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THE EFFECTS OF GLOBAL UNCERTAINTY SHOCKS ON THE BRAZILIAN ECONOMY

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Monografia apresentada ao Departamento de Ciências Econômicas, como exigência parcial para a obtenção do título de Bacharel em Ciências Econômicas, pela Universidade Federal de Pernambuco.

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Recife, 2025

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“ Ó profundidade da riqueza, tanto da sabedoria como do conhecimento de Deus! Quão insondáveis são os seus juízos, e quão inescrutáveis, os seus caminhos! Quem, pois, conheceu a mente do senhor? Ou quem foi seu conselheiro? Ou quem primeiro deu a ele para que lhe venha a ser restituído? Porque dele, e por meio dele, e para ele são todas as coisas. A ele, pois, a glória eternamente. Amém.”

Apóstolo Paulo, Carta aos Romanos Cap. 11, Vs. 33-36

RESUMO

Este estudo investiga os impactos dos choques de incerteza global na economia brasileira, com foco em variáveis macroeconômicas-chave, como PIB real, inflação, taxas de juros e taxa de câmbio. Utilizando um modelo Vetorial Autorregressivo Estrutural (SVAR), fundamentado no World Uncertainty Index (Ahir et al., 2022) e nas contribuições de Barboza and Zilberman (2018) e Baker et al. (2016), a análise revela que choques de incerteza geram efeitos contracíclicos nos indicadores macroeconômicos brasileiros. Especificamente, o PIB real sofre uma contração de 0,004% ao longo dos três anos seguintes ao choque, enquanto a inflação inicialmente aumenta em quase 0,07% imediatamente após o choque, recuando em torno de 0,1% dois trimestres depois, antes de voltar a subir. A taxa de câmbio eleva-se em 0,015% no curto prazo, sinalizando uma depreciação do Real brasileiro em relação ao Dólar americano. Além disso, a incerteza doméstica aumenta em 0,12% em resposta aos choques globais. Esses resultados ressaltam a influência da incerteza global sobre a economia brasileira e suas condições econômicas internas.

ABSTRACT

This study explores the impacts of global uncertainty shocks on the Brazilian economy, with a focus on key macroeconomic variables such as real GDP, inflation, interest rates, and exchange rates. Using a Structural Vector Autoregressive (SVAR) model, informed by the World Uncertainty Index (Ahir et al., 2022) and grounded in the work of Barboza and Zilberman (2018) and Baker et al. (2016), the analysis reveals that uncertainty shocks lead to countercyclical effects on Brazilian macroeconomic indicators. Specifically, real GDP experiences a contraction of 0.004% over the three years following the shock, while Inflation initially rises almost 0.07% immediately after the shock and declines by almost 0.1% two quarters following the shock but subsequently rises. The exchange rate rises by 0.015% in the short term, indicating a depreciation of the Brazilian Real against the U.S. Dollar. Additionally, domestic uncertainty increases by 0.12% in response to global shocks. These findings underscore the influence of global uncertainty on Brazil's economy and domestic economic conditions.

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1 Introduction

How does economic uncertainty affect the economy? A growing body of literature seeks to answer this question, particularly following the seminal work of Bloom (2009), which ignited discussions on economic uncertainty and its impact on the economy. Bloom argues that uncertainty tends to rise after major economic or political shocks, such as the Cuban Missile Crisis, the JFK assassination, the OPEC I oil-price shocks, the 9/11 terrorist attacks, and, more recently, the COVID-19 pandemic. Recent research highlights the significant negative effects of uncertainty on economic activity. In particular, the surge in uncertainty following the 2008 global financial crisis—and its potential role in slowing the recovery process —has drawn increased policy attention to the issue (Bloom, 2014).

It is common to attribute negative economic results, represented by the rise in inflation, slower growth and rise in uncertainty, to domestic or foreign economic policies. Although arguments agree about the negative relation between uncertainty and economic activity, this association still lacks evidence, especially in a developing country such as Brazil (Costa Filho, 2014). In this sense, this work aims to present casual effects. Most analysis focus in the effects of domestic uncertainty shocks. In this paper we assess the role of uncertainty shocks that originate outside the domestic economy. This is important because the international macro literature agrees that small open economies, especially in emerging economies, face more shocks (and more volatile ones) than their advanced counterparts. An extensive literature has analysed that a great deal of these shocks have originated outside the domestic economy (Schmitt-Grohé et al., 2022). Therefore it is important to investigate how global uncertainty shocks affect the economic dynamics of emerging economies such as Brazil.

Using the novel World Uncertainty Index (WUI) developed by Ahir et al. (2022), we employ a Structural Vector Autoregressive (SVAR) approach—similar to the methodology in Barboza and Zilberman (2018) and based on the work of Baker et al. (2016)—to examine how a global uncertainty shock influences domestic uncertainty and its transmission channels to Brazilian macroeconomic variables.

Our findings align with both international and domestic literature on the subject. Specifically, we find that a one-standard-deviation shock to global uncertainty, as measured by the WUI, has countercyclical effects on key Brazilian macroeconomic indicators. Real GDP contracts by 0.004% for at least three years following the shock. Inflation initially rises almost 0.07% immediately after the shock and declines by almost 0.1% two quarters following the shock but subsequently rises. The exchange rate increases by 0.015% over the next three years before beginning to decline, signaling a depreciation of the Brazilian Real relative to the United States Dollar. Additionally, domestic uncertainty rises by approximately 0.12% in response to the shock.

Overall, these results highlight the adverse effects of uncertainty shocks on the Brazilian economy, reinforcing the broader understanding that heightened uncertainty can disrupt

economic activity and financial stability. Section 2 provides a literature review on the topic; Section 3 describes the data used in this present work and elaborates especially on the World Uncertainty Index which is the main uncertainty index used in this work; Section 4 provides the model and its methodology, and Section 5 provides the results of our estimated model as well as robustness checks of our model.

2 Literature Review

This section reviews the literature relevant to the present study, organized into four subsections. First, we explore the literature on defining the concept of uncertainty. Second, we examine international research on measuring uncertainty and its transmission channels. Third, we discuss empirical findings on uncertainty and its impact on the economy. Finally, we review the literature on the effects of uncertainty specifically within the Brazilian economy.

Economics examines how households and firms allocate finite resources for production and consumption when the outcome (pay-off) of today's decision occurs in a later date. Therefore understanding the economic behavior of different economic agents requires making assumptions about what theses agents "know" or believe today about future outcomes (Davidson, 1999). For instance, the rational expectations hypothesis suggests that economic agents are fully aware of the objective probability rule governing the state process of the economy (Epstein and Wang, 1994). In contrast, economic uncertainty prevents individuals from knowing this objective probability rule, thereby limiting their ability to make fully informed decisions.

Knight (1921) coined the modern definition of uncertainty and argued that uncertainty is common in economic decision making [1]. He differentiates between two concepts that influence the economic behavior of individuals and firms regarding future outcomes: risk and uncertainty. Risk refers to situations where a known probability distribution governs a set of events. Conversely, uncertainty arises when individuals cannot assign probabilities to the possible outcomes or one does not know all the possible outcomes[2], thereby influencing how and when they allocate resources to maximize future pay-offs.

Interest regarding economic policy uncertainty intensified during the wake of the Global Financial Crises, Eurozone crises, and partisan policy disputes in the United States (Bloom, 2014; Baker et al., 2016). Economic theory suggests that uncertainty has contractionist effects on the economy. Bloom (2014) examines the ways in which economic activity is affected by uncertainty. He gives three main short-run channels: (1) real options effects, (2) risk-premium effects and (3) precautionary-savings effects. The real options effect suggests that firms perceive investment decisions as a series of options. When uncertainty is high, the option value of delaying investment increases, leading firms to adopt a more cautious approach to investment

[1] Epstein and Wang (1994)

[2] See Epstein and Wang (1994), Guerrón-Quintana (2012) and Bloom (2014) for a broader discussion on Knightian uncertainty.

and hiring, which, because of adjustment costs, makes it expensive to reverse. However, Bloom emphasizes that real options effects are not universal; they primarily arise when decisions are difficult to reverse. When actions are easily reversible, firms do not forgo an option by acting. For instance, in periods of high uncertainty, firms may prefer hiring part-time employees rather than full-time staff, as the flexibility to lay off workers mitigates the risk associated with uncertain economic conditions (Bernanke, 1983; Brennan and Schwartz, 1985; McDonald and Siegel, 1986; Pindyck, 1991; Dixit and Pindyck, 1994). In the second channel, investors expect to be compensated for taking on higher risk, and because uncertainty leads to a higher risk premia, this should ultimately elevate the cost of finance. The role of uncertainty in raising borrowing costs can decrease micro and macro growth (Arellano et al., 2012; Christiano et al., 2014; Gilchrist et al., 2014). The third channel happens when a rise in uncertainty risk should also lead consumers to increase their precautionary saving, which in turn reduces consumption expenditure. This likely has a contractionary effect for in economy in the short-run (Skinner, 1988; Romer, 1990; Bansal and Yaron, 2004).

Although it is mostly accepted in the literature that uncertainty affects the way households and firms make decisions, both theoretical and empirical works still struggle not only on how to quantify different types of uncertainty but also in understanding the transmission channels and the size of the effects theses uncertainties have on the economy (Cascaldi-Garcia et al., 2023). Haddow et al. (2013) and Bloom (2014) argue that uncertainty cannot be captured by a single measure; rather, a combination of distinct measures helps mitigate the errors associated with any individual approach. Similarly, Jurado et al. (2015) highlights that the primary challenge in analyzing uncertainty and its relationship with macroeconomic activity is the absence of an objective measure. To address this limitation, researchers have relied on various proxies and indicators, including implied or realized stock market volatility, fluctuations in firm profits, stock returns, and productivity, as well as the dispersion of subjective survey forecasts and the frequency of 'uncertainty-related' terms in news articles. Several studies, including those by Bloom (2009), Bloom (2014), Baker et al. (2016), Fernandez-Villaverde and Guerron (2020), among others, have focused on identifying suitable proxies for uncertainty.

Although there is a large body of research regarding political and economic uncertainty shocks worldwide, little is known about how these shocks affect the Brazilian economy. The first known work, to my knowledge, on the effects of uncertainty on the Brazilian economy is Costa Filho (2014) followed by Barboza and Zilberman (2018). Both aim to understand the effects of uncertainty on Brazilian economic activity. They both follow the VAR methodology constructed by Bloom (2009), differing only by the measures of uncertainty used and the estimated models. Additionally, both reach essentially the same conclusions: uncertainty has a significant contractionary impact on Brazilian activity. Barboza and Zilberman (2018) also estimate that, depending on the uncertainty proxy variable employed, industrial production in 2015 would have increased by an average of 0.9% to 3.9% if the domestic uncertainty seen in the second half of 2014 had not increased. This would have been between 0.4% and 1.3% higher in the

event of using the IBC-Br indicator. Building on the work of Alexopoulos and Cohen (2009) and Baker et al. (2016), Ferreira et al. (2019) develop the Brazilian Economic Uncertainty Indicator (IIE-Br)[3]. They construct the IIE-Br based on weighting two different uncertainty components: *i)* IIE-Br Media component: this takes into account how frequently news about uncertainty appears in the nation's major newspapers and *ii)* IIE-Br Forecasts Disagreement Component: uses the dispersion from market experts forecasts that is published in the Brazilian Central Bank's Focus Bulletin. The authors also conduct an econometric study using Bayesian Vector Autoregressive approach and conclude that uncertainty shocks cause economic downturn in subsequent periods in the Brazilian economy. Silva et al. (2022) additionally develop an index for Brazil that can measure the level of economic policy uncertainty in Brazil. Then, using a VAR model with sign restrictions, they examine the impact of uncertainty shocks on a set of Brazilian macroeconomic variables. Like its predecessors, they confirm that rising levels of uncertainty have contractionary effects, which lower consumption and have a negative impact on economic activity.
Gea et al. (2021) and Melo and Barros (2024) evaluate economic policy uncertainty in the context of stock market returns in Brazil. Both come to similar results in respect to the negative impacts uncertainty shocks have on stock market returns in Brazil.

Therefore, the literature has not explored the role of global uncertainty shocks in driving business cycles in small open economies. This is the goal of this paper. Why should global shocks matter? As pointed out by Schmitt-Grohé et al. (2022), small open economies, especially emerging economies, face more shocks (and more volatile ones) than developed economies. Hence understanding how global uncertainty shocks affects the local economy can help policymakers design policies to offset the impacts in moments of heightened uncertainty in the global economy.

3 Data

3.1 The World Uncertainty Index

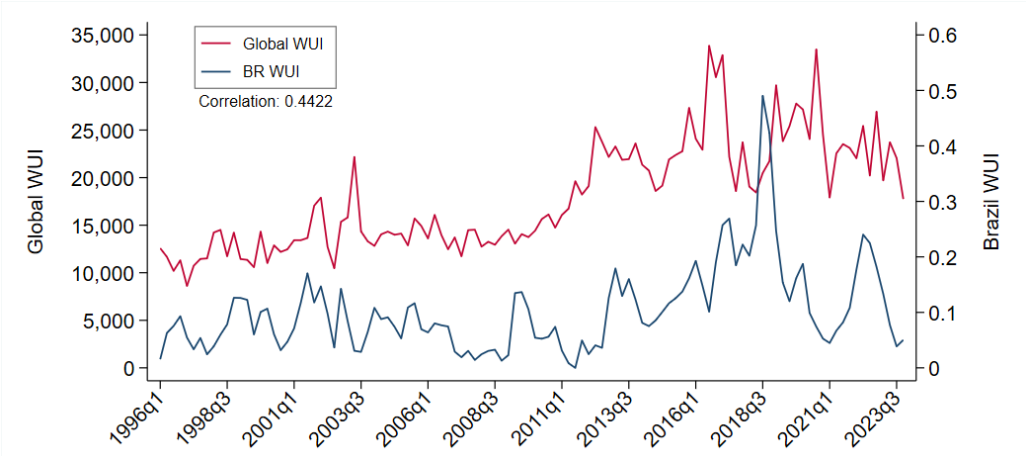
Ahir et al. (2022) build the World Uncertainty Index for an unbalanced panel of 143 countries on a quarterly basis starting in 1952. The index captures the frequencies of the word "uncertainty" and variants in the Economic Intelligence Unit (EIU) country reports[4]. To enable comparison across countries, they scale the raw counts by the total word count in each report, or the amount of "uncertainty" words per thousand words. The EIU reports are used for their standardized process and structure, allowing for comparability across time and countries. Additionally, the process used to produce EIU country reports reduces concerns about the accuracy, ideological

[3]The IIE-Br indicator is used in the second alternative model later on in this paper.

[4]As detailed in Ahir et al. (2022) the EIU is leading company in the field of country intelligence. It provides country reports covering the main economic, financial and political trends in a country. The EIU relies on a comprehensive network of experts that are based in the field, and country experts that are based at the headquarter.

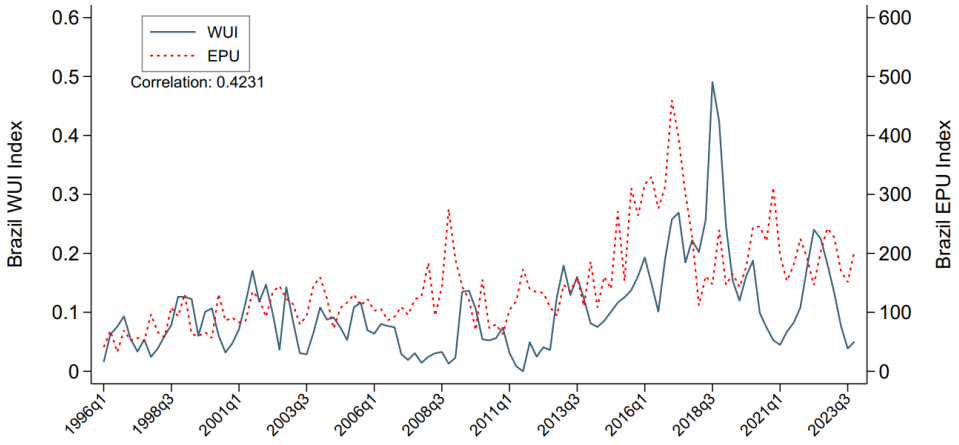
bias, and consistency of the WUI. On the downside, the EIU produces one country report per quarter, which may lead to a potentially large sampling noise. To address concerns regarding accuracy, reliability and consistency of the dataset, the authors evaluate the index in several ways. They start by looking at the story behind the biggest worldwide spikes. Second, they demonstrate that the index tends to increase around political elections and is linked to weaker GDP growth, more economic policy uncertainty (EPU), stock market volatility, and forecaster disagreement. The index is also validated by the market through commercial data sources such as Bloomberg, FRED, Haver, and Reuters. Figure 4 shows the Global WUI Index.

Figure 1: **Quarterly WUI Indexes for Brazil and Global (1996-2023)**



Note: This figure shows the World Uncertainty Indexes developed by Ahir et al. (2022). The indexes correspond to the Global WUI index and the WUI index for Brazil. The data corresponds to the period of 1996q1 to 2023q4.
Source: policyuncertainty.com

Figure 2: **Quarterly WUI and EPU Indexes for Brazil (1996-2023)**



Note: his figure shows the World Uncertainty Index developed by Ahir et al. (2022) and the EPU Index developed by Baker et al. (2016), both for Brazil. The data corresponds to the period of 1996q1 to 2023q4.
Source: policyuncertainty.com

The World Uncertainty Index differs from the Economic Policy Uncertainty Index constructed by Baker et al. (2016) in three key ways: source, frequency and country coverage. First, while the WUI is based on country reports from the same EIU source, the EPU relies on a large set of newspapers. Second, the EPU is available on a monthly frequency, while the WUI is constructed at a quarterly frequency due to the availability of the EUI reports. Third, the WUI covers a large sample of advanced and emerging markets and developing economies, while the EPU is limited to mostly advanced economies.

Ahir et al. (2022) identify four key stylized facts about the WUI[5], two of which are particularly relevant to highlight here: (1) Uncertainty is higher in emerging and low-income economies compared to advanced economies, and (2) Uncertainty is countercyclical.

Several factors may explain the first observation. Both Bloom (2014) and Ahir et al. (2022) argue that developing countries experience more frequent domestic political shocks—such as the impeachment of President Dilma Rousseff in Brazil in 2016—are more vulnerable to natural disasters, and tend to have less diversified economies, making them more susceptible to external shocks.

Regarding the second stylized fact, uncertainty tends to be higher during recessions across both advanced and developing economies. Bloom (2014) emphasizes that uncertainty increases at both macro and micro levels during economic downturns, reinforcing its countercyclical nature.

An important observation regarding the WUI indexes is their tendency to spike around election periods. Ahir et al. (2022) investigate this phenomenon through bivariate regressions between the WUI index and the lags and leads of election dates, controlling for country and time fixed effects. Their findings indicate that the WUI typically rises in the quarter preceding an election and remains elevated for one to two quarters afterward. This pattern is particularly evident in Brazil. As shown in Figure 2, the most prominent spikes in the series align with Brazilian election dates. A notable example is the 2018 election, during which uncertainty surged to an all-time high amid a highly polarized contest between left-wing and right-wing candidates.

3.2 Macro Data

We use quarterly variables related to the Brazilian economy to assess the impact of uncertainty on the economy. The data spans from the first quarter of 1996 to the last quarter of 2023. Certain variables, such as the Brazilian consumer price index, overnight interest rate, and exchange rate, EPU Global, EPU BR and IIE-Br were originally available only at a monthly frequency. To ensure consistency, quarterly averages were calculated by dividing each year into four quarters and averaging the values over three-month periods. The data regarding the Brazilian economy variables were collected mainly from the IPEA Data website and the Brazilian Central Banck

[5]See Ahir et al. (2022) and Cascaldi-Garcia et al. (2023)

(BCB). Data for the World Uncertainty Indexes were obtained from Ahir et al. (2022) via the World Uncertainty Index website. Data for the Economic Policy Uncertainty (EPU) index were sourced from the EPU website, based on the work of Baker et al. (2016). The IIE-Br index was retrieved from the FGV-IBRE website, following the methodology of Ferreira et al. (2019). Table 2 provides an overview of the series, the treatments applied to each, and their respective sources. It also identifies which variables underwent a log transformation. With the exception of the Brazilian Consumer Price Index (IPCA) and the Brazilian overnight interest rate (Selic), all variables received this transformation, as the IPCA and Selic rates are already expressed in percentage terms. Additionally, the last three variables in Table 2 —separated from the first six by a black line —were used exclusively in the alternative models. The first six variables represent those included in the main model. Both EPU variables begin in the first quarter of 1997 and the IIE-Br begins in the first quarter of 2000.

4 Model

4.1 Structural VAR Model

The main model is a structural vector autoregressive (VAR) model with recursive identification. This methodology has been widely used in empirical macroeconomics since Sims (1980). For the model we use the same approach as Barboza and Zilberman (2018) used for Brazil, which is based on the seminal work of Baker et al. (2016). Without imposing the full structure and constraints of a comprehensive theoretical model, the SVAR model provides a practical method of estimating the effects of uncertainty shocks. The model has the following format:

$$BY_t = C_0 + \sum_{i=1}^{P} C_i Y_{t-i} + u_t, \tag{1}$$

where the the vector of endogenous variables Y_t is composed by two measures of uncertainty (global and domestic), log(real GDP), IPCA, Selic, log(exchange rate). The B matrix is a 6×6 simultaneous effects matrix; C_0 is a 6×1 vector of constants; the C_i matrices are the lagged coefficients matrices with 6×6 dimensions and u_t is the structural shocks vector. By left multiplying equation (1) by B^{-1}, we obtain

$$Y_t = \beta_0 + \sum_{i=1}^{P} \beta_i Y_{t-i} + \varepsilon_t \tag{2}$$

were β_0 is a vector of constants, β_i denotes a matrix of lagged coefficients and ε_t is the the reduced form residuals.

the structural shocks u_t, are recovered from ε_t:

$$u_t = \begin{pmatrix} u_t^{WUI_G} \\ u_t^{WUI_{BR}} \\ u_t^{GDP_R} \\ u_t^{IPCA} \\ u_t^{SELIC} \\ u_t^{ExRate} \end{pmatrix} = \begin{bmatrix} a_{11} & 0 & 0 & 0 & 0 & 0 \\ a_{21} & a_{22} & 0 & 0 & 0 & 0 \\ a_{31} & a_{32} & a_{33} & 0 & 0 & 0 \\ a_{41} & a_{42} & a_{43} & a_{44} & 0 & 0 \\ a_{51} & a_{52} & a_{53} & a_{54} & a_{55} & 0 \\ a_{61} & a_{62} & a_{63} & a_{64} & a_{65} & a_{66} \end{bmatrix}^{-1} \begin{pmatrix} \varepsilon_t^{WUI_G\ shock} \\ \varepsilon_t^{WUI_{BR}\ shock} \\ \varepsilon_t^{GDP_R\ shock} \\ \varepsilon_t^{IPCA\ shock} \\ \varepsilon_t^{SELIC\ shock} \\ \varepsilon_t^{ExRate\ shock} \end{pmatrix} \tag{3}$$

Equation (3) also presents the contemporaneous causal ordering of the main estimated model. The ordering is based on the principle of prioritizing the most exogenous variables first. Our hypothesis posits that economic uncertainty influences macroeconomic variables, with global uncertainty potentially impacting domestic uncertainty, which in turn affects domestic macroeconomic conditions. By ordering uncertainty variables first, global uncertainty is only impacted by a shock to itself and domestic uncertainty to itself and global uncertainty. As for the ordering of the inflation variable and the interest rate variable, we take in to account Leeper et al. (1996) and Christiano et al. (1999). They argue that most changes in monetary policy are driven by the current state of the economy rather than random fluctuations in the behavior of monetary authorities. Additionally, any given policy action and the subsequent economic developments reflect the cumulative effects of all shocks impacting the economy. Eichenbaum and Evans (1995) find links between monetary policy and exchange rates for the U.S., and find that contractionary shocks to U.S. monetary policy are followed by persistent increases in U.S. interest rates, and sharp, persistent decreases in the spread between foreign and U. S. interest rates. In this sense, we order the exchange rate variable last in the assumption that the exchange rate tends to be more sensible to a variety of possible shocks in the economy, in this sense it is more easily affected by changes in the other interest variables. This is in compliance to the standard in economic uncertainty literature.

Its also important to point out the limitations the recursive identification method. Demiralp and Hoover (2003) argues that only rarely economic theory implies on a particular contemporaneous casual ordering. In this sense, SVAR practitioners appeal to multiple plausible stories to which variables could or could not affect other variables. This method has the drawback that alternative causal orderings might occasionally be represented by equally convincing stories. Therefore, in order to possibly mitigate a certain degree of arbitrariness in the identification of the model we test many possible orderings or variable alternatives to check for robustness.

The number of lags in the model was selected based on standard lag selection criteria, as shown in Table 3. According to these criteria, a model with one lag was selected. However, a three-lag model was also tested— as illustrated in Figure 8— since different criteria suggested either two or three lags.

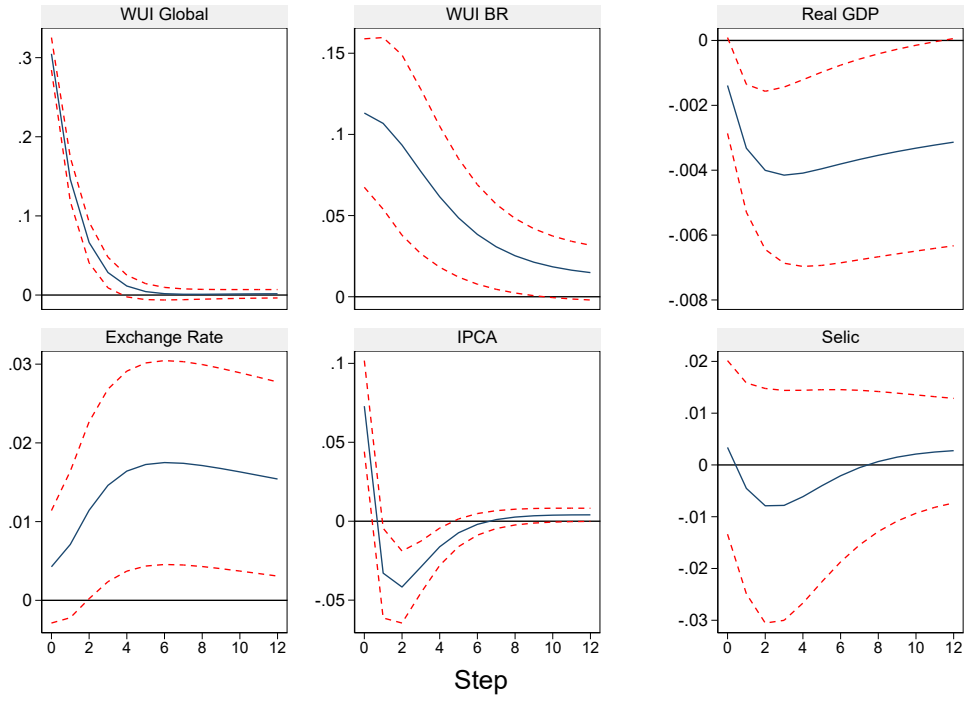
5 Results

5.1 Main Model Results

The results align with economic theory on the responses of an economy to a global uncertainty shock. Figure 3 presents the estimated results of the main model, where the impulse response function (IRF) curves exhibit the anticipated patterns following a one-standard-deviation shock to the global WUI index. All variables, except the Selic rate (Brazilian overnight interest rate), are statistically significant.

Our findings are consistent with both international and domestic literature on the subject. Specifically, we observe that a one-standard-deviation increase in global uncertainty, as measured by the WUI, has countercyclical effects on key Brazilian macroeconomic indicators. Real GDP contracts by 0.004% for at least three years following the shock. Inflation initially rises almost 0.07% immediately after the shock and declines by almost 0.1% two quarters following the shock but subsequently rises. The exchange rate increases by 0.015% over the next three years before beginning to decline, signaling a depreciation of the Brazilian Real relative to the United States Dollar. Additionally, domestic uncertainty rises by approximately 0.12% in response to the shock.

Figure 3: **Response of Brazilian macro variables to global uncertainty shocks**



Note: First order SVAR IRF's with impulse from the WUI Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse.

As seen in the figure above, global uncertainty shocks have significant impacts on domestic

uncertainty. In this sense, domestic uncertainty is one of the main channels through which global uncertainty affects the domestic economy. As previously discussed, uncertainty affects the domestic economy through three primary short-run transmission channels, as outlined by Bloom (2014): (1) real options effects, (2) risk-premium effects, and (3) precautionary-savings effects. An increase in uncertainty raises the option value of postponing investments, prompting firms to adopt a more cautious approach. Higher uncertainty also leads to an increase in the risk premium, as investors expect higher compensation for bearing increased risk. Additionally, a rise in uncertainty encourages consumers to boost their precautionary savings, which subsequently reduces consumption. Ultimately, uncertainty has countercyclical effects on the economy.

Costa Filho (2014) and Barboza and Zilberman (2018) propose a possible interpretation for the relatively low response of real GDP to uncertainty shocks. In both studies, the impact of uncertainty on GDP proxies is notably smaller compared to its effect when estimated using industrial production proxies. This implies that other components of GDP, such as agriculture or services, may not experience the same level of disruption as the industrial sector. Given that investment is predominantly driven by the industrial sector and is particularly sensitive to uncertainty through the real options effects channel[6] as argued in Bloom (2014), this suggests that other sectors of the Brazilian economy may help mitigate the effects of global uncertainty shocks on overall GDP. It is also important to exercise caution when interpreting these results. In the SVAR model, we examine just one potential shock among many that contribute to the actual real GDP of the Brazilian economy. As demonstrated in our Forecast Error Variance Decomposition, a shock to global uncertainty accounts for approximately 5% of the volatility in real GDP over the three years following the shock. Therefore, additional analysis is required before drawing definitive conclusions on this matter.

Although the Selic rate is not statistically significant in the main model, its IRF curve suggests a potential decline at least one year after the shock. In assuming that the central bank responds to an increase of inflation through monetary policy. However, as discussed in subsection 5.3, alternative model specifications, including a three-lag model[7], yield statistically significant results for the Selic. Specifically, models (*iii*) and (*iv*) indicate a decrease in the Selic rate, reinforcing the robustness of the findings.

5.2 Forecast Error Variance Decomposition

We also conduct a Forecast Error Variance Decomposition (FEVD) analyses. The FEVD monitors the volatility as impulses propagate through the system for each period $t \geq 1$. It offers insights into the relative contribution of each state disturbance to the forecast error variance of all variables within the system. Our findings indicate that the contribution of global uncertainty

[6] See also, Bernanke (1983); Brennan and Schwartz (1985); McDonald and Siegel (1986); Pindyck (1991); Dixit and Pindyck (1994)

[7] See Figure 8

shocks to volatility is relatively low for most domestic variables in the first quarter following the shock. The most affected variables are the country specific uncertainty index (WUI BR) for Brazil, at 5.4%, and the Broad Consumer Price Index (IPCA), at 5.6%. However, over time, the proportion of variance explained by global uncertainty shocks increases. Twelve quarters (three years) after the shock, these shocks account for 9.1% of domestic uncertainty (WUI BR) volatility, while their impact on real GDP volatility peaks at 5.3% after nine quarters. Inflation (IPCA) reaches 8%, and the exchange rate impact rises to 5.1% after twelve quarters. The effect on the interest rate (Selic) remains relatively small, peaking at approximately 0.21% after twelve quarters.

Table 1: Forecast Error Variance Decomposition

Shock	WUI Global	WUI BR	Real GDP	IPCA	Selic	Exchange Rate
t=1	1	0.054065	0.007976	0.056382	0.000371	0.003225
t=3	0.991169	0.076729	0.039899	0.072235	0.001415	0.012841
t=6	0.978143	0.089152	0.053231	0.080577	0.00232	0.033502
t=9	0.968105	0.091234	0.053412	0.080203	0.002139	0.045348
t=12	0.959342	0.091333	0.05147	0.080137	0.002156	0.05139

Note: The table shows the Forecast Error Variance Decomposition for each variable in our model. Thus, each column represents how much each kind of shock affects the variables, given the period.

In sum, these results highlight that external uncertainty shocks to matter for the economic dynamics in emerging economies.

5.3 Robustness

The results presented in the previous section appear to be robust to various modifications in the model, exhibiting minimal to no changes. Specifically, when replacing the WUI index with the EPU indexes (Alternative Model I), the responses of Real GDP, the Selic rate and exchange rate to a one-standard-deviation shock in global uncertainty (EPU Global) become slightly more pronounced—Real GDP declines by up to 0.006%, while the Selic rate increases by approximately 0.04% and the exchange rate increases to 0.04% However, these changes remain relatively small. Also, for each alternative model estimated we ran individual lag selection criteria to determine the optimal number of lags for each model.

The following robustness exercises were tested:

(i) In Alternative Model I we change the contemporaneous casual ordering of the main model. The domestic uncertainty variable (WUI BR) was moved to the last order. Figure 5 shows the results;

(ii) In the Alternative Model II the Economic Policy Uncertainty (EPU) indexes for Brazil and the global economy were incorporated as replacements for the WUI indexes used in the

main model. Since the EPU data series begins in 1997Q1, the sample size is reduced to one year with now 108 data points compared to 112 of the data used in the main model. This model is estimated with one lag in accordance to usual lag selection criteria. Figure 6 presents the results;

(iii) In the Alternative Model III the Brazilian Uncertainty Indicator (IIE-Br) was incorporated as a replacement for the Brazilian WUI (WUI-BR) in the main model. Since the IIE-Br data series begins in 2000Q1, this results in a smaller sample size compared to the other models with 96 data points. This model is estimated with two lags in accordance to usual lag selection criteria. Figure 7 presents the results;

(iv) In Alternative Model IV we change the number of lags to three in accordance to the usual lag selection criteria in Table 3. Figure 8 shows the results;

(v) Alternative Model V excludes the Selic variable. Figure 9 shows the results. As seen in the main results and in the robustness exercise *(i)*, the Selic variable did not show much significance in response to a one standard deviation impulse from the WUI Global variable in the model. So in order to test the real impact of this variable in the model, we estimate a model where this variable is not included as verify how the other variables respond. This model is estimated with two lags in accordance to usual lag selection criteria. Figure 9 shows the results.

Overall, the findings remain consistent across different model specifications, reaffirming that economic uncertainty has countercyclical effects on Brazilian macroeconomic variables and that heightened global uncertainty leads to increased domestic uncertainty.

6 Conclusion

This study aimed to address the following question: How do global uncertainty shocks affect the Brazilian economy? To investigate this, we examined the response of key Brazilian macroeconomic variables—including real GDP, inflation, interest rates, and exchange rates—to an uncertainty shock derived from the World Uncertainty Index developed by Ahir et al. (2022).

Employing a Structural Vector Autoregressive (SVAR) approach, consistent with Barboza and Zilberman (2018) and based on Baker et al. (2016), our findings indicate that uncertainty shocks exert countercyclical effects on Brazilian macroeconomic indicators. Specifically, real GDP experiences a contraction of 0.004% over the three years following the shock, while Inflation initially rises almost 0.07% immediately after the shock and declines by almost 0.1% two quarters following the shock but subsequently rises. The exchange rate rises by 0.015% in the short term, indicating a depreciation of the Brazilian Real against the U.S. Dollar. Additionally, domestic uncertainty increases by 0.12% in response to global shocks.

These findings highlight the impacts of global uncertainty on the Brazilian economy. Moreover, our results contribute to the growing body of empirical evidence on the effects of uncertainty in Brazil, a topic that remains relatively underexplored in the literature.

References

Ahir, H., Bloom, N., and Furceri, D. (2022). The world uncertainty index. Working Paper 29763, National Bureau of Economic Research.

Alexopoulos, M. and Cohen, J. (2009). Uncertain times, uncertain measures. *University of Toronto, Department of Economics, Working Papers*.

Arellano, C., Bai, Y., and Kehoe, P. (2012). Financial frictions and fluctuations in volatility. *Journal of Political Economy*, 127.

Baker, S. R., Bloom, N., and Davis, S. J. (2016). Measuring Economic Policy Uncertainty. *The Quarterly Journal of Economics*, 131(4):1593–1636.

Bansal, R. and Yaron, A. (2004). Risks for the long run: A potential resolution of asset pricing puzzles. *Journal of Finance*, 59:1481–1509.

Barboza, R. and Zilberman, E. (2018). Os efeitos da incerteza sobre a atividade econômica no Brasil. *Revista Brasileira de Economia*, 72.

Bernanke, B. S. (1983). Irreversibility, uncertainty, and cyclical investment*. *The Quarterly Journal of Economics*, 98(1):85–106.

Bloom, N. (2009). The impact of uncertainty shocks. *Econometrica*, 77(3):623–685.

Bloom, N. (2014). Fluctuations in uncertainty. *Journal of Economic Perspectives*, 28(2):153–76.

Brennan, M. J. and Schwartz, E. S. (1985). Evaluating natural resource investments. *The Journal of Business*, 58(2):135–157.

Cascaldi-Garcia, D., Sarisoy, C., Londono, J. M., Sun, B., Datta, D. D., Ferreira, T., Grishchenko, O., Jahan-Parvar, M. R., Loria, F., Ma, S., Rodriguez, M., Zer, I., and Rogers, J. (2023). What is certain about uncertainty? *Journal of Economic Literature*, 61(2):624–54.

Christiano, L., Eichenbaum, M., and Evans, C. (1999). Monetary policy shocks: What have we learned and to what end? In Taylor, J. B. and Woodford, M., editors, *Handbook of Macroeconomics*, volume 1, Part A, chapter 02, pages 65–148. Elsevier, 1 edition.

Christiano, L. J., Motto, R., and Rostagno, M. (2014). Risk shocks. *American Economic Review*, 104(1):27–65.

Costa Filho, A. E. d. (2014). Incerteza e atividade econômica no Brasil. *Economia Aplicada*, 18(3):421–453.

Davidson, P. (1999). *Uncertainty, International Money, Employment and Theory: Volume 3: The Collected Writings of Paul Davidson*. Palgrave Macmillan UK.

Demiralp, S. and Hoover, K. D. (2003). Searching for the causal structure of a vector autoregression. *Oxford Bulletin of Economics and Statistics*, 65(s1):745–767.

Dixit, A. and Pindyck, R. S. (1994). *Investment under uncertainty*. Princeton University Press.

Eichenbaum, M. and Evans, C. L. (1995). Some empirical evidence on the effects of shocks to monetary policy on exchange rates. *The Quarterly Journal of Economics*, 110(4):975–1009.

Epstein, L. G. and Wang, T. (1994). Intertemporal asset pricing under knightian uncertainty. *Econometrica*, 62(2):283–322.

Fernandez-Villaverde, J. and Guerron, P. (2020). Uncertainty shocks and business cycle research. *Review of Economic Dynamics*, 37 Supplement 1:S118–S166.

Ferreira, P. C., Vieira, R. M. B., da Silva, F. B., et al. (2019). Measuring brazilian economic uncertainty. *Journal of Business Cycle Research*, 15:25–40.

Gea, C., Vereda, L., Figueiredo Pinto, A. C., and Klotzle, M. C. (2021). The effects of economic policy uncertainty on stock market returns: Evidence from Brazil. *Brazilian Review of Finance*, 19(3):53–84.

Gilchrist, S., Sim, J. W., and Zakrajšek, E. (2014). Uncertainty, Financial Frictions, and Investment Dynamics. NBER Working Papers 20038, National Bureau of Economic Research, Inc.

Guerrón-Quintana, P. (2012). Risk and uncertainty. *Business Review*, pages 9–18.

Haddow, A., Hare, C., Hooley, J., and Shakir, T. (2013). Macroeconomic uncertainty: What is it, how can we measure it and why does it matter? *Bank of England Quarterly Bulletin*, Q2.

Jurado, K., Ludvigson, S. C., and Ng, S. (2015). Measuring uncertainty. *American Economic Review*, 105(3):1177–1216.

Knight, F. (1921). *Risk, Uncertainty and Profit*. Hart, Schaffner & Marx prize essays. Houghton Mifflin.

Leeper, E., Sims, C., and Zha, T. (1996). What does monetary policy do? *Brookings Papers on Economic Activity*, pages 1–78.

McDonald, R. and Siegel, D. (1986). The value of waiting to invest*. *The Quarterly Journal of Economics*, 101(4):707–727.

Melo, S. B. d. and Barros, L. A. B. d. C. (2024). A new economic policy uncertainty index for Brazil. *Brazilian Review of Finance*.

Pindyck, R. S. (1991). Irreversibility, Uncertainty, and Investment. *Journal of Economic Literature*, 29(3):1110–1148.

Romer, C. D. (1990). The Great Crash and the Onset of the Great Depression. *The Quarterly Journal of Economics*, 105(3):597–624.

Schmitt-Grohé, S., Uribe, M., and Woodford, M. (2022). *International Macroeconomics: A Modern Approach*. Princeton University Press.

Silva, P. H. N., Besarria, C. d. N., and Silva, M. D. d. O. P. d. (2022). Mensurando e avaliando os efeitos de um choque de incerteza da política econômica sobre a economia brasileira. *Economia Aplicada*, 26(3):335–374.

Sims, C. A. (1980). Macroeconomics and reality. *Econometrica*, 48(1):1–48.

Skinner, J. (1988). Risky income, life cycle consumption, and precautionary savings. *Journal of Monetary Economics*, 22(2):237–255.

A Appendix

Table 2: Variable Descriptions

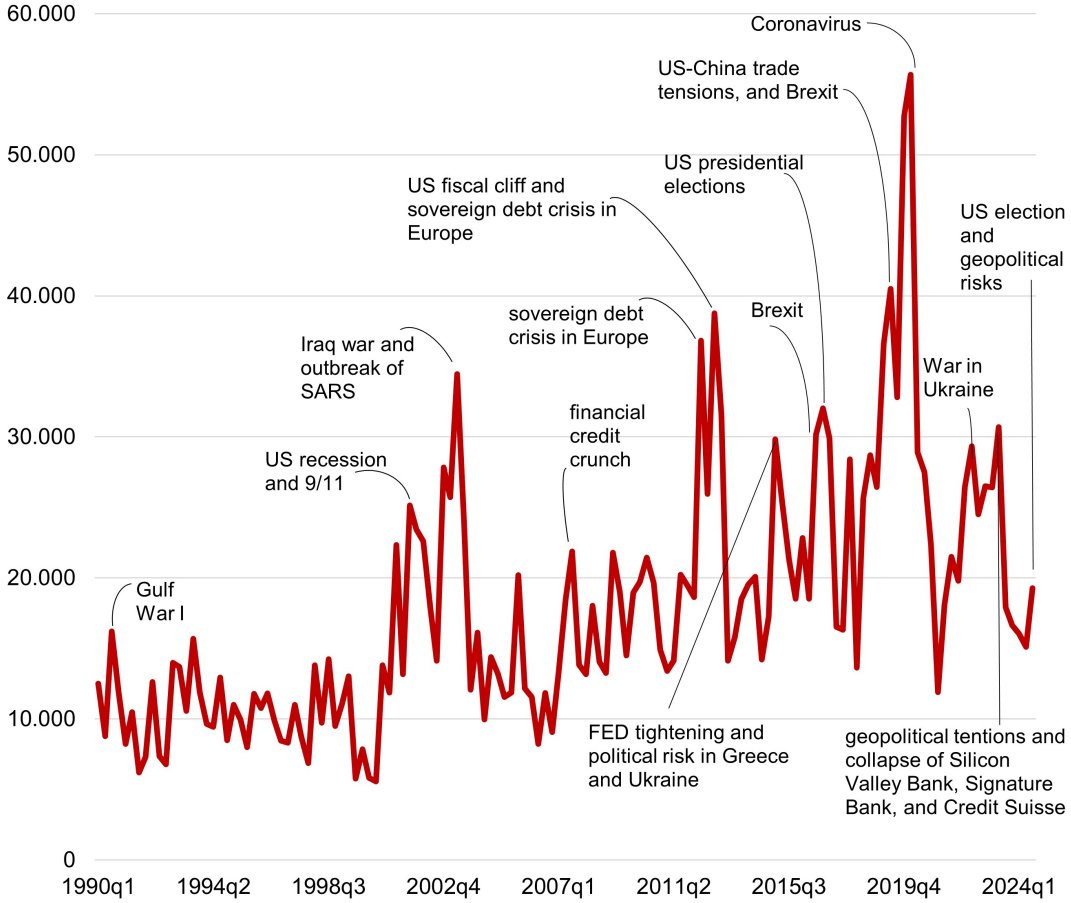
Variable	Description	Frequency	Treatment	Source
WUI Global	Global World Uncertainty Index weighted by GDP	Quarterly	Log-Difference	WUI Website
WUI BR	World Uncertainty Index for Brazil	Quarterly	Log-Difference	WUI Website
Real GDP	Real GDP for Brazil	Quarterly	Log-Difference	IBGE
IPCA	Brazilian consumer price index	Monthly	Quarterly average	IBGE
Selic	Brazilian Overnight Interest Rate	Monthly	Quarterly average	BCB
Exchange Rate	Exchange Rate (BRL/USD)	Monthly	Log-Difference and quarterly average	BCB
EPU Global	Global Economic Policy Uncertainty Index	Monthly	Log-Difference and quarterly average	EPU Website
EPU BR	Brazilian Economic Policy Uncertainty Index	Monthly	Log-Difference and quarterly average	EPU Website
IIE-Br	FGV Brazilian Uncertainty Indicator	Monthly	Log-Difference and quarterly average	FGV-IBRE

Table 3: Lag Selection Criteria for Main Model

Lag	LL	LR	df	p	FPE	AIC	HQIC	SCIC
0	-207.551				2.5e-06	4.14662	4.20878	4.3001
1	338.598	1092.3	36	0.000	1.3e-10	-5.75919	-5.32404*	-4.68484*
2	387.44	97.683	36	0.000	1.0e-10	-6.00854	-5.2004	-4.01331
3	428.32	81.76*	36	0.000	9.2e-11*	-6.1033*	-4.92218	-3.1872
4	444.757	32.874	36	0.618	1.4e-10	-5.72344	-4.16933	-1.88646

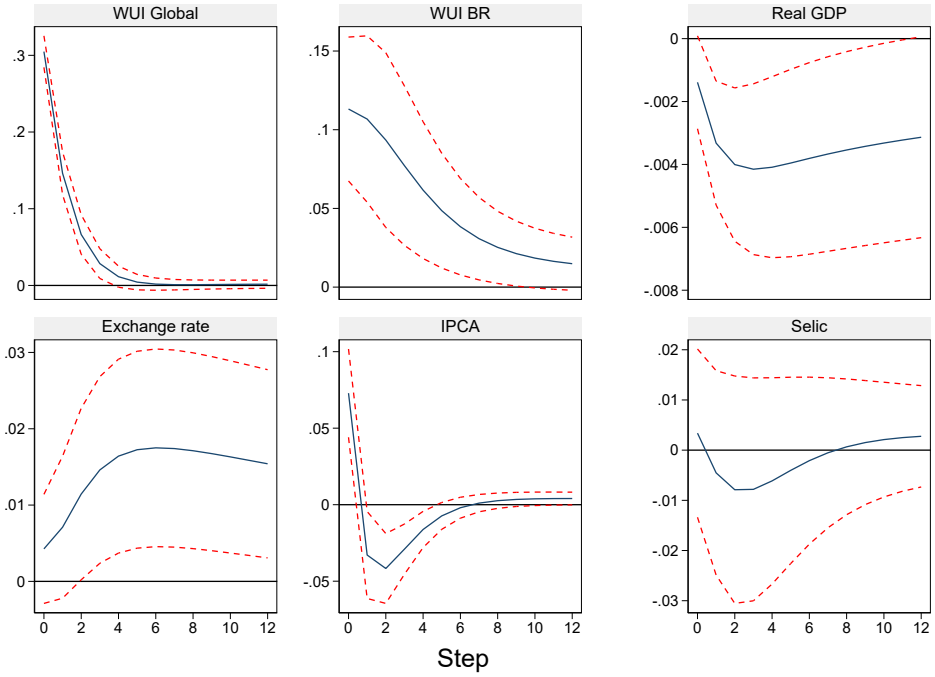
* optimal lag

Figure 4: **World Uncertainty Index (WUI) (1960q1 - 2020q1)**



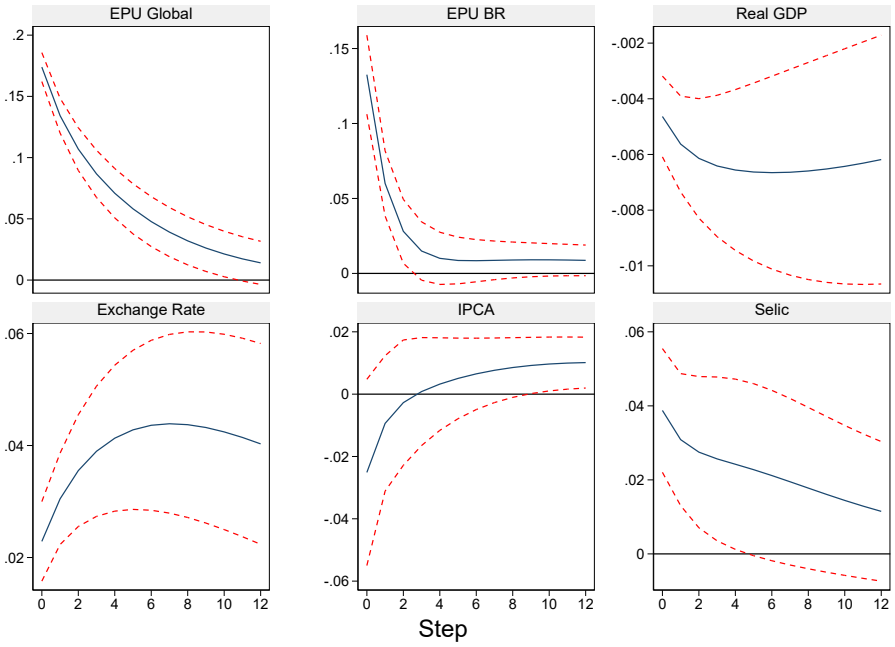
Note: This figure shows the World Uncertainty Index developed by Ahir et al. (2022). The index is normalized by the hard count of words related to uncertainty and aggregated as a GDP weighted average. The data corresponds to the period of 1960q1 to 2020q1.
Source: *policyuncertainty.com*

Figure 5: **Alternative Model I**



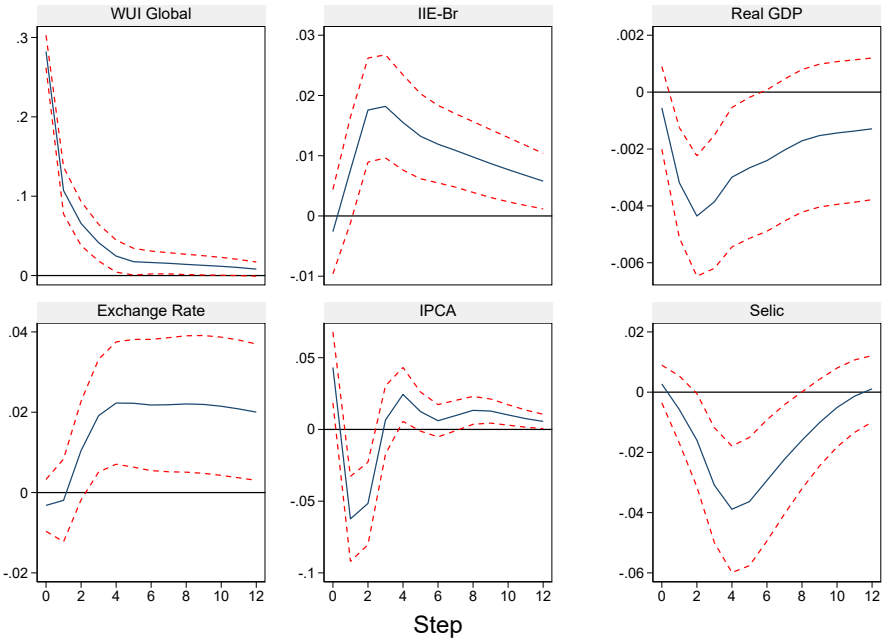
Note: Alternative Model I IRF's with impulse from the WUI Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse. We maintain all variable orders except the WUI BR which has been ordered last.

Figure 6: **Alternative Model II (EPU)**



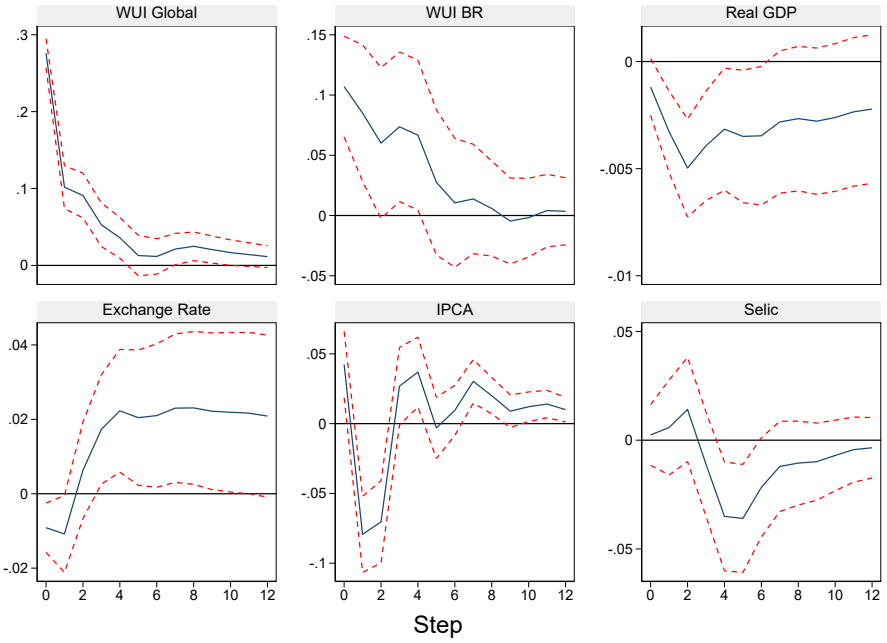
Note: Alternative Model II IRF's with impulse from the EPU Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse. In this model we change both WUI indexes for global and domestic EPU indexes.

Figure 7: **Alternative Model III (IIE-Br)**



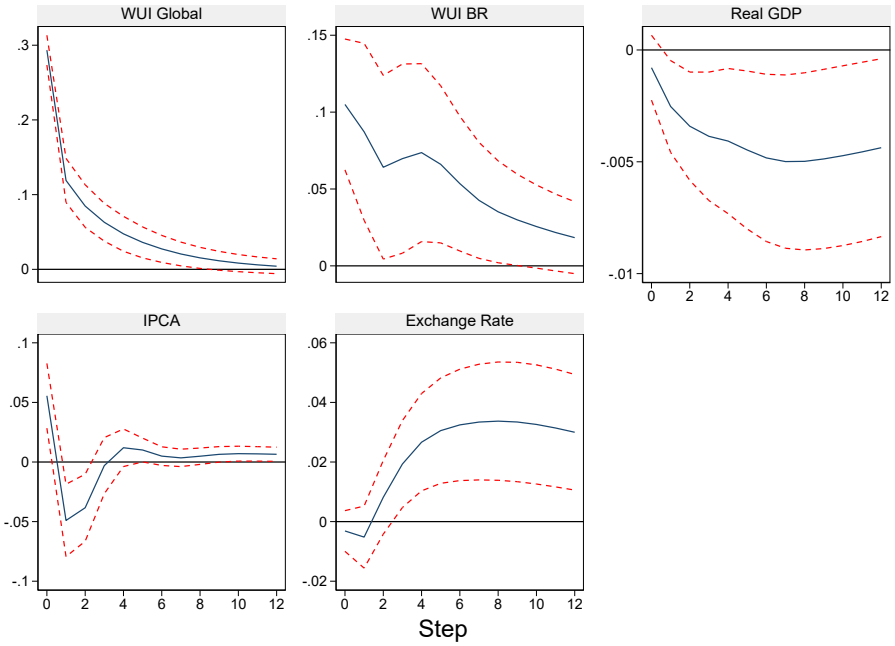
Note: Alternative Model III IRF's with impulse from the WUI Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse. We change the domestic WUI index the IIE-Br index while maintaining the ordering of the main model.

Figure 8: **Alternative Model IV**



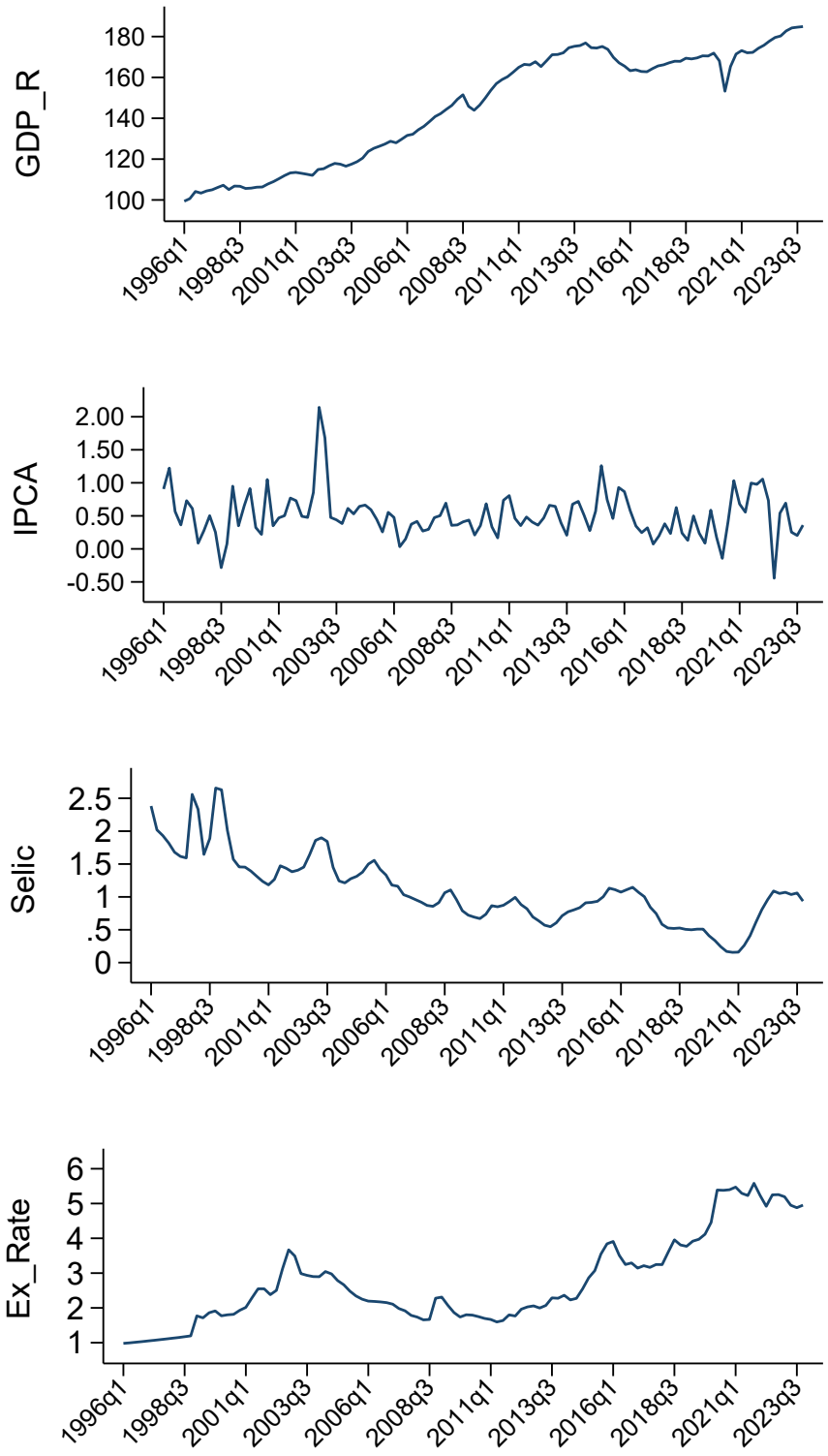
Note: Alternative Model IV IRF's with impulse from the WUI Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse. Also, 3 lags were used instead of 1.

Figure 9: **Alternative Model V**



Note: Alternative Model V IRF's with impulse from the WUI Global Index with 68% Confidence bands. The IRF's are in response to a one standard deviation impulse. In this model we exclude the interest rate variable (Selic)

Figure 10: **Quarterly Brazilian Macroeconomic Variables (1996-2023)**



Note: Brazilian series used in our baseline model.