Geopolitical Risk Shocks: Macroeconomic Effects in Bolivia, Chile, and Peru

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Abstract

This paper analyzes the macroeconomic impacts of geopolitical risk shocks on Bolivia, Chile, and Peru, employing Bayesian Structural Vector Autoregressive (BSVAR) models. Geopolitical risk shocks significantly raise inflation and interest rates in Chile and Peru, with food and energy inflation being the most affected, while Bolivia shows resilience, presumably due to its distinct economic framework. Commodity prices, particularly energy and agriculture, experience persistent impacts, highlighting the importance of commodity-specific dynamics. The 2022 Russia-Ukraine conflict exacerbated these effects, driving price volatility and global market disruptions. These findings provide insights into some of the transmission mechanisms of geopolitical shocks and highlight the importance of tailored strategies to mitigate their adverse effects.

Keywords: *Geopolitical risk, BSVAR, inflation, interest rates, economic growth, commodity prices.*
JEL Classification: *C53, E31, C22.*

1 Introduction

In today's globalized world, geopolitical risks and events are key determinants of economic conditions across nations. Russia's invasion of Ukraine and tensions in the Middle East have demonstrated how international conflicts can reverberate through energy and financial markets, affecting economies worldwide. According to international organizations, rising geopolitical tensions can trigger volatility in commodity prices, causing adverse supply shocks that hinder the post-COVID-19 global recovery by driving up food, energy, and transportation costs.[1]

As defined by S&P Global [3], geopolitical risk encompasses the risks arising from interactions between countries. These interactions involve trade relations, security partnerships, alliances, multinational climate initiatives, supply chains, and territorial disputes. The Geopolitical Risk Index (GPR), developed by Caldara and Iacoviello [4], is a widely utilized tool in the literature for quantifying these risks. The GPR aggregates a range of economic, political, and social indicators, providing a comprehensive and quantitative assessment of the potential impacts of geopolitical events. In their application, Caldara et al. [5] employ the GPR in a panel VAR model to identify geopolitical risk shocks via Cholesky decomposition, treating the GPR as the most exogenous variable. Their findings suggest that geopolitical risk tends to increase inflation, though the magnitude and impact vary across countries and historical contexts.

Mitsas, Golitsis, and Khudoykulov [6] argue that geopolitical risks influence commodity prices in multiple ways. In general, such risks negatively correlate with the returns on most commodity futures, as events like trade wars and conflicts disrupt transportation or production, leading to supply shortages and rising prices. For crude oil, gold, platinum, and silver futures, geopolitical risks have a negative impact on returns. However, geopolitical threats exhibit a weak positive effect on the volatility of corn futures, while geopolitical acts negatively influence the returns of crude oil, heating oil, platinum, and sugar futures. For silver futures, geopolitical risks have a significant negative relationship with returns, whereas geopolitical acts show no significant impact. In the case of sugar futures, geopolitical risks have an insignificant effect on prices, but geopolitical acts exhibit a significant negative relationship with returns.

Geopolitical risks impact both the supply and de-

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[1] For more information, see World Bank [1] and International Monetary Fund [2].

mand of commodities, often resulting in price fluctuations. Truong, Doan, and Nguyen [7] report that geopolitical events increase oil price volatility by 10%. Similarly, Natter and Dlouhy [8] note that economic sanctions have a significant negative effect on the oil exports of sanctioned countries.

In the study by Aizenman et al. [9], these events influence both agricultural and energy markets, resulting in higher prices and increased volatility. For instance, significant effects are observed in the prices of wheat, corn, and European natural gas. Furthermore, recent studies demonstrate that geopolitical risks typically raise the prices and volatility of energy commodities while also adversely affecting agricultural markets [10, 11].

The link between geopolitical risks and commodity prices is particularly strong. Events such as wars, sanctions, and conflicts can disrupt commodity supplies, triggering significant price fluctuations. These fluctuations can severely affect economies, especially those reliant on commodity exports.

South American economies, heavily dependent on natural resource exports, are especially vulnerable to commodity price fluctuations driven by geopolitical events. Increases in the prices of food, metals, and energy could negatively affect these economies, which rely on exporting these goods [12, 13].

Regarding economic growth, Soybilgen, Kaya, and Dedeoglu [14] find that in 18 emerging economies, geopolitical risks reduce real GDP growth. Conversely, Jha, Bhushan, and Nirola [15] analyze the impact of geopolitical risks on economic growth across 41 countries from 2000 to 2020. Their findings indicate that geopolitical risks have a significant impact on economic growth, showing positive effects in advanced economies but negative ones in developing economies, revealing an asymmetric impact. In regions such as the Middle East and Africa, geopolitical risks have a notably adverse effect on economic growth.

Geopolitical risks also affect other macroeconomic variables. Iyke, Phan, and Narayan [16] demonstrate that geopolitical risks can predict exchange rate returns in several countries, implying that geopolitical events contain valuable information that can improve investment strategies and financial forecasts.

Another critical area of study is the relationship between oil prices and exchange rates. Kisswani and Elian [17] find that oil prices and exchange rates exhibit an asymmetric relationship, influenced by both economic and geopolitical uncertainty.

Shipping costs are similarly affected by geopolitical risks. For example, Yilmazkuday [18] show that geopolitical risk shocks increase shipping costs, as measured by the Baltic Dry Index (BDI) and the Harper Petersen Charter Rates Index (HARPEX). These higher shipping costs reduce export competitiveness and raise import prices, contributing to inflation and potentially hindering economic growth.

Given the importance of geopolitical risks and their economic impacts, it is crucial to examine the potential macroeconomic effects of geopolitical risk shocks on South American economies, which could be significantly affected through various transmission channels. The literature provides limited evidence on the effects of geopolitical risk shocks on the macroeconomies of countries in this region.

In this context, the objective of this research is to estimate the effects of geopolitical risk shocks on macroeconomic variables, including inflation, GDP growth, and monetary policy interest rates in Bolivia, Chile, and Peru. Although these countries are geographic neighbors, they possess relatively distinct economic structures, making them an ideal sample for analyzing the potential impacts of global geopolitical shocks on South America. This study aims to provide a deeper understanding of how these economies respond to geopolitical shocks, filling a gap in the existing literature.

The paper is structured as follows. Section 2 provides an overview of the definition and measurement of geopolitical risk, along with an analysis of stylized facts. Section 3 details the empirical strategy employed to address the research objectives. Section 4 presents the results of the estimations. Finally, Section 5 discusses the conclusions.

2 Geopolitical Risk

Geopolitical risk refers to interactions between countries that significantly impact trade, including trade relations, security alliances, climate initiatives, and territorial disputes. Examples of these interactions include sanctions, trade wars, supply chain disruptions, and economic volatility. As of 2024, key geopolitical risks include tensions between Russia and NATO, cyberattacks, U.S.-China competition, anti-globalization movements, climate-related risks, and the ongoing aftermath of COVID-19, all of which pose challenges to global market stability [3].

2.1 Measuring Geopolitical Risk

The measurement of geopolitical risk is inherently complex and involves the use of various methodologies and data sources. One of the most widely accepted approaches is the Geopolitical Risk Index (GPR), developed by Caldara and Iacoviello [4]. This index is constructed based on the frequency of articles in reputable newspapers that discuss geopolitical events and risks. The authors define geopolitical risk as encompassing wars, terrorist acts, and tensions between states that influence international relations. The GPR captures both the risk of these events occurring and the emergence of new risks associated with escalating tensions. The construction of the GPR involves several steps:

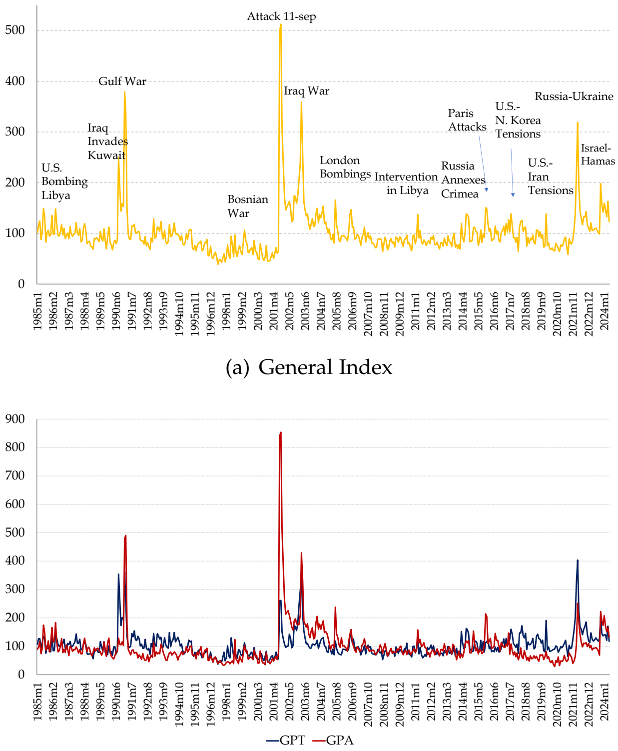
- **Definition of Geopolitics and Geopolitical Risk:** Establishing clear definitions of geopolitical risk events and potential threats.
- **Data Collection:** Collecting newspaper articles that mention terms related to geopolitics, war, military, and terrorism.
- **Article Count:** Counting the number of articles that discuss geopolitical events and risks.
- **Index Normalization:** Normalizing the index to an average value of 100 over the calculation period.
- **Index Audit:** Conducting a manual audit of articles to verify that the index accurately reflects movements in geopolitical risk.

As illustrated in Figure 1, the GPR exhibits peaks that correspond to significant geopolitical events, making it a robust measure of geopolitical risk, largely unaffected by media bias or political influence.

In addition to the general GPR, Caldara and Iacoviello [4] introduce two alternative measures of geopolitical risk:

- **Geopolitical Threat Risk Index (GPT):** Focused on articles that specifically mention geopolitical risks such as nuclear tensions, war threats, and terrorism. The GPT tends to rise in the months leading up to major events and may remain elevated afterward.
- **Geopolitical Acts Risk Index (GPA):** Based on articles that directly refer to adverse geopolitical events, such as acts of war and terrorism. The GPA peaks in response to major geopolitical events.

This study concentrates on the Geopolitical Threat Risk Index (GPT), given the empirical evidence supporting its stronger economic impact. Caldara and Iacoviello [4] suggest that geopolitical threat risks, as measured by the GPT, are more damaging to the economy than geopolitical acts, as they heighten uncertainty and signal potential future adverse events, thereby depressing asset prices and economic activity. Similarly, Salisu, Lasisi, and Tchankam [19] and Ali et al. [20] observe that financial markets in many advanced economies are more heavily influenced by geopolitical threat risks than by the actual occurrence of these events.



(a) General Index

(b) Threats and Acts Indices

Figure 1: *Geopolitical Risk Index (GPR)*

2.2 Geopolitical Threat Risks and Commodity Prices

Geopolitical events, such as wars and sanctions, have a profound impact on commodity prices—including energy, agriculture, and metals—by disrupting supply chains, creating political instability, and altering trade policies [7]. For instance, the Russia-Ukraine conflict led to significant increases in oil and natural gas prices due to supply interruptions and heightened uncertainty about future availability.

Conflicts in critical regions can also affect agricultural production and mining activities, reducing supply and driving prices upward. Furthermore, during periods of geopolitical uncertainty, investors often turn to safe-haven assets like gold, which increases demand and raises prices. These dynamics frequently result in a broad-based increase in commodity prices.

While factors such as global economic conditions and government policies also play a role in determining commodity prices, geopolitical risk is a key driver of market volatility. Adverse geopolitical events in various regions disrupt both the supply and demand for essential goods, thereby amplifying price fluctuations.

As illustrated in Figure 2, since 2021, the rise in geopolitical threat risks—peaking with Russia's invasion of Ukraine in early 2022—has been strongly correlated with most commodity price indices, particularly in the energy and agricultural sectors.

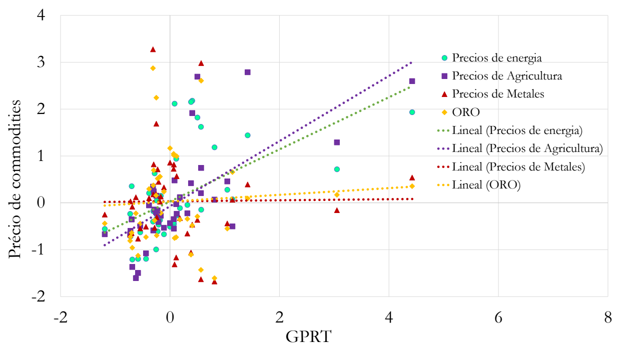


Figure 2: *Relationship Between the Geopolitical Risk Index and Commodity Prices. Source: World Bank Commodity Price Data and GPT Caldara and Iacoviello [4]. Data normalized for comparison.*

Geopolitical shocks also contribute to increased freight costs by disrupting transport routes and logistics operations. Route blockages, stricter inspections, and diversions through safer routes extend delivery times and escalate operational costs. These additional costs are passed along the supply chain, ultimately raising the final prices of commodities.

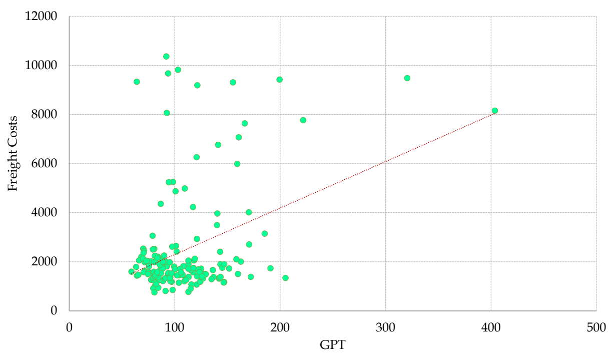


Figure 3: *Relationship Between the Geopolitical Risk Index and Freight Costs*

2.3 Geopolitical Threat Risks and Interest Rates

The literature generally suggests that an increase in geopolitical threat risks leads to a rise in interest rates. Geopolitical events often elevate inflation, prompting central banks to raise interest rates as part of their efforts to control inflationary pressures. For example, Russia's invasion of Ukraine significantly increased the Geopolitical Threat Risk Index (GPT), which, in turn, raised inflation expectations. In response, central banks in countries like Peru and Chile implemented interest rate hikes to mitigate inflationary pressures.

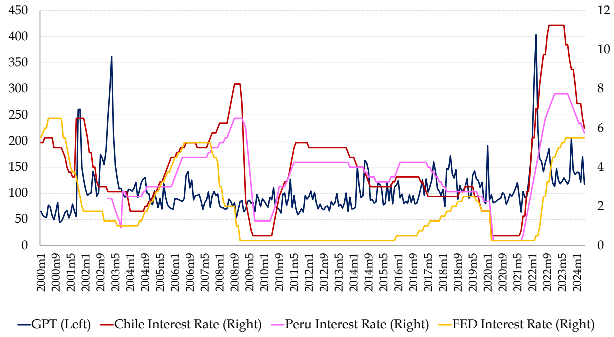


Figure 4: *Relationship Between the Geopolitical Risk Index and Interest Rates*

2.4 Geopolitical Threat Risks and Economic Growth

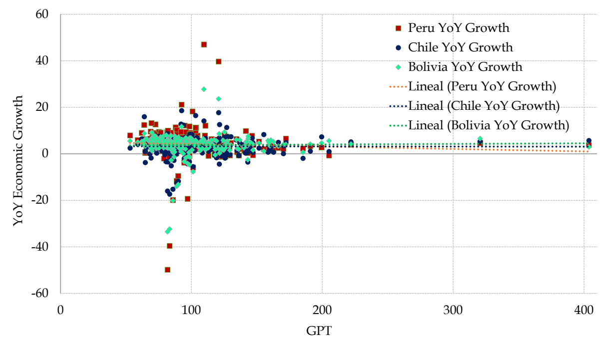


Figure 5: *Relationship Between the Geopolitical Risk Index and Economic Growth*

Geopolitical risks have a global impact; however, their economic effects tend to be less pronounced in countries with minimal involvement in international conflicts and lower trade integration with the conflicting parties. For instance, South American countries, such as Bolivia, Chile, and Peru, are less involved in international military tensions compared to regions like Europe, the Middle East, or Asia, which reduces their exposure to these risks. As illustrated in Figure 5, the correlation between economic growth in Bolivia, Chile, and Peru and the Geopolitical Threat Risk Index is relatively weak.

3 Empirical Strategy

To achieve the objectives of this research, Bayesian Structural Vector Autoregressive (BSVAR) models are developed to approximate the effects and interactions of geopolitical shocks on key macroeconomic variables, such as inflation, gross domestic product (GDP) growth, and the monetary policy interest rate, in Bolivia, Chile, and Peru.

The choice of BSVAR is justified for several reasons: first, the estimated parameters are random variables, providing posterior probability distributions that capture the underlying data-generating process; second, Bayesian methods are more flexible with small samples and series containing outliers, as they incorporate theoretical information through prior distributions; third, the identification of structural shocks in BSVAR aligns well with economic theory, allowing for sign, zero, and temporal restrictions.

Shock identification is a crucial methodological step. BSVAR models are estimated using the algorithm of Arias, Rubio-Ramírez, and Waggoner [21], which enables the imposition of sign and zero restrictions on the contemporaneous and subsequent effects of structural shocks.

The structural form of a conventional SVAR model is given by:

$$\begin{aligned} D_0 y_t = & D_1 y_{t-1} + D_2 y_{t-2} + \ldots + \\ & D_p y_{t-p} + F x_t + \eta_t, \quad t = 1, 2, \ldots, T \end{aligned} \tag{1}$$

where y_t is a vector of endogenous variables, x_t a vector of exogenous variables, and η_t are structural disturbances, with $\eta_t \sim N(0, I)$, implying that structural shocks are orthogonal and have unit variance. The objective is to find the structural matrix $D = D_0^{-1}$, such that the structural impulse-response functions $\tilde{\Psi}_0, \tilde{\Psi}_1, \tilde{\Psi}_2, \ldots$ satisfy the imposed restrictions.

A selection matrix is employed to verify compliance with the restrictions. For example, for sign restrictions, the matrix S_j represents the sign restrictions for shock j:

$$S_j \times f_j\left(D, D_1, \ldots, D_p\right) > 0 \tag{2}$$

Here, $f_j(D, D_1, \ldots, D_p)$ represents column j of the matrix $f(D, D_1, \ldots, D_p)$. Zero restrictions are verified similarly:

$$Z_j \times f_j\left(D, D_1, \ldots, D_p\right) = 0 \tag{3}$$

The posterior probability distributions are recovered using the following Gibbs sampling algorithm:

1. Draw random realizations of the coefficients $D_0, D_1, D_2, \ldots, D_p$ and F from the posterior distributions estimated from the reduced-form VAR.
2. Calculate the structural impulse-response functions $\tilde{\Psi}_0, \tilde{\Psi}_1, \tilde{\Psi}_2, \ldots$ using the coefficients from step 1.
3. Check if the restrictions are satisfied using equations 2 and 3. If the restrictions are satisfied, continue; otherwise, discard the realization.
4. Repeat until the desired number of iterations satisfying the restrictions is obtained.

To initiate Gibbs sampling, posterior distributions from the Bayesian reduced-form VAR models are required. These models are estimated using the "Artificial Coefficients Prior" [22], which is similar to the Independent Normal-Wishart prior but is more computationally efficient and suitable for non-stationary variables. This provides posterior distributions for the variance-covariance matrix and the contemporaneous and lagged coefficient matrices.

Individual BSVAR models are estimated for Bolivia, Chile, and Peru using monthly data: Bolivia (2000M1–2024M2), Chile (2000M6–2024M3), and Peru (2004M1–2024M3).[2] The models include 12 lags to capture seasonal dynamics and the persistence of effects.

The empirical results (Section 4) are derived using 30,000 iterations of Gibbs sampling, with a burn-in period of 10,000 iterations. The prior definitions follow the frameworks outlined in Arias, Rubio-Ramírez, and Waggoner [21] and Dieppe, Legrand, and Van Roye [24], ensuring methodological rigor. To assess the robustness of these results, Appendix A provides an example demonstrating that the findings remain consistent and are not significantly sensitive to variations in prior specifications.

The impulse-response functions, variance, and historical decompositions correspond to the median of the posterior distributions from each country's BSVAR models, under the following shock identification strategy:

The endogenous variables include year-over-year GDP growth (y), y-o-y inflation (π), y-o-y absolute change in the monetary policy interest rate (i), y-o-y growth of the total commodity price index (p^*), and the normalized Geopolitical Threat Risk Index (GPT), based on Caldara and Iacoviello [4].[3]

The identification strategy isolates geopolitical risk shocks by imposing a set of theoretically grounded restrictions that reflect the distinct transmission channels of such shocks. The economic rationale underlying these restrictions is as follows:

- ***Geopolitical risk shocks:*** Geopolitical risks are modeled as exogenous events that can contemporaneously influence domestic macroeconomic variables and global commodity prices. However, domestic variables and commodity prices do not contemporaneously affect geopolitical risk shocks, ensuring their exogeneity [4]. This restriction reflects the fact that geopoliti-

[2] For Bolivia, since inflation and interest rate data are available but no official data for the Global Economic Activity Index (a proxy for monthly GDP) exists for January and February 2024, projected values for these months were used following the methodology of Bolivar [23].

[3] The sources of information for the endogenous variables are Central Banks, National Statistical Institutes, and Bloomberg. The *GPR* data were downloaded from `https://www.matteoiacoviello.com/gpr.htm` in June 2024.

Table 1: *Structural Shock Identification Strategy*

Variables \ Shocks	Mon. Pol.	Supply	Demand	Commodity	Geopolitical
i	+ $(t = 0)$	•	•	•	•
y	•	+ $(t = 0)$	+ $(t = 0)$	•	•
π	- $(t = 1)$	- $(t = 0)$	+ $(t = 0)$	•	•
p^*	0 $(t = 0)$	0 $(t = 0)$	0 $(t = 0)$	+ $(t = 0)$	•
GPT	0 $(t = 0)$	0 $(t = 0)$	0 $(t = 0)$	0 $(t = 0)$	+ $(t = 0)$

Note: [+ $(t = 0)$] contemporaneous positive effect. [- $(t = 0)$] contemporaneous negative effect. [0 $(t = 0)$] contemporaneous null effect. [•] no prior restriction.

cal events, such as conflicts or trade sanctions, are not typically driven by immediate domestic economic conditions. No prior sign is imposed on these shocks, allowing the model to estimate their effects empirically.

- ***Aggregate supply and demand shocks:*** Aggregate supply shocks are assumed to have a contemporaneous positive effect on output (y) and a contemporaneous negative effect on inflation (π) due to productivity improvements [25]. In contrast, aggregate demand shocks increase both output and inflation contemporaneously, capturing the role of aggregate spending in the economy.
- ***Monetary policy shocks:*** Following Mountford [26] and Uhlig [27], monetary policy shocks are identified as raising the policy interest rate (i) contemporaneously while having a delayed contractionary effect on inflation. This reflects central banks' conventional responses to inflationary pressures [28, 29].
- ***Structural commodity price shocks:*** Commodity prices are treated as exogenous to domestic macroeconomic conditions, consistent with the open nature of the economies studied [30, 31]. Structural commodity price shocks correspond to changes in commodity prices unrelated to geopolitical risk shocks, capturing independent supply-demand dynamics [10, 11].

These restrictions are specifically tailored to the unique economic environments of Bolivia, Chile, and Peru. The reliance of these economies on imported commodities, such as energy and food, underscores the relevance of the exogeneity assumption for commodity prices. Additionally, the inclusion of the GPT variable explicitly captures the external nature of geopolitical risks, ensuring that the model effectively isolates their distinct impacts on macroeconomic variables and global commodity prices. By addressing the specific characteristics of the studied economies, this framework provides a robust foundation for identifying the effects of geopolitical risk shocks and highlights the suitability of using BSVAR models in this analysis.

4 Results

4.1 Macroeconomic Effects of Geopolitical Risk Shocks

This section presents the results that directly address the research objective: estimating the effects of geopolitical risk shocks on macroeconomic variables, including inflation, GDP growth, and monetary policy interest rates in Bolivia, Chile, and Peru.

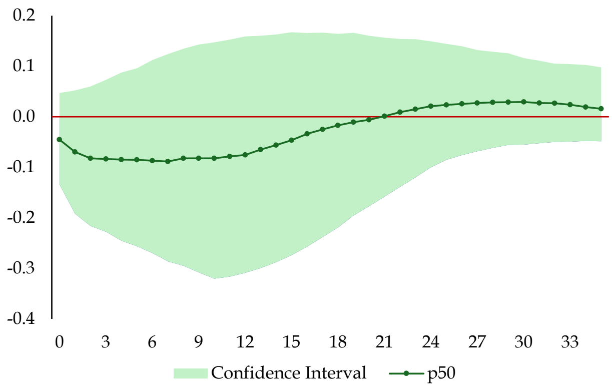
Specifically, these results are based on the impulse-response functions derived from the identification strategy outlined in Table 1, applied to the individual BSVAR models for each country. The shock of interest (i.e., the impulse) is a structural geopolitical risk shock equivalent to a one standard deviation increase in the Geopolitical Risk Threat Index.

The focus of this research is on the domestic macroeconomic effects in Bolivia, Chile, and Peru. The responses to the shock of interest are evaluated for year-over-year inflation, GDP growth, and the year-over-year absolute change in the monetary policy interest rate.

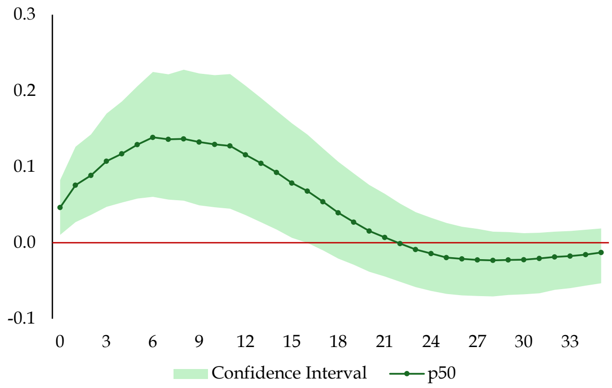
By normalizing the geopolitical risk shock to one standard deviation for all three countries, the impulse-response functions allow us to identify which economy is most (or least) sensitive to geopolitical risk shocks and their effects on domestic macroeconomic variables.

There is evidence in the literature suggesting a positive effect of geopolitical risk on prices [10, 11, 9, 7]. Accordingly, the first macroeconomic variable analyzed here is the year-over-year inflation rate. The impulse-response functions in Figure 6 suggest that an increase in geopolitical risk would lead to higher inflation rates in Chile and Peru.

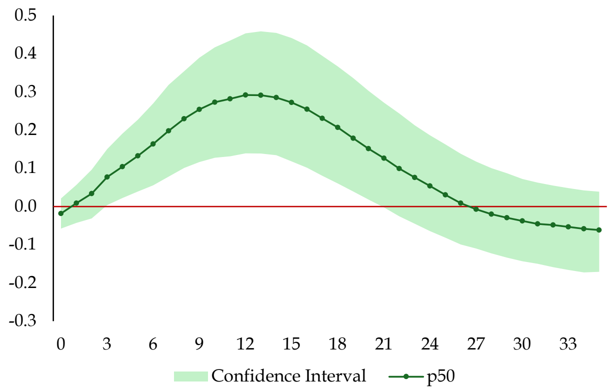
However, for Bolivia, the confidence interval includes zero across the entire time horizon of the impulse-response function (Figure 6-a). This low sensitivity of Bolivia's inflation to external shocks is consistent with findings in the literature [32, 33,



(a) Bolivia



(b) Chile



(c) Peru

Figure 6: *Response of y-o-y Inflation to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the impulse-response functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, which provide a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*

34]. Bolivia's resilience can likely be attributed to direct market interventions that complement monetary policy to mitigate demand and supply pressures on prices.

For Chile (Figure 6-b), the results suggest that a geopolitical risk shock would increase year-over-year inflation by 0.05 percentage points contemporaneously. This effect would be relatively persistent, peaking at 0.14 percentage points six months after the shock. Thereafter, the effect diminishes, with the lower confidence interval including zero after about one year.

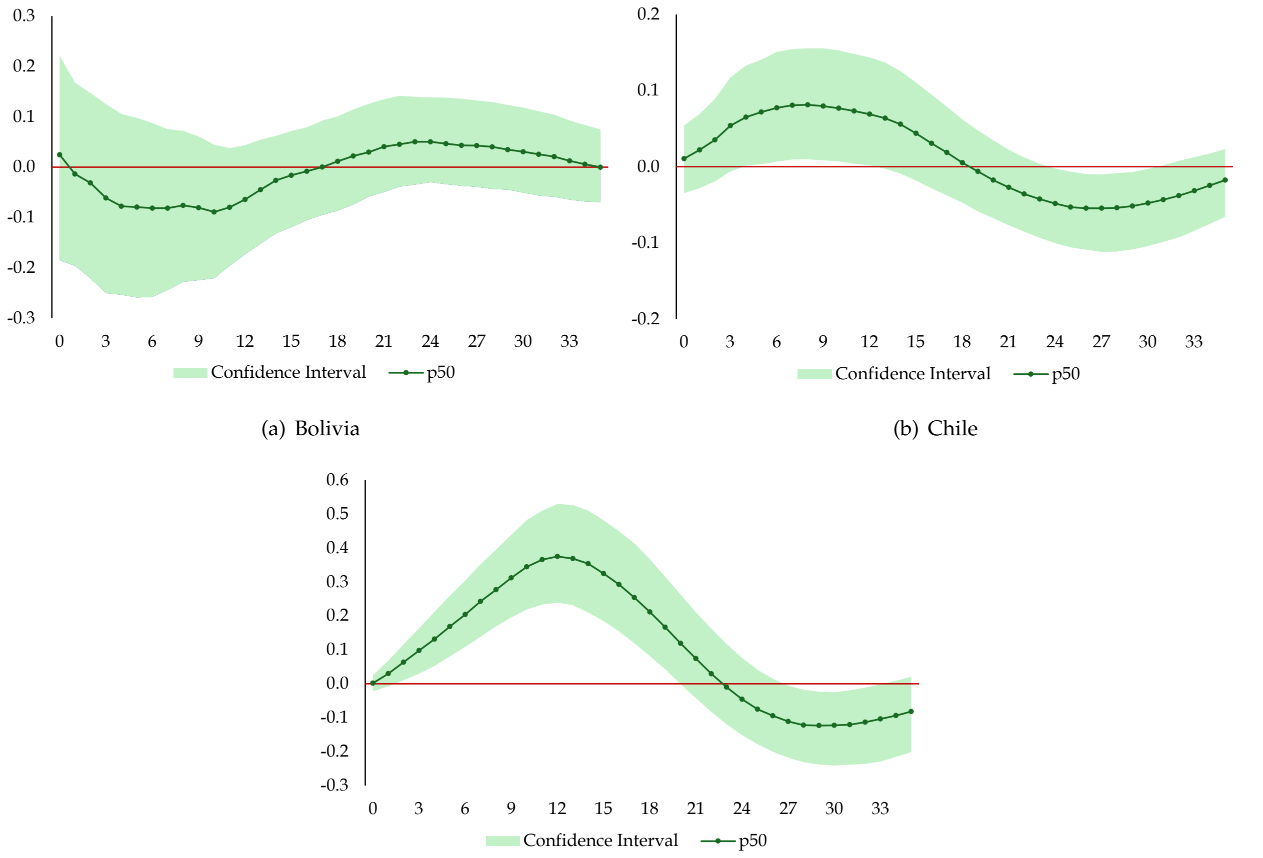
The estimates for Peru (Figure 6-c) suggest that geopolitical risk shocks would have an inflationary effect, albeit with some lag. Three months after the shock, inflation would rise by 0.08 percentage points, with zero included in the confidence intervals for earlier periods. The peak effect (0.29 percentage points) occurs approximately one year after the shock.

Given that the magnitude of the geopolitical risk shock is the same for all three economies (1 standard deviation in the Geopolitical Risk Threat Index), the impulse-response functions indicate that Peru is the most sensitive to this type of shock, both in terms of the magnitude and persistence of the inflationary effect.

Since geopolitical risk shocks appear to affect domestic inflation, at least in Chile and Peru, it is important to assess whether the monetary authorities of these countries respond to these shocks by adjusting their policy interest rates. In general, Figure 7 indicates that Chile and Peru would raise interest rates in response to geopolitical risk shocks.

For Bolivia, the impulse-response function shows confidence intervals that include zero throughout the period analyzed. This is consistent with the inflation estimates, which suggest that geopolitical risk shocks would not affect Bolivia's inflation, leaving little reason for the monetary authority to implement contractionary monetary policy.

For Chile (Figure 7-b), the monetary authority would raise interest rates starting in the fourth month after the shock. The confidence intervals exclude zero from the fourth month onward, indicating that this



(a) Bolivia

(b) Chile

(c) Peru

Figure 7: *Response of y-o-y Change in Monetary Policy Interest Rate to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the impulse-response functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, which provide a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*

contractionary stance would persist for nearly a year. Notably, this delayed response suggests that Chile's monetary policy reacts with some lag to geopolitical risk shocks.

As previously noted, Peru's inflation is the most sensitive to geopolitical risk shocks. Accordingly, Peru's monetary policy response (Figure 7-c) would involve raising the interest rate significantly, starting in the first month after the shock, with the peak effect occurring about one year later, before rates begin to decrease.

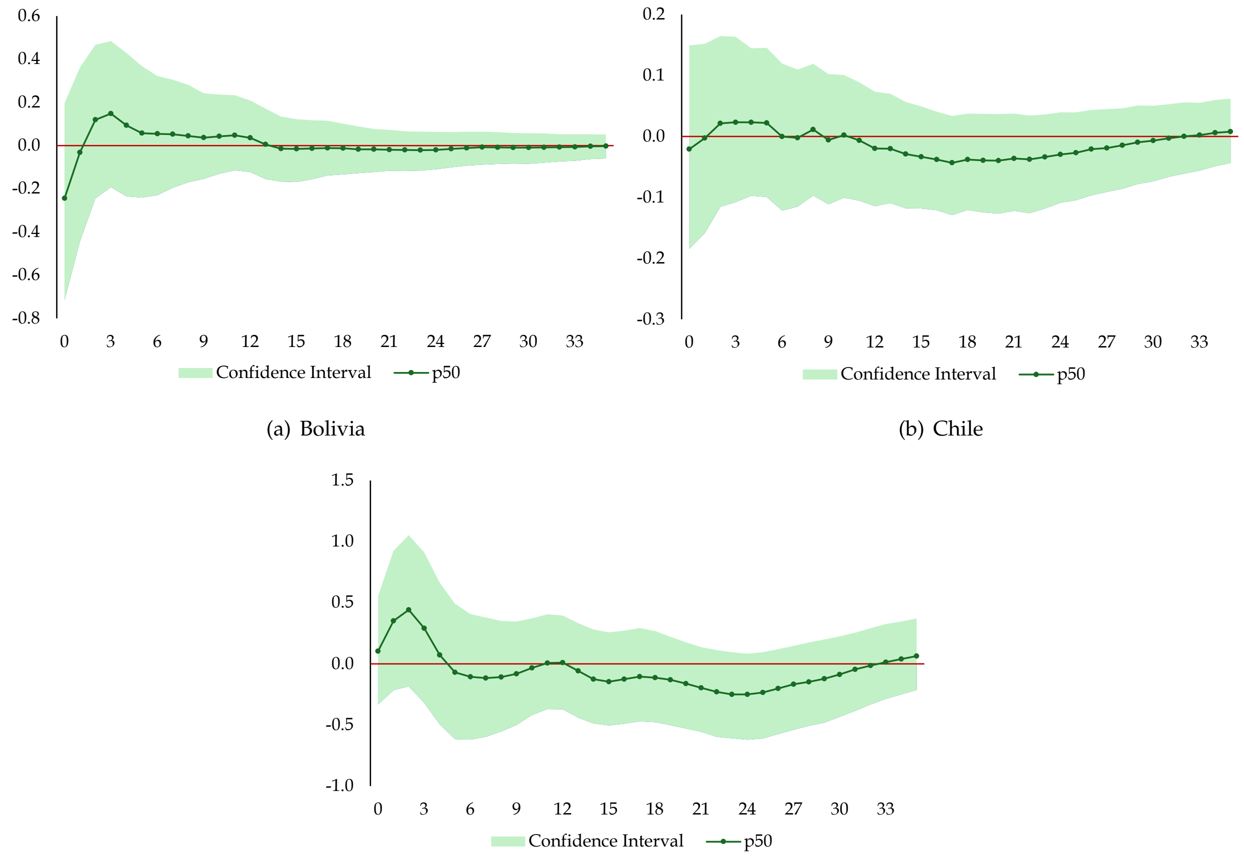
Interestingly, in both Chile and Peru, the results suggest that after a period of contractionary monetary policy (i.e., positive year-over-year changes in interest rates) in response to the geopolitical risk shock, monetary policy becomes expansionary (i.e., negative year-over-year changes in interest rates) approximately two years after the shock. This shift likely reflects the monetary authorities' assessment that the inflationary pressures from the geopolitical risk shock have subsided, as shown in Figures 6-b and 6-c, allowing for an easing of policy to offset earlier tightening.

The third macroeconomic variable analyzed in this study is year-on-year GDP growth. The results presented in Figure 8 suggest that geopolitical risk shocks have no statistically significant effect on aggregate economic activity in any of the three countries, as the confidence intervals for GDP growth include zero throughout the forecast horizon.

4.2 Geopolitical Risk and Macroeconomic Volatility

In the previous section, we evaluated the effects of geopolitical risk shocks on the dynamics of macroeconomic variables such as inflation, GDP growth, and the monetary policy interest rate. This section deepens the analysis by presenting the variance decomposition of these macroeconomic variables, helping to understand the degree to which geopolitical risk shocks contribute to the volatility of key variables in Bolivia, Chile, and Peru.

As shown in Table 2, geopolitical risk shocks ex-



(c) Peru

Figure 8: *Response of y-o-y GDP Growth to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the impulse-response functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, which provide a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*

plain less than 1% of the contemporaneous volatility of domestic macroeconomic variables across Bolivia, Chile, and Peru. While the variance percentages are similar across the countries for GDP growth and interest rates, the variance of inflation in Peru (0.8%) is higher than in Bolivia and Chile during the contemporaneous period.

Three months after the geopolitical risk shock, the variance of GDP growth explained by this shock remains marginal in all countries: 0.4% for Bolivia, 0.3% for Chile, and 0.7% for Peru. However, as time progresses, Peru shows greater sensitivity. At six months, geopolitical shocks explain 1.2% of the variance in Peru's GDP growth, compared to 0.6% in Bolivia and 0.3% in Chile. Twelve months after the shock, Peru's explained variance reaches 1.8%, again surpassing Bolivia (0.7%) and Chile (0.4%). This pattern suggests that Peru's economy is more vulnerable to geopolitical risk shocks in terms of GDP growth stability, while Bolivia and Chile exhibit relatively greater resilience.

Regarding inflation variance, the impact of geopolitical risk shocks is more evident in Chile and Peru than in Bolivia. Three months after the shock, geopolitical risk shocks explain 1.1% of inflation variance in Chile and 0.5% in Peru, compared to 0.3% in Bolivia. At six months, the impact grows, with Chile's explained variance rising to 1.5%, Peru's to 1.7%, and Bolivia's to 0.5%. After twelve months, Peru's inflation variance explained by geopolitical shocks reaches 5.2%, significantly higher than Chile's (1.5%) and Bolivia's (0.6%). This indicates that inflation volatility in Peru is considerably more sensitive to geopolitical risk shocks, with effects that amplify and persist over time, while Bolivia exhibits greater inflation stability in response to these shocks.

The variance in the monetary policy interest rate explained by geopolitical risk shocks also varies across the countries. Three months after the shock, these shocks explain 0.3% of interest rate variance in Peru, compared to 0.2% in Bolivia and Chile. At six months, Peru's explained variance rises to 3.1%, compared to 0.5% in both Bolivia and Chile. After twelve months, Peru's explained variance reaches 8.7%, while Bo-

Table 2: *Variance Decomposition of Macroeconomic Variables*

Var.	Shock / Month	Bolivia			Chile			Peru		
		Dom.	Com.	Geo.	Dom.	Com.	Geo.	Dom.	Com.	Geo.
y	$t = 1$	97.8	1.9	0.3	97.1	2.7	0.2	94.6	5.2	0.3
	$t = 3$	91.3	8.3	0.4	88.6	11.2	0.3	68.0	31.3	0.7
	$t = 6$	88.8	10.6	0.6	80.0	19.7	0.3	61.7	37.1	1.2
	$t = 12$	88.3	11.0	0.7	76.3	23.3	0.4	60.8	37.5	1.8
π	$t = 1$	99.3	0.4	0.3	93.2	6.0	0.8	99.4	0.3	0.3
	$t = 3$	98.7	0.9	0.3	78.6	20.3	1.1	98.6	0.9	0.5
	$t = 6$	97.7	1.9	0.5	62.0	36.5	1.5	89.6	8.6	1.7
	$t = 12$	97.3	2.1	0.6	50.1	48.4	1.5	68.1	26.7	5.2
i	$t = 1$	99.5	0.2	0.2	94.6	5.1	0.2	92.9	6.8	0.2
	$t = 3$	98.5	1.1	0.3	91.9	7.8	0.3	87.7	11.5	0.8
	$t = 6$	97.6	1.9	0.5	80.8	18.7	0.5	84.0	12.9	3.1
	$t = 12$	96.2	3.1	0.8	62.7	36.7	0.7	57.5	33.8	8.7

Note: These results correspond to the 50th percentile (median) of the posterior distributions recovered for the variance decompositions. **(Dom.)** Includes the percentage of variance explained by domestic shocks, such as aggregate supply, demand, and monetary policy.

livia's remains at 0.8% and Chile's at 0.7%. These results suggest that Peru's monetary policy is more sensitive to geopolitical risk shocks, reflecting greater volatility in its interest rate response, while Bolivia and Chile demonstrate greater stability in their monetary policy reactions.

4.3 Impact of Geopolitical Risk Shocks

In Section 4.1, it was shown that geopolitical risk shocks have notable effects on inflation and monetary policy interest rates, particularly in Chile and Peru. This section extends the analysis by estimating the potential impact of these shocks on the year-over-year inflation rate and the year-over-year absolute variation in interest rates.

It is crucial to note that the BSVAR models generate posterior probability distributions for the historical decomposition of endogenous variables. Accordingly, the results in this section are based on the median estimates. Additionally, GDP growth is not considered here, as evidence suggests that geopolitical risk shocks do not have a statistically significant impact on this variable.

By construction, the structural geopolitical risk shocks examined in this study are associated with geopolitical tensions between countries related to trade, security, alliances, or territorial disputes. These shocks are expected to affect commodity prices and, consequently, the domestic economies of the studied countries. The impact on macroeconomic variables reflects both demand-side effects, through changes in agent behavior, and supply-side effects, due to higher production costs stemming from increased international commodity prices and supply chain disruptions.

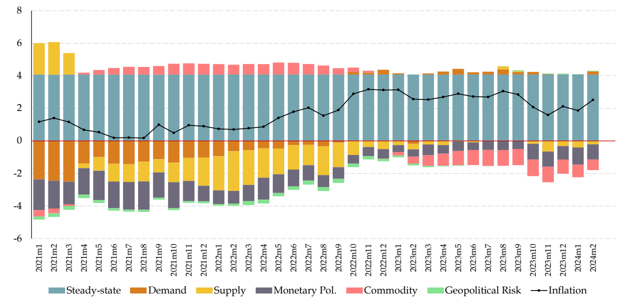
Regarding the historical decomposition of inflation since January 2021, it is generally observed that in Chile and Peru, geopolitical risk shocks led to an increase in inflation, particularly after the onset of the Russian invasion of Ukraine.

In Bolivia, however, the median effects of geopolitical risk shocks, as derived from the impulse-response function, are primarily negative, leading to a decrease in inflation between 2021 and 2022. Nevertheless, the impact is relatively marginal, with domestic shocks primarily explaining deviations from steady-state inflation levels. Given the high degree of uncertainty surrounding the effects of geopolitical risk shocks on Bolivia's inflation, and the statistical insignificance of these effects, the historical decomposition in Figure 9-a should be interpreted with caution.

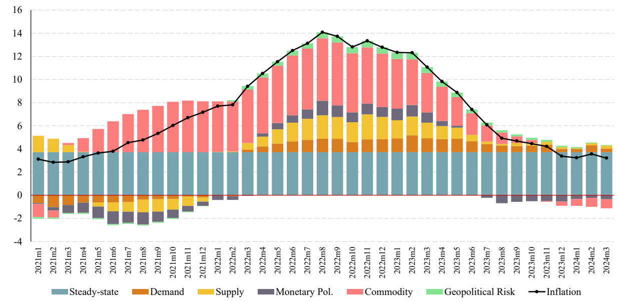
In Chile (Figure 9-b), the positive impact of geopolitical risk shocks begins in January 2022, coinciding with escalating tensions related to the Russian invasion of Ukraine. During 2022, these shocks contributed approximately 0.4 percentage points to Chile's y-o-y inflation, with an average impact of 0.3 percentage points in 2023.

For Peru (Figure 9-c), the results indicate a greater impact on inflation than in Chile. Geopolitical risk shocks began raising inflation in February 2022, with an average contribution of 0.7 percentage points during that year, peaking in the final quarter. In 2023, these shocks accounted for an average of 0.9 percentage points of inflation, with the highest impacts observed in the first half of the year.

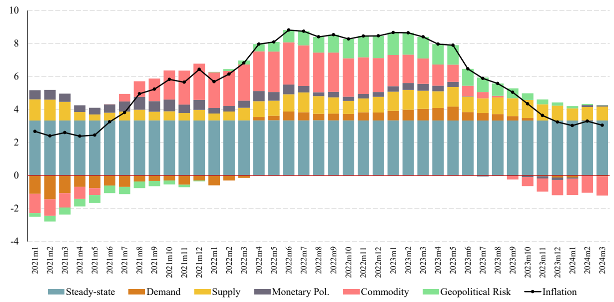
Among Bolivia, Chile, and Peru, the latter experienced the most significant inflationary effects during the analyzed period. This finding aligns with Peru's recent experience, where the Russia-Ukraine conflict has notably increased domestic prices. The conflict



(a) Bolivia



(b) Chile



(c) Peru

Figure 9: *Historical Decomposition of y-o-y Inflation*

drove up the prices of essential inputs such as fertilizers, oil, and wheat, raising agricultural production costs and food prices, thereby exerting upward pressure on inflation. Trade restrictions and port closures have further complicated international commerce, affecting both exports and imports. In 2021, Peru imported a significant portion of its fertilizers and explosives (61% of total imports in these categories) from Russia, making it a critical supplier for the Peruvian market.[4]

Figure 10 presents the historical decomposition of the y-o-y absolute variation in monetary policy interest rates in Bolivia, Chile, and Peru. In Bolivia, consistent with the minimal inflationary effects of geopolitical risk shocks, the interest rate shows no significant response to these shocks.

In Chile, the historical decomposition indicates that the central bank raised interest rates in response to geopolitical risk shocks from February 2022 until the second half of 2023. Additionally, from December 2023 to March 2024, the impact of these shocks on interest rate variations is negative, reflecting reduced geopolitical tensions compared to 2022–2023, as well as inflation falling slightly below its steady-state level during this period.

Finally, Peru's inflation exhibits the greatest sensitivity to geopolitical risk shocks, which is mirrored in the response of its monetary policy interest rate. The impact of these shocks on Peru's interest rate is positive from January 2022 through the third quarter of 2023, with the largest effects observed between June 2022 and March 2023. Thereafter, the impact turns negative, as inflation returns to steady-state levels.

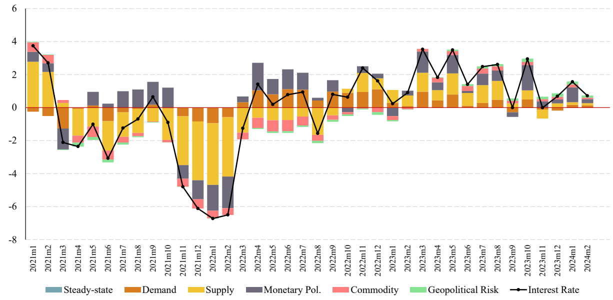
4.4 Disaggregating Inflation Dynamics Under Geopolitical Risk Shocks

This subsection analyzes the heterogeneous impacts of geopolitical risk shocks on core, food, and energy inflation across Bolivia, Chile, and Peru. The analysis employs BSVAR models, using the identification strategy detailed in Table 1. Specific inflation measures are used to replace the general inflation variable, accounting for data availability constraints. For Bolivia, energy inflation is excluded due to data limitations, while for Peru, food-energy inflation substitutes standalone energy inflation.[5]

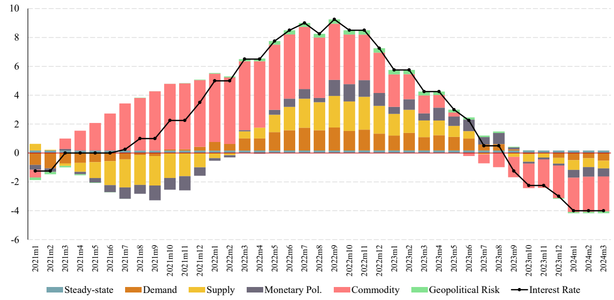
Figure 11 illustrates impulse-response functions depicting the effects of geopolitical risk shocks (a one-standard-deviation increase in the Geopolitical

[4] Ministry of Foreign Trade and Tourism. See `https://recursos.exportemos.pe/impactos-esperados-del-conflicto-belico-rusia-ucrania-en-el-comercio-exterior-peruano-oficina-macrorregional-centro.pdf`

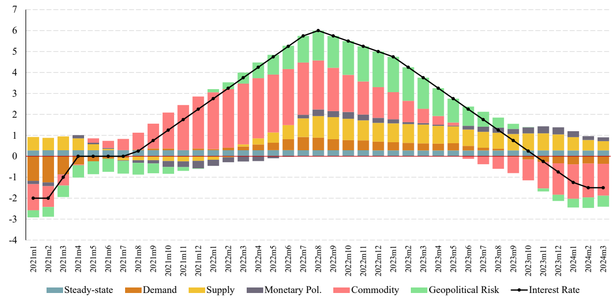
[5] Peru's food and food-energy inflation data pertain to Lima Metropolitana.



(a) Bolivia



(b) Chile



(c) Peru

Figure 10: *Historical Decomposition of the y-o-y Absolute Variation of the Monetary Policy Interest Rate*

Risk Threat Index) on core, food, and energy inflation in Chile. The results indicate that food and energy inflation are significantly impacted, while core inflation exhibits a delayed and muted response. Specifically, food inflation rises by 0.26 percentage points on impact, intensifying to approximately 0.4 percentage points within one month and persisting for nine months before gradually diminishing. Energy inflation displays a sharper contemporaneous increase of 0.58 percentage points, peaking at 0.68 percentage points after one month and subsequently declining.

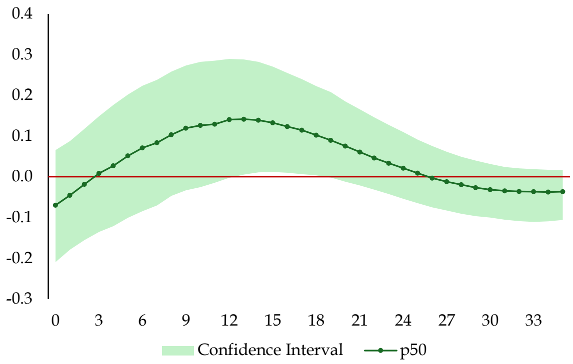
Historical decompositions of Chile's inflation dynamics (Figure 12) highlight the role of geopolitical risk shocks in driving food and energy inflation, particularly in 2022. Food inflation exhibits persistent sensitivity to these shocks throughout 2022 and 2023, whereas energy inflation's response is concentrated in 2022. Core inflation remains largely unaffected, with a slight increase observed only in late 2022. These findings underscore the distinct transmission channels of geopolitical risks across inflation components.

In Peru, geopolitical risk shocks predominantly influence food and food-energy inflation, as shown in Figure 13. The impacts on these measures are similar, although energy-related components exhibit slightly earlier responses. Both food and food-energy inflation peak approximately one year after the shock, while core inflation demonstrates a delayed and smaller response, peaking around 18 months post-shock. These patterns suggest that geopolitical risk shocks primarily affect Peru's inflation through food and energy channels, reflecting its dependency on imported commodities such as fertilizers and fuels.

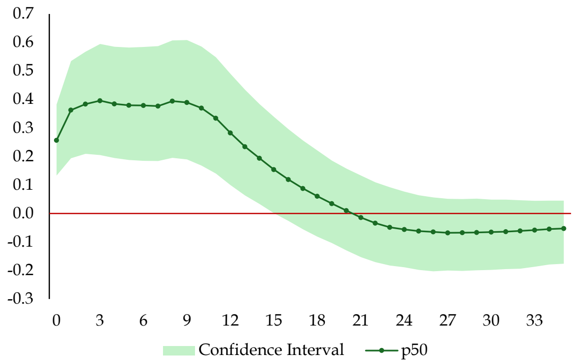
Historical decompositions (Figure 14) reveal that geopolitical risk shocks substantially influenced food and food-energy inflation during 2022 and 2023, with average contributions of 1.0 percentage points and 1.2 percentage points in 2022, rising to 1.7 percentage points and 1.2 percentage points in 2023, respectively. Core inflation shows a smaller but growing sensitivity from 2023 onward, reflecting delayed spillover effects from food and energy price shocks.

For Bolivia, geopolitical risk shocks exert minimal and statistically nonsignificant effects on general inflation, consistent with findings for food inflation (Figure 15-b). Interestingly, core inflation exhibits a slight decrease following a shock (Figure 15-a), diverging from the patterns observed in Chile and Peru.

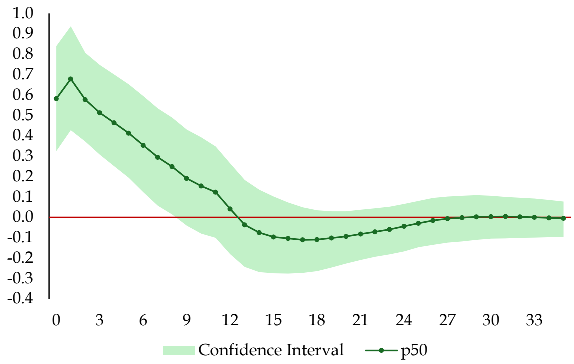
Historical decompositions (Figure 16) confirm that geopolitical risk shocks did not significantly impact core or food inflation dynamics, possibly due to Bolivia's policy interventions and lower exposure to global commodity markets.



(a) Core

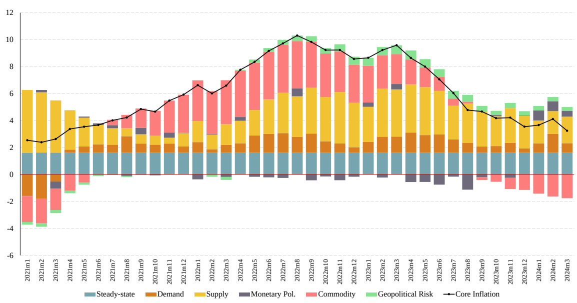


(b) Food

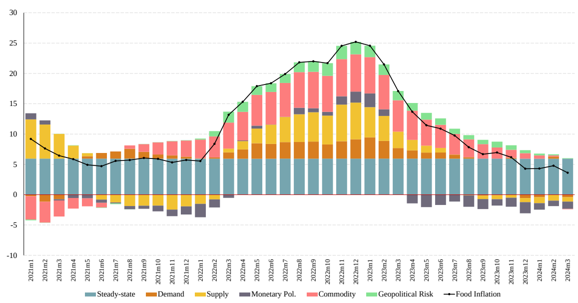


(c) Energy

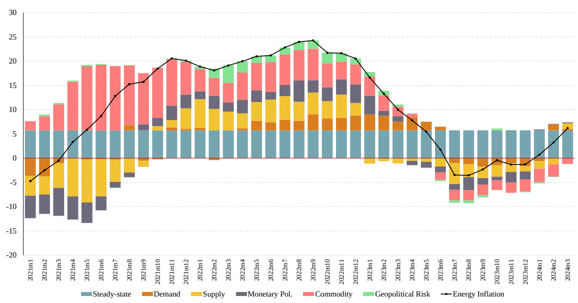
Figure 11: *Chile – Response of y-o-y Core, Food and Energy Inflation to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, ensuring robustness in Bayesian impulse-response analysis.*



(a) Core

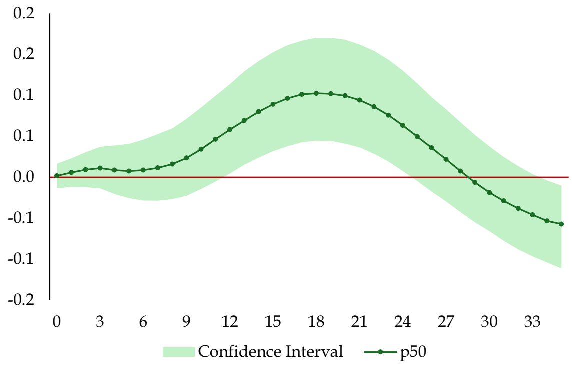


(b) Food

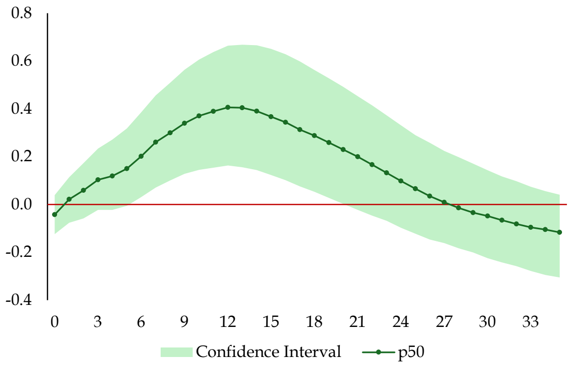


(c) Energy

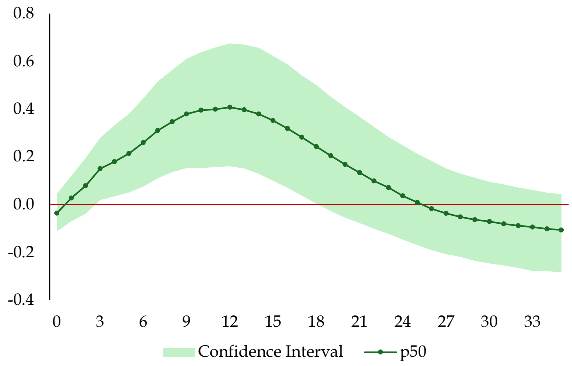
Figure 12: *Chile – Historical Decomposition of the y-o-y Core, Food and Energy Inflation*



(a) Core

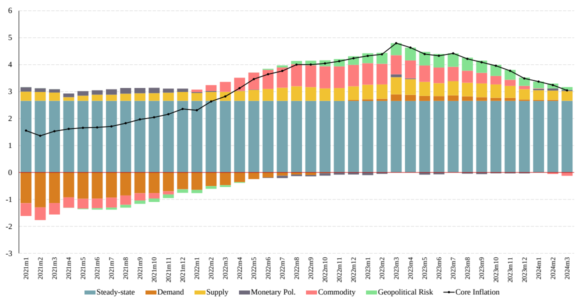


(b) Food

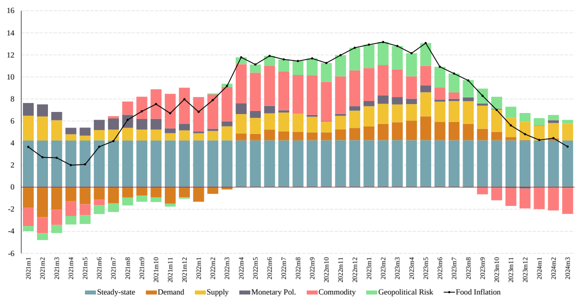


(c) Food-Energy

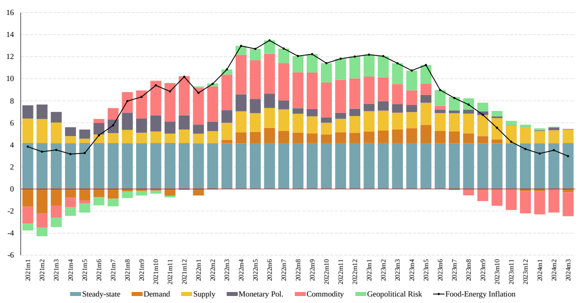
Figure 13: *Peru – Response of y-o-y Core, Food and Food-Energy Inflation to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, ensuring robustness in Bayesian impulse-response analysis.*



(a) Core

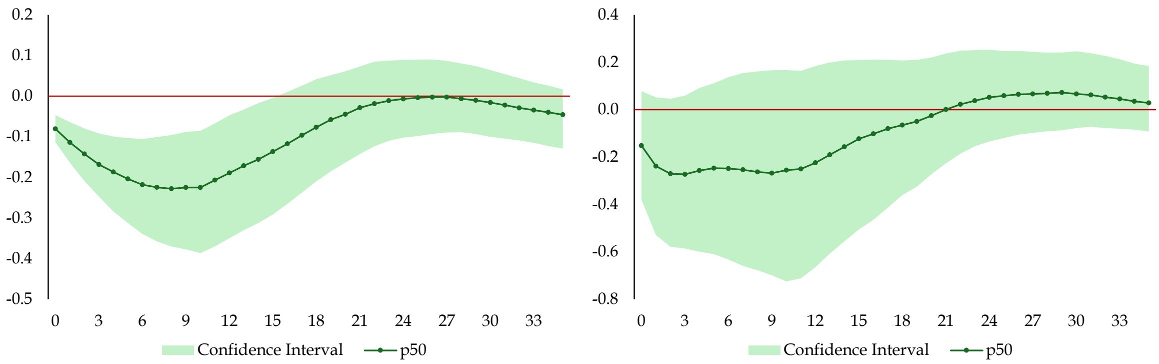


(b) Food



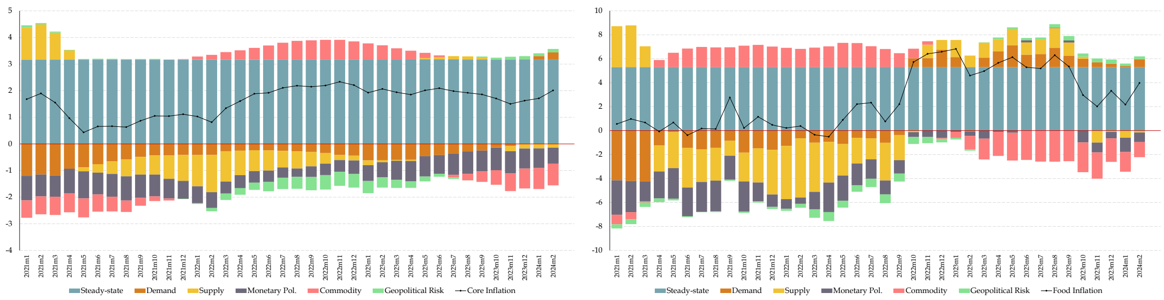
(c) Food-Energy

Figure 14: *Peru – Historical Decomposition of the y-o-y Core, Food and Food-Energy Inflation*



(a) Core (b) Food

Figure 15: *Bolivia – Response of y-o-y Core and Food Inflation to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, ensuring robustness in Bayesian impulse-response analysis.*



(a) Core (b) Food

Figure 16: *Bolivia – Historical Decomposition of the y-o-y Core and Food Inflation*

In summary, these results demonstrate the heterogeneous impacts of geopolitical risk shocks on inflation components across countries. While Chile and Peru exhibit pronounced responses in food and energy inflation, Bolivia demonstrates resilience, highlighting the critical role of structural economic differences and policy interventions in mitigating the impacts of external shocks.

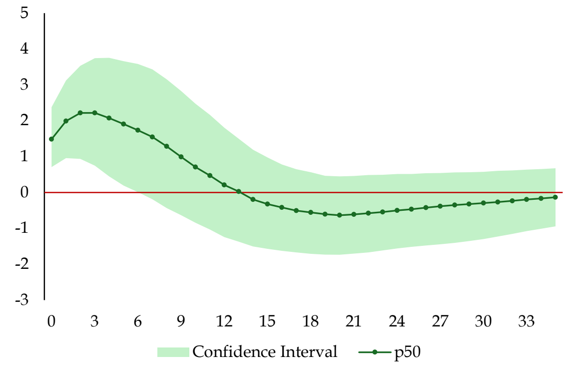
The inflationary effects observed in Peru and Chile are likely driven by higher import costs of essential goods, such as energy, food, and manufacturing inputs. These pressures affect both domestic consumption and production costs, particularly in products like oil, where price increases elevate transportation and production expenses. To address these external shocks, both countries rely on inflation-targeting frameworks and flexible exchange rate regimes. Monetary policy, particularly adjustments to the policy interest rate, plays a central role in stabilizing inflation by influencing exchange rates and domestic demand.

In contrast, Bolivia employs a distinct monetary policy framework, prioritizing exchange rate stability through a quasi-fixed exchange rate system that pegs the boliviano to the U.S. dollar. This approach limits the transmission of external price shocks to domestic inflation. Additionally, Bolivia uses fiscal policies, including food and fuel subsidies, to mitigate the impact of rising commodity prices.

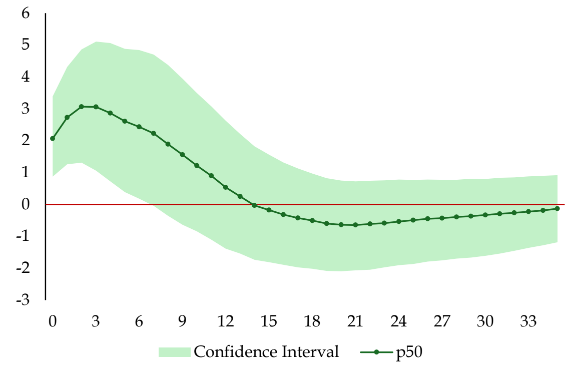
4.5 Geopolitical Risk Shocks and Commodity Prices

Geopolitical risks significantly influence commodity prices, particularly energy commodities such as oil [35, 36, 37, 38]. These risks evolve over time, shaped by broader economic conditions, and exhibit asymmetric effects across different commodities. As noted by Mitsas, Golitsis, and Khudoykulov [6], geopolitical risks impact commodity prices by triggering trade wars and conflicts that disrupt transportation and production, leading to supply shortages and price increases. Additionally, these risks elevate price volatility by simultaneously affecting supply and demand dynamics [7].

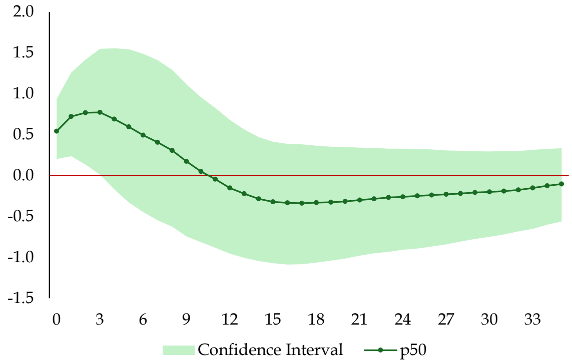
Despite extensive empirical evidence on the effects of geopolitical risk shocks on commodity prices, most studies lack insights into high-frequency reactions



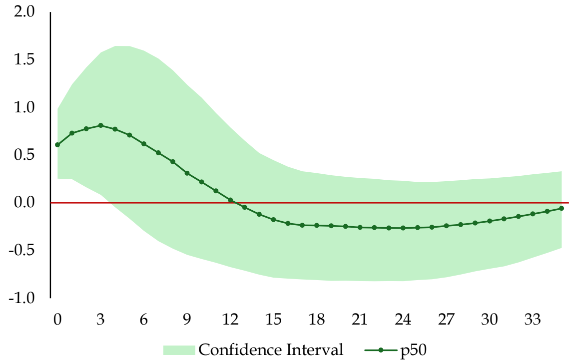
(a) Total



(b) Energy

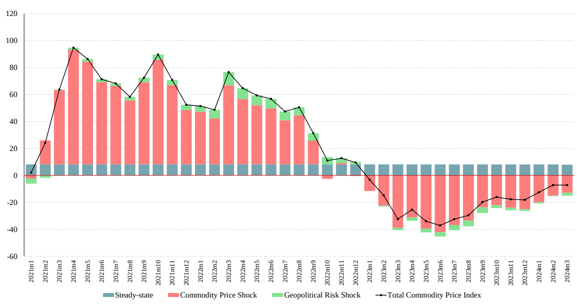


(c) Non-Energy

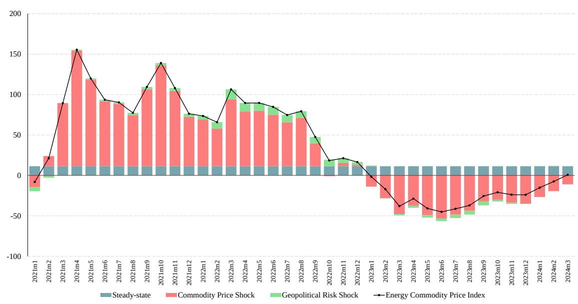


(d) Agriculture

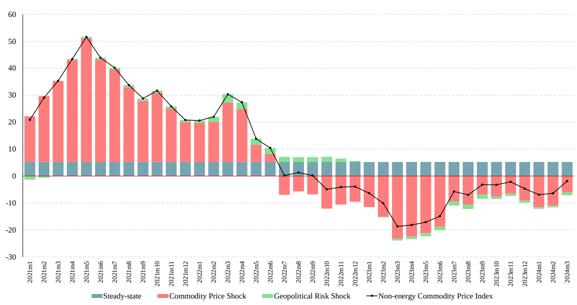
Figure 17: *Response of y-o-y Growth of Total, Energy, Non-energy, and Agriculture Commodity Price Indices to Geopolitical Risk Shocks. Note: The 50th (median), 32nd, and 68th percentiles of the impulse-response function correspond to the average of these percentiles in the individual impulse-response functions for Bolivia, Chile, and Peru.*



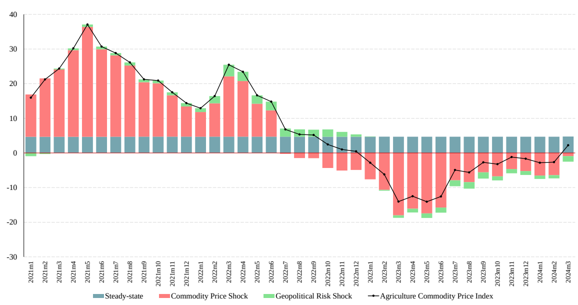
(a) Total



(b) Energy



(c) Non-Energy



(d) Agriculture

Figure 18: *Historical Decomposition of the y-o-y Growth of Total, Energy, Non-energy, and Agriculture Commodity Price Indices. Note: Historical decomposition considers the 50th percentile of the individual historical decompositions.*

of commodity price indices. This section addresses this gap by analyzing the reactions of total, energy, non-energy, and agriculture commodity price indices to geopolitical risk shocks. The section also presents historical decompositions to illustrate the monthly contributions of geopolitical risk shocks to commodity price dynamics.

Impulse-response functions and historical decompositions are estimated using BSVAR models for Bolivia, Chile, and Peru. The individual country-level results are aggregated to provide overall responses, given the consistency across the three models (see an example in Appendix B). For indices other than the total commodity price index, the respective index substitutes the total index in the models, while maintaining the aggregation methodology to ensure robustness and coherence.

Figure 17 displays the aggregated impulse-response functions for y-o-y growth rates of total, energy, non-energy, and agriculture commodity price indices in response to a one-standard-deviation increase in the geopolitical risk index. The total commodity price index experiences a contemporaneous y-o-y growth of 1.5% following the shock, peaking at 2.2% after two months. The impact persists for six months, as indicated by the lower bound of the confidence interval (Figure 17-a).

Energy commodity prices respond more strongly, with an immediate increase of 2.1% and a peak growth rate of 3.1% after three months. This heightened sensitivity reflects the significant exposure of energy markets to geopolitical risks (Figure 17-b). Non-energy commodities, including metals, exhibit a smaller response, with y-o-y growth increasing by 0.5% contemporaneously and peaking at 0.8% after two months before declining (Figure 17-c). Agricultural commodities show moderate sensitivity, with a contemporaneous growth of 0.6%, peaking at 0.8% after two months and stabilizing within four months (Figure 17-d).

The historical decompositions in Figure 18 provide insights into the monthly contributions of geopolitical risk shocks to commodity price growth. From March 2021 to the end of 2022, geopolitical risk shocks had a positive impact on total commodity prices. This impact was modest in 2021, contributing an average of 1.6 percentage points to y-o-y growth but became more pronounced in 2022, explaining 5.9 percentage points of the growth. In 2023 and early 2024, the effects turned negative (Figure 18-a).

Geopolitical risk shocks were a dominant factor in energy price dynamics during 2022, driven by the Russia-Ukraine conflict. These shocks explained up to 12.5 percentage points of the y-o-y growth of energy prices at their peak (March 2022), declining thereafter as market adjustments reduced volatility (Figure 18-b).

Non-energy commodities exhibited a more stable response; the contribution of geopolitical risk shocks peaked at 3.1 percentage points during March 2022 (Figure 18-c). Agricultural commodities showed sustained sensitivity throughout 2022, with geopolitical risk shocks explaining 2.1 percentage points on average; the dependency on imported inputs, such as fertilizers, amplified the vulnerability of this sector (Figure 18-d).

Overall, these results emphasize the nuanced effects of geopolitical risk shocks on commodity markets, highlighting substantial variations across commodity types. Energy markets exhibit the highest sensitivity, followed by agriculture and non-energy commodities, underscoring the importance of tailored policy responses to mitigate these impacts.

5 Conclusions

This study provides a comprehensive analysis of the macroeconomic effects of geopolitical risk shocks on the economies of Bolivia, Chile, and Peru, offering insights into how these shocks influence key economic indicators. The research underscores the importance of understanding the impacts of increasingly frequent and complex geopolitical events on emerging economies, particularly those in Latin America with distinct structural characteristics. Bolivia, Chile, and Peru, with their unique economic profiles, serve as a representative sample for exploring the consequences of global geopolitical risks in the South American context.

Using BSVAR models, this study identifies and decomposes the effects of structural geopolitical risk shocks on various macroeconomic variables. The findings reveal significant, yet heterogeneous, impacts across the three countries. In Chile and Peru, geopolitical risk shocks lead to higher inflation and interest rates, with variations in both magnitude and duration. Conversely, Bolivia exhibits macroeconomic stability in response to these shocks, likely reflecting differences in policy frameworks and economic structures.

A key takeaway from the disaggregated analysis of inflation dynamics is the differential impact of geopolitical risk shocks on core, food, and energy inflation. In Chile, food and energy inflation are particularly sensitive to these shocks, with pronounced and persistent effects. Peru also exhibits substantial increases in food and food-energy inflation, reflecting its dependency on imported commodities like fertilizers and fuels. Bolivia, however, shows limited sensitivity to geopolitical risk shocks across all inflation components, underscoring its resilience to external disruptions.

Similarly, the analysis of commodity prices highlights that geopolitical risk shocks significantly influence energy, non-energy, and agriculture price indices. These effects are particularly pronounced for energy commodities, which exhibit immediate and sharp responses. The persistent impact on agriculture prices also underscores the vulnerability of food supply chains to geopolitical tensions. The findings emphasize the importance of considering commodity-specific dynamics when evaluating the transmission of geopolitical shocks in resource-dependent economies like those in Latin America.

Given these findings, it is imperative for policymakers to adopt strategies to mitigate the adverse effects of geopolitical risk shocks. Potential measures include diversifying trade partnerships to reduce reliance on a limited set of import and export markets, enhancing domestic food and energy production to improve self-sufficiency, and strengthening monetary policy frameworks to better manage inflationary pressures. Additionally, fostering regional cooperation within Latin America could help buffer the impacts of global geopolitical disruptions by promoting collective resilience and shared risk management mechanisms.

Lastly, this study contributes to the growing literature on the economic consequences of geopolitical risks in emerging markets. It highlights the necessity of adaptive and preventive policies to address these global challenges and provides valuable insights for policymakers and scholars focused on enhancing economic stability and resilience in the South American region. Future research could further explore non-linear effects and sectoral responses to geopolitical shocks, offering a more granular understanding of their transmission mechanisms.

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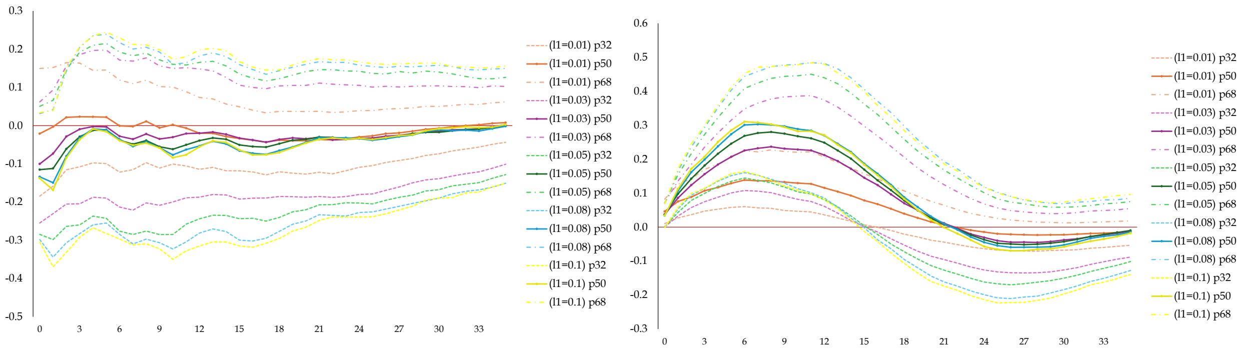
A Robustness: Impulse-Response Functions Under Different Prior Values

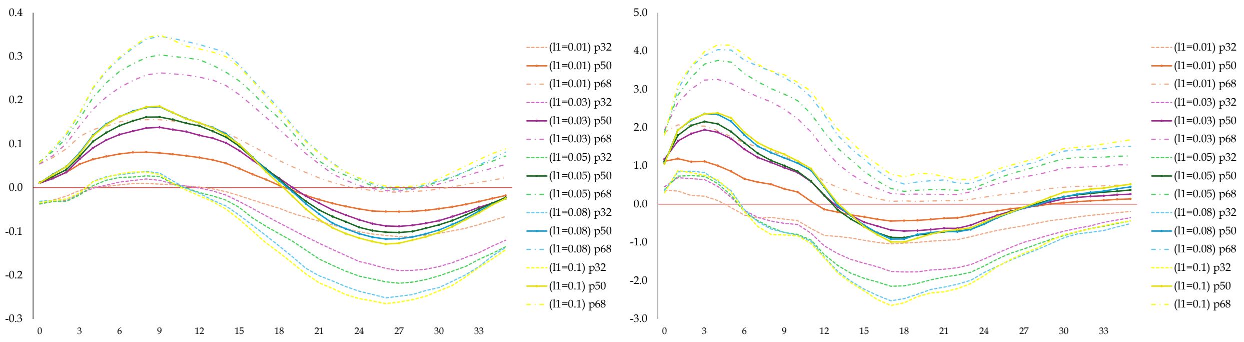
To assess the robustness of the results, we analyze the sensitivity of impulse-response functions to variations in the prior driving the overall tightness (l1) of the BSVAR models. For the case of Chile, Figure A.1 illustrates the responses of key variables, such as y-o-y GDP growth and inflation, to a geopolitical risk shock under different prior values. The results demonstrate low sensitivity to changes in priors, reinforcing the reliability of the estimated effects.



(a) GDP (b) Inflation

Figure A.1: *Chile – Response of the y-o-y GDP Growth and Inflation to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the impulse-response functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, providing a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*

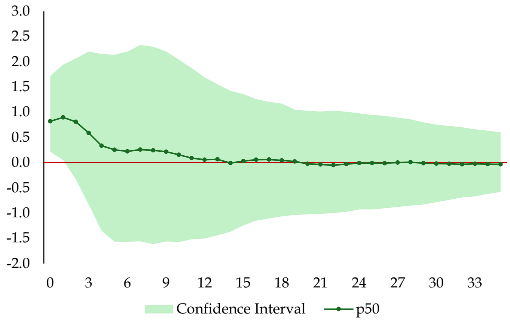
Similarly, Figure A.2 presents the responses of the y-o-y change in the monetary policy interest rate and the growth of the total commodity price index to a geopolitical risk shock under varying prior values. These findings further confirm the robustness of the impulse-response functions, as the estimated effects remain consistent across different prior specifications.



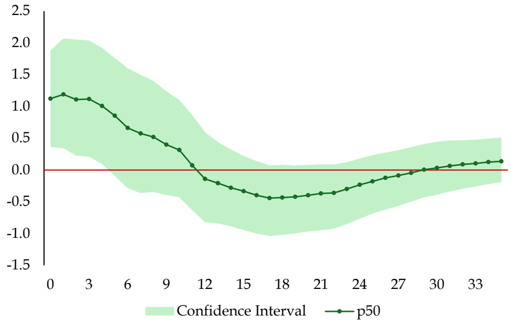
(a) Interest Rate (b) Commodity Price Index

Figure A.2: *Chile – Response of the y-o-y Change in Monetary Policy Interest Rate and Growth of Total Commodity Price Index to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the impulse-response functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, providing a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*

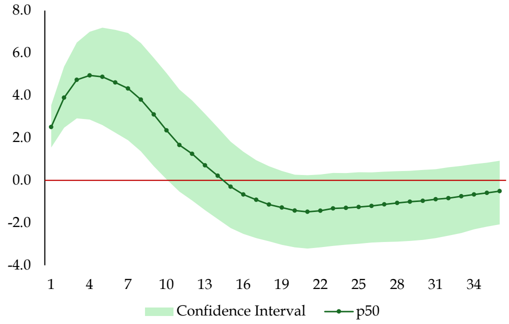
B Geopolitical Risk Shocks and Commodity Prices



(a) Bolivia

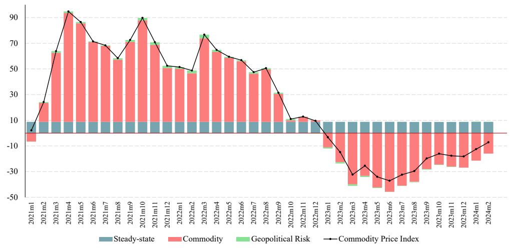


(b) Chile

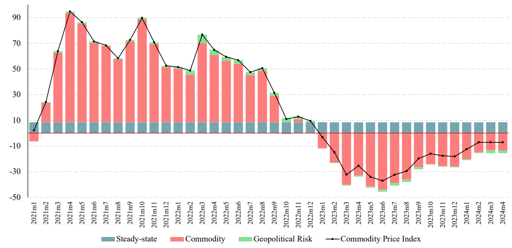


(c) Peru

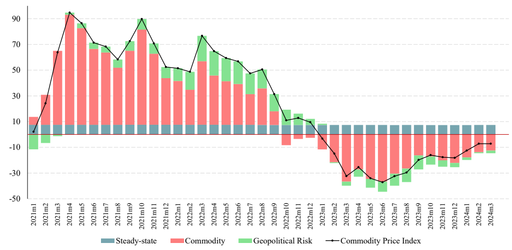
Figure B.1: *Response of the y-o-y Total Commodity Price Index Growth to a Geopolitical Risk Shock. Note: The 50th percentile (median) of the posterior distributions recovered for the Impulse-Response Functions is used as the central measure for interpreting results. The 32nd and 68th percentiles define the confidence intervals, providing a higher degree of certainty in the estimated effects, as is conventional in Bayesian impulse-response analysis.*



(a) Bolivia



(b) Chile



(c) Peru

Figure B.2: *Historical Decomposition of the y-o-y Total Commodity Price Index Growth.*