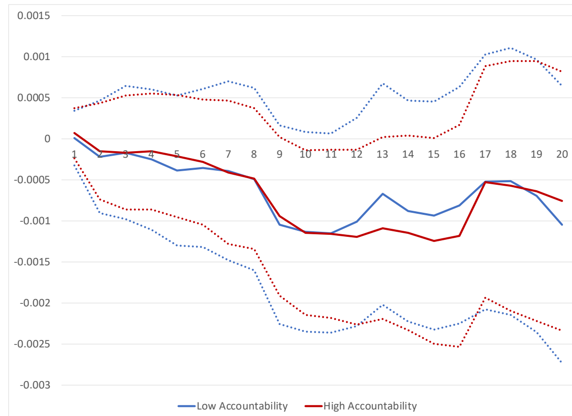
Appendix Figure A.2.1. Transmission of Monetary Policy and Country Governance

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

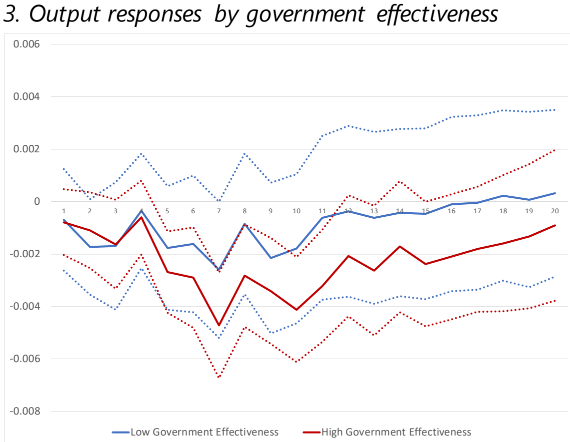
1. Output responses by government accountability



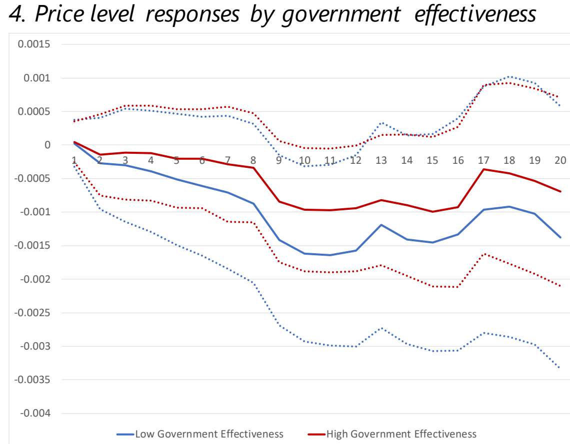
2. Price level responses by government accountability



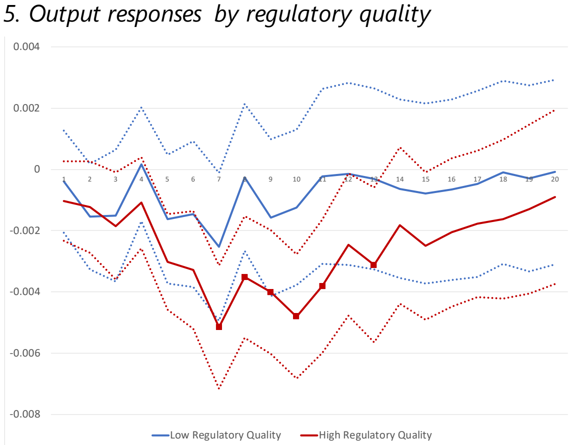
3. Output responses by government effectiveness



4. Price level responses by government effectiveness



5. Output responses by regulatory quality



6. Price responses by regulatory quality

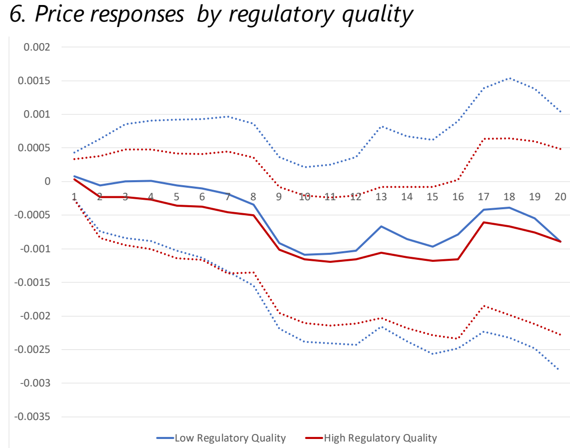
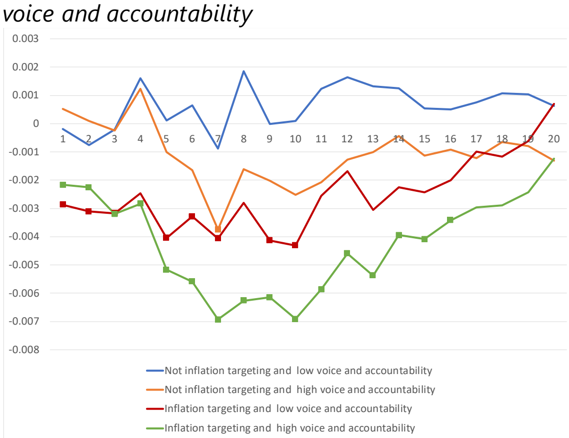


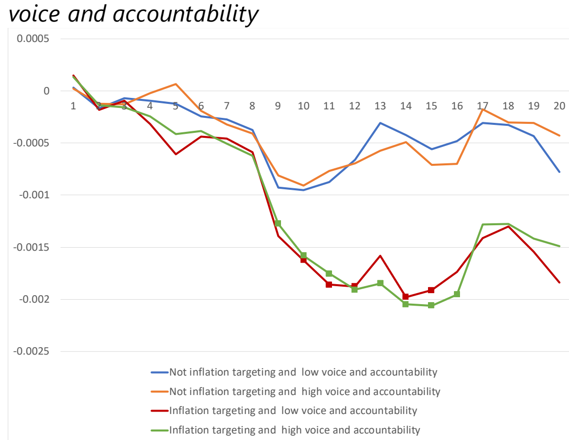
Figure A.2.2. Monetary Policy Frameworks vs. Country Governance

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. Each solid line represents the total effect on prices or output of a monetary policy shock, conditional on the country being an inflation targeter or not and conditional on the quality of country governance. Square markers indicate that the total effect is statistically significant at least the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

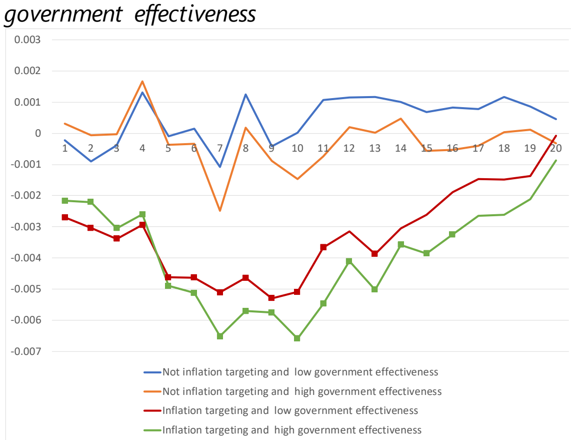
1. Output responses by monetary policy framework and voice and accountability



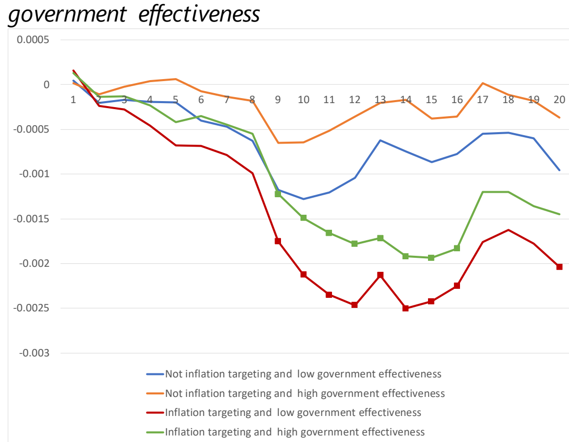
2. Price responses by monetary policy framework and voice and accountability



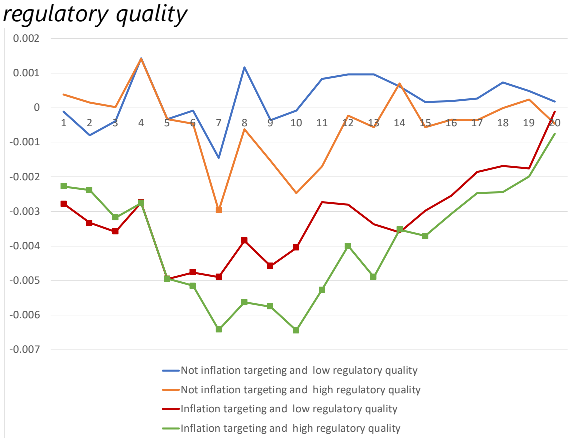
3. Output responses by monetary policy framework and government effectiveness



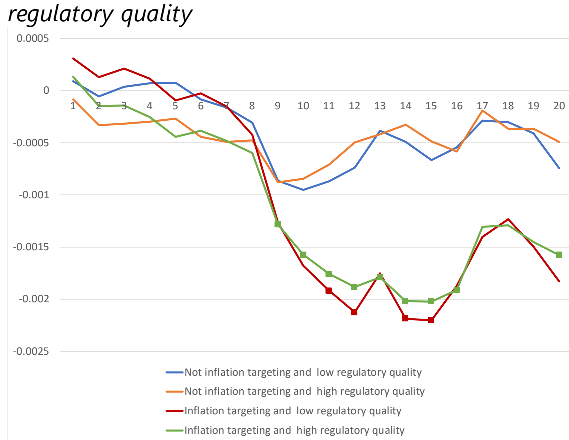
4. Price responses by monetary policy framework and government effectiveness



5. Output responses by monetary policy framework and regulatory quality



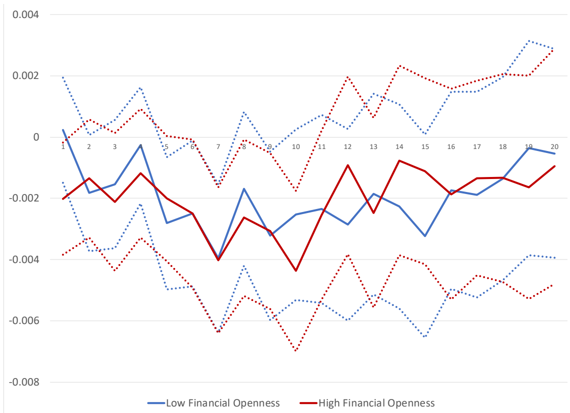
6. Price responses by monetary policy framework and regulatory quality



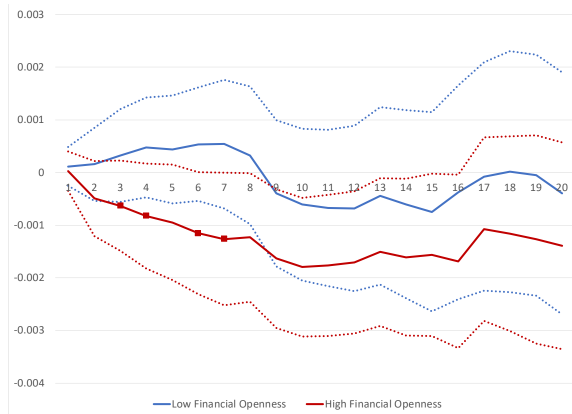
Appendix Figure A.2.3. Transmission of Monetary Policy, Capital Account, Trade Openness, and Financial Dollarization

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

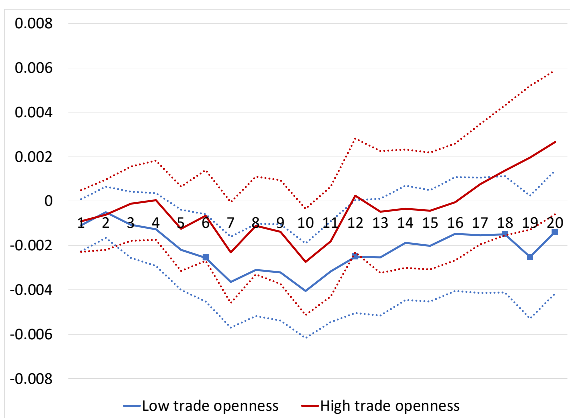
1. Output responses by capital account openness



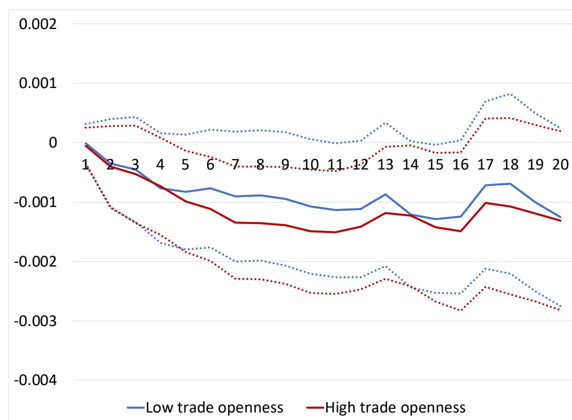
2. Price level responses by capital account openness



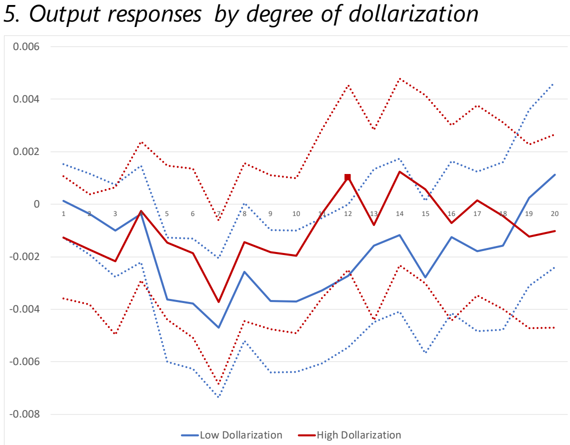
3. Output responses by trade openness



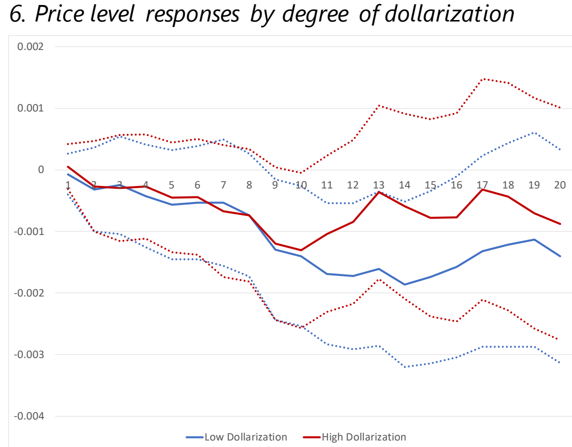
4. Price level responses by trade openness



5. Output responses by degree of dollarization



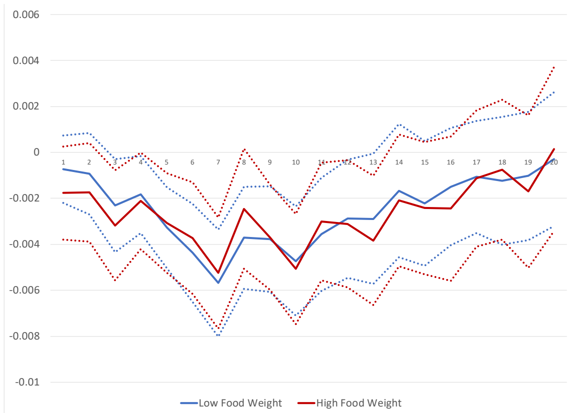
6. Price level responses by degree of dollarization



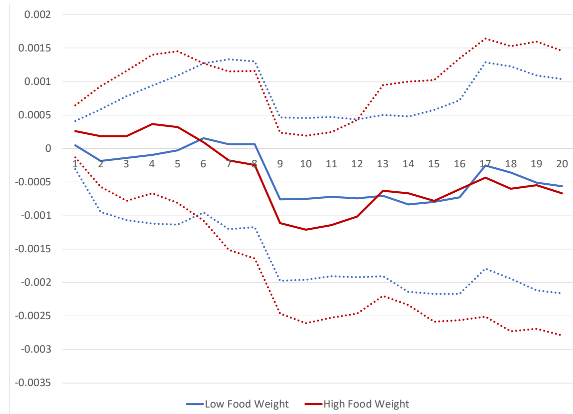
Appendix Figure A.2.4. Transmission of Monetary Policy and Other Country Characteristics

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. Square markers indicate that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level. Standard errors are robust to heteroscedasticity and autocorrelation.

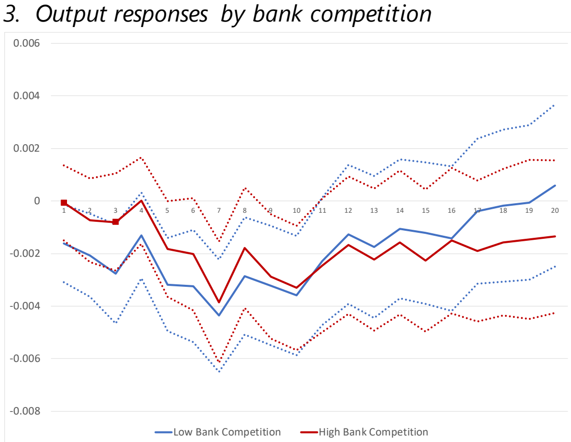
1. Output responses by food weight in CPI



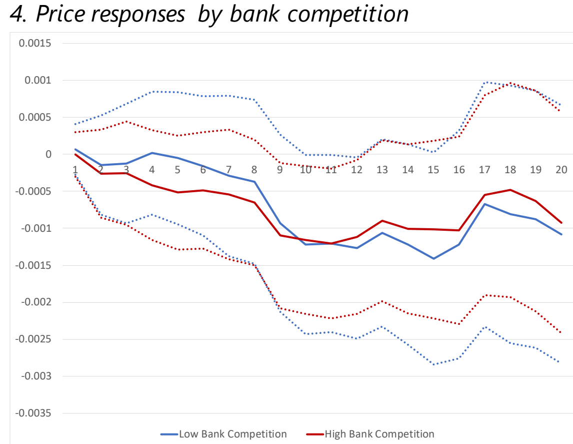
2. Price responses by food weight in CPI



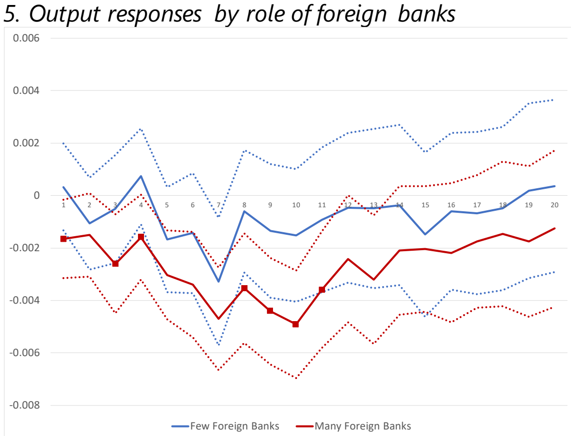
3. Output responses by bank competition



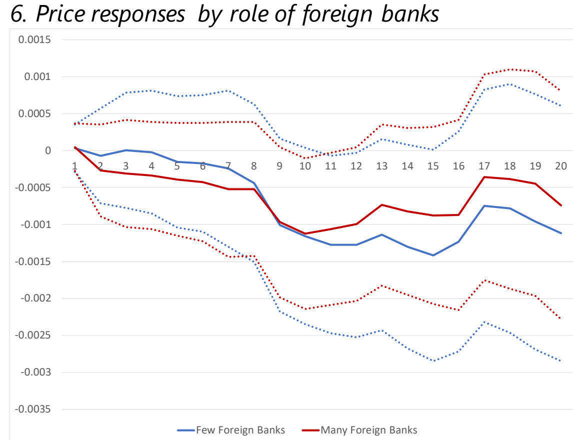
4. Price responses by bank competition



5. Output responses by role of foreign banks

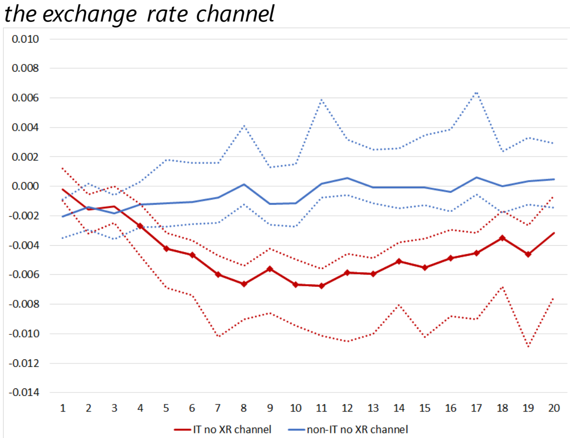


6. Price responses by role of foreign banks

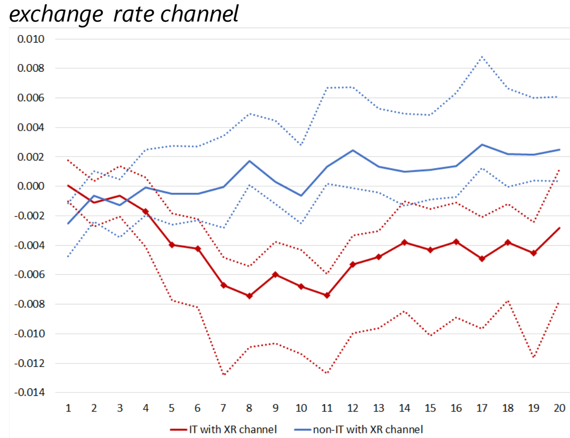


Appendix Figure A.2.5. Transmission of Monetary Policy with Endogenous IT Adoption

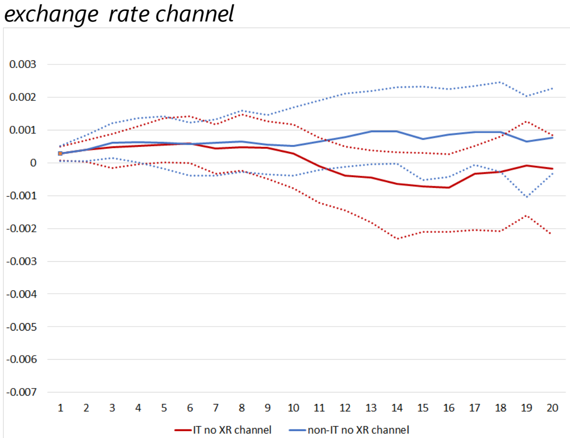
1. Output responses according to IT adoption without the exchange rate channel



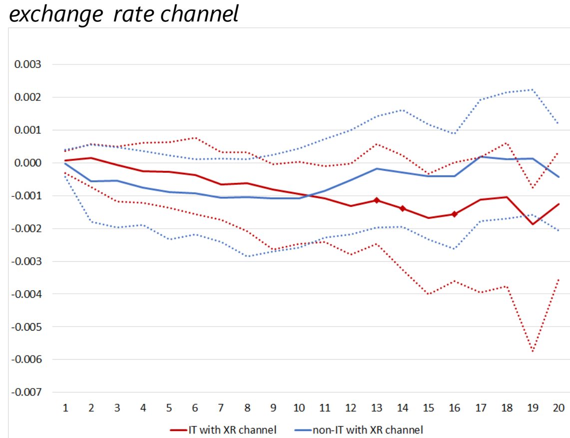
2. Output responses according to IT adoption with the exchange rate channel



3. Price responses according to IT adoption without the exchange rate channel



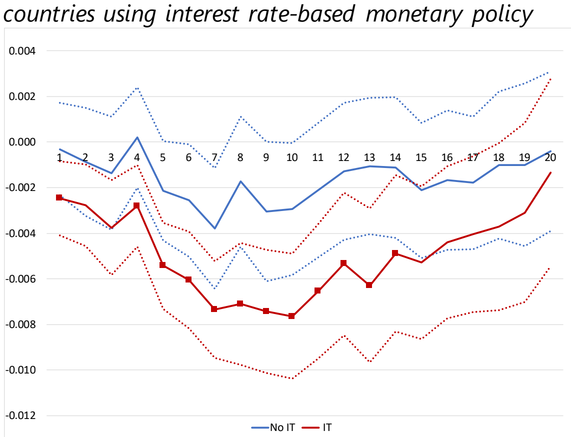
4. Price responses according to IT adoption with the exchange rate channel



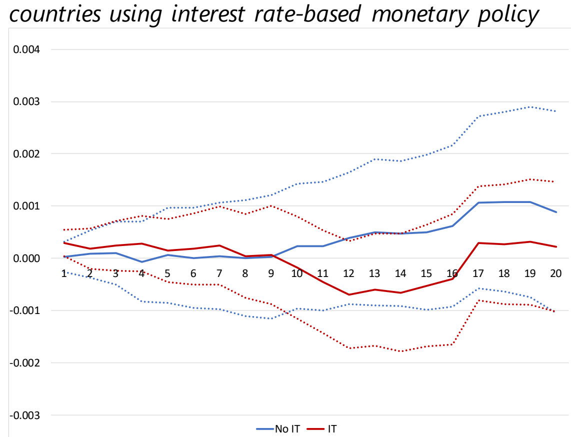
Note: The dashed lines show 90 percent bias-corrected confidence intervals. S=The square marks mean the responses in the two solid lines (blue and red) are statistically different at least at the 10 percent significance level. Inference is based on autocorrelation-robust bootstrapped confidence intervals. IT=Inflation Targeting.

Appendix Figure A.2.6. Transmission of Monetary Policy in Countries Using Interest Rate-Based Monetary Policy

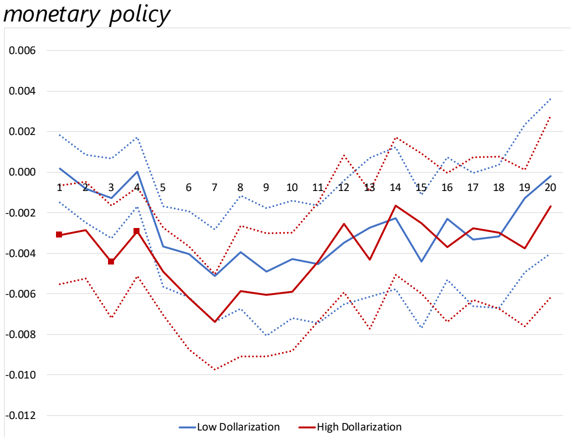
1. Output responses according to IT adoption with countries using interest rate-based monetary policy



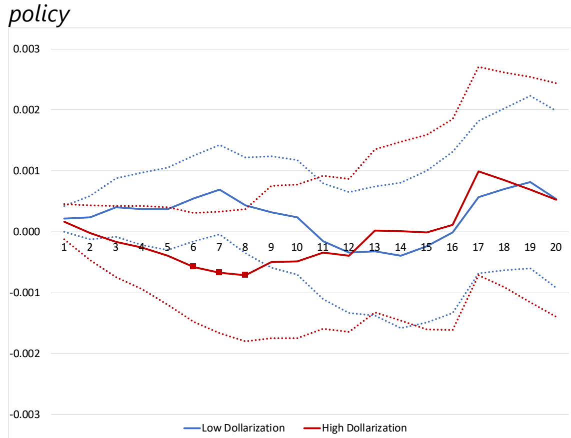
2. Price responses according to IT adoption with countries using interest rate-based monetary policy



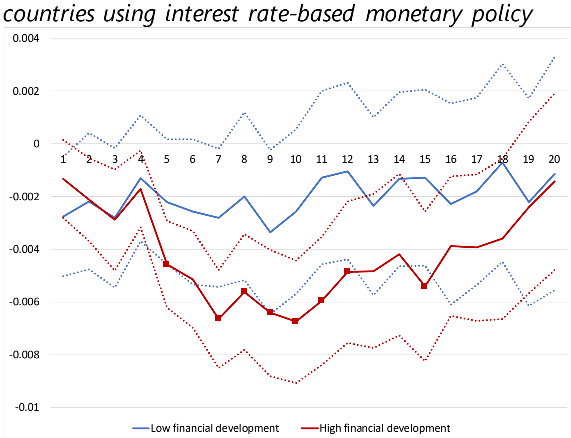
3. Output responses according to degree of dollarization with countries using interest rate-based monetary policy



4. Price responses according degree of dollarization with countries using interest rate-based monetary policy



5. Output responses according to FD index with countries using interest rate-based monetary policy



6. Price responses according to FD index with countries using interest rate-based monetary policy

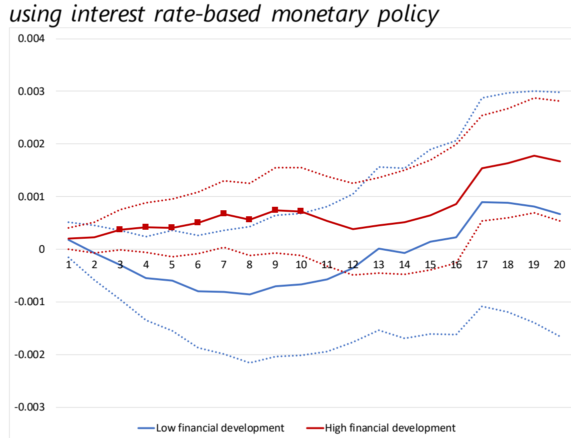
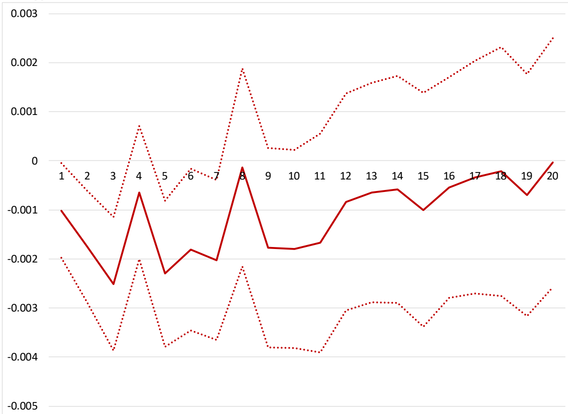
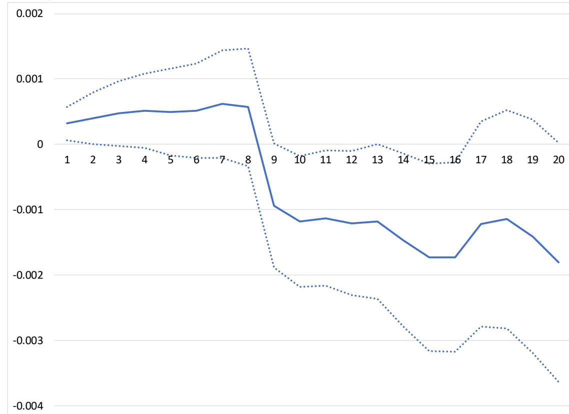


Figure A.2.7. Transmission of Monetary Policy to Output with Structural Changes

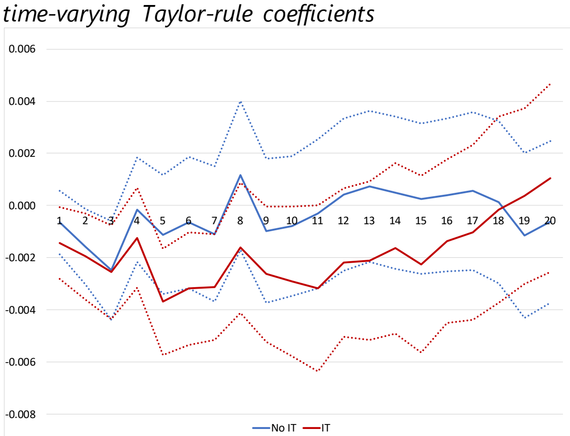
1. Output responses with time-varying Taylor-rule coefficients



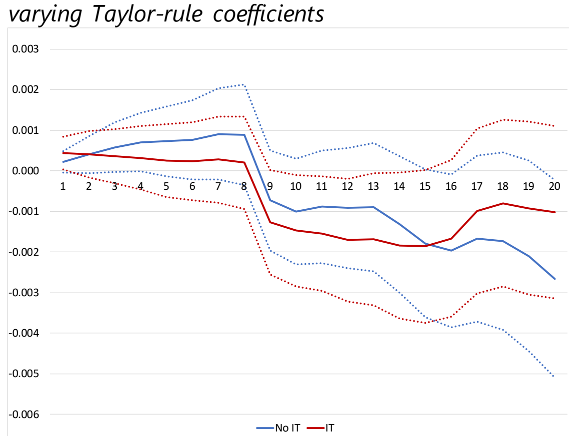
2. Price responses with time-varying Taylor-rule coefficients



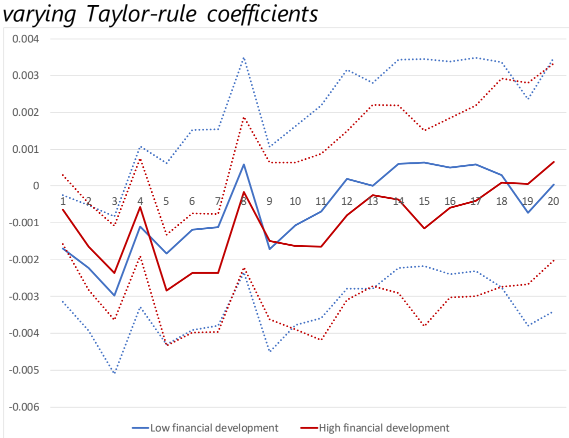
3. Output responses according to IT adoption with time-varying Taylor-rule coefficients



4. Price responses according to IT adoption with time-varying Taylor-rule coefficients



5. Output responses according to FD index with time-varying Taylor-rule coefficients



6. Price responses according to FD index with time-varying Taylor-rule coefficients

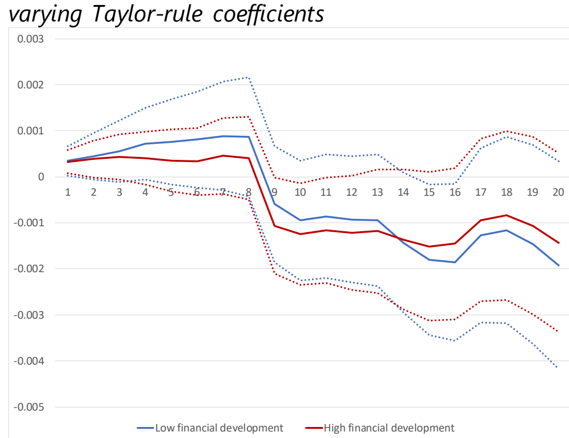
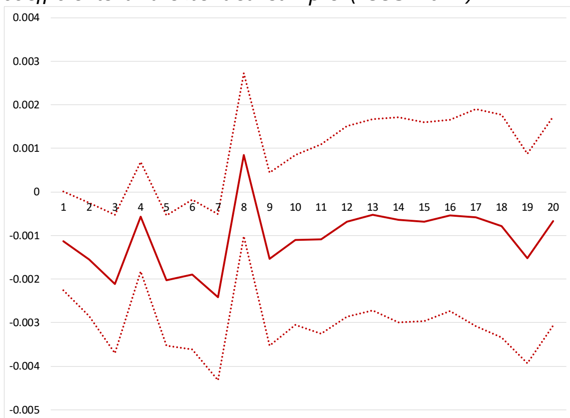
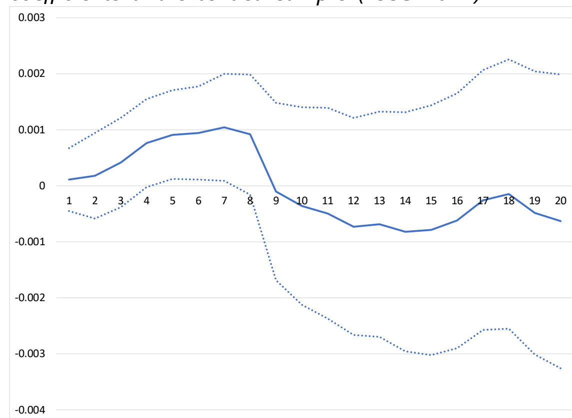


Figure A.2.8. Transmission of Monetary Policy to Output with Long Sample

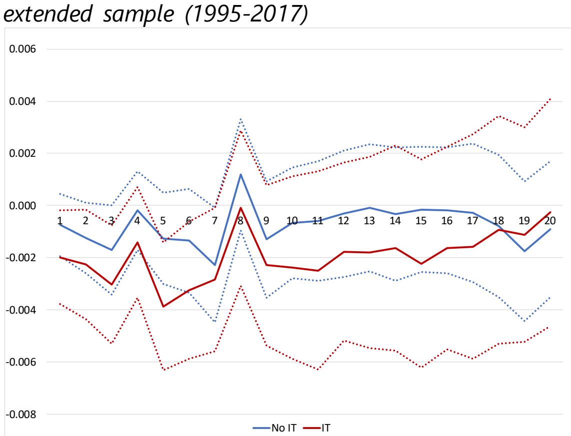
1. Output responses with time-varying Taylor-rule coefficients and extended sample (1995-2017)



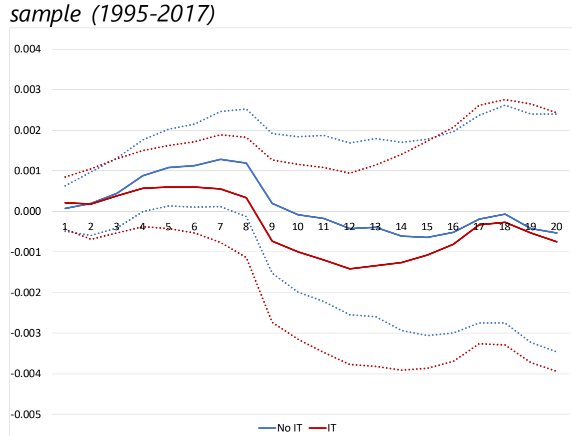
2. Price responses with time-varying Taylor-rule coefficients and extended sample (1995-2017)



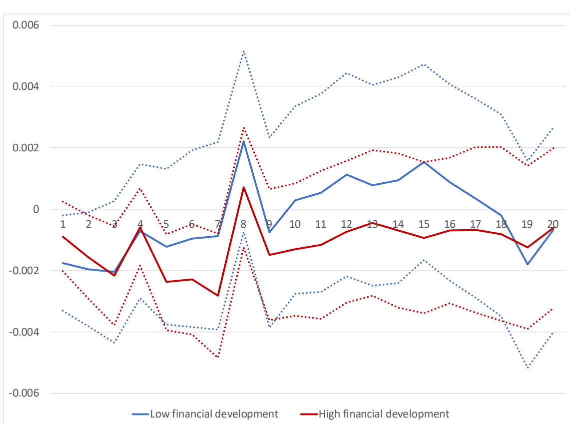
3. Output responses according to IT adoption in extended sample (1995-2017)



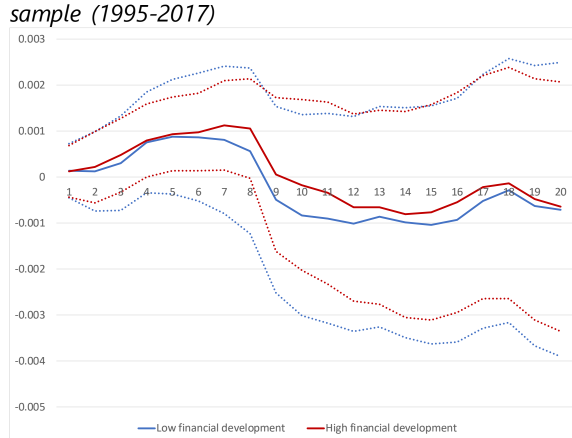
4. Price responses according to IT adoption in extended sample (1995-2017)



5. Output responses according to FD index in extended sample (1995-2017)



6. Price responses according to FD index in extended sample (1995-2017)



Appendix III. Selection of Countries with an Interest-Based Monetary Policy Framework

To determine whether the central bank uses a policy rate as the primary monetary policy instrument for most part of our sample period, we examined historical reports issued around 2009, such as IMF Article IV staff reports, and monetary policy reports issued by central banks. We consider it unlikely that a country reverts to using quantitative or administrative measures after having modernized its monetary policy framework and switched to a price-based tool. Therefore, if those historical reports indicate that an EMDE in our sample was actively using the policy rate as the primary instrument in 2009, we conclude that the country has an interest-based policy and include it in the sample for our robustness exercise. On the other hand, if quantity-based tools, such as reserve requirements and quantitative targets were used frequently in addition to (or instead of) the policy rate until at least 2009, we exclude the country from the sample. The countries selected as having an interest-rate based monetary policy framework are: Armenia, Bolivia, Botswana, Brazil, Chile, Colombia, Costa Rica, Dominican Republic, Egypt, Guatemala, Honduras, Hungary, Macedonia, Malaysia, Mexico, Pakistan, Paraguay, Peru, Philippines, Poland, Romania, Russian Federation, South Africa, Sri Lanka, Taiwan, Thailand, Turkey, Ukraine, Uruguay, and Vietnam.

Appendix IV. Attempts at Solving the Price Puzzle in Impulse Responses

$$y_{it+h} = \gamma_{10}^{h}\hat{\varepsilon}_{it} + \sum_{j=1}^{2}\gamma_{1j}^{h}\hat{\varepsilon}_{it-j} + \beta_{i}^{h} + \sum_{j=0}^{2}\beta_{1j}^{h}Z_{it-i} + \sum_{j=1}^{2}\beta_{4j}^{h}r_{it-j} + \mathbf{x}_{it}\boldsymbol{\lambda}^{h} + \omega_{it}^{h}, \gamma_{10}^{0} = 0 \quad , \qquad \text{(A.3.1))}$$

where $\hat{\varepsilon}$ is the estimated (and standardized) country-specific policy shock, the vector Z includes contemporaneous and lagged values for y, p, and *neer*. Specification (2) imposes a recursiveness assumption as it assumes that Z is predetermined and that the shock as no contemporaneous effect on output or prices. The vector $\boldsymbol{x}$ contains a number of global and country-specific controls, including the VIX, a commodity price index, the first principle component of the United States'-, euro area's-, and Japan's shadow policy rates, and country-level monthly temperature and precipitation anomalies.[1] The same equation is estimated for log prices by replacing y with p on the left-hand side of (A.3.1). The coefficients γ_{10}^{h} define the impulse response function and a separate regression is estimated for each horizon (h).[2]

The results show that output strongly declines after a contractionary monetary policy shock (Figure A.4.1.1). The estimated impulse response function shows output falling by about 0.4 percent following a contractionary one-standard deviation shock to monetary policy. The response is statistically significant at conventional levels, peaks after about 6-12 months, and fades away after about 18 months. Since our shocks are standardized at the country level, a one-standard deviation shock does not mean the same, country by country, in terms of basis points. For the median country in our sample in terms of shock volatility, a 100-basis point rise in interest rates lowers output by 0.85 percent after 10 months.[3] These dynamics are somewhat weaker than, but broadly in line with Ramey's (2016) results for the U.S. using similar identification methods.

The estimated response of the price level shows the price puzzle: Following a contractionary monetary policy shock, our estimated response of prices shows log CPI increasing for several months, and often with statistically significant responses. This anomaly is well known in the empirical literature on monetary policy in advanced economies and there several potential explanations. First, the Taylor rules used to identify the policy could be omitting variables that are useful to forecast inflation, and which are in the central bank's information set (Sims 1992) or could be using noisy measurements of economic activity. However, our specifications for the Taylor rule and the local projections are already fairly general and adding additional controls, such as commodity prices (Christiano, Eichenbaum, and

---

[1] Weather- and associated food price fluctuations can be important drivers of variations in the CPI of developing economies.

[2] Note that we also include two lags of the policy/interest rate shock in the regression, however, this does not affect the definition of the IRFs.

[3] The increase in interest rates is orthogonal to macroeconomic forecasts and past macroeconomic conditions.

Evans, 1996) does not change results. In addition, the price puzzle persists even if we use quarterly GDP instead of monthly industrial production (Figure A.4.1.2).[4]

Second, another and perhaps more worrisome form of misspecification may occur if our policy shock, despite our attempt to control for key drivers, still contains a systematic component and is not truly exogenous. This would imply an omitted variable bias in the local projection equations. To address remaining concerns about endogeneity, we estimate equation (2) with fixed effects two-stage least squares and using Gertler and Karadi's (2015) U.S. monetary policy shocks as the instrumental variable (IV).[5] The results show that IV helps to solve the price puzzle, but output responses after 12 months become positive and significant, contrary to what is predicted by theory (Figure A.4.1.4). In addition, the estimates are very large, often by one order of magnitude, when compared to the FE estimates, and may suggest a weak instruments problem.

We have also implemented Jordà et al.'s (Forthcoming) instrumental variables (IV) panel local projection approach using Gilchrist, López-Salido, and Zakrajsek's (2015) short-term monetary policy measure (i.e., the change in 2-year bond yields on announcement dates) for the United States and the euro area to build the IV. We obtain similar results (i.e., no price puzzle—even if the response of prices was never significant—but the impulse responses for output also become positive after a few months). The instruments also showed signs of being weak. Results available from the authors. We also tried using global financial conditions (proxied by the Federal Reserve Bank of Chicago's Adjusted National Financial Conditions Index) as an alternative instrument but obtained similar results (not shown but available upon request).

Third, our results may be biased because in the benchmark specification does not allow for heterogenous country responses to monetary policy (i.e., dynamic heterogeneity). To address this problem, we use the mean group estimator by Pesaran, Shin, and Smith (1999), which is robust, albeit inefficient, in the presence of dynamic heterogeneity and nonstationary variables.[6] The results in Figure A.4.1.3 show that the although output responses are not affected by dynamic heterogeneity, the price puzzle vanishes. Still, mean group estimation has some downsides, chiefly it being inefficient, which causes it to deliver wide confidence bands. In addition, because it estimates (2) country by country, it is impractical to use it to estimate the interactions of transmission with country characteristics, unless these characteristics show sufficient within-country variation.[7] Also, this approach does not clarify the reasons behind countries' heterogeneous responses.

---

[4] In principle, it is possible that noise in the data at the monthly frequency or the use of industrial production instead of GDP could bias our results. However, the impulse response of prices when using quarterly data and replacing industrial production with GDP is similar to that obtained using monthly data.

[5] This anomaly is also reported by Ramey (2016) when using Gertler and Karadi's (2015) shocks with local projections.

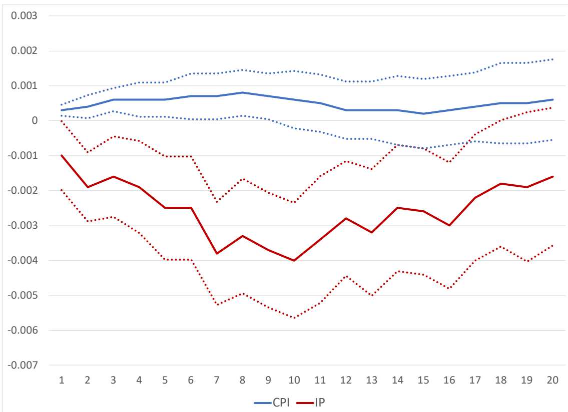
[6] The technique amounts to estimating the local projection equation (2) country by country and then averaging the results.

[7] For example, we would have to drop many countries from our sample to study the interaction transmission with inflation-targeting (IT) adoption because many countries either never had IT or had it throughout the entire sample period.

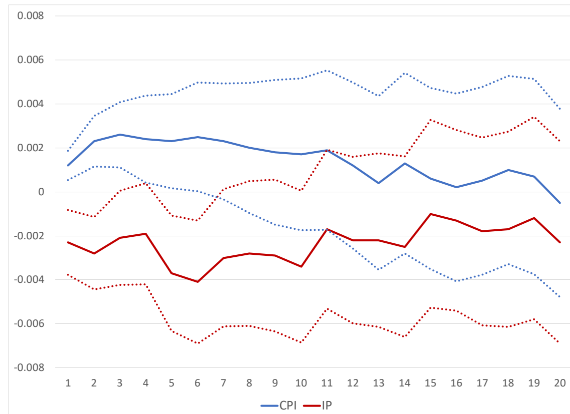
Figure A.4.1. Impulse Responses of Output and Prices Without Exchange Rate Channel

The charts show impulse responses of output and prices estimated with Jordá's (2005) local projections method using panel data and country fixed effects. The dotted lines represent the lower and upper limit of 90 percent significance confidence bands and the solid lines represent the point estimate. When the solid line has a square marker it means that the difference between the solid red line and the solid blue line is statistically significant at least at the 10 percent significance level (panels 5 and 6 only). Standard errors are robust to heteroscedasticity and autocorrelation.

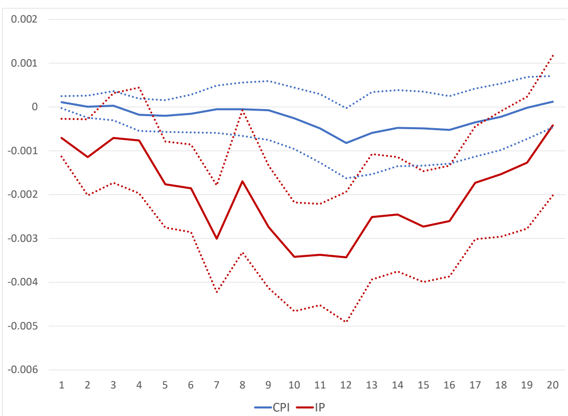
1. Baseline (fixed effects)



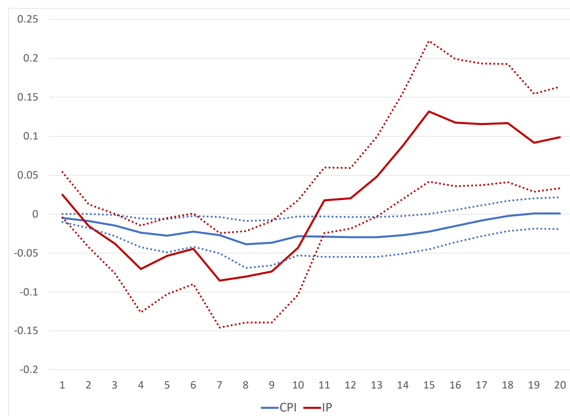
2. Data frequency (fixed effects with quarterly data)



3. Dynamic heterogeneity (mean group estimator)



4. Endogeneity (instrumental variables)



Appendix V. Estimating Monetary Policy Shocks with Financial High-Frequency Data

As a robustness check for our "Taylor-rule" derived monetary policy shocks described in Section III.B "Statistical Methods", we alternatively use high-frequency data to identify monetary policy shocks measured by the change in short-term government bond yields on the date of the monetary policy announcement. Our identifying assumption is that changes in bond yields on the day of the policy announcement reflect news about monetary policy while all other public information about the state of the economy is already priced into bond yields before the announcement. We therefore assume that the central bank does not have any private information. We use daily data because intraday data are not available for most countries in our sample and, in many cases, it was not possible ex-post to determine the exact time when the policy announcement was made. The summary statistics by country are in Table A.5.1. As in our baseline Taylor rule approach, the monetary policy shock proxied by the change in government bond yield is used as a regressor in the second stage, allowing us to measure the responses of output and inflation to monetary policy innovation.

Table A.5.1 Summary Statistics by Country of the HFI Monetary Policy Measure

Country	Change in 2-year yield in announcement days				
	N	Mean	S.D.	25th %	75th %
Argentina	-	-	-	-	
Armenia	50	-0.01	0.09	-0.03	0.01
Azerbaijan	-	-	-	-	
Bangladesh	-	-	-	-	
Bolivia	-	-	-	-	
Brazil	146	-0.02	0.14	-0.05	0.04
Bulgaria	222	0.00	0.07	-0.03	0.03
Chile	174	-0.01	0.12	-0.04	0.03
China	160	0.00	0.03	0.00	0.00
Colombia	176	0.00	0.12	-0.05	0.02
Costa Rica	49	0.00	0.02	-0.01	0.00
Croatia	-	-	-	-	
Dominican Republic	-	-	-	-	
Ecuador	263	0.00	0.06	-0.02	0.02
Egypt	-	-	-	-	
Guatemala	-	-	-	-	
Honduras	-	-	-	-	
Hungary	126	0.00	0.17	-0.06	0.02
India	123	0.00	0.05	0.00	0.00
Indonesia	107	-0.02	0.17	-0.06	0.04
Kazakhstan	-	-	-	-	
Macedonia	-	-	-	-	
Malaysia	146	0.00	0.01	0.00	0.00
Mexico	116	-0.01	0.09	-0.02	0.01
Pakistan	80	0.02	0.28	0.00	0.00
Paraguay	-	-	-	-	
Peru	148	0.00	0.11	-0.05	0.03
Philippines	-	-	-	-	
Poland	164	0.00	0.06	-0.03	0.02
Romania	71	-0.01	0.03	-0.02	0.00
Russia	48	0.13	0.75	0.00	0.08
South Africa	176	0.00	0.11	-0.01	0.00
Serbia	-	-	-	-	
Sri Lanka	-	-	-	-	
Taiwan	141	0.00	0.03	0.00	0.00
Thailand	128	-0.01	0.04	0.00	0.00
Turkey	135	-0.01	0.28	-0.12	0.06
Ukraine	-	-	-	-	
Uruguay	-	-	-	-	
Vietnam	-	-	-	-	