Monetary Policy Transmission in Emerging Markets: Proverbial Concerns, Novel Evidence*

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Abstract

Proverbial concerns remain about the effectiveness of monetary policy in emerging markets. The empirical evidence is scarce due to challenges in identifying monetary policy shocks. In this paper, we construct monetary policy shocks using analysts' forecasts of policy rate decisions. Crucial for identification, analysts can update forecasts up to the policy meeting to incorporate any information relevant to the policy rate decision. Using these shocks, we show that monetary transmission wields considerable traction on financial and macroeconomic conditions in emerging markets. Monetary tightening lifts bond yields, curbs real activity, reduces inflation, and impacts leveraged firms more strongly.

Keywords: Monetary policy shocks, financial markets, emerging markets, firm-level analysis.

JEL Codes: E50, E52

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1 Introduction

In recent years significant progress has been made in assessing the transmission of monetary policy in advanced economies. Innovative approaches for the identification of monetary policy shocks underpin this advancement, capturing variation in monetary policy that is exogenous to economic developments. For instance, Romer and Romer (1994) pioneered the narrative approach, based on the careful analysis of policy meeting transcripts and other documents to pinpoint monetary policy decisions that were not merely responding to economic conditions. Additionally, the seminal work of Kuttner (2001) and Cochrane and Piazzesi (2002) stimulated a large body of literature using high-frequency identification. This approach involves constructing monetary policy shocks based on interest rate movements within narrow windows around monetary policy announcements. The identification assumption is that financial markets anticipate endogenous monetary policy decisions depending on economic conditions and thus react only to unexpected monetary policy shocks.

Much less headway, however, has been made in the evaluation of monetary policy transmission in emerging markets. This is an important shortcoming of the literature because of proverbial concerns about the traction of monetary policy in these countries, due to limited financial development, currency mismatches, and lower institutional credibility (Frankel, 2010).[1] These concerns have been amplified in recent years because of growing evidence about the pronounced sensitivity of emerging markets to global financial shocks, especially those emanating from US monetary policy (Dedola, Rivolta and Stracca, 2017; Iacoviello and Navarro, 2019; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020; Bräuning and Ivashina, 2020; Ahmed, Akinci and Queralto, 2021). In particular, De Leo, Gopinath and Kalemli-Özcan (2022) and Degasperi, Hong and Ricco (2020) show that emerging markets tend to reduce policy rates when US monetary policy tightens. Yet, domestic bond yields increase, suggesting impaired transmission.

This paper provides a more direct assessment of the effectiveness of monetary policy transmission in emerging markets by examining the response of financial markets and macroeconomic aggregates to domestic monetary policy shocks, after controlling for global shocks.[2] This type of analysis has been difficult to carry out because the ap-

[1]Several theory contributions have highlighted how the interplay between balance-sheet constraints and currency mismatches may undermine monetary policy transmission, possibly even leading to contractionary effects from monetary easing (Krugman, 1999; Aghion, Bacchetta and Banerjee, 2000, 2001; Céspedes, Chang and Velasco, 2004; Christiano, Gust and Roldos, 2004; Cook, 2004). Cavallino and Sandri (2023) show that similar effects can also arise in emerging markets with thin financial markets, even absent currency mismatches.

[2]Note that the paper does not challenge the evidence about emerging markets' sensitivity to global

proaches used to identify monetary policy shocks in advanced economies cannot be easily replicated across a large set of emerging markets. Relying on a narrative approach is impractical because it is time intensive and due to the challenges posed by different languages and communication strategies across central banks. Similarly, the high-frequency approach is impaired by the lower level of financial market development in these economies. Intra-day data is often unavailable for analyzing interest rate changes in narrow intervals surrounding monetary policy decisions and short-term bond yields are more likely to be influenced by liquidity conditions and risk premia.

In this paper we overcome these challenges by constructing a new set of monetary policy shocks for emerging markets based on the forecasts of policy rate decisions made by analysts of major financial institutions and research and consultancy companies. Our approach mimics the one used in the high-frequency identification literature. The identification assumption is that analysts—just like investors—construct their forecasts of interest rate decisions by incorporating the endogenous reaction of monetary policy to economic conditions. Hence, analysts' forecast errors can be leveraged to isolate exogenous variation in monetary policy decisions.

The credibility of our identification assumption critically hinges on the fact that analysts must be able to revise their forecasts until the time of the monetary policy meeting. This is essential to ensure that analysts can incorporate any data release that may influence the monetary policy decision. To satisfy this condition, we use analysts' forecasts of policy rate decisions collected by Bloomberg ahead of each monetary policy meeting. These forecasts are available for a set of 18 emerging markets, starting in several cases already in the early 2000s. Analysts can submit and revise their forecasts any time prior to the meeting, thus being able to incorporate new information relevant to the policy decision. This is a crucial advantage over other surveys in which analysts are asked to provide forecasts on specific days, which could be weeks before the monetary policy meeting. For example, Blue Chip Financial Forecasts collects forecasts only at the beginning of each month and is limited to the US. Consensus Economics covers a number of emerging markets but still collects analysts' forecasts only on the third Monday of each month. An additional valuable aspect of the Bloomberg survey is that analysts have an incentive to submit accurate forecasts because their submissions are visible to Bloomberg users and because Bloomberg computes and displays a ranking of the top forecasters.

By examining Bloomberg forecasts, we provide suggestive evidence that analysts tend to provide accurate forecasts of interest rate decisions by incorporating information up

financial conditions. Instead, it asks a different question, namely whether emerging markets' monetary policy retains traction on domestic conditions after controlling for global conditions.

to the time of the policy meeting. For example, almost all forecasts are submitted in the two weeks prior to the policy meetings. In addition, when policy rate decisions are more uncertain—captured by a larger forecast dispersion across analysts—forecasts are generally submitted closer to the policy meeting, indicating that analysts try to gather more information to improve their predictions.

To further ensure that forecast errors are free from any endogenous variation in monetary policy driven by macroeconomic developments, we orthogonalize them with respect to a broad range of macroeconomic and financial variables available before each policy meeting. As discussed by Bauer and Swanson (2023*b*), this procedure also removes systematic variation in monetary policy that might be missed by analysts because of imperfect knowledge of the central bank's policy reaction function. For example, Cieslak (2018), Schmeling, Schrimpf and Steffensen (2022), and Bauer and Swanson (2023*a*) show that analysts—as well as financial markets—tend to underestimate the strength of the Fed's response to the business cycle. We find similar results for emerging markets. Stronger price dynamics and real economic indicators tend to generate positive monetary policy surprises, suggesting that analysts underestimate central banks' determination to act countercyclically. We refer to our residualized forecast errors as *monetary policy shocks*.

We proceed to examine the effects of monetary policy shocks on financial markets in the days following monetary policy decisions. Consistent with the evidence from advanced economies, monetary policy has pronounced effects on sovereign bond yields even in emerging markets. Positive monetary policy shocks increase yields in a persistent manner and for both short- and medium-term maturities. Monetary policy shocks also tend to appreciate the exchange rate and reduce stock prices but these effects are short-lived.

We then assess the transmission of monetary policy to macroeconomic conditions. We do so using a panel regression specification that makes it possible to control for global shocks—arising for example from commodity prices and global financial conditions—that are well-known to strongly impact emerging markets (Rey, 2015; Miranda-Agrippino and Rey, 2020; Kalemli-Özcan, 2019). We find results that are consistent with theory predictions and broadly in line with the evidence from advanced economies. A monetary policy tightening depresses economic activity. Industrial production declines fairly rapidly, reaching a trough after about 3 quarters. The unemployment rate increases more gradually but also more persistently. Tightening monetary policy also reduces inflationary pressures. The impact is relatively rapid on producer prices while consumer prices decline after a longer lag. We also find evidence that the exchange rate tends to appreciate in response to a monetary policy tightening.

Lastly, we examine the transmission of monetary policy using firm-level data. This makes it possible to explore possible heterogeneity in the impact of monetary policy shocks depending on firms' financial conditions. Echoing the evidence from advanced economies, we find that a monetary policy tightening has considerably stronger contractionary effects on fixed capital investment by highly leveraged firms. We also find some evidence of stronger investment responses among firms with lower liquidity or that do not pay dividends. These results confirm that financial frictions are important determinants of monetary transmission even in emerging markets.

In summary, the analysis provides encouraging evidence regarding the effectiveness of monetary policy in emerging markets. Using our carefully constructed monetary policy shocks, we find that monetary policy wields considerable influence on financial markets, macroeconomic conditions, and firm-level decisions.

1.1 Literature review

The paper builds on the literature that uses monetary policy shocks based on high-frequency identification to examine the transmission of monetary policy in advanced economies (Ramey, 2016). Various studies have focused on the effects of monetary policy on financial markets, including on bond yield, stock prices, and exchange rates (Kuttner, 2001; Cochrane and Piazzesi, 2002; Bernanke and Kuttner, 2005; Gürkaynak, Sack and Swanson, 2005; Hanson and Stein, 2015; Gilchrist, López-Salido and Zakrajšek, 2015; Nakamura and Steinsson, 2018; Andrade and Ferroni, 2021; Swanson, 2021). Several papers have also used monetary policy shocks based on high-frequency identification to study the effects of monetary policy on macroeconomic variables. For example, Gertler and Karadi (2015) use high-frequency monetary policy shocks as external instruments in a VAR to examine monetary policy transmission to credit conditions, inflation, and industrial production in the US. Jarociński and Karadi (2020) and Miranda Agrippino and Ricco (2021) analyze the impact of monetary policy shocks on macroeconomic variables by controlling for possible information effects that might be associated with monetary policy announcements.[3] Bauer and Swanson (2023*b*) extend the set of monetary policy shocks in the US by considering market reactions to press conferences, speeches, and Congressional testimonies by the Fed chair. In this paper, we provide novel evidence about the effects of monetary policy on both financial markets and macroeconomic conditions in emerging markets by leveraging our newly constructed monetary policy shocks.

Still in the context of advanced economies, considerable progress has also been made

[3]The concern is that monetary policy announcements may trigger interest rate reactions because they convey news about economic conditions rather than signaling an exogenous shift in the monetary stance. See also Romer and Romer (2000) and Nakamura and Steinsson (2018).

in examining the heterogeneity of monetary transmission across firms. Much of this literature has focused on the role of financial constraints in shaping firm responses to monetary policy shocks. Based on data for publicly listed US firms, monetary policy has been found to have a stronger impact on investment among firms with lower leverage (Ottonello and Winberry, 2020), lower liquidity (Jeenas, 2019), and that are younger and do not pay dividends (Cloyne et al., 2023). Extending the analysis to private firms, Caglio, Darst and Kalemli-Özcan (2021) show that monetary policy affects highly leveraged firms more strongly through the effect on earning-based collateral. Building on this literature, we show that monetary policy tends to have stronger effects on highly leveraged firms also in emerging markets.

Our paper is also related to recent studies that share our goal to shed light on monetary transmission in emerging markets. Brandão-Marques et al. (2021) construct monetary policy shocks for a panel of 39 emerging markets and developing economies using Taylor rule residuals, by regressing short-term rates on macroeconomic conditions and forecasts of GDP growth and inflation. Deb et al. (2023) follow a similar approach to construct monetary policy shocks for a sample of 10 emerging markets and 23 advanced economies. However, instead of regressing short-term rates on current and expected macroeconomic variables, they regress interest rates in deviations from analysts' forecasts collected three months ahead.

Relative to these papers, we strengthen the identification of monetary policy shocks along two key dimensions. First, our shocks are constructed based on unexpected movements of policy rates rather than short-term market rates. As shown in De Leo, Gopinath and Kalemli-Özcan (2022), this distinction is particularly important in emerging markets since short-term rates can considerably deviate from policy rates due to risk premia. Hence, monetary policy shocks are better identified by examining surprise movements in policy rates rather than in short-term rates. Second, we construct forecast errors using analysts' forecasts collected by Bloomberg up to the time of the monetary policy meetings rather than several months before. As discussed previously, this is crucial to ensure that analysts can incorporate any data release prior to the monetary policy meeting that could influence the policy rate decision.

Monetary policy shocks based on Bloomberg analysts' forecasts have also been used by Aruoba et al. (2021) to examine monetary transmission in Chile.[4] Consistent with our results, they find that a monetary tightening leads to a contraction in economic activity and inflation. Choi, Willems and Yoo (2024) also use Bloomberg forecasts to construct

[4]See also Meyer (2006) and Pescatori (2018) for other studies of monetary policy transmission in Chile using Bloomberg survey data.

monetary policy shocks for a few emerging markets in selected years. Their project examines differences in monetary transmission across industries based on a sample of 102 countries. Relative to these studies, we compile a database of monetary policy shocks for 18 emerging markets, entirely based on Bloomberg forecasts to enhance cross-country comparability. Furthermore, we orthogonalize analysts' forecast errors based on an array of financial and macroeconomic variables to account for possible misperceptions of central banks' reaction functions, as documented in Bauer and Swanson (2023*a*). Witheridge (2024) proposes an alternative identification strategy for monetary policy shocks in 5 emerging markets, using 1-day changes in the forward exchange rate premium around monetary policy announcements. The identification assumption is that monetary policy does not affect covered interest rate parity deviations. Based on these shocks, he finds that monetary tightening leads to an immediate and persistent *increase* in consumer prices, without impacting economic activity. In contrast, Willems (2020) finds that large monetary tighteners lead to declines in economic activity and inflation in both advanced and emerging economies.

2 A novel dataset of monetary policy shocks in EMs

In this section, we describe the construction of our monetary policy shocks. We proceed in two steps. We first compute monetary policy surprises for each monetary policy meeting based on analysts' forecast errors. We then orthogonalize these monetary policy surprises with respect to data and forecasts available up to the monetary policy meetings to further remove any predictable variation in policy rate decisions.

2.1 Monetary policy surprises

We construct forecast errors of policy rate decisions using financial analysts' forecasts collected by Bloomberg. These forecasts are available for 18 emerging market economies, going back for several countries to the early 2000s.[5] We consider forecasts up to the end of 2022.[6] Our dataset includes a total of 58,321 policy rate forecasts for 2,522 monetary policy meetings.

[5] As shown in Appendix Figure A.1, our sample of analysis includes countries at a considerably lower level of economic and financial development relative to advanced economies. Our country sample is broadly representative of the full set of emerging markets in terms of per capita GDP, domestic financial development, and international financial integration.

[6] In the case of Hungary, since 2016 the overnight deposit rate differed from the base rate, which is the focus of the Bloomberg survey. The results are robust from excluding this period.

An important prerequisite for using analysts' forecasts to identify monetary policy shocks is that such forecasts should incorporate all information relevant to the monetary policy decision up to the time of the policy meeting. Most surveys—including those commonly used in the literature such as Blue Chip Financial Forecasts or Consensus Economics—fail to satisfy this condition since they collect analysts' forecasts at a specific point in time which could be days or weeks before a monetary policy meeting. In these cases, new information (e.g., events or data releases) between the analysts' submissions and the monetary policy meeting may generate an endogenous response by central banks that would be missed by the forecasts, thus invalidating the identification of the monetary policy shocks.

In contrast, Bloomberg allows analysts to submit and update their policy rate forecasts any time prior to the monetary policy meeting. Therefore, analysts can wait for any data release that they think could influence the monetary policy decision. Furthermore, they can revise their submissions in light of new economic or financial shocks up to the day of the meeting.[7] Analysts have incentives to submit accurate forecasts because their company's name is visible to Bloomberg users and because Bloomberg creates rankings of the best forecasters.

Figure 1a shows the distribution of analysts' forecasts relative to the submission day prior to the meeting. Almost all forecasts—97.1 percent of the total sample—are submitted in the two weeks preceding the meetings. We conduct the analysis using this subset of forecasts. Submission rates are particularly high during the last week before the meeting, suggesting that analysts tend to incorporate information relevant to the monetary policy decision up close to the meeting.

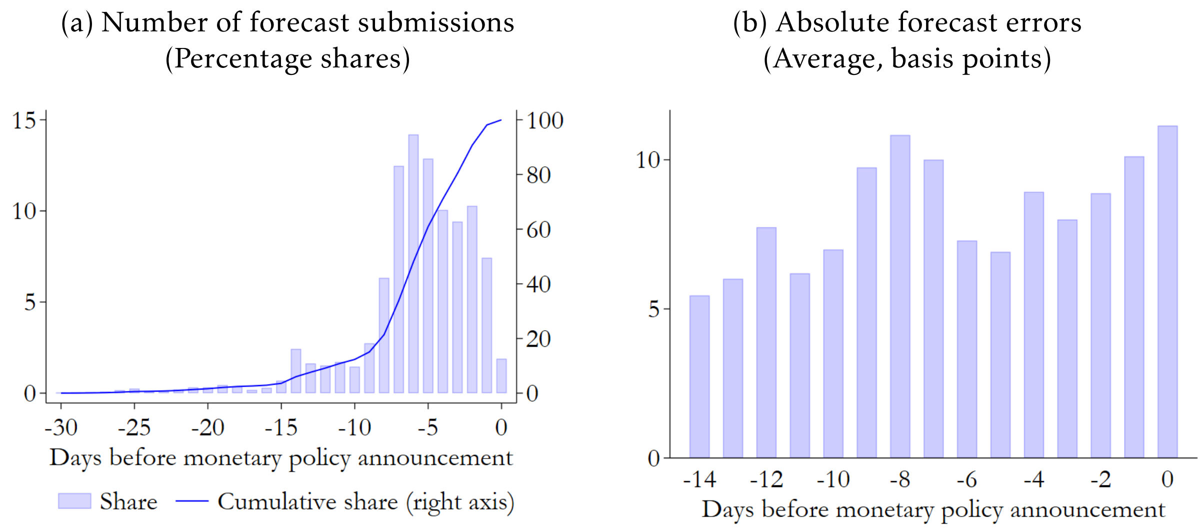
Another indication that analysts are attentive to new information that may affect the monetary policy decision comes from the distribution of forecast errors depending on the submission date. We compute the forecast error of analyst a for the policy rate decision in country c at time t as

$$FE_{a,c,t} = i_{c,t} - f_{a,c,t} \tag{1}$$

where $i_{c,t}$ is the policy rate decision and $f_{a,c,t}$ is analyst a's forecast. Figure 1b shows the average absolute forecast errors conditional on the submission day relative to the date of the policy meeting. If analysts submitted their forecasts at random times—irrespective of new data releases and shocks that may influence the monetary policy decision—the average absolute forecast errors should decline as we approach the meeting since later submissions could leverage more recent information. In contrast, absolute forecast errors

[7]While analysts can revise their submissions at any time before the monetary policy meeting, we only observe the last submission.

Figure 1: Forecast distributions by submission day prior to the meeting



Notes: The left panel shows the distribution of forecast submissions during the 30 days prior to the monetary policy announcements. The right panel plots the average absolute forecast errors based on the submission date before the monetary policy announcement.

display, if anything, a tendency to increase as the meeting date approaches.

To explore this aspect more formally, we regress the absolute forecast errors on the submission day relative to the meeting, $day_{t,c,a}$,

$$|FE|_{a,c,t} = \alpha_a + \alpha_{c,t} + \beta day_{a,c,t} + \varepsilon_{a,c,t} \tag{2}$$

Note that the variable $day_{a,c,t}$ captures the number of days between the submission date and the monetary policy meeting. Hence, higher values denote forecasts submitted further in advance of the meeting. The regression also controls for analyst fixed effects, α_a, capturing for example differences in forecasting ability across analysts, and monetary policy meeting fixed effects, $\alpha_{c,t}$, which account for differences in forecast errors across meetings.

Table 1 reports the regression results. Column (1) confirms the evidence in Figure 1b, showing that earlier submissions are associated with lower (not higher) absolute forecast errors. What can account for this finding? One conjecture is that analysts who are generally less accurate tend to submit their forecasts closer to the meeting, possibly in an effort to improve their performance. However, column (2) shows that earlier submissions remain more accurate even if we control for analysts' fixed effects.

An alternative hypothesis is that analysts submit their forecasts closer to the policy meeting when there is higher uncertainty about the policy rate decision, and thus larger

Table 1: Timing of forecast submissions

	Absolute forecast error				Number of days before the meeting
	(1)	(2)	(3)	(4)	(5)
Number of days before the meeting	-0.15***	-0.24***	0.02	-0.01	
	(0.03)	(0.03)	(0.02)	(0.02)	
Standard deviation of forecast errors					-1.32***
					(0.11)
Observations	56,223	55,498	56,222	55,498	55,498
R-squared	0.00	0.19	0.69	0.71	0.30
Forecaster fixed effects	No	Yes	No	Yes	Yes
Meeting fixed effects	No	No	Yes	Yes	No

Notes: The dependent variable in columns (1) to (4) is the absolute forecast error and the dependent variable in column (5) is the number of days between the forecast submission date and monetary policy meeting. The sample includes all submissions during the 14 days prior to the monetary policy meeting. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1, 5, and 10 percent levels.

ex-post forecast errors. This is consistent with the evidence in columns (3) and (4), showing that the relation between forecast errors and submission dates loses statistical significance once we control for policy meeting fixed effects, with or without analyst fixed effects. In column (5) we directly test for the hypothesis that analysts submit their forecasts closer to the meeting when there is greater uncertainty about the outcome, holding on for more information relevant to the policy decision.[8] We find that meetings characterized by greater uncertainty about the outcome—with a large standard deviation of forecast errors across analysts—are associated with forecast submissions closer to the meeting date. These results show that analysts are not submitting their forecasts at random times before the meeting. They instead intentionally choose when to finalize their submissions in an effort to improve their forecasts, for example waiting to collect more information when the monetary policy decision is more uncertain.

Given that Bloomberg allows analysts to incorporate information relevant to the monetary policy decision up to the time of the policy meeting, analysts' forecast errors can be used to capture the surprise component of the policy rate decision. Specifically, for each policy meeting we construct a measure of the monetary policy surprise $mps_{c,t}$ by

[8] We do so by estimating the following regression $day_{a,c,t} = \alpha_a + \beta SD_{c,t} + \varepsilon_{a,c,t}$ where $SD_{c,t}$ is the standard deviations of the forecasts for the meeting at time t in country c.

averaging the analysts' forecast errors

$$mps_{c,t} = \frac{\sum_a FE_{a,c,t}}{N_{c,t}} \tag{3}$$

where $N_{c,t}$ is the number of forecasts submitted in the two weeks prior to the meeting. Hence, a positive (negative) monetary policy surprise implies that the central bank announced a higher (lower) policy rate than analysts expected on average. Table 2 provides summary statistics of the monetary policy surprises and time coverage for each country. We also construct alternative versions of monetary policy surprises using forecasts submitted within shorter time windows preceding the meeting. As shown in Appendix Table B.1, these alternative series are all tightly correlated.

Table 2: Monetary policy surprises in emerging markets
(basis points)

	Obs.	Mean	Std. dev.	Min	Max	Start date
Brazil	213	-0.6	19.2	-93	115	Jul-99
Chile	237	-1.9	15.4	-140	34	Aug-01
Colombia	214	-1.4	12.8	-50	27	Apr-02
Egypt	92	6.6	46.0	-104	193	Mar-11
Hungary	234	-0.2	12.1	-50	113	Jan-04
India	93	2.4	10.4	-29	30	Jan-07
Indonesia	81	0.5	8.8	-20	31	May-16
Malaysia	111	-0.6	8.0	-34	18	Nov-05
Mexico	156	0.1	9.4	-50	29	Oct-05
Nigeria	71	3.9	49.7	-168	155	May-11
Peru	196	-0.6	9.4	-57	25	Jul-06
Philippines	145	-1.3	14.2	-150	23	Sep-05
Poland	209	-0.5	9.8	-45	40	Jan-04
Romania	119	-2.2	11.9	-59	40	Jun-06
Russia	76	-3.3	33.5	-174	105	Oct-13
South Africa	122	0.0	17.3	-62	55	Nov-01
Thailand	126	-0.3	9.0	-62	24	Jan-07
Türkiye	139	-2.1	60.6	-185	463	Jun-10

Notes: The column "Obs." corresponds to the number of monetary policy decisions during the sample period for each country.

A limitation of our analysis is that monetary policy surprises are constructed based on unexpected movements in *current* policy rates, with no reference to the future interest rate path. This approach overlooks possible shocks stemming from unconventional monetary policy tools—such as forward guidance or asset purchase programs—since they primarily affect expected future short-term rates or current long-term yields. These shocks play an important role in recent analyses of monetary policy transmission in advanced economies (Andrade and Ferroni, 2021; Swanson, 2021). This is because, since the global financial crisis, policy rates have often been constrained by the effective lower bound (ELB), forcing central banks to experiment with unconventional monetary policy tools. However, as illustrated in the Appendix Table A.3, ELB constraints have generally been immaterial in emerging markets where policy rates have remained well above zero. Hence, emerging market central banks could continue to conduct monetary policy via conventional policy rate decisions, without embarking on large-scale asset purchases or attempting to influence market conditions through forward guidance.

How do our monetary policy surprises constructed using analysts' forecasts compare with surprises based on high-frequency movements in financial markets? To address this question, we also construct monetary policy surprises based on Bloomberg forecasts for the US. We compare them against movements in federal funds futures in narrow time windows around FOMC announcements, as constructed by Nakamura and Steinsson (2018) and updated by Acosta (2022). Specifically, we consider changes in federal funds futures for the remainder of the month measured between 10 minutes before and 20 minutes after the FOMC announcement. These market movements isolate the surprise component of Fed decisions regarding the federal fund rate and are thus conceptually identical to our forecast-based monetary policy surprises. Figure 2 shows that our forecast-based surprises closely co-move with market-based surprises. The correlation between these two series is 0.79.[9] The close correspondence between forecast-based and market-based monetary policy surprises in the US echoes the findings of Cieslak (2018), showing a tight correspondence between the Blue Chip forecasts of the federal funds rate and the federal fund futures.[10]

2.2 Orthogonalization procedure

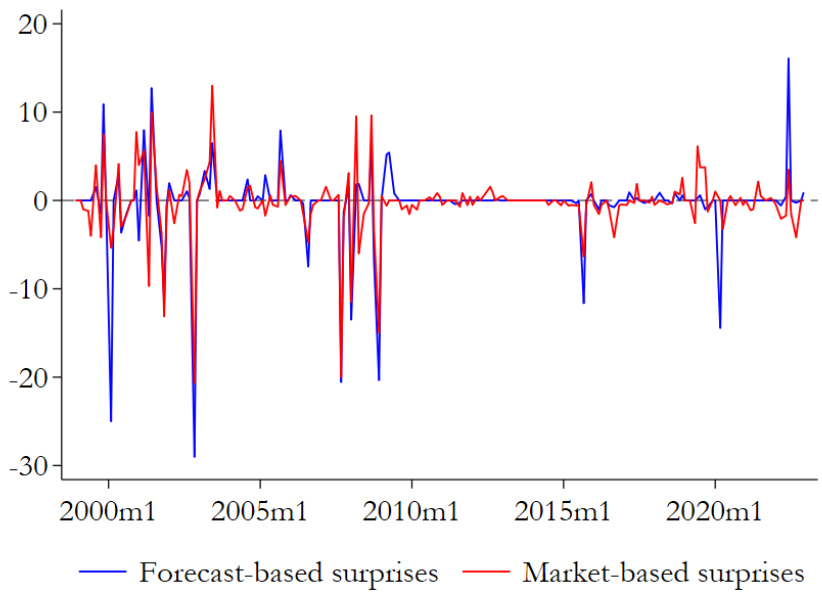
Following Bauer and Swanson (2023*b*), we orthogonalize our survey-based monetary policy surprises with respect to a broad set of macroeconomic and financial variables available before the monetary policy meetings. This is an important step to obtain more accurate measures of monetary policy shocks because of two reasons.

First, there is broad evidence that monetary policy surprises—even if based on high-

[9]Aruoba et al. (2021) also document a similarly high correlation between Bloomberg forecast errors and daily changes in 3-month interest rate swaps around monetary policy announcements for the case of Chile.

[10]Blue Chip forecasts have been collected over a 2-day period near the end of every month since 1983. Bloomberg forecasts are available over a shorter time sample but offer two key advantages for the purpose of our analysis over the Blue Chip forecasts. First, they allow analysts to update their forecasts until the monetary policy meeting to capture information relevant to the monetary policy decision. Second, Bloomberg forecasts are available for many countries, including emerging market economies.

Figure 2: Monetary policy surprises in the US
(Basis points)



Notes: Forecast-based surprises are constructed using analysts' forecast errors of policy rate decisions, based on data collected by Bloomberg. Market-based surprises are constructed using changes in federal funds future rates around monetary policy announcements for the US, following Nakamura and Steinsson (2018) and Acosta (2022).

frequency movements in financial markets—are predictable (Cieslak, 2018). A possible interpretation of these findings is that central banks may have private information about the state of the economy which influences monetary policy decisions and is correlated with past macroeconomic and financial data. For example, Miranda Agrippino and Ricco (2021) document that monetary policy surprises are correlated with the Fed's internal Greenbook forecasts.[11] However, Bauer and Swanson (2023*a*) challenge this view. They show that Greenbook forecasts are just as accurate as Blue Chip forecasts and argue that the predictability of monetary policy shocks is more likely driven by misperceptions about the central bank's reaction function. Our orthogonalization procedure removes predictable components of monetary policy surprises without taking a stance on whether they arise from information aspects or misperceptions about the monetary policy reaction.

A second reason to orthogonalize the monetary policy surprises is to control for possible data releases close to the policy meetings that may trigger an endogenous monetary

[11] See also the literature on the so-called Fed information channel, including Romer and Romer (2000), Campbell et al. (2017), Nakamura and Steinsson (2018), and Cieslak and Schrimpf (2019), Jarociński and Karadi (2020).

policy response but that analysts may have ignored. As previously described, this is unlikely to be a major concern for our analysis since analysts can update their forecasts in Bloomberg any time prior to the meeting if new data releases warrant a reconsideration of the central bank's decision. Yet, the orthogonalization provides an additional layer of reassurance.

We orthogonalize monetary policy surprises by regressing them over a rich set of macroeconomic and financial variables available before the monetary policy meetings that could influence monetary policy decisions. More specifically, we estimate the following equation

$$mps_{c,t} = \alpha_c + \beta_c X_{c,t} + \varepsilon_{c,t} \tag{4}$$

where $X_{c,t}$ is a vector that includes variables measuring price dynamics, real economic activity, and financial market conditions. We use both backward-looking data from Bloomberg, Refinitiv Datastream, and Haver, and forward-looking expectations from Consensus Economics. All variables are expressed in changes between the last data releases before the monetary policy meeting and their values 3 months before (or 12 months before if 3-month changes are not statistically significant). We consider four price indicators, namely changes in headline inflation, in one-year-ahead inflation expectations, in the inflation rate of imported commodities (Gruss and Kebhaj, 2019), and in nominal wage growth. To capture the strength of real economic activity, the vector $X_{c,t}$ also includes the change in the growth rate of industrial production, in the one-year-ahead expected growth rate of industrial production, and in the unemployment rate. Finally, we consider financial market variables, such as the percentage change in the exchange rate expressed in local currency against the US dollar, in its one-year-ahead expected level, and in stock market prices.[12]

We estimate equation (4) country by country. To ensure that our results are not driven by extreme events, we exclude exchange rate crises by removing 24 months of data before and 12 months after exchange rate depreciations that exceed 50 percent within year.[13] The goal is to find variables in the vector $X_{c,t}$ that display a statistically significant correlation with the monetary policy surprises. To this end, we start by including in the regression all variables together and then remove sequentially those with the highest p-value until we remain with regressors that meet the 10 percent threshold for statistical

[12]Changes in the exchange rate and stock prices, are computed based on three-day averages of their values prior to the policy meeting and 3-month earlier. This is to smooth out volatility at the daily frequency, which is unlikely to affect monetary policy decisions. For stock prices, Appendix Table A.1 reports the reference index used for each country.

[13]We identify three instances in our sample: Russia in January 2015, Egypt in December 2016, and Türkiye in August 2022.

significance.[14] Note that we exclude regressors that are not statistically significant since we do not want to orthogonalize the monetary policy surprises with respect to them.

Table 3 reports the coefficient estimates. Monetary policy surprises tend to be correlated in most countries with one or two regressors. However, we detect only modest predictability with an average R-squared of 0.09, confirming that analysts tend to account for almost all the information available before the monetary policy meeting. Egypt is the only country for which we do not detect any predictability of the surprises. Note that there is no theoretical prediction on the sign of the regression coefficients. Yet we find fairly consistent patterns across countries. For example, stronger price dynamics and real economic indicators tend to generate positive monetary policy surprises. Therefore, analysts underestimate central banks' determination to act countercyclically, by raising rates to counter inflationary pressures and strong economic activity. These findings are consistent with those on the US presented by Bauer and Swanson (2023*a*). Furthermore, they may also indicate that forecasters have yet to fully internalize the improvements in the conduct of monetary policy achieved in recent decades by emerging markets (Vegh and Vuletin, 2012, 2014).

[14]We only use regressors that are available for at least 90 percent of the monetary policy meetings for which we have constructed monetary policy surprise. This is to avoid restricting excessively the sample of analysis.

Table 3: Orthogonalization of monetary policy surprises

	Prices				Real variables			Financial variables			R^2
	Inflation rate	Expected inflation	Commodity inflation	Wage growth	IP growth	Expected IP growth	Unempl. rate	Exch. rate	Expected exch. rate	Stock prices	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Brazil			6.0***								0.02
			(2.1)								
Chile		16.6***			0.3*			0.5***			0.19
		(5.2)			(0.2)			(0.2)			
Colombia			4.9			0.2**			0.4*		0.03
			(4.4)			(0.1)			(0.2)		
Hungary	0.7*						-3.0**				0.04
	(0.4)						(1.5)				
India			3.6*				-0.8***				0.17
			(2.1)				(0.3)				
Indonesia		6.7**							0.7*		0.10
		(2.5)							(0.4)		
Malaysia										0.2**	0.03
										(0.1)	
Mexico	3.1**										0.04
	(1.3)										
Nigeria									-1.3**		0.06
									(0.5)		
Peru	4.3***								-0.2***		0.17
	(1.5)								(0.1)		
Philippines							-2.2***	0.8*			0.06
							(0.7)	(0.5)			
Poland			3.7***	0.8**						0.2**	0.14
			(1.4)	(0.4)						(0.1)	
Romania				0.6**		-0.8*					0.11
				(0.3)		(0.4)					
Russia					3.6**						0.22
					(1.4)						
South Africa			6.3**								0.03
			(2.7)								
Thailand				0.8*							0.05
				(0.4)							
Türkiye					1.8*						0.04
					(0.9)						

Notes: The table reports the results of country-by-country regressions in which the dependent variable is the monetary policy surprises expressed in basis points and the independent variables are reported in the columns. All independent variables are expressed in changes between the last data release before each monetary policy meeting and their values 3 months before (or 12 months before in a few cases for which the 3-month changes were not statistically significant). Commodity inflation only refers to imported commodities. ***, **,* denote statistical significance at 1, 5, and 10 percent levels.

By including in the vector $X_{c,t}$ the regressors reported in Table 3, we construct orthogonalized monetary policy surprises, $mps^{\perp}$, as the residuals in equation (4), so that $mps^{\perp}_{c,t} = \varepsilon_{c,t}$. We refer to these orthogonalized monetary policy surprises as monetary policy shocks.

3 Monetary policy transmission to financial markets

In this section, we examine the effects of monetary policy shocks on asset prices around the monetary policy decisions. This event-study approach was pioneered by Cook and Hahn (1989) and Kuttner (2001) and has been extensively used in various subsequent studies on advanced economies. We estimate the following regression to study changes in financial market conditions in the aftermath of the monetary policy meetings

$$y_{c,t+h} - y_{c,t-1} = \alpha^h_c + \beta^h mps^{\perp}_{c,t} + \varepsilon^h_{c,t} \tag{5}$$

where $y^h_{c,t}$ is a financial variable in country c at time t. We consider various financial variables, including yields on government bonds at 1, 2, and 5-year maturities, the EMBI spread, the log of the bilateral exchange rate against the US dollar, and the log of stock prices.[15] We compute changes in asset prices between the closing values on the last market day before the monetary policy announcement and h days ahead.[16] Following Swanson (2021), we examine the results over a relatively long horizon, up to 30 days, to understand the degree of persistence of the effects of monetary policy shocks on financial markets.

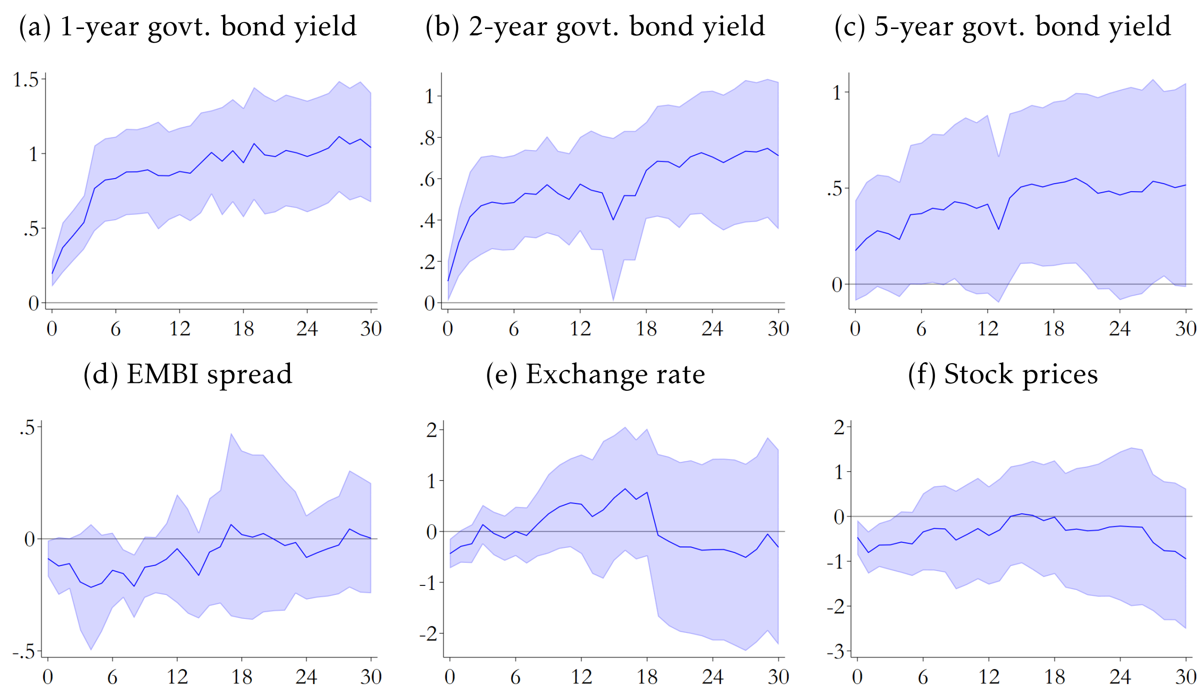
Figure 3 illustrates the regression results, reporting the estimates for β^h for different financial variables. Monetary policy shocks transmit quite strongly to government bond yields. The impact on 1 and 2-year bond yields is positive and statistically significant already on the day of the monetary policy announcement. The effect builds further during the subsequent week. A 1 percent monetary policy shock eventually raises yields on 1 and 2-year bonds by about 100 and 80 basis points, respectively. Monetary policy shocks also tend to increase 5-year bond yields but the effects are more modest and less precisely

[15] Appendix Table A.2 reports the Refinitive Datastream series codes used for government bonds.

[16] In some emerging markets, the stock market closes before the time of the monetary policy announcement. Similarly, the last exchange rate quote may precede the monetary policy announcement. In these cases, we compute the changes in stock prices and in the exchange rate with respect to the closing value of the day preceding the monetary policy announcement. Some studies on advanced economies consider financial market responses in narrower time windows, within a few minutes surrounding a monetary policy announcement (Altavilla et al., 2019; Swanson, 2021). This approach is not viable in emerging markets given limited market liquidity.

estimated. These results are consistent with the observations that our monetary policy shocks are identified based on surprise changes in current policy rates, rather than in the future path of monetary policy. Hence, they are expected to have a stronger impact on shorter-term bond yields. For example, in recent studies on the Euro Area and the US, Altavilla et al. (2019) and Swanson (2021) show that shocks to short-term policy rates affect more strongly short-term bond yields while shocks to the expected path of future interest rates future—for example arising from forward guidance or quantitative easing—tend to affect especially longer-term bond yields.

Figure 3: Financial market responses to a 1pp monetary policy shock
(Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on financial variables during the 30 days following the shock. All regressions include country fixed effects. The lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with robust standard errors.

Turning to other financial variables, a monetary policy tightening tends on impact to appreciate the exchange rate and reduce stock prices. For example, a 1 percent monetary policy shock leads on impact to an appreciation of the exchange rate by 0.5 percent and a drop in stock prices by 0.8 percent. However, these effects are short-lived, losing statistical significance within a few days. We also detect a tendency for bond spreads to decline following a monetary policy tightening but the effects are less precisely estimated.[17]

[17] We use EMBI bond spreads, which consider US dollar-denominated bonds issued by sovereign entities

Appendix Tables B.2 and B.3 present country-level estimates of the impact of monetary policy shocks on financial variables over 1 and 14-day windows, respectively. The results are broadly consistent with those obtained from the panel regressions. For example, whenever statistically significant, the impact of monetary policy shocks on government bond yields is positive. However, there is a considerable degree of heterogeneity in the strength of the impact, especially on the day of the monetary policy announcement. The country-level regressions also confirm that monetary policy shocks tend to appreciate the exchange rate on impact.

4 Macroeconomic effects of monetary policy shocks

We now examine the impact of monetary policy shocks on emerging markets' macroeconomic conditions. A significant challenge in this pursuit is that emerging markets are highly susceptible to global shocks, among which commodity price fluctuations, international trade dynamics, and especially the ebb and flows of the global financial cycle (Rey, 2015; Kalemli-Özcan, 2019; Miranda-Agrippino and Rey, 2020). Controlling for global shocks is thus essential to properly isolate the effect of domestic monetary policy. To this end, we conduct the analysis using panel local projections that allow to purge the effects of any global shocks by including time fixed effects. Specifically, we estimate the following regression specification:

$$Y_{c,t+h} - Y_{c,t-1} = \alpha_c^h + \beta^h I_{c,t} + A^h(L)\Delta Y_{c,t-1} + B^h(L)P_{c,t-1} + \tau_t^h + \epsilon_{c,t}^h \quad (6)$$

The variable $Y_{c,t}$ is a vector including the log of industrial production, the unemployment rate, the log of headline CPI or core CPI, the log of the bilateral exchange rate against the US dollar, and the one-year government bond yield in country c in month t.[18] The parameter $h \geq 0$ captures the horizon of the local projection which extends up to 3 years. As recommended by Montiel Olea and Plagborg-Møller (2021), the regression includes a rich set of lags to capture possible autocorrelation in the dependent variables. Specifically, the vector $\Delta Y_{c,t-1} = Y_{c,t-1} - Y_{c,t-1-12}$ includes yearly changes of the dependent variables and $A^h(L)$ and $B^h(L)$ are matrix polynomials of degree 11, thus allowing for 12 lags. We also control for factors related to the COVID-19 pandemic. The vector $P_{c,t-1}$ includes the log of

with at least 2.5 years until maturity. The EMBI spread is not available for Thailand, in which case we use the CEMBI spread; this tracks the performance of US dollar-denominated corporate bonds with at least 2.5 years until maturity.

[18]Using the nominal effective exchange rate instead of the bilateral exchange rate does not alter the results. For Colombia and Peru, we use two-year yields since one-year yields are not available.

new COVID-19 cases in a given month, an index capturing the stringency of lockdowns, and an indicator for income support and debt relief measures during the pandemic from the Oxford COVID-19 Government Response Tracker. Finally, the regression controls for country and time fixed effects, denoted with α_c^h and τ_t^h, respectively. The inclusion of time fixed effects is critical to control for the large array of global shocks that can substantially impact macroeconomic conditions in emerging markets

The variable $I_{c,t}$ reflects exogenous variations in interest rates associated with monetary policy decisions. Thus, the focus of the analysis is on the regression coefficient β^h which measures the causal effect of monetary policy on the dependent variables. Following Ramey (2016), we first construct $I_{c,t}$ by converting our monetary policy shocks to monthly frequency and estimating equation (6) using OLS.[19] We then show that the results are robust to using our monetary policy shocks as external instruments as in Gertler and Karadi (2015) and Stock and Watson (2018). Given the proverbial volatility of emerging market data, we implement a light data cleaning procedure to ensure that the results are not driven by outliers. Specifically, we trim the 0.25 top and bottom percentiles of the data. Also, to avoid excessive volatility in the impulse response functions, we smooth the series for industrial production, unemployment, and the CPI using three-month moving averages.[20]

The OLS estimation results are reported in Figure 4.[21] In line with the literature, we rescale the monetary policy shocks to generate an increase in bond yields by 1 percentage point on impact. Bond yields remain elevated for about 9 months. The monetary tightening generates a contraction of industrial production of more than 2 percent. This effect starts to materialize with a lag of a few months and peaks 8 months after the shock. We also observe a gradual increase in the unemployment rate, which rises by about 0.5 percentage points. Turning to the effects on prices, the monetary tightening has a fairly rapid impact on producer prices which start to decline about 6 months after the interest rate shock. The effects build over time, leading eventually to a reduction in producer prices of about 6 percent. Regarding consumer prices, core inflation broadly follows the dynamics of producer prices, although the quantitative effects are more modest, with a total cumulative decline of about 2 percent. Headline inflation responds instead with a longer lag, starting to decline about a year after the monetary tightening.

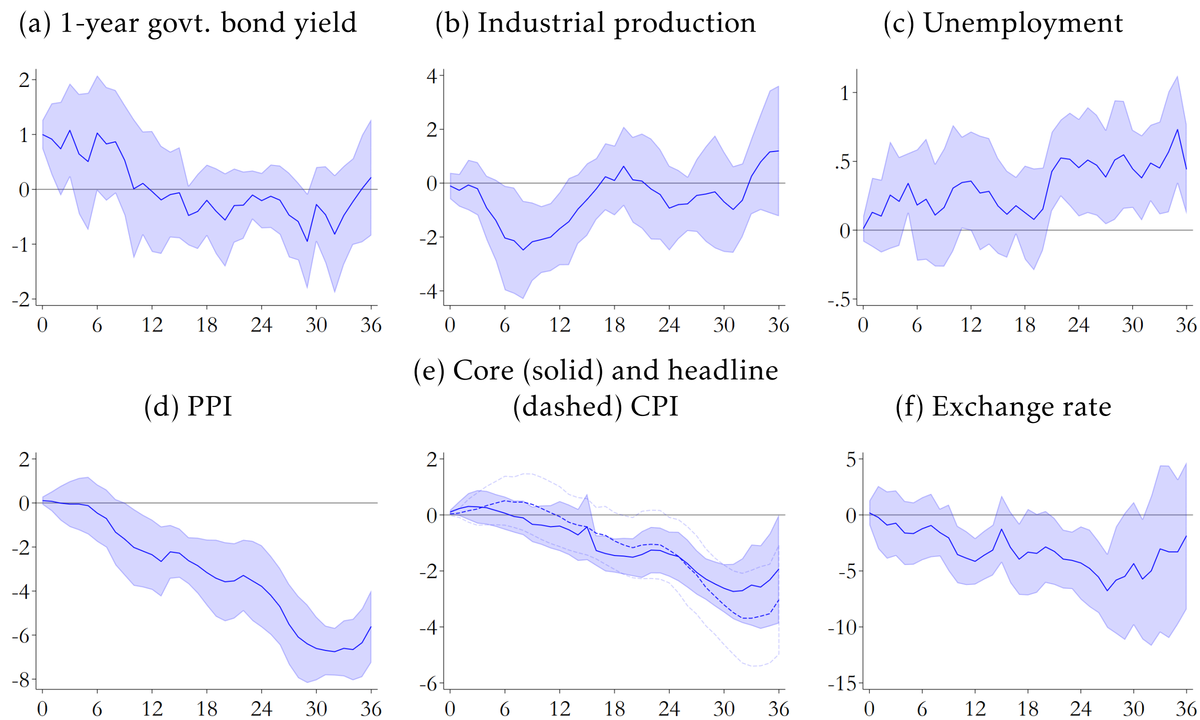
[19]We convert monetary policy shocks to monthly frequency following Bauer and Swanson (2023*b*), by summing all shocks within each month. The financial variables in the regression equation—namely bond yields and the exchange rate—are equal to their average values in the last three working days of each month.

[20]We control for the autocorrelation induced by the moving averages using a rich lag structure and clustering the standard errors by country. Not using moving averages produces similar but more volatile results.

[21]The regressions do not include Nigeria because it lacks monthly industrial production data.

We also detect a tendency for the exchange rate to appreciate in response to the monetary tightening. The effect builds over time, leading to a temporary appreciation of about 5 percent. These results contrast with prior studies on emerging markets that have at times found a puzzling depreciation of the exchange rate in response to a monetary policy tightening (Kohlscheen, 2014; Hnatkovska, Lahiri and Vegh, 2016). Using our novel set of monetary policy shocks and a more recent sample of analysis, our results show no evidence of such an exchange rate puzzle.

Figure 4: Macroeconomic responses to a 1pp monetary policy shock
(Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on macroeconomic variables during the 36 months following the shock. All regressions include lags for the dependent variable and for the controls, as well as country and time fixed effects. The lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the country level.

We now test for the robustness of our estimates to using our monetary policy shocks as external instruments. In this case, the variable I_t in equation (6) is the 1-year yield on sovereign bonds which is instrumented using our monetary policy shocks while controlling for the other regressors in equation (6). As discussed in Stock and Watson (2018), the main rationale for using this instrumental variable (IV) approach comes from the observation that monetary policy surprises around monetary policy announcements may capture only a subset of all monetary shocks. For example, Swanson (2023) shows that in the case of the US speeches by the Fed Chair are an important additional source of monetary policy shocks. This, however, is likely to be less of a concern for emerging economies, since central banks tend to communicate less frequently outside of monetary policy meetings.

Figure 5 reports the impulse responses based on the IV estimation and Appendix Figure B.1 shows that first-state F-statistics are well above the reference critical value.[22] The IV estimates are remarkably similar to the OLS results in Figure 4. This confirms that in emerging markets monetary policy shocks tend to originate mostly around policy announcements, so instrumentation is not essential to capture additional sources of shocks.

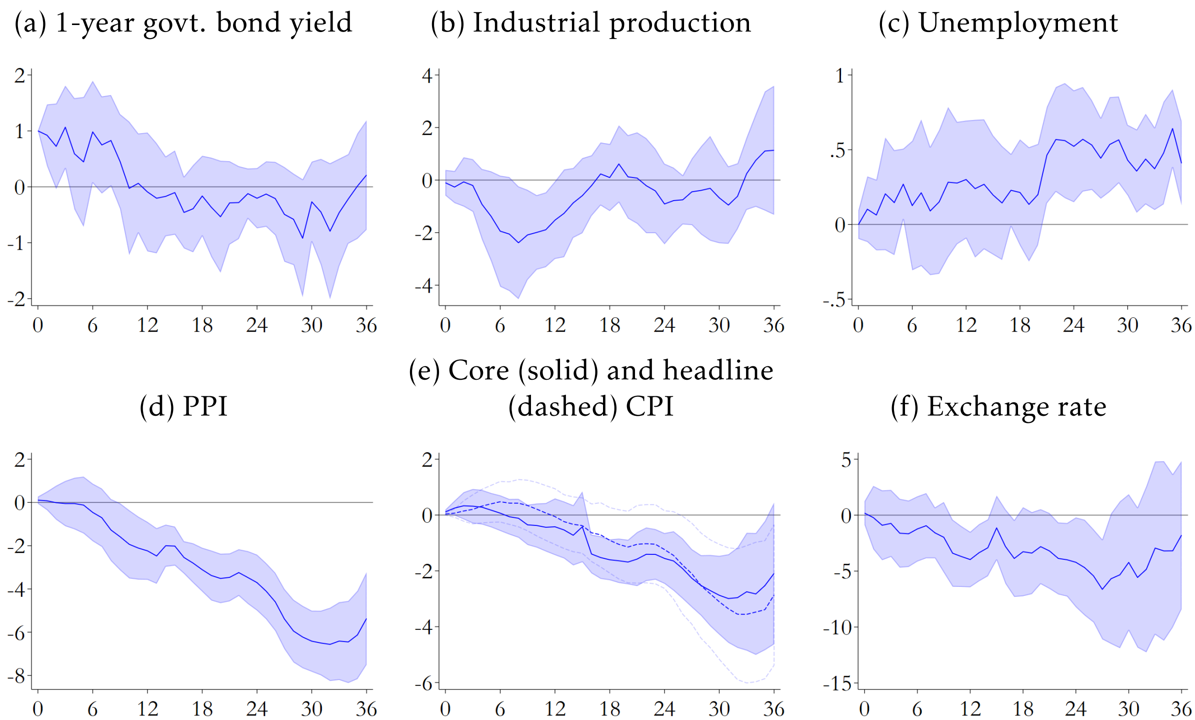
We subject our results to two additional robustness tests. First, we assess the importance of the orthogonalization procedure in the construction of the shocks. The results in Figure 4 use our orthogonalized monetary policy surprises as monetary policy shocks. In Appendix Figure B.2, we replicate the analysis without the orthogonalization. The point estimates still suggest patterns consistent with the results based on the orthogonalized shocks. This is not surprising considering that the orthogonalization procedure detects limited predictability of the policy rate decisions beyond the analysts' forecasts, as discussed in section 2.2. However, when the shocks are not orthogonalized, the estimated effects are quantitatively smaller and the confidence bands are considerably wider. Therefore, in line with Bauer and Swanson (2023*b*), the orthogonalization procedure is important to improve the precision of the estimates.

Second, we re-estimate the local projections excluding Egypt and Malaysia, the only two countries that did not have an inflation targeting regime during our sample period. As shown in Appendix Figure B.3, the point estimates remain largely unchanged. Restricting the sample to inflation targeting countries leads, however, to a considerable reduction in the confidence bands surrounding the CPI impact. We also see a faster and stronger impact on the unemployment rate.

How do our estimates about the impact of monetary policy in emerging markets compare to those for advanced economies? Bauer and Swanson (2023*b*) provide a comprehensive recent analysis of monetary transmission based on US data. Our estimates are broadly consistent with their results. In the US, industrial production reaches a peak

[22] IV analyses of monetary policy transmission in the literature often suffer from weak instruments. This is not the case in our study. Figure B.1 reports the effective F-statistic for weak instruments of Montiel Olea and Pflueger (2013) from the first stage of the IV estimations, as recommended by Andrews, Stock and Sun (2018). The reported critical value corresponds to the rule of thumb of 10 and the critical value from Montiel Olea and Pflueger (2013), which allows testing the null hypothesis that the Nagar bias is 10 percent larger relative to a worst-case benchmark.

Figure 5: Macroeconomic responses estimated using an IV approach
(Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on macroeconomic variables during the 36 months following the shock. Regressions are estimated using an IV approach in which the orthogonalized monetary policy shocks are instruments for 1-year sovereign bond yields. All regressions include lags of the dependent variable and the controls, as well as country and time fixed effects. The lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the country level.

contraction after about 8 months, in line with our results. The magnitude of the impact is also similar. A 1 percent increase in bond yields triggered by a monetary policy tightening is associated with a peak drop in US industrial production ranging between 1.6 to 2.8 percent, against 2.5 percent in emerging markets. The unemployment rate also tends to increase by similar magnitudes, rising by about 0.5 percentage points in both the US and across emerging markets. Regarding the effects on inflation, the estimates for the US suggest a maximum CPI decline between 0.8 and 4 percent, depending on different econometric specifications and sample periods. Our estimates are on the higher end of this range, indicating that Phillips curves in emerging markets are likely steeper than in the US. This result is consistent with Willems (2020) who finds that large monetary tightenings entail a lower sacrifice ratio in emerging markets than in advanced economies.

5 Monetary transmission across firms

In the previous section, we examined the effects of monetary policy on macroeconomic aggregates. We now turn to assess the properties of monetary transmission using firm-level data. Recent studies based on advanced economies have shown that monetary policy affects firms differently depending on their financial characteristics, likely reflecting the role of borrowing constraints (Ottonello and Winberry, 2020; Cloyne et al., 2023; Caglio, Darst and Kalemli-Özcan, 2021). Building on these insights, we test whether monetary transmission also has heterogeneous effects across firms in emerging markets based on their financial conditions. This is a particularly important area of research for emerging markets given that borrowing constraints should be even more pervasive than in advanced economies because of a lower level of financial development and higher risk premia.

We conduct the analysis using data for publicly listed firms provided by Refinitiv Datastream. These data are available at a quarterly frequency and include a rich set of information regarding income flows and balance-sheet positions. Our sample includes 9,378 firms.[23] Appendix Table A.4 reports country-level summary statistics of the data. We first examine the average impact of monetary policy across all firms by estimating the following local projections

$$y_{f,t+h} - y_{f,t-1} = \alpha_f^h + \beta^h I_{c,t} + A^h(L)\Delta y_{f,t-1} + B^h(L)X_{c,t-1} + \tau_{s,t}^h + \epsilon_{f,t}^h \quad (7)$$

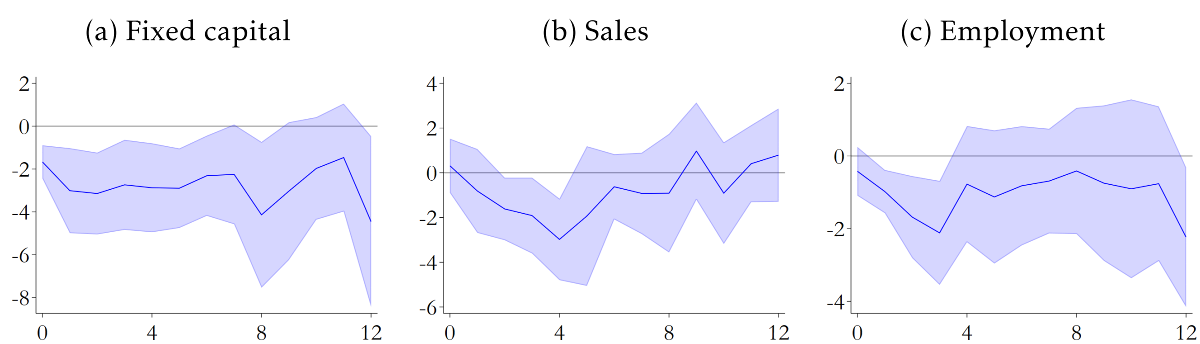
The regression specification mimics the structure used for the macro-level analysis in equation (6). The vector $y_{f,t}$ includes firm-level outcomes, such as sales, fixed capital, and inventories that we deflate using the country-level PPI. Note that we use the subscript f to denote individual firms. The variable $I_{c,t}$ is the sum of our monetary policy shocks in quarter t in country c. The regression controls for 4-quarter lags of both firm-level and country-specific variables. Specifically, the vector $\Delta y_{f,t-1}$ captures year-on-year changes in the firm-level dependent variables and the vector $X_{c,t-1}$ includes the country-level controls used in equation (6), namely changes in the macroeconomic variables $\Delta Y_{c,t-1}$ and the pandemic-related indicators $P_{c,t-1}$. The firm-level local projections also allow to control for firm fixed effects α_f^h and for sector-time fixed effects $\tau_{s,t}^h$, which remove variation in the data caused by sectoral shocks as well as global shocks that may affect sectors heterogeneously.

We estimate equation (7) considering all firms with at least 5 years of data and drop-

[23] In line with the literature, we exclude firms that operate within the public sector or in the finance, insurance and real estate sectors.

ping observations with quarter-on-quarter growth rates of the dependent variable above 200 percent. We cluster the standard errors by firm and time. The estimates for β^h are reported in Figure 6. As in the previous country-level analysis, we examine the impact of a contractionary monetary policy shock that generates a 1 percent increase in the one-year bond yield. In line with theoretical predictions, we find that a monetary tightening deters investment, reduces sales, and lowers employment. The fixed-capital stock and sales decline by about 3 percent, while employment falls by about 2 percent. The transmission lags are also consistent with priors. The monetary policy shock generates a swift contraction in investment, consistent with the increase in borrowing costs and the expected contractionary effects on demand triggered by the monetary tightening. Sales contract instead with a lag of about 3 quarters, in line with the delayed effects of monetary policy on household consumption. Employment contracts within the first year of the monetary policy tightening and then again after three years, broadly in line with the dynamics for the unemployment rate estimated based on macroeconomic data.

Figure 6: Firm-level responses to a 1pp monetary policy shock
(percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on firm-level variables during the 12 quarters following the shock. All regressions include lags for the dependent variable and for the controls, as well as firm and sector-time fixed effects. The lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the firm and time level.

Does the transmission of monetary policy depend on firms' financial characteristics? To address this question, we expand the regression equation (7) to include an interaction term between the monetary policy shocks and firms' financial characteristics F_j

$$y_{f,t+h} - y_{f,t-1} = \alpha_f^h + \left(\beta^h + \gamma^h F_f\right) I_{c,t} + \phi^h F_f + A^h(L)\Delta y_{f,t-1} + B^h(L) X_{f,t-1} + \tau_{s,t}^h + \epsilon_{f,t}^h \quad (8)$$

The variable F_f is alternatively defined as the firm's leverage, firm's liquidity, or a dummy indicator capturing whether the firm pays dividends.[24] These financial indicators have been used in the literature to capture the tightness of financing constraints. Firms with higher leverage, lower liquidity, and that do not pay dividends are expected to face tighter financing constraints. The variable F_f is set equal to the median value of leverage or liquidity for a given firm during the estimation period; and takes value of 1 if firms ever pay dividends and zero otherwise.

In line with the literature, we focus on the extent to which firms' financial conditions shape the impact of monetary policy on fixed capital investment. This is because investment decisions are directly controlled by the firm—unlike sales that also depend on demand—and are influenced by financing constraints since they often require external finance. The top row in Figure 7 shows the impact of a monetary policy shocks on investment, depending on the level of firm's leverage, liquidity, and by differentiating firms that pay dividends or do not.[25] The bottom row displays the estimates for the interaction coefficient γ^h which indicate if the differences across firms are statistically significant.

Note that when focusing on the estimates for γ^h, we can improve identification by using a regression specification which includes country-sector-time fixed effects. This allows controlling for any aggregate domestic shock that may impact firm investment beyond monetary policy, including for example the effects of fiscal policy or structural reforms. More specifically, the bottom row estimates for γ^h reported in Figure 7 are obtained by estimating the following regression

$$y_{f,t+h} - y_{f,t-1} = \alpha_f^h + \gamma^h F_f I_{c,t} + \phi^h F_f + A^h(L)\Delta y_{f,t-1} + \tau_{c,s,t}^h + \epsilon_{f,t}^h \tag{9}$$

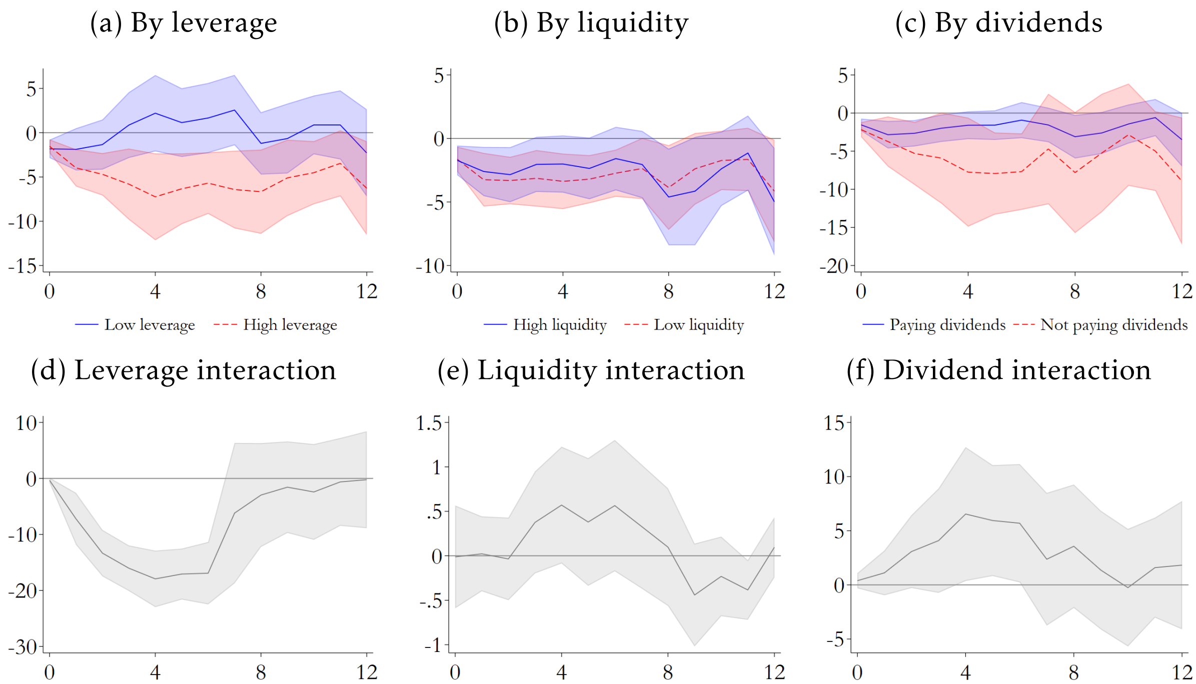
where $\tau_{c,s,t}^h$ are country-sector-time fixed effects. Using this specification, we can test whether firms' financial conditions affect the impact of monetary policy but we can no longer recover the average impact of monetary policy on firms' outcomes.

The results show that monetary policy tends to have a stronger impact on firms facing tighter financial conditions. The leverage position emerges as a particularly important factor in shaping the reaction of firm investment to monetary policy shocks. Consistent with the findings of Caglio, Darst and Kalemli-Özcan (2021) in the US, we find that firms with higher leverage reduce investment more strongly and persistently in response to a monetary policy tightening than firms with lower leverage. In fact, firms with sufficiently low leverage do not reduce investment, possibly because they see opportunities to gain

[24] Leverage is given by the ratio between firms' assets and liabilities. Liquidity is defined as ratio of current assets to current liabilities.

[25] We compare firms with leverage and liquidity levels equal to the 10 and 90 percentiles of the sample distribution.

Figure 7: Heterogeneous responses of fixed capital across firms
(Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on firm-level variables during the 12 quarters following the shock, differentiating across firms' financial characteristics. All regressions include lags for the dependent variable and for the controls. The panels in the first row are generated from regressions that include firm and sector-time fixed effects; panels (a) and (b) compare firms with leverage and liquidity ratios equal to the 10th and 90th percentiles of the sample distribution respectively, and panel (c) compares firms that paid dividends in their past to firms that never did. Panels in the second row are generated from regressions that include country-sector-time fixed effects and display the coefficient estimates for the interaction terms. The lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the firm and time level.

market shares relative to highly leveraged firms that have to cut investment. In line with the findings of Jeenas (2019) and Cloyne et al. (2023) using US data, our point estimates also suggest a stronger investment response by firms with lower liquidity and that do not pay dividends. However, differences are quantitatively more modest and less precisely estimated.

The role of leverage in shaping investment responses to monetary policy shocks is consistent across several robustness checks. As illustrated in Appendix Figure B.4, higher leverage continues to amplify the impact of monetary policy on investment even if we consider a more homogeneous set of firms, limiting the sample to those operating in the manufacturing sector. The results also hold if we estimate equation (8) using firms' time-varying (lagged) leverage rather than the median levels over time. Finally, we verified that our results hold even if we rescale firms' leverage by the average country level. This step is important to ensure that our findings are not driven by variation in leverage across countries that could be correlated with other country-specific characteristics affecting monetary transmission.

6 Conclusions

A large literature has examined in great detail the nature and strength of monetary transmission in advanced economies. The empirical evidence shows that monetary policy can significantly stir financial and macroeconomic conditions in line with theoretical predictions. However, considerable doubts remain about the effectiveness of monetary policy transmission in emerging markets because of the lower level of financial development, greater exposure to global financial shocks, and weaker credibility of institutions. Empirical analyses on monetary transmission in emerging markets remain scarce, mostly due to the challenges in the identification of monetary policy shocks. For example, the limited degree of financial market development—one of the possible impairments to monetary transmission—prevents using high-frequency identification techniques that have become central to the analysis of monetary policy in advanced economies.

This paper provides novel evidence about monetary policy transmission across a set of 18 emerging markets. A key contribution of the paper is to build a novel dataset of monetary policy shocks based on analysts' forecasts of policy rate decisions. Critical to the identification strategy, we use survey data from Bloomberg which allows analysts to submit and revise their forecast of interest rate decisions until the time of the meeting. Analysts can thus incorporate any data release that may influence the monetary policy decision. Therefore, analysts' forecast errors can be used to construct a measure of the monetary policy surprise associated with individual meetings, capturing policy rate decisions that are exogenous to economic and financial developments. To further ensure that these monetary policy surprises are free from endogenous monetary policy responses, we orthogonalize them with respect to a rich set of variables known prior to each policy meeting.

Using our newly constructed monetary policy shocks, we present a rich set of novel results on monetary policy transmission in emerging markets. The results indicate that monetary policy in emerging markets exercises considerable traction on financial and macroeconomic conditions. Starting from the effects on financial markets in the days after the monetary policy announcements, we find that monetary policy has highly significant and persistent effects on sovereign bond yields, at both short- and medium-term maturities. A monetary tightening also generates a temporary appreciation of the exchange rate and a reduction in stock prices. Turning to the macroeconomic effects, monetary tightening leads to a contraction in real economic activity, as reflected in a temporary drop in industrial production and a gradual increase in the unemployment rate. Furthermore, monetary tightening considerably curbs inflationary pressure, with a rapid pass-through to producer prices and a more delayed effect on consumer prices. We also examine the transmission of monetary policy to firm-level variables. Consistent with evidence from advanced economies, we find that monetary policy has a stronger impact on the investment decisions of more leveraged firms.

In summary, our results provide encouraging evidence about the effectiveness of monetary policy transmission in emerging markets. Emerging markets' appear to be capable of influencing domestic financial and macroeconomic conditions in accordance with theoretical predictions. These findings also inform the debate on the vulnerability of emerging markets to global financial conditions. A large literature has documented that global financial shocks can considerably influence financial conditions in emerging markets, casting doubts on the effectiveness of monetary policy transmission. Our results suggest that monetary policy might be better positioned than commonly assumed in retaining traction on domestic conditions and thus in leaning against the effects of global financial shocks. Further exploration of this aspect is an important priority for future research.

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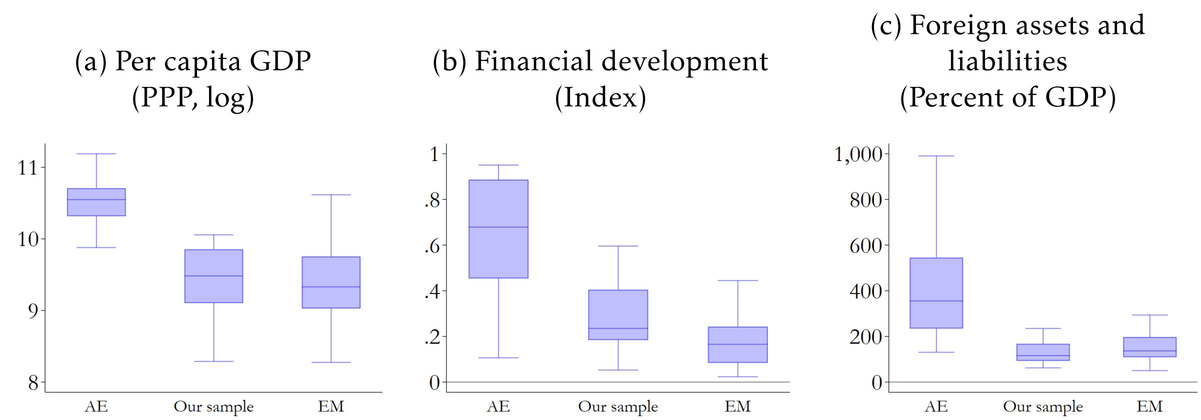
Appendix

A Descriptive statistics and data sources

Figure A.1: Sample of analysis against advanced economies and emerging markets



Notes: The figure shows cross-country distributions of per capita GDP, financial development, and the sum of foreign assets and liabilities for our sample of emerging markets and for the entire set of advanced economies (AE) and emerging markets (EM) according to the IMF classification. Country values are the averages over our period of analysis. We exclude countries with a population of less than 2 million. The financial development index is from the IMF Financial Development Index Database.

Table A.1: Stock market indexes

Country	Index	Codes
Brazil	Bovespa Index (Ibovespa)	BRBOVES
Chile	Standard and Poor's / CLX IGPA CLP Index	IGPAGEN
Colombia	FTSE Colombia Index	WICOLML
Egypt	EGX 30 index	EGCSE30
Hungary	Hungary Stock Market (BUX)	BUXINDX
India	NIFTY 500	ICRI500
Indonesia	Jakarta Composite	JAKCOMP
Mexico	MXSE IPC INDEX	MXIPC35
Malaysia	FTSE BURSA MALAYSIA KLCI	FBMKLCI
Nigeria	NGX ALL SHARE INDEX	NIGALSH
Peru	S&P/BVL GENERAL(IGBVL)	PEGENRL
Philippines	Philippines Stock Exchange PSEi Index	PSECOMP
Poland	WARSAW General Index (WIG)	POLWIGI
Romania	Romania Bet (Local Currency)	RMBETRL
Russia	RUSSIA RTS INDEX	RSRTSIN
South Africa	FTSE / JSE All Share	JSEOVER
Thailand	Bangkok S.E.T.	BNGKSET
Türkiye	ISE National Index 100	TRKISTB

Notes: The table reports the stock market index and the Refinitiv Datastream series codes used in the analysis for each country.

Table A.2: Refinitiv Datastream series codes for government bonds

Country	1 year	2 years	5 years
Brazil	TRBR1YT	TRBR2YT	TRBR5YT
Chile	TRCL1YT	TRCL2YT	TRCL5YT
Colombia		TRCO2YT	TRCO5YT
Egypt	TREG1YT	TREG2YT	TREG5YT
Hungary	TRHN1YT		TRHN5YT
India	TRIN1YT	TRIN2YT	TRIN5YT
Indonesia	TRID1YT		TRID5YT
Malaysia	TRMY1YT	TRMY2YT	TRMY5YT
Mexico	TRMX1YT	TRMX2YT	TRMX5YT
Nigeria	TRNG1YT	TRNG2YT	TRNG5YT
Peru		TRPE2YT	TRPE5YT
Philippines	TRPH1YT	TRPH2YT	TRPH5YT
Poland	TRPO1YT	TRPO2YT	TRPO5YT
Romania	TRRO1YT	TRRO2YT	TRRO5YT
Russia	TRRS1YT	TRRS2YT	TRRS5YT
South Africa	TRSAC1Y	TRSAC2Y	TRSAC5Y
Thailand	TRTH1YT	TRTH2YT	TRTH5YT
Türkiye	TRTK1YT	TRTK2YT	TRTK5YT

Notes: The table reports the Refinitiv Datastream series codes of government bond yields used in the analysis for each country.

Table A.3: Monetary policy rates in emerging markets
(Percent)

Country	Obs.	Mean	SD	Min	Max	Share≤0.50
Brazil	213	13.21	5.41	2.00	26.50	0.0
Chile	237	3.74	2.04	0.50	11.25	4.6
Colombia	214	5.46	2.21	1.75	12.00	0.0
Egypt	92	11.23	3.45	8.25	18.75	0.0
Hungary	234	4.95	3.67	0.60	13.00	0.0
India	93	6.54	1.38	4.00	9.00	0.0
Indonesia	81	4.56	0.82	3.50	6.00	0.0
Malaysia	111	2.88	0.56	1.75	3.50	0.0
Mexico	156	5.82	1.85	3.00	10.50	0.0
Nigeria	71	12.61	1.39	8.00	16.50	0.0
Peru	196	3.54	1.57	0.25	7.50	8.2
Philippines	145	4.28	1.53	2.00	7.50	0.0
Poland	209	3.19	1.83	0.10	6.75	8.1
Romania	119	4.64	2.73	1.25	10.25	0.0
Russia	76	8.31	2.77	4.25	20.00	0.0
South Africa	122	6.84	2.10	3.50	13.50	0.0
Thailand	126	1.89	0.98	0.50	4.75	13.5
Türkiye	139	9.88	5.13	4.50	24.00	0.0

Notes: The sample is restricted to meetings for which we have analysts' forecasts.

Table A.4: Descriptive statistics of the firm-level data

Country	Start	Firms	Leverage ratio	Liquidity ratio	Share of firms paying dividends (percent)
Brazil	2000q1	417	1.3	1.8	75.1
Chile	2001q1	202	0.5	3.6	89.0
Colombia	2005q1	61	0.4	1.5	85.7
Egypt	2005q1	201	0.5	2.4	74.7
Hungary	2000q1	52	0.4	2.0	53.8
India	2000q2	3,046	0.6	3.1	65.9
Indonesia	2001q1	683	0.5	3.1	67.5
Malaysia	1999q2	1,245	0.5	2.7	80.8
Mexico	2000q1	127	0.5	1.9	59.2
Nigeria	2007q2	97	0.7	1.2	77.4
Peru	2001q1	149	0.5	1.9	78.9
Philippines	1999q1	220	0.5	3.3	67.6
Poland	2000q2	716	0.5	2.5	55.4
Romania	2005q1	187	0.4	2.9	62.4
Russia	2004q1	780	0.6	19.3	62.0
Thailand	1999q2	813	0.5	2.2	92.6
Türkiye	2001q1	382	0.5	2.2	64.3

Notes: For the leverage and liquidity ratios, the table reports the cross-firm average of the firm-specific median leverage. For the share of firms paying dividends, firms are classified as paying dividends if they ever paid a dividend during their lifetime.

B Additional results and robustness analysis

B.1 Monetary policy surprises

Table B.1: Correlations of monetary policy surprises based on alternative time windows

	Last 2 weeks	Last week	Last 3 days
Last 2 weeks	1.000		
Last week	0.994	1.000	
Last 3 days	0.929	0.934	1.000

Notes: The table reports the average of the correlations across emerging markets.

B.2 Monetary policy impact on financial markets

Table B.2: Contemporaneous effects of monetary policy shocks on financial markets by country

	1-year govt. yield			2-year govt. yield			5-year govt. yield			EMBI spread			Exchange rate			Stock prices		
	Coeff. (1)	Obs. (2)	R2 (3)	Coeff. (4)	Obs. (5)	R2 (6)	Coeff. (7)	Obs. (8)	R2 (9)	Coeff. (10)	Obs. (11)	R2 (12)	1y (13)	Obs. (14)	R2 (15)	Coeff. (16)	Obs. (17)	R2 (18)
Brazil	0.549***	134	0.12	0.427**	134	0.06	-0.023	169	0.00	-0.085	198	0.01	-1.014**	207	0.04	-0.774	207	0.01
	(0.184)			(0.174)			(0.083)			(0.082)			(0.405)			(0.779)		
Chile	0.160	169	0.03	0.154**	169	0.05	0.160**	147	0.04	0.054***	225	0.04	-0.014	232	0.00	-0.449	232	0.01
	(0.098)			(0.068)			(0.065)			(0.017)			(0.416)			(0.292)		
Colombia				0.062	188	0.01	0.081	188	0.01	-0.124**	175	0.03	-0.793**	189	0.01	-0.360	189	0.00
				(0.073)			(0.064)			(0.048)			(0.371)			(0.874)		
Egypt	-0.019	51	0.01	-0.012	22	0.05	0.079	51	0.01	-0.087**	50	0.16	0.018	51	0.00	-0.943**	51	0.06
	(0.021)			(0.014)			(0.087)			(0.040)			(0.040)			(0.364)		
Hungary	0.161**	228	0.08				0.124**	228	0.02	0.114*	207	0.03	0.180	228	0.00	-1.034	228	0.01
	(0.065)						(0.060)			(0.069)			(0.819)			(1.586)		
India	0.500**	39	0.16	0.483***	39	0.19	0.570***	39	0.21	-0.002	38	0.00	-1.385**	39	0.10	1.216	39	0.01
	(0.206)			(0.178)			(0.139)			(0.059)			(0.674)			(2.065)		
Indonesia	-0.046	80	0.00				0.094	80	0.01	-0.213**	79	0.05	-1.363**	80	0.04	3.358***	80	0.09
	(0.130)						(0.095)			(0.095)			(0.636)			(1.254)		
Malaysia	0.588***	111	0.30				0.327***	111	0.29	-0.080	108	0.01	-0.843**	111	0.03	-0.402	111	0.00
	(0.217)						(0.077)			(0.061)			(0.427)			(0.838)		
Mexico	0.475***	112	0.29				0.477***	155	0.19	0.020	140	0.00	-0.379	155	0.00	-1.004	155	0.01
	(0.156)						(0.113)			(0.038)			(0.684)			(0.969)		
Nigeria	0.291*	66	0.05	0.166	66	0.01	0.101*	66	0.05	-0.036	60	0.01	0.331	66	0.03	-0.442	66	0.05
	(0.155)			(0.137)			(0.060)			(0.038)			(0.244)			(0.385)		
Peru				0.150	144	0.02	0.243***	144	0.07	0.019	163	0.00	-0.132	167	0.00	1.400	167	0.00
				(0.105)			(0.081)			(0.083)			(0.573)			(2.078)		
Philippines	0.039	140	0.00	0.046	140	0.00	0.203***	140	0.05	0.030	139	0.00	0.055	140	0.00	-0.059	140	0.00
	(0.105)			(0.064)			(0.040)			(0.041)			(0.154)			(0.680)		
Poland	0.418***	206	0.23	0.448***	206	0.18	0.263***	206	0.09	0.041	203	0.00	-1.707**	206	0.03	0.999	206	0.01
	(0.063)			(0.102)			(0.072)			(0.035)			(0.756)			(1.001)		
Romania	0.268*	111	0.03	0.170	67	0.03	0.194	111	0.00	-0.026	75	0.00	-0.344	113	0.00	-0.645	113	0.00
	(0.150)			(0.149)			(0.296)			(0.077)			(0.818)			(1.409)		
Russia	0.268***	56	0.09	0.202***	56	0.11	0.203**	56	0.13	-1.892	49	0.32	-1.450*	56	0.07	-3.971***	56	0.33
	(0.089)			(0.070)			(0.087)			(1.346)			(0.749)			(0.832)		
	(0.087)			(0.068)			(0.085)			(1.349)			(0.735)			(0.809)		
South Africa	0.070	109	0.00	0.101	109	0.04	0.047	109	0.01	-0.113	102	0.03	-0.958	112	0.02	-2.128*	112	0.08
	(0.052)			(0.078)			(0.079)			(0.153)			(0.905)			(1.128)		
Thailand	0.227***	126	0.21	0.274***	126	0.20	0.202***	126	0.10	0.069	125	0.01	-0.395	126	0.01	0.259	126	0.00
	(0.072)			(0.058)			(0.068)			(0.074)			(0.315)			(1.315)		
Türkiye	0.166	109	0.06	-0.014	109	0.01	0.321	109	0.01	-0.093	99	0.11	-0.977**	109	0.17	0.434	109	0.01
	(0.104)			(0.078)			(0.461)			(0.053)			(0.263)			(0.226)		

Notes: All regressions include a constant. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1, 5, and 10 percent levels.

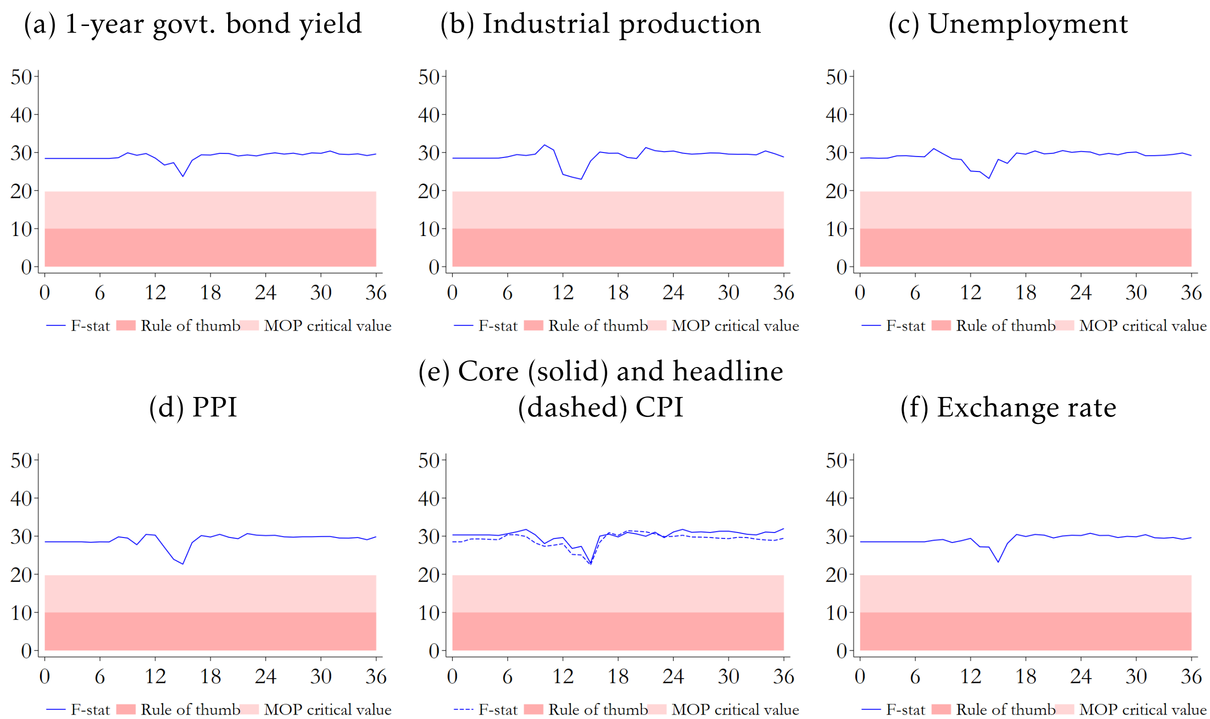
Table B.3: Effects of monetary policy shocks on financial markets by country 2 weeks after the shock

	1-year govt. yield			2-year govt. yield			5-year govt. yield			EMBI spread			Exchange rate			Stock prices		
	Coeff. (1)	Obs. (2)	R2 (3)	Coeff. (4)	Obs. (5)	R2 (6)	Coeff. (7)	Obs. (8)	R2 (9)	Coeff. (10)	Obs. (11)	R2 (12)	1y (13)	Obs. (14)	R2 (15)	Coeff. (16)	Obs. (17)	R2 (18)
Brazil	0.843**	134	0.04	1.381***	134	0.07	0.833**	169	0.03	-0.171	195	0.00	-0.759	207	0.00	-2.597	207	0.01
	(0.418)			(0.448)			(0.369)			(0.471)			(1.662)			(2.413)		
Chile	0.783***	169	0.05	0.680***	169	0.09	0.175	147	0.01	0.035	220	0.00	0.513	232	0.00	1.961	232	0.01
	(0.285)			(0.196)			(0.241)			(0.102)			(1.332)			(2.113)		
Colombia				-0.070	188	0.00	0.320	188	0.01	-0.146	176	0.00	-0.807	189	0.00	-5.994	189	0.01
				(0.955)			(0.391)			(0.273)			(2.189)			(4.720)		
Egypt	0.244	51	0.01	0.059	22	0.01	0.380*	51	0.03	-0.654	50	0.14	3.870	51	0.33	1.711	51	0.01
	(0.364)			(0.349)			(0.214)			(0.451)			(2.650)			(1.645)		
Hungary	1.748***	228	0.19				1.172**	228	0.06	0.319**	197	0.01	3.534**	228	0.02	-1.560	228	0.00
	(0.473)						(0.490)			(0.143)			(1.499)			(2.565)		
India	0.917***	39	0.27	0.981***	39	0.17	1.143***	39	0.17	-0.110	37	0.01	0.719	39	0.00	5.100	39	0.03
	(0.213)			(0.316)			(0.303)			(0.191)			(1.676)			(4.241)		
Indonesia	0.512	80	0.02				-0.006	80	0.00	-0.327	76	0.02	-3.871	80	0.04	4.936	80	0.01
	(0.562)						(0.343)			(0.333)			(3.053)			(5.054)		
Malaysia	1.032***	111	0.30				-0.177	111	0.01	-0.688*	103	0.03	-2.649	111	0.01	9.074**	111	0.04
	(0.258)						(0.363)			(0.359)			(1.831)			(4.259)		
Mexico	0.912***	112	0.17				0.620**	155	0.04	0.142	140	0.00	-0.235	155	0.00	-2.235	155	0.00
	(0.216)						(0.283)			(0.219)			(3.408)			(3.008)		
Nigeria	1.164*	66	0.09	1.029***	66	0.16	0.751*	66	0.15	-0.161	57	0.01	0.222	66	0.00	-1.173	66	0.01
	(0.620)			(0.162)			(0.444)			(0.270)			(0.229)			(1.177)		
Peru				0.232	144	0.00	0.561**	144	0.02	-0.080	159	0.00	-0.355	167	0.00	10.172	167	0.02
				(0.313)			(0.266)			(0.309)			(1.568)			(6.378)		
Philippines	-0.064	140	0.00	-0.119	140	0.00	0.149	140	0.00	-0.417***	136	0.07	0.302	140	0.00	8.979***	140	0.09
	(0.111)			(0.144)			(0.132)			(0.081)			(0.455)			(1.167)		
Poland	1.056***	206	0.18	1.065***	206	0.13	0.780***	206	0.07	0.080	198	0.00	0.022	206	0.00	-3.476	206	0.00
	(0.225)			(0.275)			(0.297)			(0.164)			(2.507)			(3.452)		
Romania	1.574**	111	0.04	1.112*	67	0.08	0.850	111	0.02	0.104	73	0.00	0.228	113	0.00	-8.140	113	0.01
	(0.790)			(0.574)			(0.751)			(0.347)			(2.438)			(6.262)		
Russia	0.334	56	0.01	0.461	56	0.03	0.770*	56	0.08	3.871	46	0.05	16.097**	56	0.23	0.370	56	0.00
	(0.456)			(0.368)			(0.404)			(3.848)			(6.865)			(3.726)		
South Africa	1.140***	109	0.16	0.866***	109	0.17	0.518**	109	0.07	-0.155	103	0.01	0.129	112	0.00	-3.525	112	0.02
	(0.126)			(0.229)			(0.226)			(0.141)			(2.545)			(3.849)		
Thailand	0.988***	126	0.31	1.170***	126	0.29	1.061***	126	0.17	-0.201	124	0.00	0.155	126	0.00	0.940	126	0.00
	(0.307)			(0.283)			(0.288)			(0.267)			(1.921)			(8.971)		
Türkiye	1.129***	109	0.13	0.139	109	0.00	-0.095	109	0.00	-0.302*	95	0.09	-3.365	109	0.08	0.906	109	0.00
	(0.378)			(0.505)			(0.930)			(0.154)			(2.455)			(1.010)		

Notes: All regressions include a constant. Robust standard errors are reported in parentheses. ***, **,* denote statistical significance at 1, 5, and 10 percent levels.

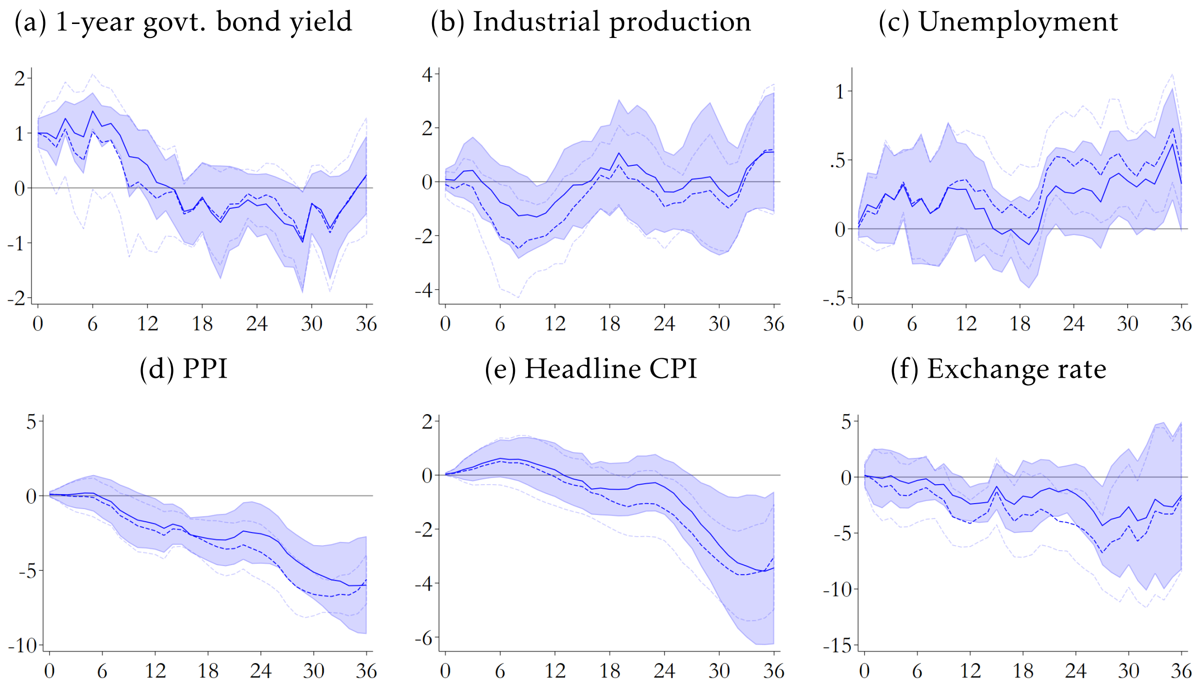
B.3 Monetary policy impact on macroeconomic conditions

Figure B.1: *F*-statistic from IV first-stage estimation



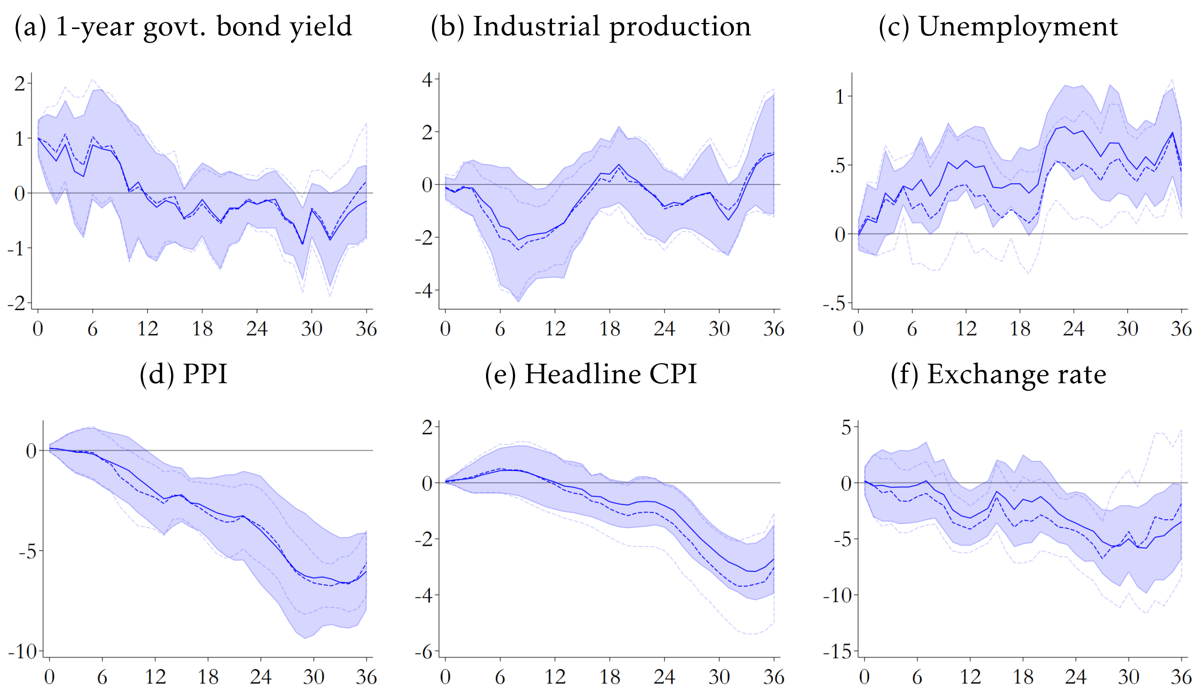
Notes: The figure plots the effective *F*-statistic of Montiel Olea and Pflueger (2013) from the first stage of the IV regressions. The dark shaded area denotes values below the rule-of-thumb of 10, below which instruments are considered weak. The light shaded area denotes values below the simplified critical value of Montiel Olea and Pflueger (2013), which allows testing the null hypothesis that the Nagar bias is 10 percent larger relative to a worst-case benchmark.

Figure B.2: Macroeconomic responses using non-orthogonalized monetary policy surprises
(Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on macroeconomic variables during the 36 months following the shock. All regressions include lags for the dependent variable and for the controls, as well as country and time fixed effects. The solid lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the country level, using the non-orthogonalized version of the monetary policy shocks. The dotted lines denote the point estimates and the 90 percent confidence intervals of the baseline regressions, also reported in Figure 4.

Figure B.3: Macroeconomic responses including only inflation targeting countries (Percent)



Notes: The figure shows the effects of a one-pp monetary policy shock on macroeconomic variables during the 36 months following the shock. All regressions include lags for the dependent variable and for the controls, as well as country and time fixed effects. The solid lines denote the point estimates and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the country level, with a sample that only includes countries with an inflation targeting regime. The dotted lines denote the point estimates and the 90 percent confidence intervals of the baseline regressions, also reported in Figure 4.

B.4 Monetary policy impact on firm-level data

Figure B.4: Heterogeneous responses of fixed capital across firms, leverage interaction, robustness

(Percent)

(a) Manufacturing only (b) Time-varying leverage (c) Rescaled leverage

Notes: The figure shows the differential effects of a one-pp monetary policy shock on firms' fixed capital during the 12 quarters following the shock, distinguishing firms by leverage. All regressions include lags for the dependent variable and for the controls, as well as country-sector-time fixed effects. The lines denote the point estimates for the interaction terms and the shaded areas correspond to 90 percent confidence intervals constructed with standard errors clustered at the firm and time level.