economies

MDPI

Article

Monetary Policy Adjustments in Mexico During COVID-19: Fear of Floating and Macroeconomic Volatility

Jesús Eduardo López-Mares *, Juan Manuel Ocegueda-Hernández and Rogelio Varela-Llamas

Facultad de Economía y Relaciones Internacionales, Universidad Autónoma de Baja California, Tijuana 22427, Baja California, Mexico; jmocegueda@uabc.edu.mx (J.M.O.-H.); rvarela@uabc.edu.mx (R.V.-L.)
* Correspondence: jesus.lopez74@uabc.edu.mx

Abstract: The aim of this paper is to investigate how the central bank of Mexico—a prototypical emerging market economy (EME)—adjusted its reaction coefficients according to an estimated Taylor-type rule in response to the COVID-19 pandemic and the posterior surge in inflation. To do so, we estimate a small open economy model and employ Bayesian methods with a rolling window strategy. Our findings suggest that, during and after the COVID-19 crisis, the central bank slightly reduced its response to inflation and significantly decreased the reaction to the output gap. Further, the exchange rate response increased, pointing to a higher fear of floating. Additionally, a counterfactual experiment shows that these policy adjustments effectively dampened the macroeconomic volatility during the pandemic. We attribute these changes to the lower sensitivity of inflation to the output gap and the amplification of external shocks. However, we argue that these adjustments, particularly the heightened fear of floating, are temporary measures designed to anchor inflation expectations.

Keywords: monetary policy rules; macroeconomic volatility; rolling windows; Bayesian estimation; small open economy

check for updates

Academic Editor: Robert Czudaj

Received: 2 March 2025
Revised: 12 March 2025
Accepted: 14 March 2025
Published: 20 March 2025

Citation: López-Mares, J. E., Ocegueda-Hernández, J. M., & Varela-Llamas, R. (2025). Monetary Policy Adjustments in Mexico During COVID-19: Fear of Floating and Macroeconomic Volatility. *Economies*, *13*(3), 82. https://doi.org/10.3390/economies13030082

Copyright: © 2025 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (https://creativecommons.org/licenses/by/4.0/).

1. Introduction

The recent crisis caused by the COVID-19 pandemic has posed significant challenges for central banks. The widespread shutdowns across nearly all sectors of the economy led to severe demand and supply shocks. In the aftermath of the pandemic, economies experienced substantial inflationary pressures, driven by supply chain disruptions and international conflicts (Ascari et al., 2024; Binder et al., 2025). In this context, one natural question arises: How have the reaction coefficients of central banks in emerging market economies (EMEs) evolved during and after the COVID-19 pandemic? This paper addresses this issue by estimating the reaction coefficients of a Taylor-type rule within a small-scale open economy model, using data from Mexico—a prototypical EME operating under an inflation-targeting regime. Additionally, we conduct a counterfactual analysis to assess whether these changes in the policy reaction coefficients helped mitigate macroeconomic volatility.

We adopt the framework of simple monetary policy rules, similar to those described by Taylor (1993), which have become a standard tool for describing the behavior of central banks under inflation-targeting regimes (El-Shagi & Ma, 2023). Specifically, we estimate the small open economy model from Lubik and Schorfheide (2007) using Bayesian methods. This model has been widely used to analyze parameter instability (e.g., Chen & MacDonald, 2012; Best, 2013; Zamarripa, 2021). Building on the approach of Zamarripa (2021), we

implement a rolling windows strategy to analyze the period from 2001—when the inflation-targeting regime was officially adopted in Mexico—through the last quarter of 2023.

Mexico's adoption of inflation-targeting in 2001, alongside its transition to a flexible exchange rate in the mid-1990s, provides a compelling case for studying how EMEs adapted their monetary policy to macroeconomic shocks triggered by the COVID-19 pandemic. These policy changes were responses to nearly two decades of domestic economic crises and high inflation. By 2001, Mexico had made notable progress in improving its macroeconomic stability, with inflation rates lower than in the previous decades. This progress continued after 2001, with later crises largely driven by external factors.

During the onset of the pandemic, the central bank of Mexico reduced interest rates from 8.25% to 4%. However, in the aftermath of COVID-19, as inflation began to rise, the central bank increased interest rates to levels surpassing those observed before the pandemic. Nonetheless, it is unclear whether these interest rate adjustments reflect significant changes in the coefficients of its policy rule, as there is no existing literature analyzing potential shifts since the COVID-19 pandemic.

Previous studies estimating Taylor-type rules for Mexico have found that the Taylor principle has held, at least since the adoption of inflation-targeting, and although the empirical studies have identified a positive reaction to exchange rate fluctuations, this response has declined consistently over the past years (Gaytán & González-García, 2007; Sidaoui & Ramos-Francia, 2008; Best, 2013; Zamarripa, 2021).

In addition to interest rate adjustments, the Mexican central bank also implemented some macroprudential policies during the pandemic. Heath and Acosta (2023) note that these non-interest-rate measures were primarily designed to facilitate financial support for micro, small, and medium-sized businesses via the banking sector, to ensure sufficient liquidity for the proper functioning of payment systems, and to maintain adequate US dollar liquidity via a swap line with the US Federal Reserve. According to these authors, the central bank of Mexico did not implement quantitative easing. In contrast, other studies have documented that several EMEs adopted quantitative easing for the first time, even when not constrained by the zero lower bound (Guerra et al., 2024; Beirne & Sugandi, 2023; Uz Akdogan, 2023).

Although these macroprudential measures aimed to safeguard financial stability, the central bank's primary instrument for influencing economic activity and inflation remained the policy rate, reinforcing the relevance of analyzing interest rate adjustments. In this regard, EMEs followed similar paths. At the onset of the pandemic, they implemented significant interest rate cuts; however, as persistent inflation emerged, they quickly reversed course by increasing interest rates. As noted by Serletis and Dery (2025), EMEs raised interest rates ahead of advanced economies.

Our results reveal notable changes in the central bank's policy rule following the COVID-19 pandemic. We show that Mexico's central bank slightly decreased its response to inflation while still ensuring adherence to the Taylor principle. In contrast, the output response dropped significantly, approaching values close to zero. Moreover, we document an increase in the reaction to exchange rate fluctuations, which suggests that, in periods of instability, the central bank experiences a higher fear of floating. Although these changes might be interpreted as a shift toward a more discretionary stance by the central bank, we argue that they are temporary measures intended to anchor inflation expectations in response to the increased volatility and uncertainty following the pandemic. Rather than signaling a permanent departure from a rule-based framework, these adjustments align with the central bank's commitment to its inflation-targeting regime.

The counterfactual analysis indicates that the adjustments to the policy reaction coefficients were effective in reducing the volatility of target variables during the COVID-19

crisis. If the central bank had kept parameters unchanged, the implied volatility of all the target variables—except for output—would have been higher. Additionally, our findings show that if the central bank had not increased the exchange rate coefficient, the standard deviation of all the key variables would have increased.

We argue that the lower response to the output gap can be attributed to the reduced sensitivity of inflation to economic slack—evidenced by the significant decline in the slope of the Phillips curve. Meanwhile, the increased response to exchange rate variations can be linked to the heightened volatility of external shocks, which central banks may address to prevent higher inflationary pressures. This finding aligns with the literature suggesting that the central banks of EMEs tend to react more vigorously to exchange rate fluctuations (Montes & Ferreira, 2020; Ahmed, 2021; Fabris & Lazić, 2022; Yilmazkuday, 2022).

The contribution of this paper is twofold. First, to the best of our knowledge, this is the first study to use a dynamic stochastic general equilibrium (DSGE) model to analyze how the central banks in EMEs reacted in response to the COVID-19 pandemic. Analyzing shifts in the behavior of the central banks in EMEs is crucial, as they face different challenges compared to AEs. Specifically, many central banks in AEs had to implement unconventional monetary policies due to constraints imposed by the zero lower bound (Yilmazkuday, 2022; Serletis & Dery, 2025), whereas many EMEs were apparently not constrained by the zero lower bound. However, exchange rate dynamics play a more prominent role in EMEs, particularly during recession episodes. This occurs as investors reallocate capital to what they perceive as safer currencies—particularly the US dollar—potentially creating external imbalances (Hale & Juvenal, 2023).

This phenomenon has been documented for Mexico by Jaramillo et al. (2019) and López and Bush (2019), who emphasize the role of external factors in exchange rate movements. For instance, Jaramillo et al. (2019) note that since 2001, the most significant episodes of depreciation have been linked to external shocks. Furthermore, research has widely documented that currency depreciation in emerging market economies (EMEs) amplifies inflationary pressures (Adolfson, 2007; Best, 2013), particularly when inflation expectations are not well anchored (Anderl & Caporale, 2024; Kwon & Shin, 2023).

Second, we extend the existing literature on Taylor-type rules by incorporating a counterfactual experiment, akin to those conducted by Justiniano and Primiceri (2008) and Castelnuovo (2010). While previous studies have accounted for the impacts of COVID-19 on monetary policy (e.g., Anderl & Caporale, 2024; Yilmazkuday, 2022; Guerra et al., 2024), our contribution lies in conducting a counterfactual experiment to assess the theoretical second moments of target variables under alternative parameterizations of monetary policy rules. The results contribute to the literature by emphasizing the importance of managing exchange rate fluctuations during periods of uncertainty. In this sense, we argue that the central bank of Mexico was constrained not by the lower bound but possibly by the risk of capital outflows and higher inflationary pressures, explaining the increased fear of floating.

This paper is organized as follows. Section 2 describes the model, Section 3 presents the data and priors for the Bayesian estimate, Section 4 presents the results, and Section 5 concludes.

2. The Small Open Economy Model

The model is a small-scale new Keynesian open economy model with price rigidity, based on Lubik and Schorfheide (2007), who derived a simplified version of the Galí and Monacelli (2005) model. This framework has been applied to México by Best (2013) and Zamarripa (2021) and to other economies by Zheng and Guo (2013) and Alstadheim et al.

(2021), among others. The model includes a new Keynesian open economy Phillips curve, described by the following equation:

$$\pi_t = \beta E_t \pi_{t+1} + \alpha\beta E_t \Delta q_{t+1} - \alpha \Delta q_t + \frac{\kappa}{\tau + \alpha(2-\alpha)(1-\tau)}(y_t - \overline{y}_t) + u_t \quad (1)$$

where π_t represents inflation, Δq_t is the rate of change of terms of trade, y_t is the log of the aggregate output and $\overline{y}_t$ represents the log of the potential output. The parameter β is the discount factor, κ represents the slope of the Phillips curve in a closed economy version of the model, which is a function of price stickiness, α is the import share, and lastly, τ is the intertemporal elasticity of substitution (inverse risk aversion). Following Best (2013), we add an exogenous cost-push shock u_t, which follows an AR(1) process. As noted by Lubik and Schorfheide (2007), when $\alpha = 0$, the model reduces to its closed-economy counterpart.

In addition, the model incorporates a forward looking IS curve represented by:

$$\begin{aligned} y_t = E_t y_{t+1} - [\tau + \alpha(2-\alpha)(1-\tau)](R_t - E_t \pi_{t+1}) - \rho_z z_t \\ -\alpha[\tau + \alpha(2-\alpha)(1-\tau)] E_t \Delta q_{t+1} + \alpha(2-\alpha)\tfrac{1-\tau}{\tau} E_t \Delta y^*_{t+1} \end{aligned} \quad (2)$$

In this expression, z_t represents a productivity shock with an autoregressive parameter ρ_z, and y^*_t denotes the foreign log of the output. Both z_t and y^*_t are modeled as AR(1) processes. The exchange rate is introduced into the model through the assumption of relative purchasing power parity, which is expressed as follows:

$$\pi_t = \Delta e_t + (1-\alpha)\Delta q_t + \pi^*_t \quad (3)$$

Here, π^*_t represents a foreign inflation shock that follows an AR(1) process. Similarly, we assume that Δq_t follows an AR(1) process, with innovation ϵ^q_t. This assumption comes from the fact that, if the terms of trade were determined endogenously, the model would be overly restricted, creating problems in the estimation process (Lubik & Schorfheide, 2007).

Lastly, we model the central bank's behavior using a Taylor-type rule, assuming that the central bank responds to inflation, output, and exchange rate. Additionally, we incorporate an interest rate smoothing parameter, ρ_R, to account for gradual adjustments to monetary policy. The rule is expressed as follows:

$$R_t = \rho_R R_{t-1} + (1-\rho_R)\left[\psi_\pi \pi_t + \psi_y y_t + \psi_e \Delta e_t\right] + \epsilon^R_t \quad (4)$$

where ϵ^R_t represents an exogenous monetary policy shock and ψ_i with $i = \Delta\pi$, y and e denote the corresponding reaction parameters.

3. Estimation Strategy

Following the conventional literature, we estimate the parameters using Bayesian techniques. As highlighted by Lubik and Schorfheide (2007), since the variables in the monetary policy rule are all endogenous, estimating Equation (4) using ordinary least squares would yield a biased estimate. Bayesian estimation involves forming prior beliefs about the distributions of parameters, $p(\Omega)$. These priors are then updated with data through the likelihood function denoted by $p\left(Y^T|\Omega\right)$ to form the posterior distribution via Bayes' theorem.

$$p(\Omega|Y^T) = \frac{p(Y^T|\Omega)p(\Omega)}{p(Y^T)} \quad (5)$$

We evaluate the likelihood function with the Kalman filter. To obtain the posterior mode, we employ numerical optimizers, and to generate the posterior distribution, we run simulations with the Metropolis–Hastings algorithm (for a more detailed descrip-

tion of Bayesian inference, see An & Schorfheide, 2007). For each estimation, we run 200,000 iterations, with the initial 20% discarded as burn-in. This relatively large number of iterations aligns with the approach taken by Best (2013) and Zamarripa (2021), both of whom employed 300,000 iterations. Nevertheless, our preliminary analyses indicate that the Markov chain Monte Carlo (MCMC) results converge well before 200,000 iterations, and tests using 100,000 iterations produce nearly identical posterior estimates. Accordingly, we adopt 200,000 iterations as a middle ground to ensure robustness across estimations while maintaining computational efficiency.

The model is estimated using 10-year rolling windows, following Zamarripa (2021). The first window spans from the first quarter of 2001 to the last quarter of 2010, and the final window covers the first quarter of 2014 to the final quarter of 2023, with each successive estimation shifting the window forward by one year. This approach yields fourteen different posterior estimations. Notably, the last four windows capture the COVID-19 pandemic and the subsequent global inflationary episode.

3.1. Data

We employ six variables for the period 2001Q1–2023Q4. This allows us to focus only on the inflation-targeting regime and capture the dynamics during and after the pandemic, in line with our research objective. Specifically, we include the log difference of the GDP for both Mexico and the US, multiplied by 100 to obtain the quarterly growth rates. The same log difference treatment is applied to the nominal exchange rate and terms of trade.

The CPI inflation rate for Mexico is calculated by taking the log difference of the quarterly CPI and multiplying it by 400 to obtain annualized rates following Lubik and Schorfheide (2007). Lastly, we use the annual rate of Cetes at 91 days as the policy interest rate. All the variables are seasonally adjusted and demeaned prior to estimation.

The GDP and CPI data for Mexico are obtained from the National Institute of Statistics and Geography (INEGI). The exchange rate, terms of trade, and interest rate data are provided by the Bank of Mexico, while the US GDP data are sourced from the Federal Reserve Economic Data (FRED). Figure 1 presents a visual inspection of the series.

3.2. Priors

Our selection of priors is primarily based on Lubik and Schorfheide (2007), Best (2013), and Zamarripa (2021) due to the models' similarities and the specific focus on Mexico in the latter two studies. The discount factor, β, is fixed at 0.99. The parameters α and τ follow a beta distribution with a prior mean of 0.5 and a standard deviation of 0.20, while κ follows a gamma distribution with a mean of 0.5. The monetary policy reaction parameters ψ_π and ψ_y also follow a gamma distribution, with means of 1.5 and 0.5, respectively, consistent with the values suggested by Taylor (1993). Regarding ψ_e, we adopt the approach of Zamarripa (2021) in shaping the posterior density, assuming it follows a normal distribution centered at zero, rather than the more restrictive gamma distribution proposed by Lubik and Schorfheide (2007), which confines the parameter to positive values. However, as a robustness check, we re-estimate the model using a gamma distribution with a mean of 0.125, finding that the results remain largely unchanged.

For exogenous shocks, all the autoregressive parameters are assumed to follow a beta distribution with a mean of 0.7 and a standard deviation of 0.10. This specification concentrates most of the prior probability mass between 0.5 and 0.9, in line with previous empirical evidence for Mexico (see Best, 2013; Zamarripa, 2021). Nonetheless, the results are not sensitive to the mean of the autoregressive parameters. Moreover, because the beta distribution is defined on the interval [0, 1], it naturally restricts the autoregressive parameter values, ensuring that shocks exhibit persistence while preventing explosive

dynamics (i.e., values exceeding one). To specify the distribution of the standard deviations, we apply the loose prior approach suggested by Best (2013) and Zamarripa (2021), allowing the data to be more informative, considering an inverse gamma distribution. Table 1 summarizes the prior distributions.

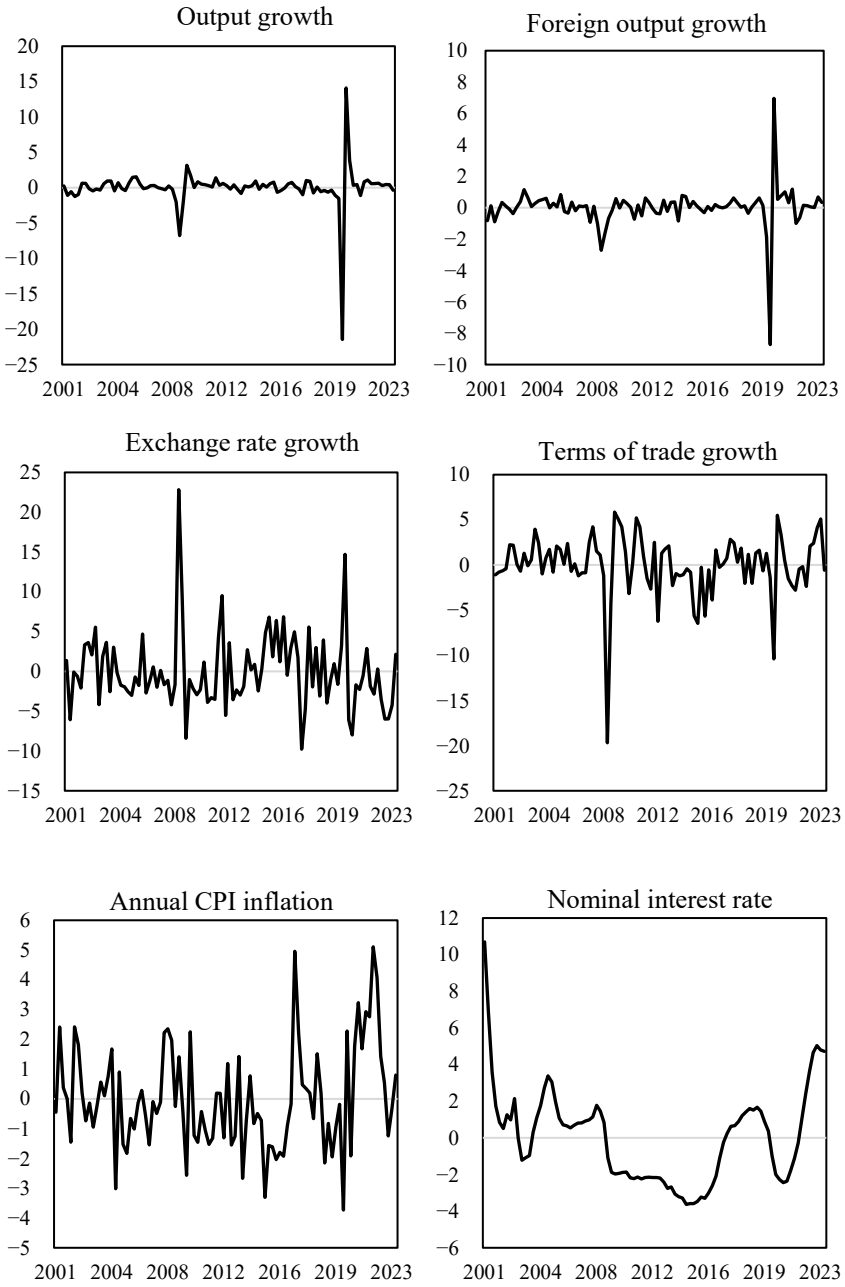

Figure 1. Evolution of the observable variables. Note: All the variables are demeaned and seasonally adjusted.

Table 1. Prior distribution of the estimated parameters.

Parameter	Density	Mean	SD
ψ_π	G	1.50	0.10
ψ_y	G	0.50	0.10
ψ_e	N	0.00	0.10
α	B	0.50	0.10
κ	G	0.50	0.20

Table 1. *Cont.*

Parameter	Density	Mean	SD
τ	B	0.50	0.20
ρ_R	B	0.70	0.10
ρ_q	B	0.70	0.10
ρ_z	B	0.70	0.10
ρ_{π^*}	B	0.70	0.10
ρ_{y^*}	B	0.70	0.10
ρ_u	B	0.70	0.10
σ_a	IG	7.00	6.00
σ_ϕ	IG	7.00	6.00
σ_ξ	IG	7.00	6.00
σ_ϱ	IG	7.00	6.00
σ_{ϵ_R}	IG	7.00	6.00
σ_{R*}	IG	7.00	6.00
$\sigma_{\Pi*}$	IG	7.00	6.00
σ_{Y*}	IG	7.00	6.00

4. Results

Figure 2 depicts the evolution of the posterior median of the estimated parameters across different windows, along with the corresponding 5th and 95th posterior percentiles. With respect to the non-policy coefficients, the import share parameter remains stable at around 0.10 in all the estimations—except for the first window—while τ exhibits greater variation, jumping from 0.75 in the 2010Q1–2019Q4 window to 0.88 in the 2011Q1–2020Q4 estimation window, stabilizing around this value afterward.

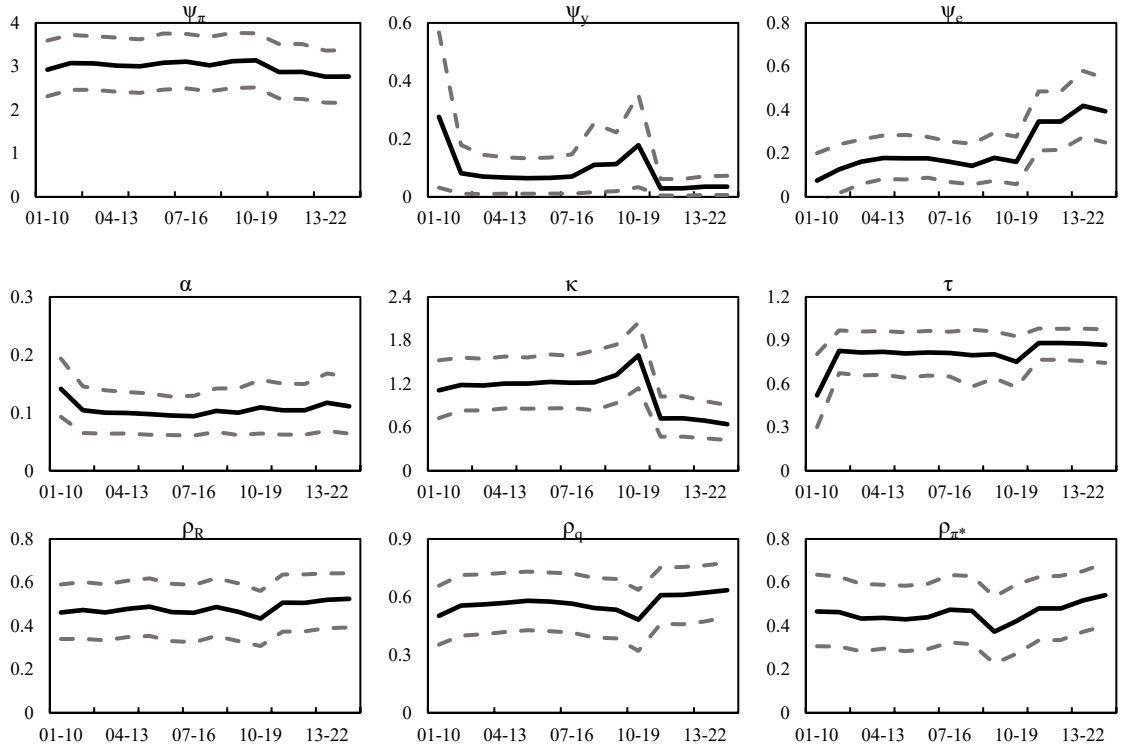

Figure 2. *Cont.*

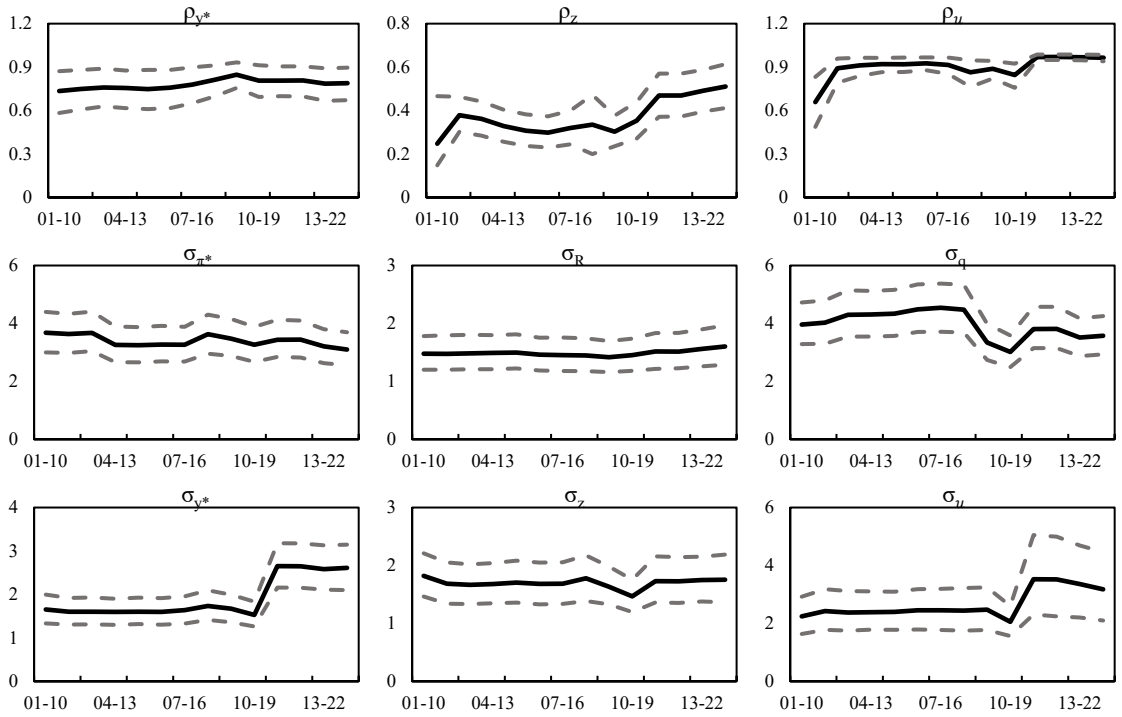

Figure 2. Evolution of the estimated parameters. Note: The solid line represents the posterior median estimate for each subsample, while the dashed lines represent the 5th and 95th posterior percentiles. The windows span from the first quarter to the last quarter of the corresponding years.

Notably, the slope of the Phillips curve, κ, remains stable between the 2001Q1–2010Q4 and 2008Q1–2017Q4 windows, then starts rising during the next two subperiods, peaking at 1.59 in the 2010Q1–2019Q4 estimation. However, once the pandemic is included in the subsamples, κ declines rapidly, reaching its minimum of 0.64 in the last window. The decline in the slope of the Phillips curve following COVID-19 is consistent with the findings of Haschka (2024) and Bobeica and Hartwig (2023) for the US and the euro area, respectively.

Even prior to COVID-19, the widely held belief in the recent literature was that the slope of the Phillips curve has globally declined over the past decades (Blanchard et al., 2015; Del Negro et al., 2020). This decline is often associated with stronger anchoring of inflation expectations (Blanchard, 2016; Haschka, 2024) and increased globalization, which amplify the impact of external shocks (Szafranek, 2017; Heise et al., 2022).

Best (2013) supports this narrative for Mexico and estimates a 50% reduction in this parameter between the 1981–1994 and 1995–2005 regimes. The latter period is characterized by the central bank's transition to an inflation-targeting regime—which enhanced its ability to anchor inflation expectations—and the country experiencing greater trade openness. Nonetheless, the results presented here and in Zamarripa (2021) reveal that the slope of the Phillips curve parameter remains relatively stable throughout the inflation-targeting period, at least prior to the disruptions caused by the pandemic.

The decline in κ as soon as the sample is expanded to include data after 2020 can be attributed to shocks from the COVID-19 pandemic, coupled with international conflicts that disrupted global supply chains. Given Mexico's strong integration into international trade, both in exports and imports, these disruptions likely exacerbated external shocks, thereby reducing the influence of domestic economic slack on inflation variations.

The relevance of external and supply shocks is confirmed by the evolution of the estimated standard deviations of shocks, which show a marked increase in the volatility of foreign output and supply shocks over the last four windows. Overall, these results align with the globalization and inflation hypothesis. This hypothesis states that as globalization

intensifies, external factors play a larger role in explaining inflation variations, while the role of domestic economic slack diminishes.

In contrast, the standard deviation of the terms of trade shock declines compared to earlier windows and exhibits more erratic behavior overall. The general estimated evolution of the standard deviations of the shocks is largely consistent with the findings of Chavarín et al. (2023), who document the importance of external shocks for Mexico during and after the pandemic.

With regard to the autoregressive parameters, all the shocks—except for the foreign output shock (ρ_{y*})—display similar patterns, becoming more persistent after the 2011Q1–2020Q4 subsample. Remarkably, the supply shock exhibits the highest persistence, which may help explain the sustained inflation experienced in the country in the aftermath of the COVID-19 pandemic.

The policy coefficients also exhibit notable changes. First, we notice that ψ_π shows stable behavior in all the subperiods prior to the COVID-19 pandemic. The response to inflation oscillates around values somewhat above 3, with a peak at 3.14 in the 2010Q1–2019Q4 window. However, after accounting for the pandemic—represented by the last four windows—the inflation response decreases, reaching a minimum of 2.76 in the 2013Q1–2022Q4 window. These findings indicate that Mexico's monetary authority has consistently adhered to the Taylor principle throughout all the subperiods. In contrast, the recent literature generally finds that most of AEs and EMEs display a stronger reaction to inflation when accounting for COVID-19 (Anderl & Caporale, 2024; Guerra et al., 2024; González-Astudillo & Tanvir, 2023).

With respect to ψ_y, we observe a notable drop in the second subsample. Following this, ψ_y stabilizes throughout the successive windows from 2002Q1–2011Q4 to 2007Q1–2016Q4. Thereafter, ψ_y begins an upward trend, which continues until the 2010Q1–2019Q4 estimation. In the 2011Q1–2020Q4 window, the median value of the parameter distribution falls to 0.03—a reduction of over 80% compared to the 0.18 response observed in the 2010Q1–2019Q4 subsample. This small reaction coefficient persists in all the subsequent windows.

A plausible explanation for this outcome is the observed decline in κ. As the influence of the output gap on inflation diminished, achieving lower inflation would have required larger output losses. In response, the central bank appears to have reduced its emphasis on output fluctuations to stabilize inflation. Moreover, this finding further underscores the central bank's strong commitment to price stability, as it moderated its reaction to the output variations despite the significant drop in economic activity at the onset of the pandemic—a decision that may partly explain the slow economic recovery in Mexico after the crisis.

In this regard, Anderl and Caporale (2024) also find a marked decline in the output gap coefficient for some inflation-targeting countries, particularly in the UK, Canada, and Sweden. By contrast, in non-targeting countries, the response remains relatively stable in most cases, and even increases in the US economy, where monetary policy follows a dual mandate. However, the evidence is mixed; for instance, Guerra et al. (2024) report no significant changes for a group of Latin American countries, and similarly, Gropelli and Kfoury (2023) find no significant shifts for the Brazilian economy.

In contrast, the exchange rate response shows an upward trend starting in the 2011Q1–2020Q4 subperiod, reaching a peak of 0.42 in 2013Q1–2022Q4. For comparison, in the last subsample before the pandemic (2010Q1–2019Q4), the estimated response to the exchange rate was 0.16, implying an increase of over 162%. This shift likely reflects that, in light of the economic challenges presented by the pandemic and the subsequent inflationary pressures, the central bank exhibits a higher fear of floating.

This result is noteworthy given that previous studies have shown that the Mexican central bank reduced its reaction to exchange rate movements, particularly after 2001 (among them Zamarripa, 2021; Gaytán & González-García, 2007; Sidaoui & Ramos-Francia, 2008; Best, 2013). These studies attribute this reduction to the adoption of the inflation-targeting regime that successfully anchored inflation expectations and lessened the need for exchange rate interventions. Nonetheless, the results in Figure 2 indicate that as the pandemic unfolded, the central bank faced new challenges and reacted more aggressively to exchange rate variations.

We interpret the heightened fear of floating as a temporary response by the central bank. Considering its reduced ability to influence inflation through the output gap, the stronger reaction to the exchange rate likely reflects its commitment to fighting future inflation driven by external supply shocks. Consequently, this response appears to be a short-term measure aimed at anchoring inflation expectations rather than a permanent change. This interpretation aligns with the findings of Anderl and Caporale (2024), who document a significant increase in the exchange rate response for inflation-targeting economies like Canada and Australia, while non-targeting countries show no notable changes in this parameter.

In this sense, the changes in ψ_y and ψ_e might be part of the central bank's strategy to effectively communicate its commitment to keeping inflation under control, despite the shifting macroeconomic conditions brought about by the post-pandemic environment, including the slow economic recovery. Given that the external shocks amplified inflationary pressures worldwide, maintaining a passive or expansionary monetary policy could have negatively affected inflation expectations. By adjusting its policy stance, the central bank likely aimed to reinforce its credibility and anchor long-term inflation expectations, as suggested by Carstens (2025).

Lastly, the smoothing parameter, ρ_R, remains stable in all the subperiods, with a slight increase from the 2011Q1–2020Q4 window and beyond. Overall, this policy parameter does not exhibit significant variations.

In sum, these changes in the policy coefficients may stem from the evolution of non-policy coefficients. As we noted earlier, inflation has become less sensitive to drops in output, while external shocks become more volatile. Additionally, when facing uncertainty, EMEs tend to experience capital outflows, which exert pressure on the exchange rate (Bhattarai et al., 2020). As highlighted by Guerra et al. (2024), this imposes constraints on central banks, which must react to prevent greater instability in the exchange rate and, ultimately, in inflation. In this regard, the central banks in EMEs may find themselves constrained like those in AEs in terms of loosening monetary policy, though the underlying reasons differ. While AEs are constrained by the zero lower bound, EMEs are bounded due to the exchange rate volatility during uncertainty periods.

This volatility is often a consequence of the so-called "flight to safety" phenomenon, where investors tend to reallocate capital toward assets denominated in perceived safer currencies, usually the US dollar. This dynamic can increase the fear of floating in EMEs, as sharp exchange rate depreciations may amplify macroeconomic instability. Empirical evidence of this behavior during the onset of the COVID-19 pandemic is provided by Hale and Juvenal (2023), who document significant depreciations in most EME currencies, including the Mexican peso. Similarly, Jaramillo et al. (2019) show that previous episodes of large depreciations in Mexico have been closely related to external shocks.

Counterfactual Experiment: The Implied Volatility Under Different Monetary Policy Regimes

For the counterfactual experiment, we construct different policy rule scenarios and compare their theoretical moments. We do not rely on a loss function following Benigno

and Woodford (2005), who argue that using a quadratic loss function to assess welfare in the presence of an inefficient steady state may lead to erroneous results. In this model, the inefficient steady state arises from the assumption of monopolistic competition. Therefore, we instead focus solely on the implied volatility derived from the theoretical moments. These theoretical moments are calculated analytically after solving the model in its state space representation.

To conduct the counterfactual experiment, we calibrate the model using the average of the posterior median estimate spanning the COVID-19 period, i.e., from the 2011Q1–2020Q4 to 2014Q1–2023Q4 subsamples. This scenario tries to capture the macroeconomic dynamics and the shock distributions during and after the pandemic. We refer to this scenario as "Pandemic Windows", which functions as our baseline scenario. In contrast, the "Non-Pandemic Windows" scenario is based on the average of the posterior medians spanning the 2001Q1–2010Q4 to 2010Q1–2019Q4 windows and represents the average economic conditions without the influence of the pandemic. Table 2 shows the average of each parameter in each scenario and the respective percentage change from the "Non-Pandemic Windows" to the "Pandemic Windows".

Table 2. Average posterior median with different samples.

Parameters	Average Non-Pandemic Windows Medians	Average Mean Pandemic Windows Median	Change
ψ_π	3.06	2.82	−8%
ψ_y	0.11	0.03	−71%
ψ_e	0.15	0.38	145%
α	0.10	0.11	5%
κ	1.25	0.69	−44%
τ	0.78	0.88	13%
ρ_R	0.47	0.51	10%
ρ_q	0.55	0.62	13%
ρ_{π^*}	0.44	0.50	14%
ρ_{y^*}	0.77	0.80	3%
ρ_z	0.32	0.48	50%
ρ_u	0.87	0.97	11%
σ_{π^*}	3.44	3.29	−4%
σ_R	1.47	1.55	6%
σ_q	4.08	3.68	−10%
σ_{y^*}	1.62	2.62	62%
σ_z	1.68	1.74	4%
σ_u	2.37	3.39	43%

Note: The non-pandemic windows values represent the average of the estimated median values from the windows from 2001Q1–2010Q4 to 2010Q1–2019Q4, and the pandemic windows values express the average estimated median values from the windows 2011Q1–2020Q4 to 2014Q1–2023Q4.

We corroborate the results shown in Figure 2 that, within the non-policy coefficients, κ, ρ_z, σ_{y*} and σ_u are the parameters that exhibit greater changes. Among the policy coefficients, the response to the exchange rate is 145% higher in the "Pandemic Windows" than in the "Non-Pandemic Windows" scenario, while the response to the output gap shows a significant drop of 71%.

The results of the counterfactual experiment are shown in Table 3. The second row shows the theoretical moments derived from the calibrated model using the average posterior medians from the "Pandemic windows" or baseline scenario. In the third row of Table 3, we keep the non-policy coefficients unchanged but modify the policy rule parameters to those estimated from the "Non-Pandemic Windows". This alternative scenario is referred to as the "Non-Pandemic Windows Rule".

Table 3. Counterfactual scenarios with different policy rule parameters.

Scenarios	σ_π	$\%\Delta\sigma_\pi$	$\sigma_{\Delta y}$	$\%\Delta\sigma_{\Delta y}$	$\sigma_{\Delta e}$	$\%\Delta\sigma_{\Delta e}$
Pandemic Windows parameters	7.10	0.00%	5.23	0.00%	4.08	0.00%
Non-Pandemic Windows Rule	7.38	3.89%	5.14	−1.82%	4.42	8.38%
ψ_π (pre-pandemic)	6.68	−5.96%	5.20	−0.66%	4.07	−0.18%
ψ_y (pre-pandemic)	8.04	13.18%	5.18	−0.94%	4.19	2.85%
ψ_e (pre-pandemic)	7.29	2.68%	5.26	0.50%	4.39	7.69%

Note: The changes in the standard deviation are calculated with respect to the "Pandemic Windows" scenario, i.e., the second row.

The results concerning the "Non-Pandemic Windows Rule" indicate that, if Mexico's central bank had kept its policy coefficients unchanged during and after COVID-19, all the variables—except output growth—would have experienced higher volatility compared to the baseline scenario, as reflected by columns 3, 5 and 7. Compared with the base case scenario, the depreciation rate would have been 8.4% more volatile, and inflation would have exhibited an almost 4% increase in the implied standard deviation. These findings suggest that adjustments in monetary policy allowed the central bank to mitigate the volatility of the key macroeconomic variables during the COVID-19 episodes.

Additionally, to investigate the contribution of each parameter to the volatility of the target variables, in Table 3, we change each policy rule coefficient individually. In the fourth row, we revert the inflation coefficient to its pre-pandemic level while keeping the other parameters at the baseline values. This scenario results in lower overall volatility compared to the baseline. The average pre-pandemic reaction to inflation was higher than the post-pandemic average, as shown in Table 2. According to this result, a stronger inflation reaction might have been necessary to further mitigate the volatility in the macroeconomic variables.

The fifth row displays the theoretical moments when adjusting only ψ_y from 0.03 to its pre-pandemic level, 0.11. The model implies that, if the central bank had not reduced its response to the output gap, it could have led to a higher standard deviation in inflation (13% higher than the baseline) and only the output growth standard deviation would have decreased slightly (less than 1%). This result illustrates the trade-off faced by the central bank of Mexico between stabilizing output movements and inflation, likely influenced by the elevated volatility and persistence of cost-push shocks as documented in the "Pandemic Windows".

Finally, in the sixth row, we keep all the other parameters at their baseline levels except for ψ_e, which is calibrated to 0.15, its pre-pandemic level. We find that if the central bank had not experienced an increased fear of floating during COVID-19, the implied volatility of all the variables would have been greater. Again, these results illustrate that EMEs are probably constrained in their ability to loosen monetary policy during recession episodes, possibly explained by the potential capital outflows that could result in greater external imbalances and inflationary pressures.

A final caveat is that these results may be model-specific, and more complex models could be required to gain further insights into the effects of changes in the monetary policy rule on welfare. Additionally, further analysis is needed to assess whether alternative monetary policy regimes—beyond inflation targeting—could have delivered superior welfare outcomes. To this end, a non-linear model with a second-order approximation or higher might be required.

5. Conclusions

This study aimed to analyze how the central bank of Mexico's policy coefficients evolved following the COVID-19 pandemic. Our analysis focused on Taylor-type interest rate rules as the primary tool for stabilizing output and inflation—particularly because,

unlike many other emerging market economies, Mexico did not implement quantitative easing (Heath & Acosta, 2023). To this end, we employed a rolling window estimation of the small open economy model developed by Lubik and Schorfheide (2007) using Bayesian techniques. Additionally, we conducted a counterfactual experiment to assess if these policy adjustments helped the central bank of Mexico mitigate the macroeconomic volatility arising from the pandemic and the subsequent surge in inflationary pressures.

In summary, the results indicate that Mexico's central bank adjusted its monetary policy coefficients to account for shocks induced by COVID-19. Notably, the findings show that the central bank experienced a higher fear of floating during and after the COVID-19 pandemic. Furthermore, the response to the output gap declined near zero, while the reaction to inflation somewhat decreased. Additionally, the counterfactual experiment highlights that changes in the policy rule coefficients played an important role in reducing macroeconomic volatility, as implied by the theoretical standard deviations. Most importantly, the increased fear of floating enabled the central bank to lower the volatility across all the target variables.

We attribute the lower response to the output gap in the estimated monetary policy rule and the findings of the counterfactual experiment to the lower sensitivity of inflation to domestic economic slack—evidenced by the significant decline in the estimated slope of the Phillips curve. The higher response to the exchange rate can be attributed to the amplification of external shocks that could lead to external imbalances and inflationary pressures through disruptions to international supply chains. As suggested by Guerra et al. (2024) and Hale and Juvenal (2023), during periods of crisis and uncertainty, external capital shifts from AE to EMEs. Such capital outflows exacerbate exchange rate volatility and inflationary pressures. In this context, even at the onset of the pandemic, the central bank was likely constrained not by the zero lower bound (ZLB) but by the risk of capital outflows stemming from heightened uncertainty. Furthermore, the amplification of external shocks may explain the drop in the slope of the new Keynesian Phillips curve, as suggested by the globalization and inflation hypothesis.

Our results may be extended to other economies, especially those that are strongly integrated into international markets and follow inflation-targeting regimes. In the aftermath of the pandemic, heightened external and supply shocks—and persistent inflation—may have compelled the central banks in inflation-targeting countries to adjust their policy stances to keep inflation expectations anchored. In this sense, although the significant changes in policy coefficients following COVID-19 might suggest a shift toward a more discretionary stance in Mexico, we argue that the central bank has remained consistent with its inflation-targeting regime. Instead of signaling permanent changes, these adjustments—most notably the heightened fear of floating—appear to be temporary measures aimed at communicating its commitment to controlling inflation and, consequently, stabilizing long-term inflation expectations.

Lastly, although we view these policy changes as temporary responses, there remains a risk that prolonged external shocks—driven by ongoing international conflicts or the potential imposition of tariffs from the US—could increase uncertainty, prompting the central bank to consider more permanent adjustments to its monetary policy framework. In this regard, as new data become available, future research should focus on assessing whether such changes ultimately materialize.

Author Contributions: Conceptualization, J.E.L.-M. and J.M.O.-H.; Methodology, J.E.L.-M. and R.V.-L.; Software, J.E.L.-M.; Validation, J.E.L.-M., J.M.O.-H. and R.V.-L.; Formal Analysis, J.E.L.-M., J.M.O.-H. and R.V.-L.; Investigation, J.E.L.-M., J.M.O.-H. and R.V.-L.; Resources, J.E.L.-M., J.M.O.-H. and R.V.-L.; Data Curation, J.E.L.-M., J.M.O.-H. and R.V.-L.; Writing—Original Draft Preparation, J.E.L.-M., J.M.O.-H. and R.V.-L.; Writing—Review & Editing, J.E.L.-M., J.M.O.-H. and R.V.-L.; Visual-

ization, J.E.L.-M., J.M.O.-H. and R.V.-L. All authors have read and agreed to the published version of the manuscript.

Funding: This research was funded by Universidad Autónoma de Baja California.

Informed Consent Statement: Not applicable.

Data Availability Statement: The article uses publicly available data. The sources and data are defined in Section 3.1.

Conflicts of Interest: The authors declare no conflict of interest.

References

Adolfson, M. (2007). Incomplete exchange rate pass-through and simple monetary policy rules. *Journal of International Money and Finance*, *26*(3), 468–494. [CrossRef]

Ahmed, R. (2021). Monetary policy spillovers under intermediate exchange rate regimes. *Journal of International Money and Finance*, *112*, 102342. [CrossRef]

Alstadheim, R., Bjørnland, H. C., & Maih, J. (2021). Do central banks respond to exchange rate movements? A Markov-switching structural investigation of commodity exporters and importers. *Energy Economics*, *96*, 105138. [CrossRef]

An, S., & Schorfheide, F. (2007). Bayesian analysis of DSGE models. *Econometric Reviews*, *26*(2–4), 113–172. [CrossRef]

Anderl, C., & Caporale, G. M. (2024). Time-varying parameters in monetary policy rules: A GMM approach. *Journal of Economic Studies*, *51*(9), 148–176. [CrossRef]

Ascari, G., Bonam, D., & Smadu, A. (2024). Global supply chain pressures, inflation, and implications for monetary policy. *Journal of International Money and Finance*, *142*, 103029. [CrossRef]

Beirne, J., & Sugandi, E. (2023). Central bank asset purchase programs in emerging market economies. *Finance Research Letters*, *54*, 103769. [CrossRef]

Benigno, P., & Woodford, M. (2005). Inflation stabilization and welfare: The case of a distorted steady state. *Journal of the European Economic Association*, *3*(6), 1185–1236. [CrossRef]

Best, G. (2013). Fear of floating or monetary policy as usual? A structural analysis of Mexico's monetary policy. *The North American Journal of Economics and Finance*, *24*, 45–62. [CrossRef]

Bhattarai, S., Chatterjee, A., & Park, W. Y. (2020). Global spillover effects of US uncertainty. *Journal of Monetary Economics*, *11*, 71–89. [CrossRef]

Binder, C., Ozturk, E., & Sheng, X. S. (2025). The effects of inflation uncertainty on firms and the macroeconomy. *Journal of International Money And Finance*, *151*, 103239. [CrossRef]

Blanchard, O. (2016). The Phillips curve: Back to the '60s? *American Economic Review*, *106*(5), 31–34. [CrossRef]

Blanchard, O., Cerutti, E., & Summers, L. (2015). *Inflation and activity—Two explorations and their monetary policy implications*. NBER working papers 21726. National Bureau of Economic Research. [CrossRef]

Bobeica, E., & Hartwig, B. (2023). The COVID-19 shock and challenges for inflation modelling. *International Journal of Forecasting*, *39*(1), 519–539. [CrossRef]

Carstens, A. (2025, February 5–6). *Lessons learned and challenges ahead for central banks in the Americas [Speech]*. Chapultepec Conference, Ciudad de México, Mexico. Available online: https://www.bis.org/speeches/sp250206.htm (accessed on 10 March 2025).

Castelnuovo, E. (2010). Trend inflation and macroeconomic volatilities in the post-WWII U.S. economy. *The North American Journal of Economics and Finance*, *21*(1), 19–33. [CrossRef]

Chavarín, R., Gómez, R., & Salgado, A. (2023). Sectoral supply and demand shocks during COVID-19: Evidence from Mexico. *Latin American Journal of Central Banking*, *4*(1), 100083. [CrossRef]

Chen, X., & MacDonald, R. (2012). Realized and optimal monetary policy rules in an estimated Markov-switching DSGE model of the United Kingdom. *Journal of Money, Credit and Banking*, *44*(6), 1091–1116. [CrossRef]

Del Negro, M., Lenza, M., Primiceri, G. E., & Tambalotti, A. (2020). *What's up with the Phillips curve?* NBER working papers 27003. National Bureau of Economic Research. [CrossRef]

El-Shagi, M., & Ma, Y. (2023). Taylor rules around the world: Mapping monetary policy. *Economics Letters*, *232*, 111275. [CrossRef]

Fabris, N., & Lazić, M. (2022). Evaluating the role of the exchange rate in monetary policy reaction function of advanced and emerging market economies. *Journal of Central Banking Theory and Practice*, *11*(2), 77–96. [CrossRef]

Galí, J., & Monacelli, T. (2005). Monetary policy and exchange rate volatility in a small open economy. *The Review of Economic Studies*, *72*(3), 707–734. [CrossRef]

Gaytán, A., & González-García, J. (2007). Cambios estructurales en el mecanismo de transmisión de la política monetaria en México: Un enfoque VAR no lineal. *Monetaria, Centro de Estudios Monetarios Latinoamericanos*, *30*(4), 367–404.

González-Astudillo, M., & Tanvir, R. (2023). *Hawkish or dovish fed? Estimating a time-varying reaction function of the federal open market committee's median participant*. Finance and Economics Discussion Series, 2023-070. Board of Governors of the Federal Reserve System. [CrossRef]

Gropelli, F., & Kfoury, M. (2023). The Central Bank of Brazil's time-varying Taylor rule. *Revista Brasileira de Economia*, *77*, 512–532. [CrossRef]

Guerra, R., Kamin, S., Kearns, J., Upper, C., & Vakil, A. (2024). *Latin America's non-linear response to pandemic inflation*. BIS working papers 1209. Monetary and Economic Department.

Hale, G., & Juvenal, L. (2023). External balance sheets and the COVID-19 crisis. *Journal of Banking & Finance*, *147*, 106570. [CrossRef]

Haschka, R. E. (2024). Examining the New Keynesian Phillips curve in the U.S.: Why has the relationship between inflation and unemployment weakened? *Research in Economics*, *78*(4), 100987. [CrossRef]

Heath, J., & Acosta, J. (2023). The Bank of Mexico's response to the post-pandemic inflation. In B. English, & K. Forbes (Eds.), *Monetary policy responses to the post-pandemic inflation*. Center for Economic Policy Research (CEPR).

Heise, S., Karahan, F., & Şahin, A. (2022). The missing inflation puzzle: The role of the wage-price pass-through. *Journal of Money, Credit and Banking*, *54*(S1), 7–51. [CrossRef]

Jaramillo, J., Pech, L. A., Ramírez, C., & Sanchez-Amador, D. (2019). *Nonlinear exchange rate pass-through in Mexico*. Working papers, 2019-16. Banco de México.

Justiniano, A., & Primiceri, G. E. (2008). The time-varying volatility of macroeconomic fluctuations. *American Economic Review*, *98*(3), 604–641. [CrossRef]

Kwon, J., & Shin, W. (2023). Nonlinear exchange rate pass-through and monetary policy credibility: Evidence from Korea. *Economics Letters*, *230*, 111234. [CrossRef]

López, G., & Bush, G. (2019). *Uncertainty and exchange rate volatility: The case of Mexico*. Working papers, 2019-12. Banco de México.

Lubik, T., & Schorfheide, F. (2007). Do central banks respond to exchange rate movements? A structural investigation. *Journal of Monetary Economics*, *54*(4), 1069–1087. [CrossRef]

Montes, G. C., & Ferreira, C. F. (2020). Does monetary policy credibility mitigate the fear of floating? *Economic Modelling*, *84*, 76–87. [CrossRef]

Serletis, A., & Dery, C. (2025). Monetary policy in advanced and emerging economies. *Macroeconomic Dynamics*, *29*, e9. [CrossRef]

Sidaoui, J., & Ramos-Francia, M. (2008). The monetary transmission mechanism in México: Recent developments. In Bank for International Settlements (Ed.), *Transmission mechanisms for monetary policy in emerging market economies* (Vol. 35, pp. 363–394). Bank for International Settlements.

Szafranek, K. (2017). Flattening of the New Keynesian Phillips curve: Evidence for an emerging, small open economy. *Economic Modelling*, *63*, 334–348. [CrossRef]

Taylor, J. (1993). Discretion versus policy rules in practice. *Carnegie-Rochester Conference Series on Public Policy*, *39*, 195–214. [CrossRef]

Uz Akdogan, I. (2023). Monetary policy responses to COVID-19 in emerging European economies: Measuring the QE announcement effects on foreign exchange markets. *Empirica*, *50*, 625–655. [CrossRef] [PubMed]

Yilmazkuday, H. (2022). COVID-19 and Monetary policy with zero bounds: A cross-country investigation. *Finance Research Letters*, *44*, 102103. [CrossRef] [PubMed]

Zamarripa, R. (2021). Estimating the Bank of Mexico's reaction function in the last three decades: A Bayesian DSGE approach with rolling-windows. *The North American Journal of Economics and Finance*, *56*, 101362. [CrossRef]

Zheng, T., & Guo, H. (2013). Estimating a small open economy DSGE model with indeterminacy: Evidence from China. *Economic Modelling*, *31*, 642–652. [CrossRef]

Disclaimer/Publisher's Note: The statements, opinions and data contained in all publications are solely those of the individual author(s) and contributor(s) and not of MDPI and/or the editor(s). MDPI and/or the editor(s) disclaim responsibility for any injury to people or property resulting from any ideas, methods, instructions or products referred to in the content.