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Latin America's non-linear response to pandemic inflation

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Abstract

This paper estimates empirical Taylor rules to analyze the recent monetary policy of the five main Latin American inflation-targeting central banks. We find that during the inflationary surge of 2021–23, monetary policy reacted more strongly and more quickly to changes in inflation than predicted by a standard linear Taylor rule, estimated on data from the pre-pandemic period. Although this appears to represent a shift in the monetary reaction function, we think it more likely that Latin American central banks have been following a non-linear strategy, responding more aggressively to inflation, the higher it rose. We confirmed this by adding the square of inflation to the Taylor rule model: its coefficient was positive and significant, indicating that policy interest rates exhibited a non-linear response to inflation, even during the pre-pandemic period, and the model did a better job of predicting the sharp rise in interest rates during 2021–23.

Keywords: Latin America, central banks, monetary policy, Covid-19, interest rates.

JEL classification: E52, E58, E50.

[1] The views expressed here are those of the authors and do not necessarily reflect those of the American Enterprise Institute (AEI) or the Bank for International Settlements (BIS). We thank Ben Clements, Jon Frost, John Roberts, Philip Turner, Stan Veuger, Alejandro Werner, two anonymous reviewers and participants in a June 2023 BIS Americas office research seminar for useful comments and suggestions. We thank Beatrice Lee for excellent research assistance. Any errors are our own.

1. Introduction

A persistent issue for central banks in emerging market economies (EMEs) has been their difficulties in pursuing counter-cyclical monetary policies such as those adopted in advanced economies (AEs). The flexible inflation targeting pursued by most AE central banks entails tightening monetary policy when inflation exceeds their targets, but loosening policy when economic activity declines below its equilibrium level. Such policies are generally pursued by AE central banks, even when their formal mandates are for price stability alone.

In EMEs, however, loosening policy in response to weak activity has been complicated by several factors. First, historically, EME recessions have been triggered by financial crises, which often have been the product of investor worries about excessively lax macroeconomic policies. Therefore, even in the face of sharp recessions, EME central banks frequently have been forced to tighten policy in order to bolster investor confidence and restrain capital outflows. Second, and as a related matter, in EMEs with histories of high and poorly anchored inflation, even small and transitory increases in inflation had to be curtailed through monetary tightening before inflation expectations rose out of control. These considerations have applied with particular force in Latin America, given its long history of high inflation and even hyperinflation.

Over the past one and a half decades or so, EME central banks, including those in Latin America, appear to have pursued more balanced monetary policies.[2] By balanced policies, we mean policies that respond both to deviations of economic activity from some equilibrium level as well as deviations of inflation from target. Even central banks with a mandate for a single target—inflation—are generally understood to take economic activity into account as well. In the early phase of the pandemic recession, Latin America's central banks appeared to participate in the EMEs' countercyclical response, cutting policy interest rates and even employing quantitative easing (QE) despite soaring credit spreads and plunging currencies.[3] But subsequently, monetary policy in Latin America tightened aggressively in response to rising inflation, and to a considerably greater extent that in the AEs and many other EMEs.[4] This raises a question as to whether Latin American central banks have abandoned their balanced approach to monetary policy in favor of a strategy that places overwhelming weight on the control of inflation.

To address this issue, in this paper, we take a close look at Latin American monetary policies in the pandemic era. Throughout, we focus on the central banks of the five most prominent, inflation-targeting Latin American economies: Brazil, Chile, Colombia, Mexico, and Peru.

We find that in the years immediately preceding the pandemic, estimated Taylor rules show that Latin American central banks had been responding in a balanced manner to both inflation and output, had been substantially smoothing their policy-rate movements, and had not been responding separately to movements in exchange

2 See, among others, Coulibaly (2012), García-Silva and Marfán (2012), McGettigan et al. (2013), Takats (2012), Vegh and Vuletin (2012, 2016), Vegh et al. (2017), and BIS (2023).

3 See Aguilar and Cantu (2020), Ayres et al. (2021), Cavallo and Powell (2021), Gelos et al. (2020), and IMF (2021).

4 See Kamin and Kearns (2022), Kamin (2023) and Warner (2023).

rates. However, extending the estimation of the Taylor rules through 2023 Q4, we show that the coefficient on inflation rose substantially and significantly. Consistent with that evidence, policy rates generally rose more than predicted by these models in the 2021–2023 period.

These findings could be interpreted to mean that Latin American central banks switched to a more hawkish strategy in response to the post-pandemic surge in inflation. However, we believe it more likely that their policy in 2021–23 represented a continuation of a non-linear strategy that that they had executed even in the pre-pandemic period: boosting their response to inflation as inflation rose higher. This is a sensible strategy, since small variations in inflation around the targeted level are unlikely to alter inflation expectations, whereas large increases in inflation are more likely to de-anchor those expectations.

To assess this possibility, we re-estimated the standard Taylor rule to include the square of the inflation rate as an explanatory variable. This term proved to be positive and statistically significant, even in the pre-pandemic period. Moreover, out-of-sample predictions of this non-linear Taylor rule track the rise in interest rates in 2021–23 better than the conventional Taylor rule model that includes only the level of the inflation rate.

These results confirm that the behavior of Latin American's central banks after the pandemic recession was not a deviation from earlier policies but rather a continuation of how they had responded to previous bouts of exceptionally high inflation. The results are robust to alternative specifications of the empirical Taylor rule model: replacing actual inflation and output gaps with their expected values; estimating the models using generalized method of moments (GMM) rather than OLS; estimating country-specific regression models rather than panel-data regressions; and using core inflation rather than headline.

This paper is one of very few efforts to analyze the responses of Latin America's central banks to the surge in inflation that followed the pandemic recession. Its major contribution is to show that these responses were stronger than can be explained by a standard linear empirical Taylor Rule model, estimated over the preceding decade. However, they can in large part be explained by a simple non-linear version of the empirical Taylor Rule model in which the elasticity of the policy rate with respect to inflation rises, the higher the rate of inflation. Surprisingly, despite a substantial literature on estimating non-linear Taylor Rules, we found no prior papers that employed our very simple and intuitive approach toward incorporating this non-linearity: adding the square of inflation as an additional explanatory variable in the model.

All told, our paper adds to the literature on estimating empirical Taylor rules for emerging market countries, including Mohanty and Klau (2004), Moura and de Carvalho (2010), Takats (2012), Vegh and Vuletin (2012), Vegh et al. (2017), Caporale et al. (2018), McKnight et al. (2020) and De Leo (2023). It also contributes to the body of research on non-linear Taylor rules (some of which also addresses emerging market countries), including Peterson (2007), Moura and de Carvalho (2010), Kulikauskas (2014), Cukierman and Muscatelli (2008), Ma et al. (2018), and Caporale et al. (2018).

The rest of the paper proceeds as follows. In Section II below, we review the responses of the region's central banks to the pandemic recession and the surge in inflation that followed. In Section III, we estimate Taylor rules to assess how the region's central banks calibrated their policies in the years before the pandemic to balance the potentially conflicting objectives of stabilizing output and inflation before the pandemic. We use these estimates to assess whether that balance shifted after the start of the pandemic. Section IV analyses the robustness of our findings to alternative data, specifications, and estimation methods. Section V concludes.

2. Monetary policy responses to the pandemic recession and inflation

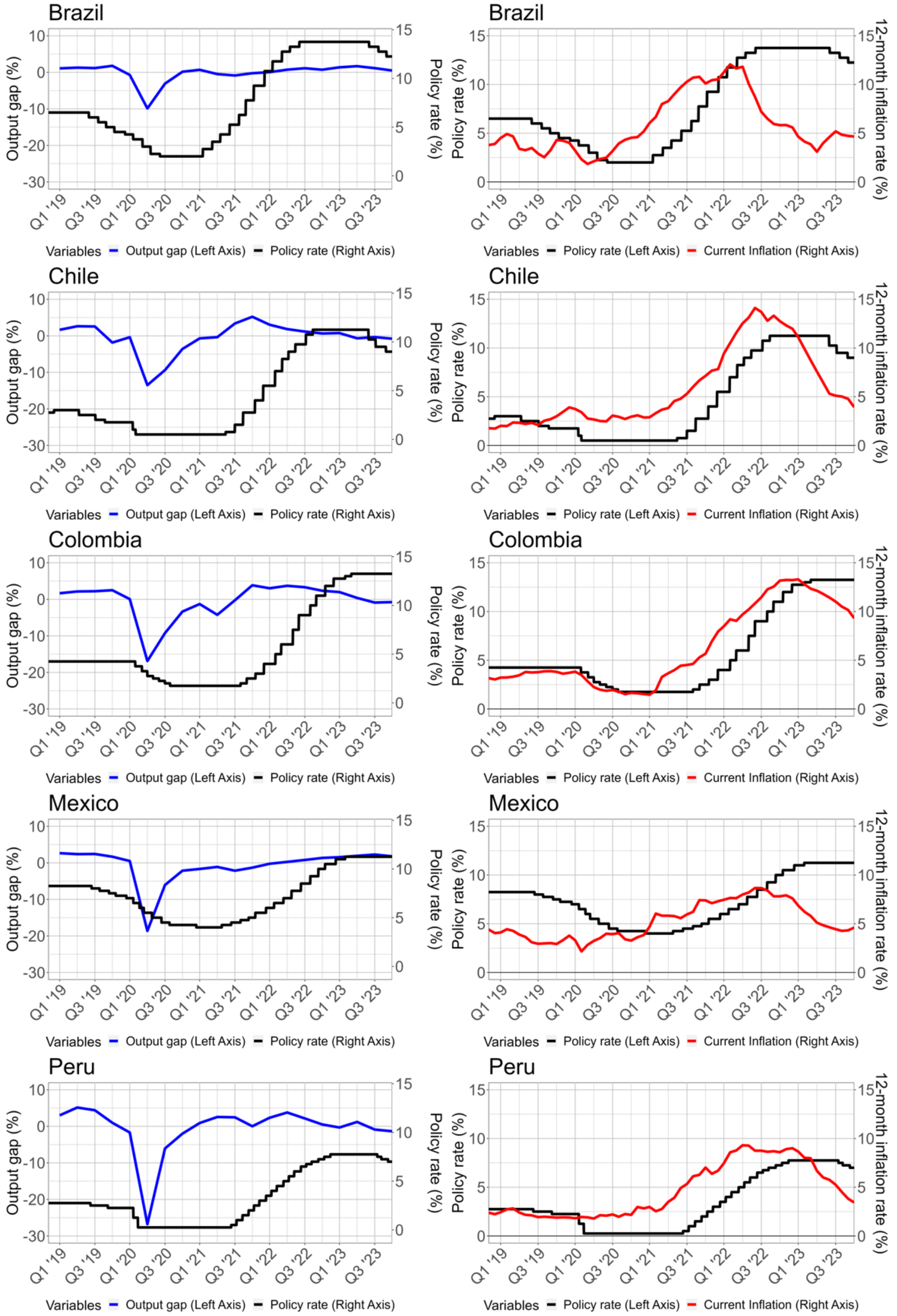
Latin American central banks faced daunting challenges in responding first to the steep COVID-19 pandemic recession and then to the dramatic surge in inflation that followed. Figure 1 compares Latin American policy rates to the two main inputs into a standard Taylor rule: estimated output gaps on the left, and inflation rates on the right.[5] The left-hand panels of the figure make clear that Latin American central banks lowered rates quickly and substantially in the first half of 2020 in response to the declines in GDP. They generally continued to lower rates into the second half of that year, even as output started to rebound. And they kept rates low for some time thereafter, despite output gaps nearly closing in some countries. These outcomes are all consistent with a policy reaction function that weights output heavily.

We now turn to the right-hand panels of Figure 1. Latin American central banks did not start raising policy rates in the region until well after inflation had started to pick up. All of them wrestled for months with the question of whether increases in inflation were transitory and whether they were large enough to merit raising rates. Brazil tightened first, in mid-March 2021, followed by Mexico (June 2021), Chile (July 2021), Peru (August 2021), and lastly Colombia (October 2021). While their interest rates started out historically low at the beginning of the tightening cycle, they eventually rose above their ranges for the last decade or so.

Latin American central banks proved to be considerably more aggressive in their response to inflation than their counterparts around the world. Figure 2 compares Latin America's monetary policy tightening with the actions of other central banks. It plots the rise in policy rates since the beginning of 2021 against the rise in inflation during this period. The trend line is upward sloping, as we would expect, and all of the five Latin American central banks show rate increases that lie at or above the trend line. This suggests that Latin American central banks generally reacted more aggressively to the rise in inflation than in most other parts of the world.

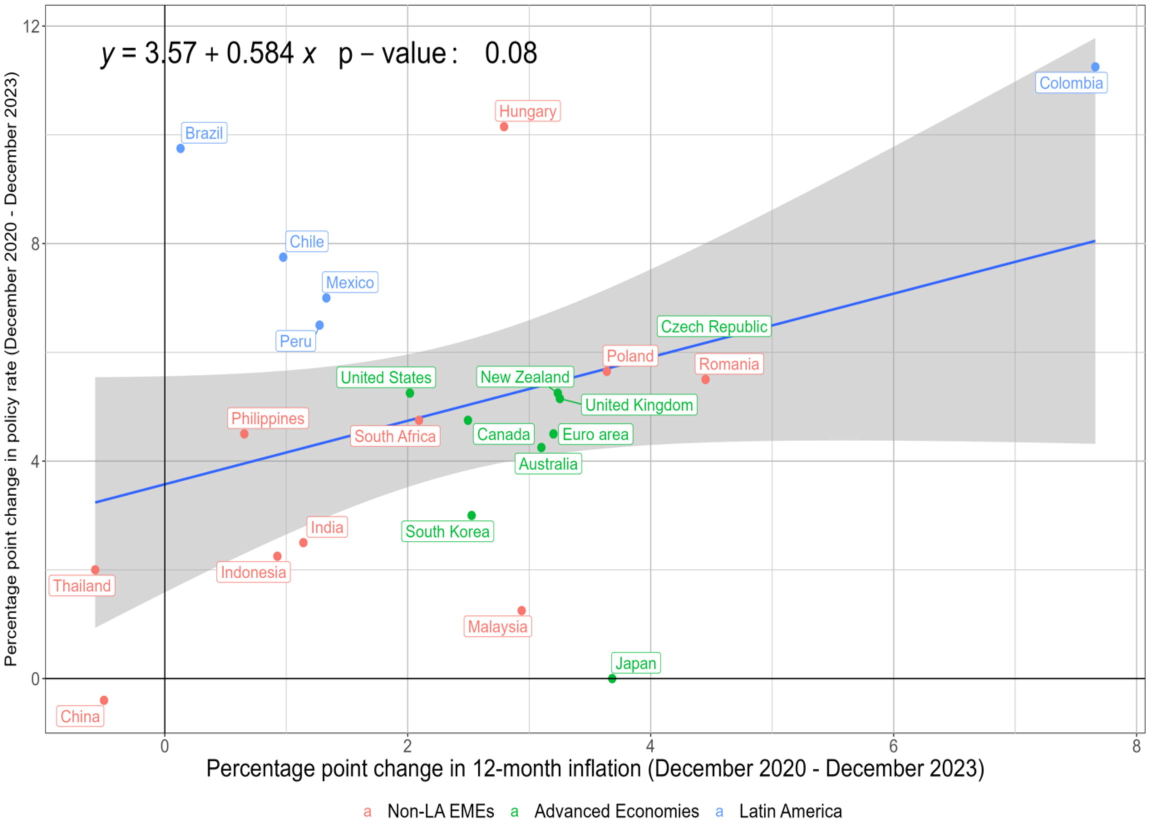
5 The calculation of output gaps is described below.

Fig. 1. Response of Latin American monetary policy to output and inflation



Source: Bank for International Settlements, CEIC

Fig 2. Changes in policy rates and current inflation since December 2020



Source: Bank for International Settlements; CEIC

3. An estimated Taylor rule for Latin American monetary policy

The evidence reviewed above prompts a number of questions: How had Latin American central banks been balancing the objectives of output and inflation stabilization before the pandemic? And was their subsequent aggressive response to the surge in inflation consistent with, or a deviation from, their earlier monetary policy strategy?

To address these questions, we estimate standard linear Taylor rules for Latin American central banks over the 13 years leading up to the pandemic—2007 to 2019. This estimation period was chosen so as to start early enough to include the GFC, the episode most similar to the pandemic crisis, but not so early as to include the transition to inflation targeting in these countries.[6] We then assess whether these Taylor rules may have shifted during the pandemic period compared to in the preceding 13 years.

[6] Inflation targeting was adopted in 1999 in Brazil, Chile, and Colombia, 2001 in Mexico, and 2002 in Peru. (De Gregorio, 2019; Perez Caldentey and Vernengo, 2019).

3.1 Estimation strategy for the standard linear model

We start with a standard open-economy central bank reaction function:

$$i_t = r^* + \pi_t + \beta(\pi_t - \pi^T) + \gamma(y_t - y^*) + \delta(\Delta e_t) + \lambda(i_{t-1}) + \epsilon_t \quad (1)$$

where i is the policy interest rate, π represents year-over-year inflation, π^T the inflation target, y the level of real GDP, $y^*$the level of potential GDP, e the real multilateral exchange rate (a rise indicates appreciation), Δ the percent change from the previous period, and ϵ the error term. The lagged interest rate is included, as is standard in empirically estimated Taylor rules, to capture central banks' inclination to smooth out interest rates over time. The change in the real exchange rate is included because many EME central banks appear, or have appeared in the past, to respond to changes in the currency value. This may be either because these central banks attempt to target the exchange rate in addition to inflation and output, and/or because exchange rate changes may signal future movements in inflation, an especially salient consideration in small open economies.

Output gaps are calculated as the percent difference between real GDP and trend real GDP. Real-time data on Latin American GDP were not available, and so despite their desirability, as highlighted by Orphanides (2001), we use the revised data found in the CEIC database. To calculate trend output, we apply a two-sided HP filter with a smoothing parameter of 1600 to the real GDP series. In principle, because a two-sided HP filter incorporates information about future real GDP that central banks would not know in real time, it is not an ideal means of identifying trend real GDP. However, estimates of the Taylor rule model using output gaps calculated with one-sided HP filters, available on request, yielded very small and statistically insignificant coefficients on the output gap; by comparison, as described below, estimates of the response of monetary policy to output gaps using two-sided filters yield sizeable and significant coefficients that are robust to many different specifications. We surmise that central banks have much more information about the extent of slack in the economy than may be derived from the evolution of real GDP alone, and thus a two-decided HP filter may better approximate the central banks' actual assessment of the economic situation.

In practice, we do not observe r^*either and, at least during the estimation period, there were few changes in the target inflation rate. Accordingly, rolling these terms into the intercept, the specification becomes:[7]

$$i_t = \alpha + \beta\pi_t + \gamma(y_t - y^*) + \delta(\Delta e_t) + \lambda(i_{t-1}) + \epsilon_t \quad (2)$$

7 This specification follows that in Mohanty and Klau (2004), who in turn referenced Taylor (2001). Somewhat similar approaches to estimating Taylor rules for EMEs are found in Takats (2012), Vegh and Vuletin (2012), Vegh et al. (2017), and de Leo (2023).

This equation is estimated using quarterly data. Table 8, to be described below in the robustness section, shows the results separately for each Latin American country. The coefficients on inflation and output are generally significant and their magnitudes are sensible. However, for our analysis below, we prefer to estimate the equation using data for all five Latin American countries using panel data regression. This makes it easier to generalize about Latin American monetary policy. More importantly, it allows us to introduce time fixed effects into the model, which may capture the effects of common shocks not otherwise measured in our explanatory variables.

3.2 Estimation results for the standard linear model

Table 1 presents the estimation results, using headline inflation rates estimated by OLS. Focusing on column 1, which spans the pre-pandemic period, the estimated coefficients on inflation, the output gap, and lagged interest rates are of sensible magnitudes. In the long run, Latin American nominal policy rates rise 1.3 percentage points for each percentage point rise in inflation (real rates rise 0.3 percentage points) and 1.2 percentage points for each percentage point widening of the output gap.[8]

These parameters suggest that in the decade before the pandemic, Latin American central banks were already following a balanced strategy, that is, a reaction function that placed significant weight on stabilizing output as well as inflation. Moreover, the coefficient on the change in the real exchange rate is (literally) zero, suggesting that even well before the pandemic, the region's central banks were not responding to movements in the currency on average, once inflation and output were taken into account.[9] In column 2, we drop the real exchange rate, with no resulting change to the other coefficients.

These results are generally in the ballpark of other estimates of empirical Taylor rules for Latin America, although those estimates are so varied as to make direct comparisons difficult. Estimating models separately by country, Mohanty and Klau (2004) found the long-run sensitivity of interest rates to inflation to range from .3 to 1.5 and of the output gap from 1.1 to 3.5; they found statistically significant responses of policy to changes in exchange rates. Moura and de Carvalho (2010) estimated long-run inflation responses (in their simpler models with symmetric monetary responses) ranging from .6 to 2.3 and output responses of near 0 to 1.3; they did not find many significant responses to exchange rates. Estimates by McKnight et al. (2020) are less directly comparable to those described above, but they find the Latin American central banks to all focus strongly on stabilizing inflation, and most on stabilizing real exchange rates and output gaps. Consistent with nearly all studies in other parts of the world, all these analyses identified significant interest-rate smoothing behavior, as evidenced by significant coefficients on lagged policy rates.

8 The long-run effect of a variable is calculated by dividing its coefficient by 1 minus the coefficient on the lagged dependent variable.

9 This finding conflicts with the widespread view that in earlier times, Latin American central banks responded to exchange rate depreciation by hiking rates. When the start date for the regression is moved back to 1998, before any of the central banks adopted inflation targeting, the coefficient on the real exchange rate is indeed estimated to be negative and statistically significant. (Results are available in Kamin and Kearns, 2022.) This suggests that central banks initially did raise rates in response to real exchange rate depreciation (that is, declines in the currency), but they abandoned this approach more recently.

Column 3 of Table 1 extends the estimation sample to 2023 Q4, now encompassing the pandemic era. The coefficient on inflation rises slightly, while that on the output gap declines. However, the decline in the coefficient on the output gap appears to be unduly influenced by the huge and historically unprecedented pandemic recession in 2020, as shown by the plunging output gap in Figure 1. Column 4 repeats the regression but adds separate dummy variables for each quarter of 2020 (and for four of the five countries); this is equivalent to extracting the 2020 observations from the dataset. In this estimation, the coefficient on the output gap now remains unchanged from its value in the 2007–2019 estimation. However, the coefficient on the inflation rate rises, while that on the lagged policy rate declines.

Table 1. OLS linear Taylor rules with current values of explanatory variables

	(1) OLS 2007q1- 2019q4	(2) OLS 2007q1- 2019q4	(3) OLS 2007q1- 2023q4	(4) OLS 2007q1- 2023q4	(5) OLS 2007q1- 2023q4
Current Inflation	0.13***	0.13***	0.15***	0.16***	0.13***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Output Gap	0.12***	0.12***	0.07***	0.12***	0.12***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Lagged Policy Rate (1q)	0.90***	0.90***	0.88***	0.87***	0.90***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Quarterly % Change in Real Ex Rate	0				
	(0.01)				
PANDEMIC					1.01
					(0.91)
Current Inflation X PANDEMIC					0.09**
					(0.05)
Output Gap X PANDEMIC					0.01
					(0.06)
Lagged Policy Rate (1q) X PANDEMIC					-0.13*
					(0.07)
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.98	0.99
Adj. R^2	0.97	0.97	0.98	0.98	0.98
Num. obs.	260	260	340	340	340

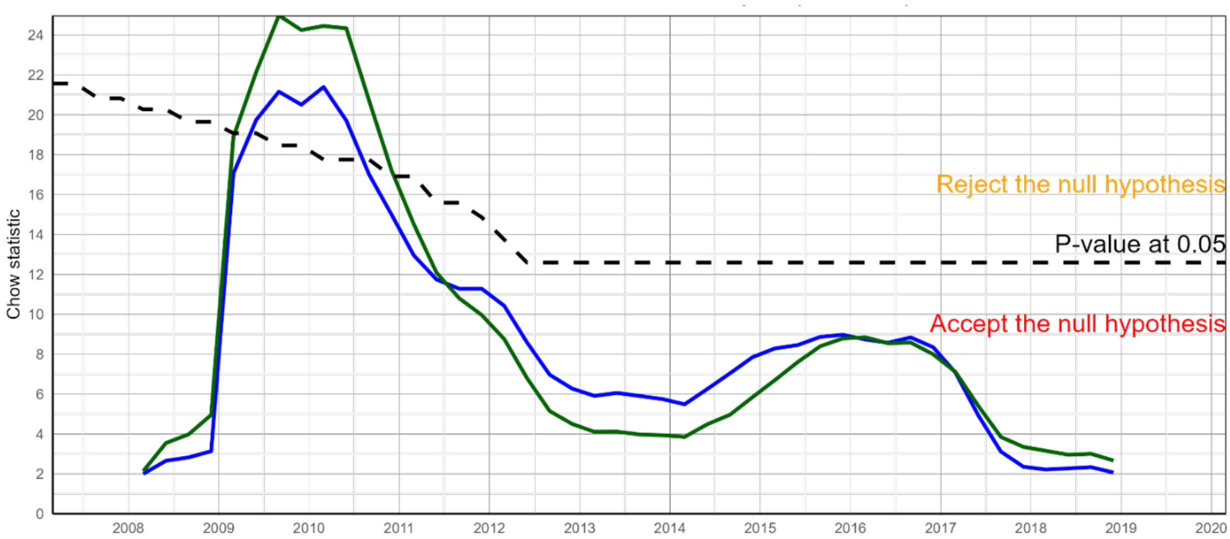
***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from the Bank of International Settlements (BIS) and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020. Output gap estimated with a two-sided HP filter.

Column 5 adds interaction terms to the model shown in column 4: a "pandemic" dummy variable for the period 2021 Q1 through 2023 Q4 multiplied by all of the explanatory variables. The purpose of this estimation is to highlight any possible shifts in coefficients from the pre-pandemic period to 2021–23, the period of the post-pandemic-recession surge in inflation. As a result of this specification, the coefficients on the explanatory variables that are not interacted with the pandemic dummy are unchanged from those shown in Column 2, which is estimated over the pre-pandemic period. The coefficients on the interaction terms show the shift in the coefficient during the 2021–23 period. They show a substantial and significant rise in the coefficient on inflation, along with a substantial and borderline significant decline in the lagged policy rate. Thus, it appears that Latin American central banks not only became more hawkish as inflation surged, increasing the weight they placed on inflation, but they also became more nimble and fast-acting in response to the surge. This shift is confirmed by a Chow test for a break in the model's relationships around 2019 Q4, which rejects the hull hypothesis of parameter stability with a probability of 1.8 percent (F-test of 3.03).

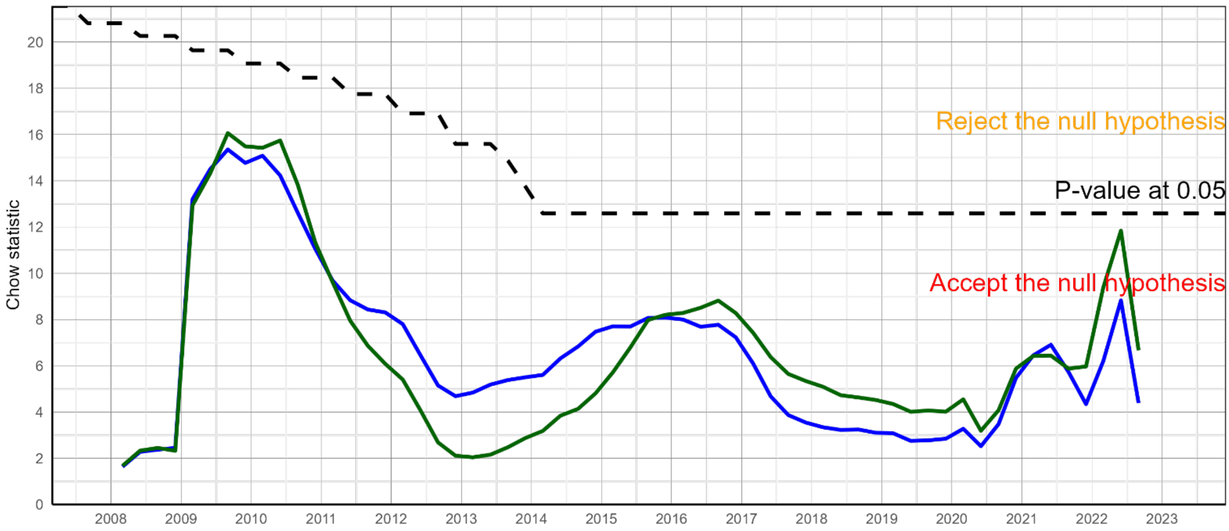
Figures 3 and 4 examine the structural stability of the model over the entire range of the 2007–2019 and 2007–2023 samples, respectively, based on a test for parameter instability with an unknown breakpoint (Andrews, 1993). The blue line in each figure represents the F-test statistic for a rolling Chow test of structural stability; it tests the likelihood that the parameters of the model remain the same before and after each quarter in the sample. Despite the significance of the shifts in the model identified by the Chow test with a specified breakpoint in 2019 Q4, the only break identified by the Chow tests is around the period of the global financial crisis, and that is only for the model estimated through 2019. This likely reflects the lower power of the test with unknown breakpoint compared with the standard test with a known breakpoint.

Fig. 3. Chow test for structural breaks at each point, 2007–2019



Note: H0 = the coefficients of the independent variables are the same across the groups or periods.
H1 = the coefficients are different across the groups or periods.
Dep var: Policy rate.
Model 1 (Blue) Ind var: Current Inflation, Output Gap, Lagged Policy Rate (1q).
Model 2 (Green) Ind var: Current Inflation squared, Output Gap, Lagged Policy Rate (1q).
Entire sample: Q1 2007 to Q4 2019.
Critical values based on Andrews D (1993).

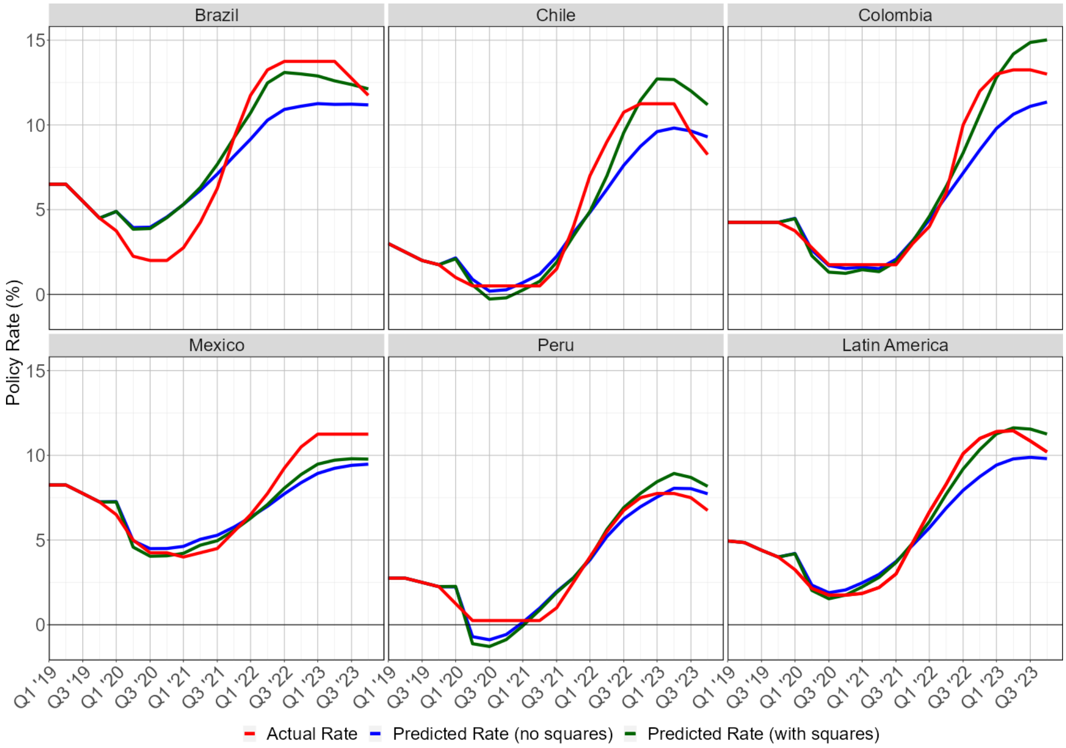
Fig. 4. Chow test for structural breaks at each point, 2007–2023



Note: H0 = the coefficients of the independent variables are the same across the groups or periods.
H1 = the coefficients are different across the groups or periods.
Dep var: Policy rate.
Model 1 (Blue) Ind var: Current Inflation, Output Gap, Lagged Policy Rate (1q).
Model 2 (Green) Ind var: Current Inflation squared, Output Gap, Lagged Policy Rate (1q).
Entire sample: Q1 2007 to Q4 2019.
Critical values based on Andrews D (1993).

Finally, Figure 5 traces out the implications of the shift in coefficients for the model's forecast performance. The path of actual policy interest rates in each of the jurisdictions (red line) is compared to the out-of-sample path predicted by the model shown in Column 2 (blue line). Focusing on the initial recession phase of the pandemic, the model tracks the decline in policy rates reasonably well (although its predictions for interest rates in Brazil are too high during the pandemic recession, and it does not recognize the zero lower bound in the case of Peru). But later on, most of the Latin American central banks tightened policy much more sharply than predicted the model. This suggests, again, that Latin American central banks had abandoned their balanced approach to monetary policy in favor of a more hawkish stance.

Fig. 5. Simulations of linear Taylor models estimated 2007-2019, based on Tables 1 and 2, Column 2.



Sources: Bank for International Settlements; CEIC
Note: Predicted rates based on dynamic simulation of equations.
In Latin America panel, actual and predicted rates are the mean average of the country-specific rates shown in the other five panels.

3.3 A simple non-linear Taylor rule model

The results described above could be interpreted to mean that the reaction function of Latin American central banks shifted significantly during the pandemic era. But we think it more likely that the model, estimated over a lengthy and (for the most part) more normal period, may not provide a good guideline for how Latin American central banks would react in response to an inflationary surge of dramatic proportions. In particular, we think it plausible that Latin American monetary policy may exhibit a non-linear response to inflation, with the sensitivity of interest rates rising as inflation becomes especially pronounced. Such behavior could reflect concerns that the higher inflation rises, the greater the likelihood that inflation expectations become unanchored, and therefore the greater the need to reverse the rise in inflation.

As noted in the introduction, there is a large and growing body of research that explores how monetary policy responses to changes in output and inflation may change, depending on the initial level of inflation. Examples include Peterson (2007), Moura and de Carvalho (2010), Kulikauskas (2014), Cukierman and Muscatelli (2008), Ma et al. (2018), and Caporale et al. (2018). These analyses generally identify threshold levels of inflation and assess whether monetary policy responses differ, depending on whether inflation is above or below these thresholds. However, a key challenge for these studies is identifying the appropriate threshold level to use.[10]

In our study, we adopt a much simpler and more general approach. As shown in Table 2, we re-estimate the Taylor rule model described above, but adding interaction terms with inflation. The model in column 1, estimated over the 2007–2019 period, includes both the square of the inflation rate (alongside the level) and the level of the output gap multiplied by the rate of inflation. The coefficient on the level of inflation is now insignificant, while the coefficient on its square is positive and significantly different from zero. This configuration indicates that during the pre-pandemic period, the sensitivity of interest rates to inflation grew larger as inflation itself rose. In other words, interest rates exhibited a non-linear response to inflation. However, the coefficient on the output gap times inflation is not significant.

In column 2, we drop the three explanatory variables with coefficients that are not significantly different from zero: the level of inflation, the output gap multiplied by inflation, and, as before, the real exchange rate. The remaining coefficients are little changed from column 1. In column 3, we extend the estimation period to 2023 Q4, again including quarterly dummies to effectively remove 2020 from the sample. Finally, column 4 presents the model that includes the interaction terms with the pandemic dummy. The coefficients on both the output gap and the square of inflation are unchanged during the 2021–23 period from their values in the pre-pandemic period. This suggests that this non-linear version of the model may better capture the behavior of monetary policy over both pre- and post-pandemic periods. Notably, the non-linear model still shows a significant decline in the coefficient on the lagged policy rate from the pre-pandemic period; this is worth exploring in further research. As a result, the Chow test for a break in this model in 2019 Q4 continues to reject parameter stability (probability of 1.2 percent, F-test of 3.3).

Returning to Figures 3 and 4, the green line in each panel represents the F-test statistic for the Chow test with unknown breakpoint applied to the non-linear model. Again, perhaps reflecting the lower power of the test, no breakpoint in structural stability is identified, except in the shorter time range for the period around the GFC.

To get more insight into the behavior of monetary policy during the inflation surge, the green lines in Figure 5 compare the out-of-sample predictions of the non-linear model to the actual paths of interest rates (in red) and the predictions of the linear Taylor rule models (in blue) described in the previous sub-section. As may be seen, the non-linear models come much closer to tracking the sharp rise in interest rates during 2022 and 2023 in Brazil, Chile, and Colombia. Therefore, the aggressive response of monetary policy to inflation in 2021–2023 appears to have been less of a break from previous behavior than it might appear from the perspective of a linear Taylor rule. That aggressive response was consistent with earlier responses of Latin American central banks to sharp surges in inflation.

[10] In an attempt to emulate this approach, we used the upper bound of each of the Latin American central banks' target ranges for inflation as the threshold. However, when we did so, we did not identify significant differences in the behaviour of monetary policy, depending on whether inflation was above or below this level (estimation results are available on request).

Table 2. OLS non-linear Taylor rules with current values of explanatory variables

	(1) OLS 2007q1-2019q4	(2) OLS 2007q1-2019q4	(3) OLS 2007q1-2023q4	(4) OLS 2007q1-2023q4
Current Inflation	-0.06			
	(0.07)			
Current Inflation squared	0.02***	0.02***	0.01***	0.02***
	(0.01)	0.00	0.00	0.00
Output Gap	0.13**	0.14***	0.14***	0.14***
	(0.05)	(0.03)	(0.02)	(0.03)
Current Inflation X Output Gap	0.00			
	(0.01)			
Lagged Policy Rate (1q)	0.88***	0.88***	0.87***	0.88***
	(0.03)	(0.03)	(0.02)	(0.03)
Quarterly % Change In Real Ex Rate	0.01			
	(0.01)			
PANDEMIC				1.92**
				(0.94)
Current Inflation squared X PANDEMIC				0.00
				0.00
Output Gap X PANDEMIC				-0.02
				(0.06)
Lagged Policy Rate (1q) X PANDEMIC				-0.15**
				(0.07)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.99
Adj. R^2	0.98	0.98	0.98	0.98
Num. obs.	260	260	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020.

4. Robustness

In this section, we present various alternative specifications of the Taylor rule model and show that the results described above are robust.

4.1 OLS estimation of Taylor rule with core inflation rate

Even if their inflation target is expressed in terms of headline inflation, many central banks also focus on core inflation, which excludes volatile food and energy prices, in their day-to-day operations. Tables 3 and 4 replicate the specifications shown in Tables 1 and 2, but substitute core inflation for headline inflation. The results are broadly similar to the above-described results, both in terms of the coefficients estimated for the 2007–2019 period and the estimated shifts in those coefficients in 2021–23. That said, the coefficient on core inflation in Table 3 is a bit smaller and less significant than that on headline inflation in Table 1, suggesting Latin American central banks might have been focusing more on headline inflation than core.

Figure 6 repeats the exercise shown in Figure 5, comparing the path of actual interest rates during the pandemic period with the predictions of the two models (linear and non-linear) with core inflation. As in Figure 5, the predictions of the linear Taylor model (blue line) using core inflation are substantially lower than the trajectory of actual interest rates in 2021–22. And, also as in Figure 5, the predictions of the non-linear model do a much better job of tracking the rise in interest rates during this period.

Table 3. OLS linear Taylor rules with current values of explanatory variables and core inflation

	(1) OLS 2007q1- 2019q4	(2) OLS 2007q1- 2019q4	(3) OLS 2007q1- 2023q4	(4) OLS 2007q1- 2023q4	(5) OLS 2007q1- 2023q4
Core Inflation	0.08*	0.08*	0.17***	0.16***	0.08*
	(0.04)	(0.04)	(0.03)	(0.04)	(0.04)
Output Gap	0.12***	0.12***	0.07***	0.11***	0.12***
	(0.03)	(0.03)	(0.02)	(0.03)	(0.03)
Lagged Policy Rate (1q)	0.93***	0.93***	0.88***	0.87***	0.93***
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Quarterly % Change in Real Ex Rate	0.01				
	(0.01)				
PANDEMIC					1.49
					(0.93)
Core Inflation X PANDEMIC					0.39***
					(0.08)
Output Gap X PANDEMIC					-0.01
					(0.06)
Lagged Policy Rate (1q) X PANDEMIC					-0.32***
					(0.08)
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.98	0.98
Adj. R^2	0.97	0.97	0.98	0.98	0.98
Num. obs.	260	260	340	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020.

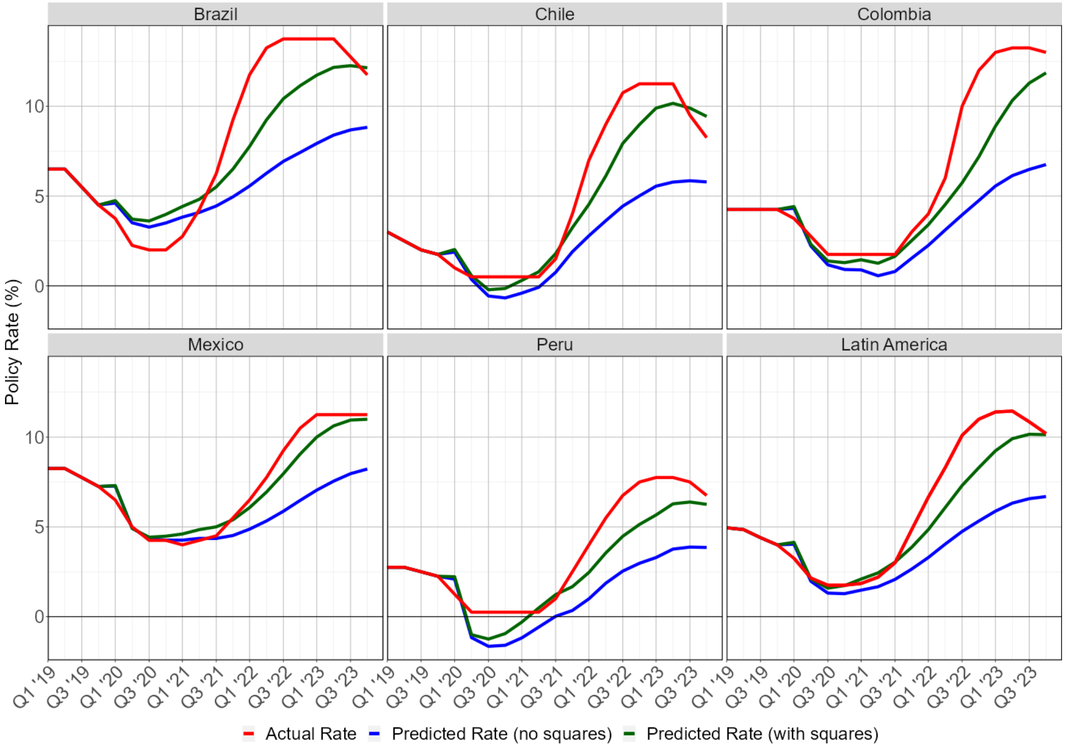
Table 4. OLS non-linear Taylor rules with current values of explanatory variables and core inflation

	(1)	(2)	(3)	(4)
	OLS	OLS	OLS	OLS
	2007q1-2019q4	2007q1-2019q4	2007q1-2023q4	2007q1-2023q4
Core Inflation	-0.20**			
	(0.08)			
Core Inflation squared	0.04***	0.02***	0.02***	0.02***
	(0.01)	0.00	0.00	0.00
Output Gap	0.14**	0.13***	0.13***	0.13***
	(0.06)	(0.03)	(0.02)	(0.03)
Core Inflation X Output Gap	0.00			
	(0.01)			
Lagged Policy Rate (1q)	0.89***	0.89***	0.84***	0.89***
	(0.03)	(0.03)	(0.03)	(0.03)
Quarterly % Change in Real Ex Rate	0.01			
	(0.01)			
PANDEMIC				3.10***
				(1.05)
Core Inflation squared X PANDEMIC				0.01**
				(0.01)
Output Gap X PANDEMIC				-0.03
				(0.06)
Lagged Policy Rate (1q) X PANDEMIC				-0.30***
				(0.09)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.98
Adj. R^2	0.97	0.97	0.98	0.98
Num. obs.	260	260	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020.

Fig. 6. Simulations of linear Taylor models with core inflation estimated 2007-2019, based on Tables 3 and 4, Column 2



Sources: Bank for International Settlements; CEIC
Note: Predicted rates based on dynamic simulation of equations.
In Latin America panel, actual and predicted rates are the mean average of the country-specific rates shown in the other five panels.

4.2 OLS estimation of Taylor Rule with inflation and output expectations

We now present a variant of the Taylor rule discussed above in which the contemporaneous inflation rate and output gap are replaced by the expectations of inflation and the output gap one year later, derived from Consensus Forecasts.[11] Such a model would be consistent with the view that monetary policy should respond to expectations of future rather than contemporaneous economic outcomes.[12] The estimation results for the model with expectations, estimated over the 2007–2019 period, are shown in Column 1 of Table 5. The estimated coefficients on the output gap, real exchange rate, and lagged policy rate are broadly similar to those in the model with contemporaneous inflation. However, the coefficient on inflation expectations is considerably larger, suggesting that even before the pandemic, Latin American monetary policy, while taking output into account, was weighted toward controlling inflation. Column 4 again extends the sample to the pandemic period and adds the pandemic interaction terms; as in Table 1, it shows a substantial and

[11] Inflation and output expectations in Consensus Forecasts are for the following calendar year. Four-quarter-ahead forecasts were calculated as a weighted average of current- and next-year forecasts, weighted by the number of quarters in each year. To calculate the expected output gap, we first fit a two-sided HP filter to the series for expected real GDP in order to calculate trend expected GDP, and then calculate the percent difference between expected GDP and its trend.

[12] See, among others, Clarida, Gali, and Gertler (2000).

statistically significant rise in the coefficient on inflation and a significant decline in the coefficient on the lagged policy rate from the pre-pandemic period. Table 6 presents the analogous estimations to Table 2, but using inflation expectations instead of actual inflation. The results are again broadly similar.

Figure 7 repeats the exercise shown in Figure 5, comparing the path of actual interest rates during the pandemic period with the predictions of the two models (linear and non-linear) with inflation and output expectations. Again, the predictions of the linear Taylor model (blue line) generally underpredict the rise in interest rates in 2021–22. The predictions of the non-linear Taylor model (green line) in Figure 7 track the run-up in rates less closely than those using actual inflation, as shown in Figure 5. It is likely that as a result of the difficulty predicting inflation during this period, with most forecasts missing the mark, central banks switched to relying more heavily on incoming data and less heavily on inflation predictions. This is consistent with the widespread viewpoint that monetary policy around the world was becoming more data-dependent.

Table 5. OLS linear Taylor rules with expected values of explanatory variables

	(1) OLS 2007q1-2019q4	(2) OLS 2007q1-2019q4	(3) OLS 2007q1-2023q4	(4) OLS 2007q1-2023q4
Expected Inflation	0.36^{***}	0.36^{***}	0.42^{***}	0.36^{***}
	(0.06)	(0.06)	(0.05)	(0.06)
Expected Output Gap	0.08^{***}	0.08^{***}	0.06^{***}	0.08^{***}
	(0.02)	(0.02)	(0.02)	(0.02)
Lagged Policy Rate (1q)	0.88^{***}	0.88^{***}	0.85^{***}	0.88^{***}
	(0.03)	(0.03)	(0.02)	(0.03)
Quarterly % Change in Real Ex Rate	0.00			
	(0.01)			
PANDEMIC				0.56
				(0.89)
Expected Inflation X PANDEMIC				0.28^{**}
				(0.11)
Expected Output Gap X PANDEMIC				-0.04
				(0.04)
Lagged Policy Rate (1q) X PANDEMIC				-0.14^{**}
				(0.07)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	Yes	Yes
R^2	0.98	0.98	0.99	0.99
Adj. R^2	0.98	0.98	0.98	0.98
Num. obs.	260	260	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020.

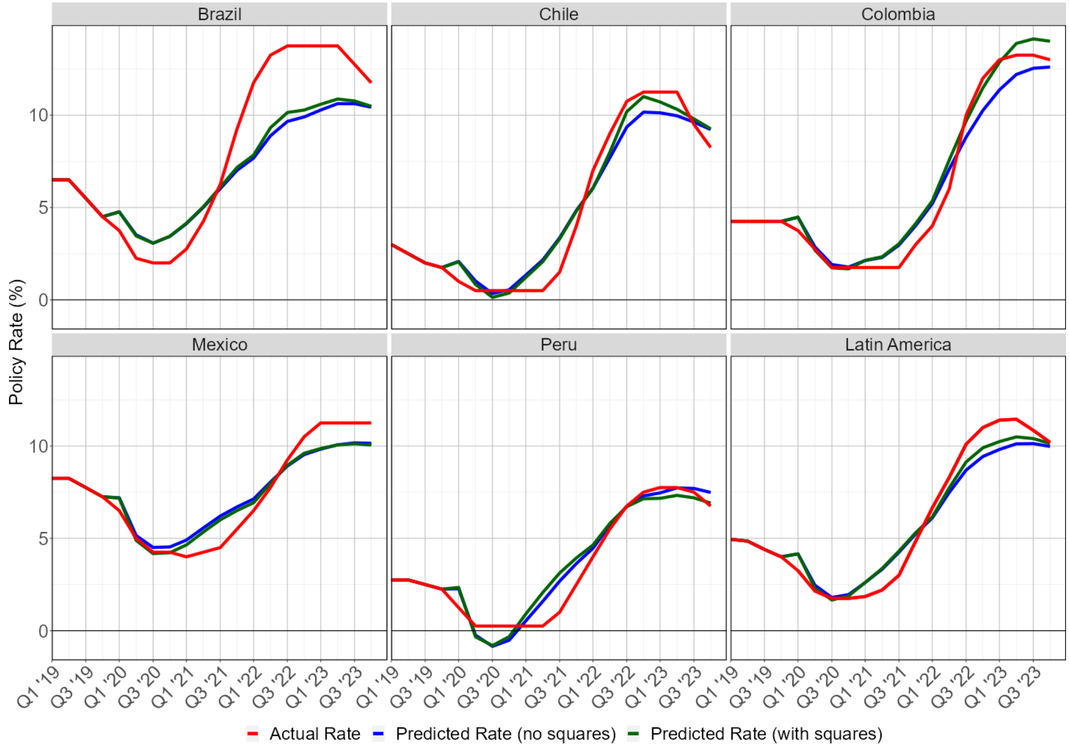
Table 6. OLS non-linear Taylor rules with expected values of explanatory variables

	(1) OLS 2007q1-2019q4	(2) OLS 2007q1-2019q4	(3) OLS 2007q1-2023q4	(4) OLS 2007q1-2023q4
Expected Inflation	-0.24			
	(0.21)			
Expected Inflation squared	0.07***	0.04***	0.04***	0.04***
	(0.02)	(0.01)	0.00	(0.01)
Expected Output Gap	0.10*	0.09***	0.07***	0.09***
	(0.05)	(0.02)	(0.02)	(0.02)
Expected Inflation X Expected Output Gap	0.00			
	(0.01)			
Lagged Policy Rate (1q)	0.87***	0.87***	0.85***	0.87***
	(0.03)	(0.03)	(0.02)	(0.03)
Quarterly % Change in Real Ex Rate	0.01			
	(0.01)			
PANDEMIC				1.77**
				(0.88)
Expected Inflation squared X PANDEMIC				0.01
				(0.01)
Expected Output Gap X PANDEMIC				-0.06
				(0.04)
Lagged Policy Rate (1q) X PANDEMIC				-0.15**
				(0.07)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	Yes	Yes
R^2	0.98	0.98	0.99	0.99
Adj. R^2	0.98	0.98	0.98	0.98
Num. obs.	260	260	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020.

Fig. 7. Simulations of linear Taylor models with expected explanatory variables, estimated 2007-2019, based on Tables 5 and 6, Column 2



Sources: Bank for International Settlements; CEIC
Note: Predicted rates based on dynamic simulation of equations.
In Latin America panel, actual and predicted rates are the mean average of the country-specific rates shown in the other five panels.

4.3 GMM Estimation of Taylor Rule with Inflation and Output Expectations

Because inflation expectations may be endogenous with respect to the policy interest rate, we estimated the model with expectations using generalized method of moments (GMM). This may not be strictly necessary—Carvalho, Nechio, and Tristao (2021) show that estimation bias using OLS for Taylor rules may be minimal. However, we include GMM estimation for robustness. Table 7 presents the 2007–2019 and 2007–2023 GMM estimations of the Taylor rule. Columns 1 and 2 show levels of expected inflation, analogous to columns 1 and 3 of Table 5. Columns 3 and 4 include the square of expected inflation, analogous to columns 1 and 3 of Table 6. As predicted by Carvalho, Nechio, and Tristao (2021), the GMM estimates are quite similar to the OLS estimates in Tables 5 and 6. Accordingly, we do not show simulations of these equations.

Table 7. GMM estimates with expected values of explanatory variables

	(1) GMM 2007q1-2019q4	(2) GMM 2007q1-2023q4	(3) GMM 2007q1-2019q4	(4) GMM 2007q1-2023q4
Expected Inflation	0.32***	0.38***	-0.19**	
	(0.04)	(0.03)	(0.08)	
Expected Inflation squared			0.06***	0.04***
			(0.01)	(0.00)
Expected Output Gap	0.08***	0.07***	0.10***	0.07***
	(0.01)	(0.02)	(0.03)	(0.02)
Expected Inflation X Expected Output Gap			-0.00	
			(0.01)	
Lagged Policy Rate (1q)	0.88***	0.87***	0.88***	0.88***
	(0.01)	(0.01)	(0.01)	(0.01)
Quarterly % Change In Real Ex Rate	0.01		0.01	
	(0.01)		(0.01)	
Constant	-0.66***	-1.05***	0.68***	-0.29
	(0.19)	(0.25)	(0.25)	(0.19)
Country FE	No	No	No	No
Time FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	Yes	No	Yes
Num. Obs.	260	340	260	340
AR(1) p-value	0.116	0.117	0.116	0.114
AR(2) p-value	0.141	0.0821	0.154	0.0807
Hansen p-value	1	1	1	1
Sargan p-value	0	0	0	0

***p < 0.01, **p < 0.05, *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS, CEIC, and Consensus Forecasts. No Country FEs because GMM controls for heterogeneity by taking first differences. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020. Output gap estimated with a two-sided HP filter.

4.4 Estimation of Individual country-specific Taylor rules

Table 8 presents non-panel OLS estimation results for the levels of actual inflation and output gaps, applied separately to data from each country. For each country, estimations run through 2019 Q4; the first column presents the model with levels of inflation and output gaps, while the second column adds the square of inflation to the equations. As noted in Section III.A, the results are broadly similar to panel estimation results shown in Table 1: the coefficients on the levels of inflation and the output gap are broadly similar to each other, and the coefficients on the lagged policy rate are relatively high, and the real exchange rate is insignificant in all cases but Colombia, where it is the wrong sign.

Table 8. OLS linear Taylor rules with current values of explanatory variables, individual country regressions

	(1) Brazil 2007q1- 2019q4	(2) Chile 2007q1- 2019q4	(3) Colombia 2007q1- 2019q4	(4) Mexico 2007q1- 2019q4	(5) Peru 2007q1- 2019q4
Current Inflation	0.29***	0.17**	0.24***	0.11*	0.18**
	(0.06)	(0.07)	(0.06)	(0.06)	(0.08)
Output Gap	0.30***	0.20***	0.28***	0.19***	0.12***
	(0.05)	(0.07)	(0.05)	(0.02)	(0.04)
Lagged Policy Rate (1q)	0.96***	0.59***	0.72***	0.85***	0.72***
	(0.05)	(0.09)	(0.05)	(0.03)	(0.10)
Quarterly % Change In Real Ex Rate	0.01	-0.06	0.03**	-0.01	-0.02
	(0.02)	(0.04)	(0.02)	(0.01)	(0.04)
Num. obs.	52	52	52	52	52
R^2 (full model)	0.95	0.80	0.95	0.97	0.82
R^2 (proj model)	0.95	0.80	0.95	0.97	0.82
Adj. R^2 (full model)	0.95	0.78	0.95	0.97	0.80
Adj. R^2 (proj model)	0.95	0.78	0.95	0.97	0.80

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Individual country regressions: Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. Output gap estimated with a two-sided HP filter.

Table 9 presents country-specific estimates of the model shown in column 1 of Table 2. Here, the addition of several more explanatory variables, coupled with the limited number of observations for each country, results in many insignificant coefficients. As one approach to streamlining the model, we replicate the specification shown in Table 2, column 2, which includes the square of inflation, the output gap, and the lagged policy rate. As shown in Table 10, the coefficients on these variables are all statistically significant, supporting the existence of non-linear responses to inflation.

The out-of-sample simulation results for these models are shown in Figure 8. The non-linear model, in green, does a better job than the linear model, in blue, of tracking the recent movements in policy rates in Chile, Colombia, and Peru, and does at least as well as the linear model for Brazil and Mexico. Accordingly, and consistent with the Latin America average chart, these simulations also provide evidence that the non-linear model is a better representation of the region's monetary policy.

Table 9. OLS non-linear Taylor rules with current values of explanatory variables, individual country regressions

	(1) Brazil 2007q1-2019q4	(2) Chile 2007q1-2019q4	(3) Colombia 2007q1-2019q4	(4) Mexico 2007q1-2019q4	(5) Peru 2007q1-2019q4
Current Inflation	0.40	-0.07	-0.06	-0.15	0.11
	(0.33)	(0.21)	(0.22)	(0.30)	(0.19)
Current Inflation squared	-0.01	0.03	0.03	0.02	0.00
	(0.03)	(0.02)	(0.02)	(0.03)	(0.03)
Output Gap	0.46^{*}	0.23^{*}	-0.11	-0.34^{**}	-0.03
	(0.26)	(0.13)	(0.12)	(0.15)	(0.09)
Current Inflation X Output Gap	-0.03	0.01	0.10^{***}	0.10^{***}	0.05^{*}
	(0.04)	(0.04)	(0.03)	(0.03)	(0.03)
Lagged Policy Rate (1q)	0.97^{***}	0.59^{***}	0.72^{***}	0.95^{***}	0.74^{***}
	(0.05)	(0.10)	(0.05)	(0.04)	(0.10)
Quarterly % Change In Real Ex Rate	0.01	-0.06	0.02	-0.01	-0.01
	(0.02)	(0.05)	(0.01)	(0.01)	(0.04)
Num. obs.	52	52	52	52	52
R^2 (full model)	0.95	0.82	0.97	0.98	0.83
R^2 (proj model)	0.95	0.82	0.97	0.98	0.83
Adj. R^2 (full model)	0.94	0.80	0.96	0.98	0.81
Adj. R^2 (proj model)	0.94	0.80	0.96	0.98	0.81

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$. Standard errors are in parentheses.

Note: Individual country regressions Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. Output gap estimated with a two-sided HP filter.

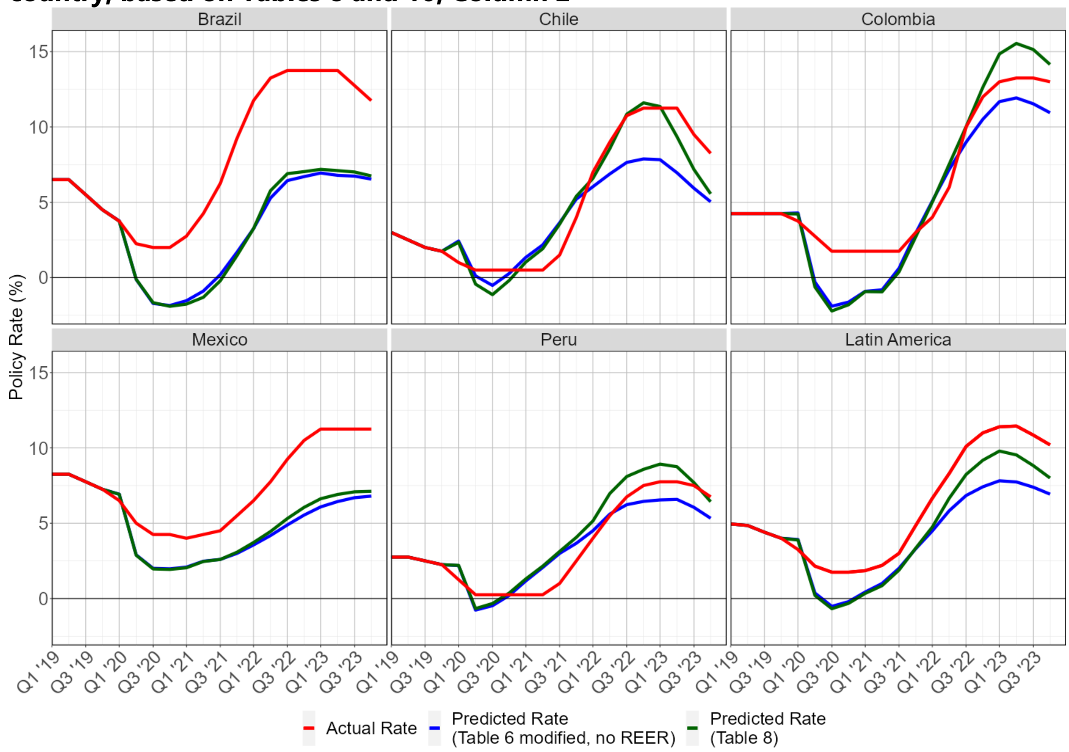
Table 10. OLS non-linear Taylor rules with current values of explanatory variables, individual country regressions, reduced models

	(1) Brazil 2007q1-2019q4	(2) Chile 2007q1-2019q4	(3) Colombia 2007q1-2019q4	(4) Mexico 2007q1-2019q4	(5) Peru 2007q1-2019q4
Current Inflation squared	0.02^{***}	0.02^{***}	0.02^{***}	0.01^{*}	0.03^{**}
	(0.00)	(0.01)	(0.01)	(0.01)	(0.01)
Output Gap	0.32^{***}	0.23^{***}	0.28^{***}	0.19^{***}	0.11^{***}
	(0.05)	(0.07)	(0.05)	(0.02)	(0.04)
Lagged Policy Rate (1q)	0.97^{***}	0.58^{***}	0.74^{***}	0.85^{***}	0.71^{***}
	(0.05)	(0.09)	(0.05)	(0.03)	(0.09)
Intercept	-0.74	1.09^{***}	0.71^{***}	0.53^{***}	0.70^{**}
	(0.44)	(0.29)	(0.20)	(0.15)	(0.28)
Num. obs.	52	52	52	52	52
R^2 (full model)	0.95	0.81	0.95	0.97	0.82
R^2 (proj model)	0.95	0.81	0.95	0.97	0.82
Adj. R^2 (full model)	0.94	0.80	0.95	0.97	0.81
Adj. R^2 (proj model)	0.94	0.80	0.95	0.97	0.81

$^{***}p < 0.01$; $^{**}p < 0.05$; $^{*}p < 0.10$. Standard errors are in parentheses.

Note: Individual country regressions Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from BIS and CEIC. Output gap estimated with a two-sided HP filter.

Fig. 8. Simulations of linear Taylor models estimated 2007-2019 separately by country, based on Tables 8 and 10, Column 2



Sources: Bank for International Settlements; CEIC
Note: Predicted rates based on dynamic simulation of country-specific equations.
In Latin America panel, actual and predicted rates are the mean average of the country-specific rates shown in the other five panels.

4.5 Estimation with quadratic calculation of output trend

In the above estimates, the output gap is calculated as the deviation of output from its trend, where the trend is calculated by applying an HP filter to the data for real GDP. As an alternative, we fit a quadratic trend to the GDP data and use that to calculate the output gap. We replicate the specifications shown in Tables 1 and 2, and the results are presented in Tables 11 and 12. They show a much smaller coefficient on the output gap than in the model using the HP filtered GDP trend. However, the coefficients on the other explanatory variables, as well as their interaction with the dummy variable for 2021–23, are nearly identical. Thus, they continue to support the role of non-linearity in the monetary policy reaction function.

Table 11. OLS linear Taylor rules with current values of explanatory variables, quadratic trend output gap

	(1) OLS 2007q1-2019q4	(2) OLS 2007q1-2019q4	(3) OLS 2007q1-2023q4	(4) OLS 2007q1-2023q4	(5) OLS 2007q1-2023q4
Current Inflation	0.14***	0.14***	0.16***	0.16***	0.14***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Output Gap	0.06***	0.06***	0.06***	0.06***	0.06***
	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Lagged Policy Rate (1q)	0.88***	0.88***	0.87***	0.85***	0.88***
	(0.03)	(0.03)	(0.02)	(0.02)	(0.03)
Quarterly % Change In Real Ex Rate	0.00				
	(0.01)				
PANDEMIC					1.00
					(0.89)
Current Inflation X PANDEMIC					0.10**
					(0.05)
Output Gap X PANDEMIC					0.03
					(0.04)
Lagged Policy Rate (1q) X PANDEMIC					-0.16**
					(0.07)
Time FE	Yes	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.98	0.99
Adj. R^2	0.97	0.97	0.98	0.98	0.98
Num. obs.	260	260	340	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from the Bank of International Settlements (BIS) and CEIC. PANDEMIC = 1 if date > = 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020. Output gap estimated with Quadratic Trend GDP, regressing Real GDP Index on time trend and squared time trend.

Table 12. OLS non-linear Taylor rules with current values of explanatory variables, quadratic trend output gap

	(1) OLS 2007q1-2019q4	(2) OLS 2007q1-2019q4	(3) OLS 2007q1-2023q4	(4) OLS 2007q1-2023q4
Current Inflation	-0.06			
	(0.07)			
Current Inflation squared	0.02***	0.02***	0.01***	0.02***
	(0.01)	0.00	0.00	0.00
Output Gap	0.08**	0.07***	0.07***	0.07***
	(0.03)	(0.01)	(0.01)	(0.01)
Current Inflation X Output Gap	0.00			
	(0.01)			
Lagged Policy Rate (1q)	0.87***	0.87***	0.86***	0.87***
	(0.03)	(0.03)	(0.02)	(0.03)
Quarterly % Change In Real Ex Rate	0.01			
	(0.01)			
PANDEMIC				1.91**
				(0.92)
Current Inflation squared X PANDEMIC				0.00
				0.00
Output Gap X PANDEMIC				0.01
				(0.04)
Lagged Policy Rate (1q) X PANDEMIC				-0.18***
				(0.07)
Time FE	Yes	Yes	Yes	Yes
Country FE	Yes	Yes	Yes	Yes
Country-2020q dummies	No	No	Yes	Yes
R^2	0.98	0.98	0.98	0.99
Adj. R^2	0.98	0.98	0.98	0.98
Num. obs.	260	260	340	340

***p < 0.01; **p < 0.05; *p < 0.10. Standard errors are in parentheses.

Note: Quarterly panel regression for Brazil, Chile, Colombia, Mexico, and Peru. Dependent Variable is the last daily observed policy rate in each quarter. Data are from the Bank of International Settlements (BIS) and CEIC. PANDEMIC = 1 if date >= 2021q1; PANDEMIC = 0 if date < 2021q1. Final column contains interactions with each country (except Brazil) and PANDEMIC. "Country-2020q dummies" refers to dummies interacting each country (except Brazil) interacted with each quarter of 2020. Output gap estimated with Quadratic Trend GDP, regressing Real GDP Index on time trend and squared time trend.

5. Conclusion

This paper compares Latin American monetary policy during the pandemic period to its behavior in previous years. We first estimate a panel-regression Taylor rule for the five main inflation-targeting central banks over the period 2007 to 2019. We find that in the years immediately preceding the pandemic, Latin American central banks had been responding in a balanced and countercyclical manner to both inflation and output, had been substantially smoothing their policy-rate movements, and had not been responding separately to movements in exchange rates.

We then extend the estimation of the Taylor rule through 2023 Q4 and show that the coefficient on inflation rose significantly. This shift is confirmed when we compared the evolution of actual policy interest rates during the pandemic period to the predictions of the model, estimated through 2019: policy rates generally rose more than predicted in 2021 through 2023.

Our findings could be interpreted to mean that Latin American central banks had become considerably more hawkish in the period of the inflation surge after the pandemic recession. But we believe it more likely that the central banks were simply continuing to use a strategy they had employed in the pre-pandemic period: responding more to variations in inflation during periods of high inflation than during periods of low inflation. Such an approach make sense, considering that inflation expectations are more likely to become unanchored when inflation is farther above the targeted level. This makes containing inflation all the more necessary. We provided support for this hypothesis by adding the square of inflation to the Taylor rule model: the coefficient on this term was positive and significant, indicating that policy interest rates exhibited a non-linear response to inflation.

Our research is the first to examine the shifts in Latin American monetary policies associated with the surge in inflation that occurred in 2021–23. It is also the first to fit a very simple and general non-linear version of an empirical Taylor rule to the data and use it to explain the recent evolution of monetary policy. Future research could extend this analysis to central banks in other parts of the world to see whether their monetary policy strategy exhibits similar characteristics. Such research would improve the understanding of central banks' monetary policy in practice and inform sound policymaking in the future.

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