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How Much Does Monetary Policy Affect the Fiscal Multipliers in a Small and Open Economy? The Peruvian Case

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How Much Does Monetary Policy Affect the Fiscal Multipliers in a Small and Open Economy? The Peruvian Case

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Abstract

This paper examines the influence of monetary policy and the zero lower bound (ZLB) context on government consumption and investment multipliers in Peru from 1996Q1 to 2023Q3. Utilizing a hybrid Time-Varying Parameter Vector Autoregression with Stochastic Volatility (TVP-VAR-SV) model, the study derives impulse response functions, fiscal multipliers, forecast error variance decompositions, and historical decompositions for every quarter of the sample. The results reveal that contractionary monetary policies, particularly post-2003Q4 when the Central Reserve Bank of Peru (BCRP) began setting the reference rate, have adversely impacted both types of fiscal multipliers. Furthermore, during the COVID-19 crisis, the Peruvian economy encountered a scenario closely resembling the ZLB. This occurred as the BCRP reduced the reference interest rate to a historic low of 0.25%. Under these conditions, the findings indicate a positive and substantial enhancement in the effectiveness of the government investment multiplier. This study contributes to the broader understanding of interaction of monetary and fiscal policy in emerging market economies, particularly under a context of inflation targeting regime and dirty float exchange rate regime.

JEL Classification: C11, C32, C52, E32, E62, H30.

Keywords: Fiscal Policy, Monetary Policy, Fiscal Multiplier, VAR Model with Time-Varying Parameters, Stochastic Volatility, Bayesian Estimation, Peruvian Economy.

1 Introduction

In the realm of contemporary economic analysis, the Peruvian economy presents a compelling case study, having experienced profound transformations in its fiscal and monetary policy landscape over the past several decades. This paper endeavors to rigorously explore the dynamic interactions between these two policy domains, with a particular emphasis on assessing the evolving influence of policy framework changes on fiscal multipliers within Peru's unique economic context. This evolution, characterized by a consolidation of public finances, the adoption of an explicit inflation targeting regime, the decentralization of public spending, and a transition to a dirty floating exchange rate system, has been pivotal in reshaping the country's fiscal and monetary milieu. These developments have not only bolstered Peru's economic stability—evidenced by its low fiscal debt, controlled inflation rates, and strong net international reserves—but have also enhanced its attractiveness to international investors, thereby distinguishing it as a prominent Latin American economy.

Our research is predicated upon and extends the foundational analyses conducted by Meléndez Holguín and Rodríguez (2023), and Rodríguez and Pérez Rojo (2023), which have delineated the temporal variations in the impacts of Peru's fiscal and monetary policies. This study further investigates the intricate manner in which monetary policy may exert influence over fiscal multipliers, a relationship that is significantly contingent upon the prevailing economic context, as expounded by Ilzetzki et al. (2013). Additionally, we scrutinize the repercussions associated with fluctuations in the monetary policy reference rate, incorporating insights from Christiano et al. (2011). Our analysis is aimed at furnishing a comprehensive and nuanced understanding of the interplay between fiscal multipliers and monetary policy within the evolving economic framework of Peru, thereby contributing substantively to the broader discourse on the efficacy of economic policies in emerging market economies.

For our empirical analysis, we employ quarterly data spanning from 1996Q1 to 2023Q3. The methodological cornerstone of this study is the application of the TVP-VAR-R1-SV model, as proposed by Chan and Eisenstat (2018). This model represents a time-varying parameter vector autoregressive model with stochastic volatility (TVP-VAR-SV), albeit with the distinct feature of having constant intercepts and parameters for the lagged variables. This specific model variant was selected over other unrestricted and restricted TVP-VAR-SV models based on Bayesian selection criteria, as substantiated in the works of Meléndez Holguín and Rodríguez (2023) and Rodríguez and Pérez Rojo (2023). Utilizing this model allows for an incisive assessment of the evolving effects of fiscal shocks on economic activity and facilitates an examination of the manner in which fiscal multipliers are influenced by monetary policy on a quarterly basis.

This study further enhances the contributions of Meléndez Holguín and Rodríguez (2023) by incorporating aspects of the exchange market and monetary policy into the TVP-VAR-R1-SV framework. This inclusion, encompassing variables such as the exchange rate, inflation, and the monetary policy reference rate, allows for a more precise calculation of shock impacts through the utilization of impulse-response functions (IRFs), forecast error variance decompositions (FEVDs), historical decompositions (HDs), and the computation of fiscal multipliers. This comprehensive approach endeavors to provide a more accurate and detailed portrayal of the interdependencies within Peru's economic system, offering valuable insights into the nuanced mechanisms of policy interaction in an emerging market context.

2 Literature Review

The interplay between monetary policy and fiscal multipliers has garnered considerable attention in economic literature, particularly within the framework of dynamic stochastic general equilibrium (DSGE) models. A pivotal contribution to this discourse was made by Christiano et al. (2011), who employed a DSGE model to examine the U.S. economy. Their findings were significant in that they highlighted an elevated fiscal multiplier during periods when the Federal Reserve's interest rate approached the zero lower bound (ZLB). This implies a heightened efficacy of fiscal policy when traditional monetary policy is constrained by an interest rate that is close to zero.

Building on this, Tulip (2018) presented a nuanced perspective, suggesting that earlier debates on monetary policy had not fully accounted for the possibility of fiscal activism. The convergence of low-interest rates and substantial fiscal stimulus in the U.S. prompted Tulip to integrate countercyclical fiscal policy within a comprehensive U.S. model, which concluded that the detrimental impacts of the ZLB on the economy are mitigated when such fiscal measures are enacted. Adding further depth to the analysis, Merola (2012) extended the DSGE approach to incorporate financial frictions. Merola's model revealed that fiscal multipliers are amplified under ZLB conditions when these frictions are present. The rationale is that fiscal stimulus can reduce the external finance risk premium, thereby catalyzing investment. Carrillo and Polly (2013) employ a New Keynesian model with financial frictions and find that the government spending multiplier when the economy enters a liquidity trap. This observation can be attributed to the strong link between capital goods and the collateral held by firms, a connection we emphasize as the capital-accumulation channel. In the scenario of a liquidity trap, an increase in government spending results in a decrease in the real interest rate, thereby ushering in a phase of low-cost credit.

Pyun and Rhee (2014) study 21 countries through a Panel VAR model and find that the fiscal multipliers were higher than 1 during the financial crisis because both monetary and fiscal policy were expansionary and their interaction was important. Belinga and Lonkeng Ngouana (2015) employ a SVAR model with the local projections method for the US economy and their results reveal that the multiplier effect associated with federal government spending is considerably larger when the monetary policy is accommodative compared to when it is not.

In contrast, Braun et al. (2013) provided a countervailing view using a stochastic New Keynesian model with a Rotemberg pricing framework. Their research suggested that, for a broad spectrum of empirically relevant parameters, the fiscal multiplier remains below unity even within the ZLB context. This finding challenges the assertion of an enhanced multiplier effect at the ZLB and suggests a more complex relationship between fiscal stimulus and its economic impact under such conditions. Hills and Nakata (2014) use a New Keynesian model with Rotemberg price adjustments and argue that the fiscal multiplier is higher in a ZLB context, but no so higher when the lag of the nominal interest rate is introduced in the policy rule. Johannsen (2014) works with a New Keynesian model with endogenous capital and points out that when the zero lower bound (ZLB) is a limiting factor, uncertainty regarding fiscal policy can lead to significant reductions in consumption, investment, and overall economic output. However, when the monetary authority is not restricted by the ZLB, the impact of such uncertainty tends to be relatively minor .In the same line, Ramey and Zubairy (2018) find that the fiscal multipliers are lower than 1 in a context of ZLB using Jordà's local projection method and data for the US when WWII is excluded from the sample.

In the context of Peru, an array of studies has examined the variability of fiscal multipliers across diverse economic conditions and temporal frames. Sánchez and Galindo (2013) employed a Logistic Smooth Transition VAR (LSTVAR) model, uncovering that fiscal spending multipliers exert more substantial effects during recessions than booms. Vtyurina and Leal (2016), scrutinizing fiscal policy effectiveness in Peru between 1995 and 2015 using a Threshold VAR (TVAR) model, concluded that both current and capital expenditure multipliers were more potent during recessions, with capital spending identified as particularly influential, though the multipliers did not surpass unity. Subsequent analyses by Jiménez et al. (2023) and Meléndez Holguín and Rodríguez (2023), utilizing various restricted and unrestricted TVP-VAR-SV models, provided contrasting insights: the former suggested an increase in fiscal multipliers between 1995 and 2018, while the latter observed peak values mid-sample before a decline. Nevertheless, both studies did not incorporate exchange rate, inflation, and interest rate considerations.

Additionally, monetary policy studies in Peru have yielded significant insights. Bigio and Salas (2006) pioneered the exploration of the evolving relationship between key economic indicators — interest rate, real exchange rate, output gap, and inflation — from 1994 to 2004, employing a Smooth Transition Vector Autoregressive (STR-VAR) model. Their findings highlighted time-varying impacts of monetary policy (MP) shocks, with pronounced responses in recession and boom periods. Castillo et al. (2016) initiated the application of TVP-VAR-SV models, revealing that MP shocks induced GDP growth and inflation instability during the 1980s. Under an Inflation Targeting (IT) regime, they noted time-variant MP responses to supply and demand shocks. Further exploration by Portilla et al. (2022), following Koop et al. (2009) methodology, established that MP shocks initially dampen GDP growth while reducing inflation over time. Rodríguez and Pérez Rojo (2023) estimated restricted and unrestricted TVP-VAR-SV models, concluding that countercyclical MP shocks diminish both GDP growth and inflation, with GDP reacting more swiftly and intensely, possibly due to price stickiness, and highlighted temporal shifts in these effects from 1996 to 2018.

Nonetheless, the aforementioned literature predominantly examines fiscal and monetary policies in isolation within their respective models. Remarkably, empirical studies specifically analyzing the interaction between the Central Reserve Bank of Peru's (BCRP) reference rate and fiscal multipliers over time are absent, a gap this paper aims to address. In this study, we assess the impact of an uptick in the reference rate on government consumption and investment multipliers, while concurrently examining their fluctuating values in a ZLB context. This analysis promises to contribute a novel and nuanced perspective to the existing body of literature, offering insights into the complex dynamics of policy interplay in an evolving economic landscape.

3 Methodology

3.1 The Empirical Model

This subsection describes the empirical model based on Chan and Eisenstat (2018). We consider the TVP-VAR-R1-SV model. We define $\mathbf{y}_t$ as an $n \times 1$ vector, the following equation describes a TVP-VAR–R1-SV model:

$$\mathbf{B}_{0,t}\mathbf{y}_t = \boldsymbol{\mu} + \sum_{i=1}^{p} \mathbf{B_i}\mathbf{y}_{t-i} + \boldsymbol{\epsilon}_t, \tag{1}$$

where $\boldsymbol{\epsilon}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_t)$, $t = 1, 2..., T$, $\boldsymbol{\mu}$ is an $n \times 1$ vector of constant intercepts; $\mathbf{B}_{0,t}$ is an $n \times n$ triangular inferior matrix containing the coefficients of contemporaneous effects, with diagonal elements equal to one; $\mathbf{B}_i$ is an $n \times n$ matrix containing the constant parameters of the lagged variables; and $\boldsymbol{\epsilon}_t$ is the heteroscedastic innovation, such that $\boldsymbol{\Sigma}_t = diag(\exp(h_{1t}), \exp(h_{2t}), \dots, \exp(h_{nt}))$. The logs of volatilities $\mathbf{h}_t = (h_{1t,}..., h_{nt})'$ are modeled as a random walk:

$$\mathbf{h}_t = \mathbf{h}_{t-1} + \boldsymbol{\zeta}_t, \tag{2}$$

where $\boldsymbol{\zeta}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_h)$, considering that the initial condition $\mathbf{h}_0$ must be estimated jointly with the parameters. Thus, we define a $k_\beta \times 1$ vector $\boldsymbol{\beta} = vec((\boldsymbol{\mu}, \mathbf{B}_1, \mathbf{B}_2, ...\mathbf{B}_n)')$ containing the intercepts and coefficients of the VAR model related to the variables' lags. Additionally, $\boldsymbol{\gamma}_t$ is a $k_\gamma \times 1$ vector that characterizes the contemporaneous relations between the variables. Once the matrices have been defined, we can rewrite (1) as follows:

$$\mathbf{y}_t = \widetilde{X}_t\boldsymbol{\beta} + \mathbf{W}_t\boldsymbol{\gamma}_t + \boldsymbol{\epsilon}_t, \tag{3}$$

where $\widetilde{\mathbf{X}}_t = \mathbf{I}_n \otimes (1, \mathbf{y}'_{t-1}, ..., \mathbf{y}'_{t-p})$, the operator $\otimes$ is the Kronecker product, and $\mathbf{W}_t$ is an $n \times k_\gamma$ matrix containing the appropriate elements of$-y_t$.[1]

Finally, we rewrite the model in space-state form:

$$\begin{aligned} \mathbf{y}_t &= \mathbf{X}_t\boldsymbol{\theta}_t + \boldsymbol{\epsilon}_t. && (4)\\ \boldsymbol{\theta}_t &= \boldsymbol{\theta}_{t-1} + \boldsymbol{\eta}_t && (5) \end{aligned}$$

where $\boldsymbol{\eta}_t \sim \mathcal{N}(\mathbf{0}, \boldsymbol{\Sigma}_\theta)$, $\mathbf{X}_t = (\widetilde{X}_t, \mathbf{W}_t), \boldsymbol{\theta}_t = (\boldsymbol{\beta}', \boldsymbol{\gamma}'_t)$ considering that the initial condition $\boldsymbol{\theta}_0$ must be estimated jointly with the parameters.

4 Empirical Results

4.1 Data

To rigorously assess the influence of monetary policy on fiscal multipliers in the Peruvian context, the study takes into account several key attributes unique to the country. Peru, being a small, open economy with a degree of dollarization, necessitates the inclusion of international variables to adequately capture external shocks. Since 2002, Peru has been operating under an inflation targeting regime within its monetary policy framework, alongside a floating exchange rate system. For this analysis, a dataset spanning from 1996Q1 to 2023Q3 has been compiled. This comprehensive dataset has been sourced from the Central Reserve Bank of Peru's official website, ensuring the reliability and robustness of the data used in the study.

The selected variables for our analysis include the Export Price Index (XPI), the nominal exchange rate (ER) denominated in Peruvian Nuevos Soles per US Dollar, general government consumption (GC), general government investment (GK), Gross Domestic Product (GDP) at constant 2007 prices, general government tax revenue (TR), the consumer price index (INF), and the interest rate (IR). Notably, the interest rate variable is a composite of the interbank interest rate (up to 2003Q3) and the reference interest rate (from 2003Q4 to 2023Q3). It is imperative to emphasize

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[1] For example, when $n = 3$, $\mathbf{W}_t$ has the following form: $\mathbf{W}_t = \begin{pmatrix} 0 & 0 & 0 \\ -y_{1t} & 0 & 0 \\ 0 & -y_{1t} & -y_{2t} \end{pmatrix}$

where y_{it} is the i-th element of y_t for $i = 1, 2$.

that the fiscal variables (GC, GK, GDP, and TR) have been adjusted for inflation using the consumer price index (base year 2007 = 100) and have undergone seasonal adjustment employing the Tramo-Seats method, as delineated by Gómez and Maravall (1996).

The choice of XPI as a foreign variable is predicated on its demonstrated efficacy in reflecting the influence of external shocks on GDP growth, as corroborated by Ojeda Cunya and Rodríguez (2022). Furthermore, Ganiko and Montoro (2018) have highlighted XPI's capacity to encapsulate the majority of TR fluctuations. Our study also disaggregates general government non-financial spending into GC and GK to distinctly analyze their respective impacts on GDP growth, a methodology supported by existing literature. However, it is crucial to note that our study does not incorporate forecasts of policy variables, thus excluding the potential effects of policy anticipation, primarily due to the non-availability of such data.

In the TVP-VAR-SV model, the series are inputted as annual growth rates and sequenced in the following order: $y_t = (XPI_t, ER_t, GC_t, GK_t, GDP_t, TR_t, INF_t, IR_t)\prime$. This arrangement is predicated on the assumption that all internal variables instantaneously react to shifts in XPI and ER, consistent with Peru's status as a small, open economy. Additionally, it's important to note that government expenditure variables (GC and GK) do not immediately respond to changes in GDP, given that fiscal budgets are set in advance. Furthermore, as per Jiménez (2003), GC directly influences GK within the same period, since GK often serves as an adjustment mechanism to achieve deficit targets. Moreover, TR, representing fiscal income, is inherently responsive to GDP fluctuations, as tax revenues are closely tied to the level of economic activity. Additionally, the inflation rate (INF) responds instantly to both domestic and international shocks. However, this immediate reaction is not observed in the case of interest rate (IR) shocks since their impact on the economy is observed with delay.

4.2 Priors and Hyperparameters

The starting conditions, symbolized as θ_0 and h_0, are distributed according to normal distributions, with $\sim \mathcal{N}(\mathbf{a}_\theta, \mathbf{V}_\theta)$ and $\mathbf{h}_0 \sim \mathcal{N}(\mathbf{a}_h, \mathbf{V}_h)$. Following Chan and Eisenstat (2018), it is assumed that the disturbance covariance matrices linked to the state equations are diagonal, presented as $\mathbf{\Sigma}_\theta = diag(\sigma^2_{\theta_1}, \sigma^2_{\theta_2}, ..., \sigma^2_{\theta k_\theta})$ and $\mathbf{\Sigma}_h = diag(\sigma^2_{h_1}, \sigma^2_{h_2}, ..., \sigma^2_{h_n})$. Each element on the diagonals of $\mathbf{\Sigma}_\theta$ and $\mathbf{\Sigma}_h$ follows an independent inverse gamma distribution, denoted as $\sigma^2_{\theta_i} \sim \mathcal{IG}(\upsilon_{\theta_i}, S_{\theta_i})$ and $\sigma^2_{h_j} \sim \mathcal{IG}(\upsilon_{h_j}, S_{h_j})$, for $i = 1, ..., k_\theta$, and $j = 1, ..., k_h$, respectively. The parameters in the model are defined to have certain means and variances: $\mathbf{a}_\theta = \mathbf{0}$, $\mathbf{V}_\theta = 10 \times \mathbf{I}_{k_\theta}$, $\mathbf{a}_h = \mathbf{0}$, $\mathbf{V}_h = 10 \times \mathbf{I}_n$, The degrees of freedom for the inverse gamma distributions are conservatively set to $\upsilon_{\theta_i} = \upsilon_{h_j} = 5$, and the scale parameters are determined to ensure the prior mean of σ^2_{hj} is 0.1^2. Furthermore, the scale parameters S_{θ_i} are set at 0.01^2 for the lagged variables' coefficients, $S_{\theta_i} = 0.1^2$ for the intercepts, and $S_{h_j} = 0.1^2$. This configuration suggests a prior belief in the parameters' stability by enforcing a stringent prior around the mean values.

4.3 Stochastic Volatility

In Figure 2, we observe the temporal evolution of the standard deviation of the shocks for each variable under study. The volatility patterns exhibited by the Export Price Index (XPI) and Gross Domestic Product (GDP) align closely with the findings presented by Meléndez Holguín and Rodríguez (2023). However, the trajectories for Government Investment (GK) and Government Consumption (GC) diverge from their prior analysis. Specifically, the GC equation demonstrates a consistent downward trend in volatility throughout the entire sample period. Conversely, GK volatility displays an upward trajectory from 2000 to 2012.

Consistent with the results reported by Rodríguez and Pérez Rojo (2023), the standard deviations for the Nominal Exchange Rate (ER), Inflation (INF), and Interest Rate (IR) exhibit similar patterns. Nevertheless, the incorporation of an extended sample period reveals that the COVID crisis induced a marked increase in the standard deviation of shocks within the ER, GK, and GDP equations. This suggests that the pandemic has significantly exacerbated economic uncertainty. In contrast, the inflation equation reveals only a marginal increase, which may reflect the relative effectiveness of the monetary policy response. Additionally, the Peruvian economy has experienced considerable political turmoil, culminating in an unprecedented spike in ER volatility. This political instability has evidently exerted a pronounced impact on economic uncertainty, as evidenced by the elevation of the ER to its historical zenith.

4.4 Impulse Response Functions

In the first row of Figure 3 we have the median of GDP responses to GC and GK shocks normalized to 1% in each quarter, as well as their respective confidence bands for percentiles 16 and 84 %. We can see that both shocks have a positive impact on GDP in the whole sample. We can also see that the GDP IRFs to a GC shock show a declining trend over time, while the the GDP IRFs to a GK shock show a increasing trend like in Jiménez et al. (2023), especially during the COVID crisis. In the second row of Figure 3 we have the median of the GDP IRFs throughout the sample for GC and GK shocks. The GDP IRF to a GC shock for the first quarter is 0.14%, while to a GK shock is 0.52%. The former is smaller and the latter is higher than the ones found in Meléndez Holguín and Rodríguez (2023), though. The GDP IRFs for a GK shock are higher than for a GC shock like Salinas and Chuquilín (2013), BBVA Research (2014), Vtyurina and Leal (2016), and Jiménez et al. (2023), and Meléndez Holguín and Rodríguez (2023). However, the GDP IRF to a GK shock in the first horizon is the only significant value.

4.5 Fiscal Multipliers

This subsection details the multipliers for Government Consumption and Government Investment, which are calculated in the following manner:

$$m_{t,H} = \frac{\sum_{h=0}^{H} \frac{\partial \Delta y_{t+h}}{\partial \epsilon_{t,\Delta g_t}}}{\sum_{h=0}^{H} \frac{\partial \Delta g_{t+h}}{\partial \epsilon_{t,\Delta g_t}}} \times \frac{Y_t}{G_t} \ , \tag{6}$$

where $m_{t,H}$ is the fiscal multiplier in period t over H horizons; $\frac{\partial \Delta y_{t+h}}{\partial \epsilon_{t,\Delta g_t}}$ is the IRF of GDP growth in period $t+h$ for a fiscal shock in period t; $\frac{\partial \Delta g_{t+h}}{\partial \epsilon_{t,\Delta g_t}}$ is the IRF of growth in the fiscal variable in period $t+h$ for a shock on itself in period t; and $\frac{Y_t}{G_t}$ is the inverse of the ratio of the fiscal variable to GDP (in levels) in period t, both seasonally adjusted and in nominal values.

The third row of Figure 3 illustrates the progression of the one-year multipliers for Government Consumption and Government Investment. The blue line shows the multipliers obtained following (6), and the red lines are the confidence bands (percentiles 16 and 84). We observe an ascension of the GC Multiplier from 0.25 to 0.45 Nuevos Soles over the period from 1997Q1 to 2000Q4, followed by a diminution through 2005Q1, a trend attributable to fiscal decentralization and the resultant devolution of expenditure competencies to sub-national governments. These entities displayed a comparatively lower efficacy in fiscal management, as explicated by Jiménez et al. (2018). The multiplier then augmented to a peak of 0.65 Nuevos Soles in 2008Q4 (around the subprime crisis), before exhibiting a declining trajectory concomitant with an increase in inflexible fiscal expenditures through the terminus of the sample.

Regarding the GK multiplier, it growths from 0.72 to 1.75 Nuevos Soles between 1997Q1-2001Q1, a rise underpinned by policies aimed at public finance stabilization. Noteworthy are two salient peaks coinciding with the El Niño events of 1998Q1 to 1999Q4. Subsequently, a decrement to 0.90 Nuevos Soles was observed in 2008Q1, attributable to similar influences affecting the GC multiplier. In the context of the subprime mortgage crisis and the ensuing global economic deceleration from 2008Q2 to 2011Q2, the GK multiplier increased, positing the instrumentality of GK in economic stimulus. A pronounced declining trend was noted during the second commodity price surge, with the multiplier reaching 0.50 Nuevos Soles by 2016Q2. Thereafter, a significant surge was observed around the second El Niño phenomenon and the associated capital recovery projects from 2017Q2 to 2019Q1. Furthermore, the multiplier evidenced a substantial rise at the onset of the COVID-19 crisis in 2020Q2, followed by a decline amidst political tumult and frequent ministerial changes.

Table 1 consolidates the average values of the GC multiplier (0.28 Nuevos Soles) and the GK multiplier (1.06 Nuevos Soles), juxtaposing these with multipliers reported by other scholars. The mean GC multiplier derived in this study aligns closely with figures reported by BBVA Research (2014) and Meléndez Holguín and Rodríguez (2023), whereas the GK multiplier surpasses unity, resonating with the estimates of Consejo Fiscal (2018) yet diverging from those posited by Meléndez Holguín and Rodríguez (2023). This discrepancy underscores the potential undervaluation of the GK multiplier when monetary policy considerations are eschewed, as observed in the work of Jiménez et al. (2023) as well.

Table 2 presents a regression analysis wherein the estimated fiscal spending multiplier serves as the endogenous variable, and the exogenous variables include the interest rate, public debt as a percentage of GDP, trade openness as a percentage of GDP, and a Zero Lower Bound dummy variable. Given the nature of the public spending multiplier, which can influence the value of determinants through various channels, we employ lagged variables to mitigate potential reverse causality within the regression framework. Additionally, the model is augmented by a constant and a linear trend.

Analyses are conducted for two distinct periods: 1999Q2-2022Q4, and 2003Q4-2022Q4—the latter commencing when the BCRP initiated reference interest rate control. We discern that the interest rate exerts a negative impact on both GC and GK multipliers, with a pronounced and statistically significant effect post-2003Q4. Specifically, an uptick of 100 basis points in the interest rate correlates with a reduction of the GC and GK multipliers by -0.0281 and -0.0663 Nuevos Soles, respectively, on average. Furthermore, public debt as a percentage of GDP impacts both fiscal multipliers negatively and significantly, with an accentuated effect post-2003Q4. Contrastingly, trade openness positively affects both fiscal multipliers, deviating from the extant literature that suggests a more open economy would dilute the multiplier effect as a greater share of income is allocated to imported goods. Notably, when the sample commences in 2003Q4, the GK multiplier escalates by 0.5699 Nuevos Soles in a ZLB scenario (2020Q2 to 2021Q2), signifying a substantial effect, while the GC multiplier increases by 0.0711 Nuevos Soles, albeit insignificantly. These ZLB context effects remain consistent across the entire sample, with the impact on the GC multiplier attaining significance at the 10% level.

4.6 Forecast Error Variance Decomposition

Figure 4 delineates the trajectory of the Forecast Error Variance Decompositions (FEVDs) for Real GDP, disaggregated into Non-Primary Real GDP and Primary Real GDP across the observational window[2]. The robustness of our empirical framework was enhanced by substituting the aggregate Real GDP with its Non-Primary and Primary counterparts in separate estimations. The first row of Figure 4 presents the FEVD for Real GDP, where Monetary Policy (MP) shocks are observed to account for a variance contribution oscillating between 5% and 20% from 1997Q1 until 2003Q4, post which, their influence wanes. This attenuation in variance contribution coincides temporally with the BCRP's policy shift towards an explicit reference interest rate control.

The second and third rows of Figure 4, depicting Non-Primary Real GDP and Primary Real GDP, respectively, reveal a more pronounced susceptibility of the latter to MP shocks. Within the GDP's FEVD, GC shocks elucidate approximately 15% of the variance through to 2009Q4; their explanatory power, however, diminishes progressively to non-significance by the series' terminus. Contrariwise, GK shocks display a crescendo in explanatory significance, burgeoning from 50% to command a 90% share of GDP variance explanation by the sample's close. This trend is mirrored in the Non-Primary Real GDP FEVD, albeit with a discernible contraction during the COVID-19 pandemic—a contraction that is concomitantly compensated by AD shocks.

In the domain of Primary Real GDP, GK shocks initially explicate approximately 45% of the variance, yet this influence is notably attenuated between 2010Q1-2014Q4—particularly within the second horizon—which is subsequently subsumed by AD shocks. Lastly, while TR shocks do not exert a discernible influence on the variance of Non-Primary Real GDP, they do impart a modest yet distinguishable effect on the variance of Primary Real GDP, providing insights into their nuanced role in shaping the broader Real GDP variance narrative.

4.7 Historical Decomposition

Utilizing the analytical framework established by Wong (2017), Figure 7 delineates the HDs of GDP, Non-Primary GDP, and Primary GDP for each identified shock, quantifying their contributions in real terms. A notable observation is the predominant impact of MP shocks, particularly prior to the adoption of explicit reference interest rate control in 2003Q4. These shocks exerted a significant and positive influence on Primary GDP, especially during the initial El Niño phenomenon (FEN) observed in the sample spanning 1998Q1 to 1999Q2. Post this period, the prevalence of MP shocks diminishes considerably, exhibiting negligible effects during the subprime crisis and a discernible negative contribution during the COVID-19 pandemic within the Primary GDP sector.

External shocks presented a markedly positive effect on overall GDP from 2003Q1 to 2008Q1, coinciding with the first period of commodity price boom. However, this positive trend inverted during the subprime crisis. Subsequent to the crisis, a second, albeit shorter and less pronounced, commodity price boom (2010Q1 to 2013Q4) was observed. The influence of these external shocks turned negative around 2016, amidst a global economic deceleration. This pattern of external shocks holds true for Non-Primary GDP but deviates for Primary GDP.

[2] Non-Primary Real GDP: non-primary manufacturing, construction, commerce, electricity and water and other services. Primary Real GDP: agriculture, fishing, mining and hydrocarbons, and manufacturing of primary resource processing.

Government spending shocks, specifically GK shocks, demonstrated a negative impact on GDP between 1997Q2-1999Q4, a period characterized by the destruction of physical capital due to the first FEN in the sample. From 2002Q2 to 2007Q2, these shocks continued to exhibit a negative influence, attributed to a decentralization process transferring expenditure competencies to subnational governments, which, as Jiménez et al. (2018) suggest, were less efficient than the national government. Conversely, GC shocks had a positive role during this time, reflecting the consolidation of public financial organization. During the subprime crisis, GK shocks positively influenced GDP, underscoring their effectiveness as a tool for economic stimulation in recessionary periods.

Between 2014Q2-2017Q4, GC shocks were predominantly negative, corresponding to an increment of the non-flexible spending, which made it less productive. Concurrently, during the second FEN period in the sample (2017Q1-2017Q3), GK shocks exerted a positive but small influence. The following year, the GK shocks are negative due to the lack of implementation of projects to rebuild the physical capital affected by the climatological event. This pattern of behavior in GC and GK shocks is mirrored in Non-Primary GDP but diverges for Primary GDP. During the COVID-19 crisis (2020Q2-2020Q4), GK shocks were negative, attributed to mobility restrictions and the consequent suspension of various public projects. However, a recovery in GK shocks was observed in the subsequent year, a trend consistent across Non-Primary and Primary GDP sectors. It is crucial to highlight that AD shocks were the principal contributors to the GDP decline during the health crisis, as social mobility restrictions altered household consumption patterns, leading to an unprecedented peak in the savings rate.

5 Conclusions

This research meticulously evaluates the influence of monetary policy on government spending multipliers in Peru, spanning from 1996Q1 to 2023Q3. Utilizing a restricted TVP-VAR-SV model, we adeptly capture the dynamic evolution of these multipliers, while concurrently identifying a model that is both parsimonious and efficient. The analysis delineates a discernible negative impact of monetary policy on both GC and GK multipliers, particularly pronounced post the implementation of interest rate control by the BCRP. In a scenario approximating the ZLB – notably during the COVID-19 crisis – the GK multiplier is observed to increase substantially.

The IRFs reveal that both GC and GK shocks exert a significant and positive impact on GDP. However, a notable decline in the influence of GC shocks is evident from 2008Q4 onwards. In examining the FEVDs of GDP, it becomes apparent that expenditure shocks are a substantial contributor to the variance of economic activity. This is especially true for GK shocks, which account for almost the entire variance in the latter years of the sample period, in contrast to GC shocks whose contribution diminishes concomitantly with the rising significance of GK shocks. The results pertaining to the GDP HDs further illustrate that GK shocks were predominantly negative during most of the crises under study, including the two El Niño events and the COVID-19 crisis, with the notable exception of the subprime crisis. Conversely, GC shocks were predominantly positive in periods marked by the consolidation of public finances.

The analysis demonstrates that the GC multiplier peaked in 2008Q4, thereafter exhibiting a declining trend through to the end of the sample period. The GK multiplier, on the other hand, exhibits greater volatility but reaches its zenith in 2011Q1 and 2011Q3, and again in 2020Q2 (during the COVID-19 crisis). A critical observation from this study is that the incorporation of monetary policy considerations into the analysis significantly amplifies the GK multiplier. The mean GK multiplier, calculated as 1.06, is notably higher in this study compared to others that do not factor in monetary policy dimensions.

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Table 1. Comparison of One Year Fiscal Multipliers

Source	Cicle/Model	GC Multiplier	GK Multiplier
BBVA Research (2014)	Lineal	0.30	1.50
MEF (2015)	Expansion	0.82	1.74
	Recession	0.95	1.69
BCRP (2012-2015)	Lineal	0.46	0.75
Vtyurina and Leal (2016)	Expansion	0.05	0.40
	Recession	0.10	0.60
Consejo Fiscal (2018)	Lineal	0.90	1.08
Jiménez et al. (2023)	H-TVP-VAR-SV	0.44	0.89
Meléndez Holguín and Rodríguez (2023)	TVP-VAR-R1-SV	0.34	0.44
Meléndez Holguín (2024)	TVP-VAR-R1-SV	0.28	1.06

Table 2. Determinants of the Variation of Fiscal Multipliers

	1999Q2-2022Q4		2003Q4-2022Q4	
VARIABLES	GC Multiplier	GK Multiplier	GC Multiplier	GK Multiplier
Interest rate (-1)	-0.0035	-0.0108	-0.0243***	-0.0617**
	(0.0024)	(0.0101)	(0.0080)	(0.0304)
Debt/GDP (-1)	-0.0084***	-0.0091**	-0.0116***	-0.0160***
	(0.0010)	(0.0041)	(0.0013)	(0.0050)
Trade openness (-1)	0.0080***	0.0152***	0.0116***	0.0246***
	(0.0013)	(0.0052)	(0.0018)	(0.0069)
ZLB	0.0772*	0.5212***	0.0711	0.5699***
	(0.0437)	(0.1809)	(0.0505)	(0.1921)
Constant	0.6884***	1.4498***	0.7242***	1.4251***
	(0.0836)	(0.3454)	(0.1022)	(0.3884)
Trend	-0.0091***	-0.0138***	-0.0098***	-0.0149***
	(0.0004)	(0.0017)	(0.0005)	(0.0019)
Observations	95	95	77	77
R-squared	0.6709	0.4268	0.7371	0.4486

Note: Robust standard errors are in parentheses.
***p<0.01,**p<0.05,*p<0.1.

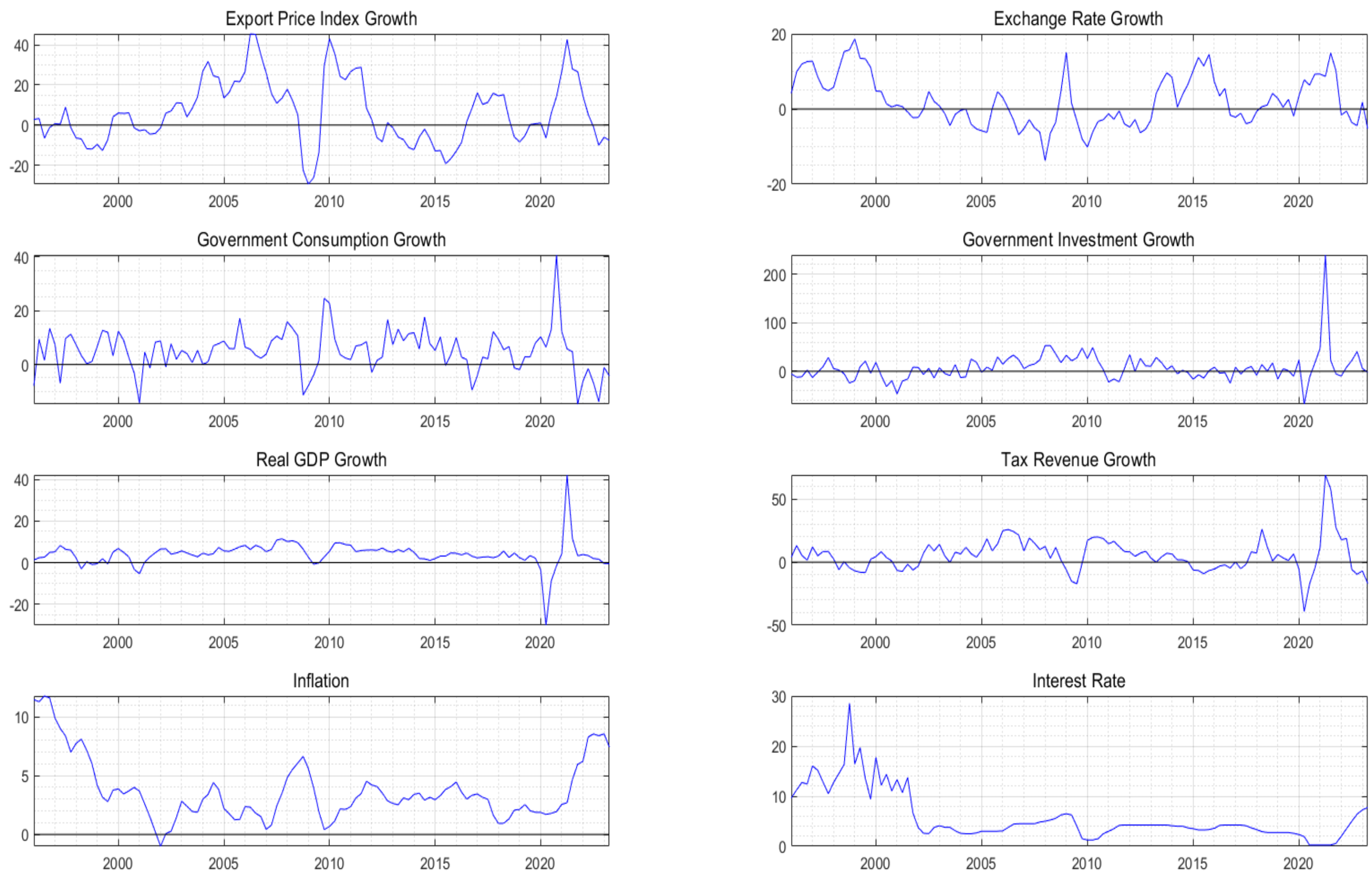

Figure 1. Time Series (1996Q1-2023Q3).

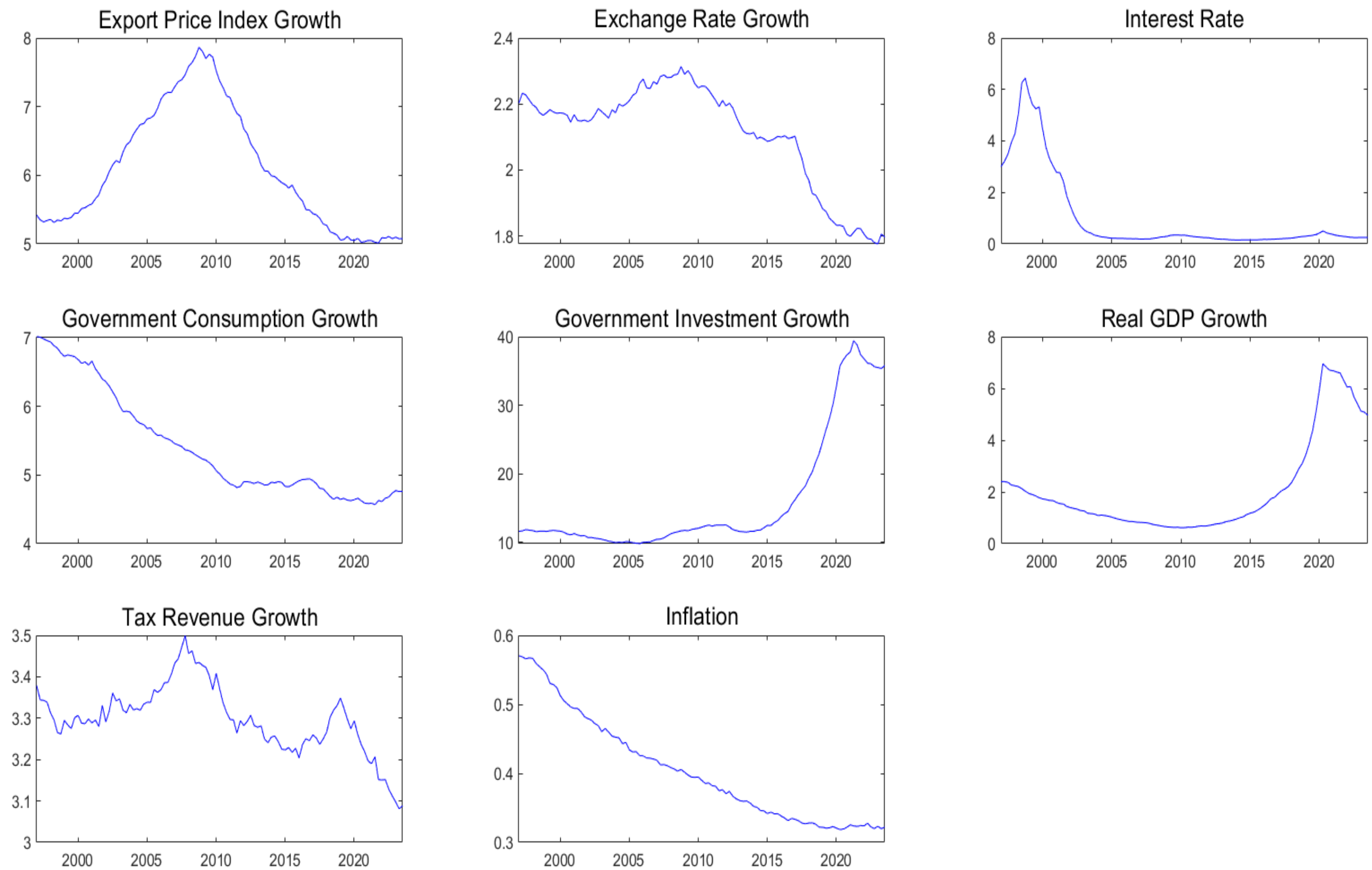

Figure 2. Standard Deviation of the Innovations in each Equation

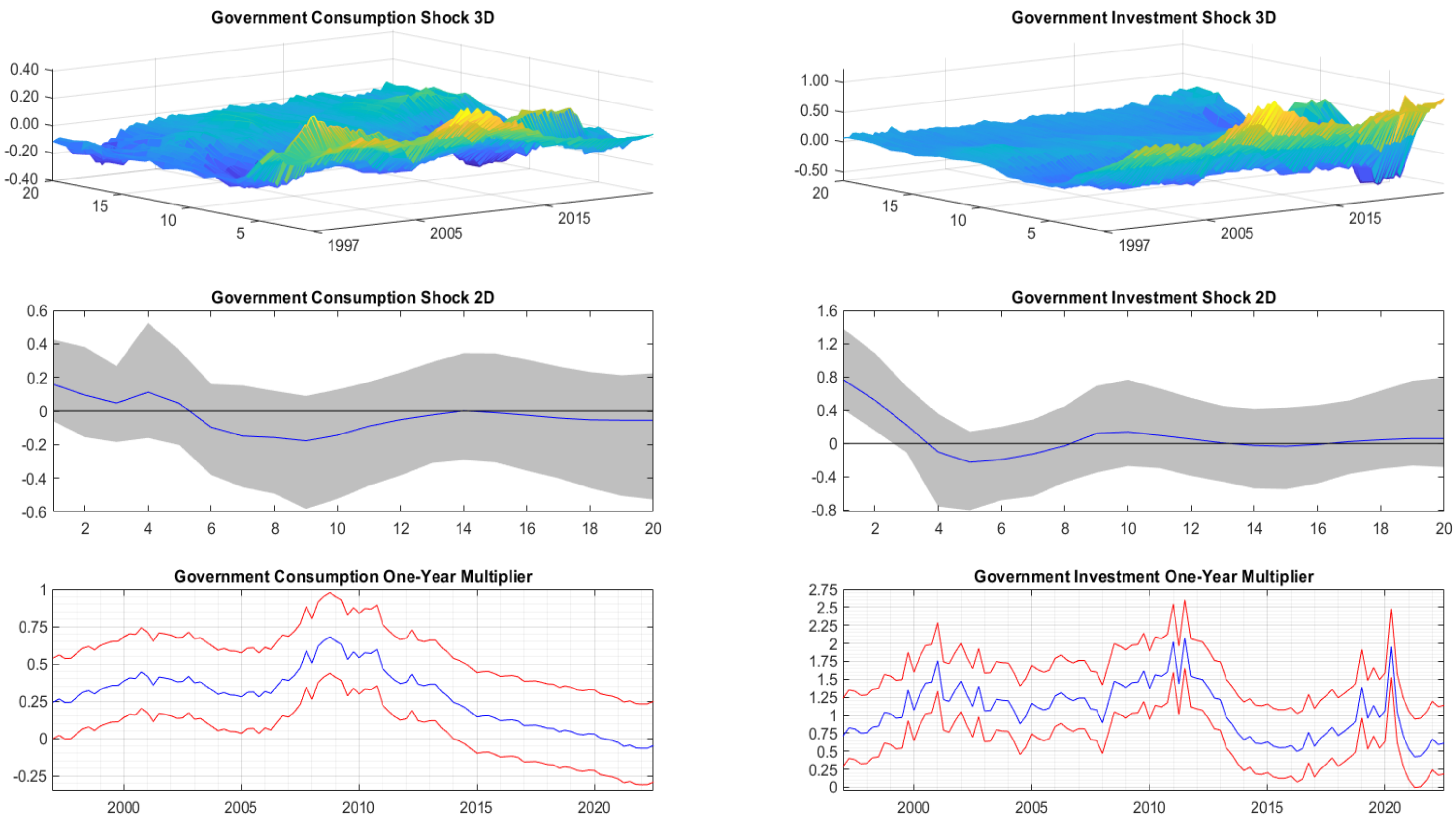

Figure 3. First Row: Median Time-Varing IRFs of Real GDP Growth to a Government Consumption Shock and a Government Investment Shock. The shock is normalized to increase the Fiscal Instrument by 1% at each point in the sample. Second Row: Median IRF of the Real GDP Growth to a a Government Consumption Shock and a Government Investment Shock. The solid black line represents the model and the shaded area its 68% error band. Third Row: One Year Government Consumption Multiplier and One Year Government Investment Multiplier.The red lines represents its 68% error band.

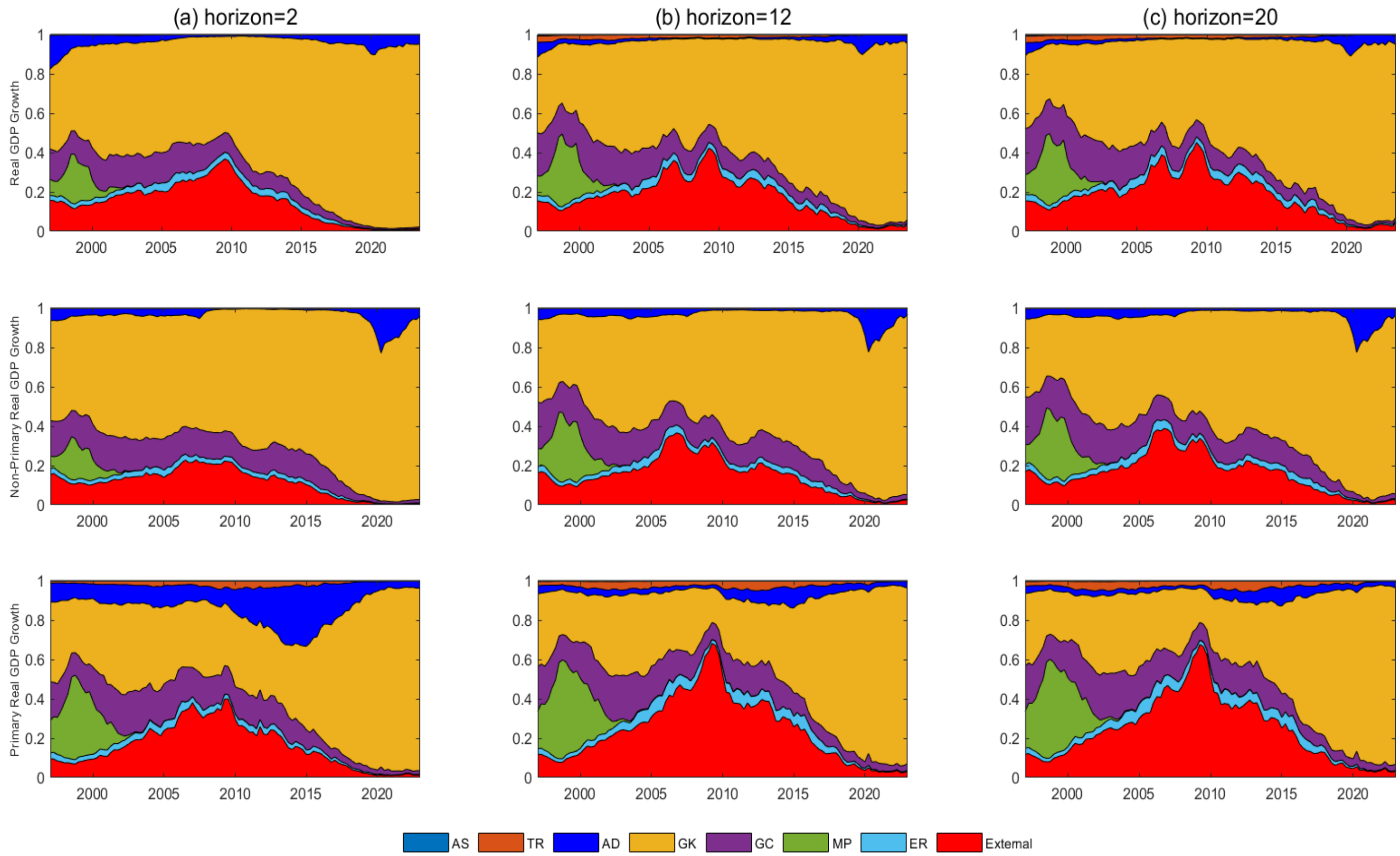

Figure 4. Time Evolution of the FEVD of the Real GDP Growth, Non-Primary Real GDP Growth, and the Primary Real GDP Growth.

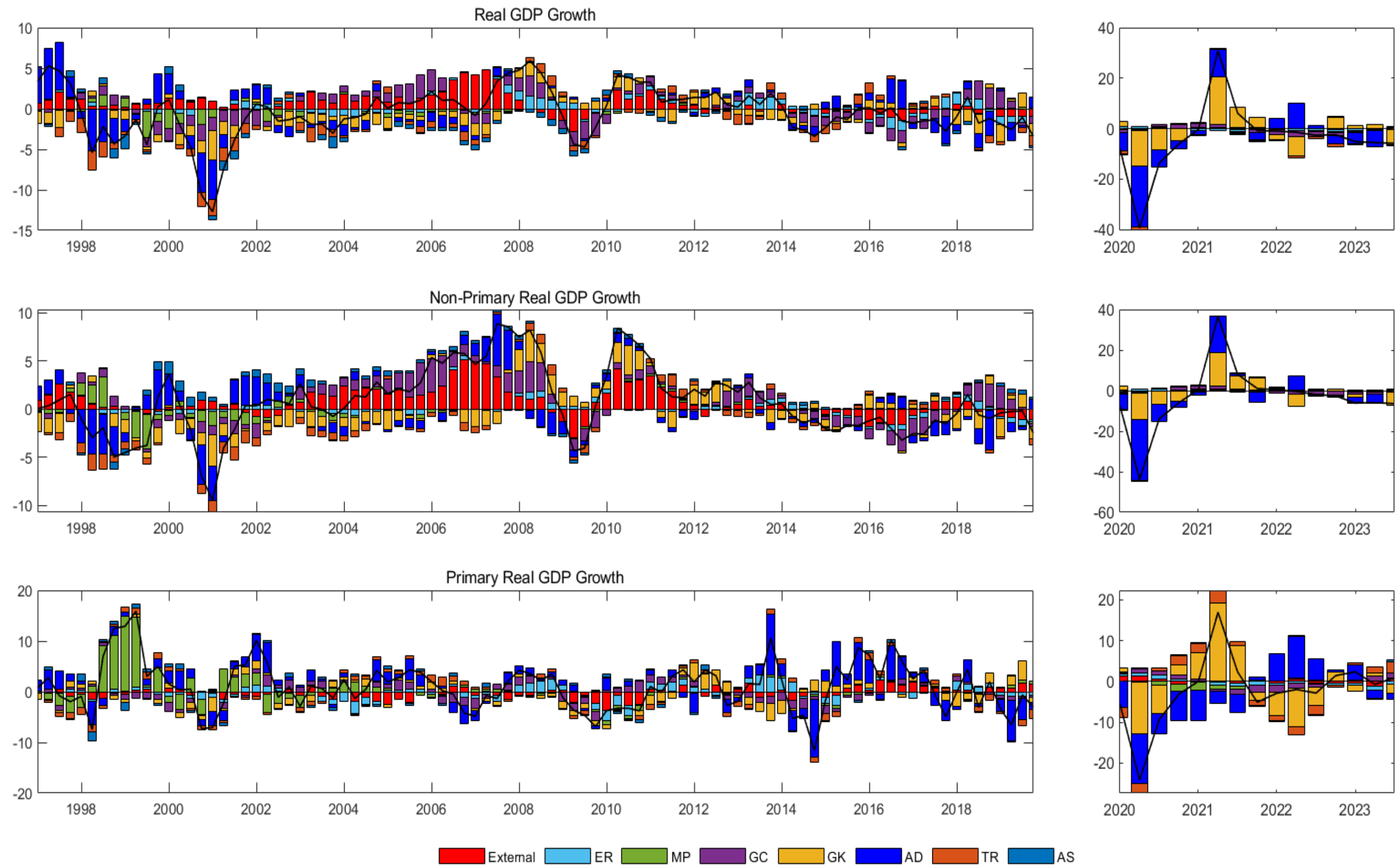

Figure 5. Historical Decomposition of the Real GDP Growth, Non-Primary Real GDP Growth, and the Primary Real GDP Growth