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Energy Price Dynamics in the Face of Uncertainty Shocks and the role of Exchange Rate Regimes: A Global Cross-Country Analysis*

António Afonso[1] José Alves[2] João Jalles[3] Sofia Monteiro[4]

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Abstract

This study examines the effects of geopolitical risk and global uncertainty on energy prices, conditioned by different exchange rate regimes, for 185 economies over the period 1980-2023. The central question is how uncertainty impacts energy prices and whether exchange rate flexibility mediates these effects. Using panel data techniques, including OLS and Panel VAR, we assess both demand and supply-side channels, exploring country-specific differences. Our key findings indicate that uncertainty shocks significantly raise energy prices, particularly in countries with flexible exchange rates, where currency depreciation amplifies global price fluctuations. Asymmetric results are found regarding emerging markets, with flexible exchange rates, which tend to have lower energy prices, while oil-exporting countries and OPEC members experience distinct pricing dynamics. These results underscore the importance of exchange rate policy choices in shaping energy market responses to global shocks. Policymakers may need to adopt complementary measures to manage the volatility arising from global uncertainty.

JEL: C23; E44; G32; H63
Keywords: Geopolitical Risk; World Uncertainty Index; Global Energy Markets; Exchange Rate Regimes; Asymmetric Effects.

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1. Introduction

The global energy market plays a pivotal role in shaping macroeconomic stability and growth, particularly given the rising influence of uncertainty shocks and varying exchange rate regimes. Energy prices, especially for key commodities like oil and natural gas, are highly sensitive to global economic and political conditions. In recent years, the volatility of these prices has been increasingly attributed to uncertainty shocks, ranging from geopolitical tensions to fluctuations in global financial markets. These shocks, combined with differences in exchange rate regimes across countries, create a complex landscape for understanding energy price dynamics (Kang and Ratti, 2013; Bakas and Triantafyllou, 2018; Caldara and Iacoviello, 2022).

The volatility of energy prices has long been a concern for policymakers, economists, and investors. Historically, energy prices have shown a strong correlation with periods of economic turbulence, such as the oil crises of the 1970s or the Global Financial Crisis (GFC) of 2008 (Alquist and Kilian, 2010). More recently, geopolitical tensions, trade wars, and global health crises (such as the COVID-19 pandemic) have intensified these concerns (Salisu et al., 2022). At the same time, exchange rate regimes – whether flexible or fixed – have emerged as critical factors in moderating the impact of uncertainty shocks on local energy prices. Countries with flexible exchange rate regimes may absorb shocks differently than those with fixed regimes, influencing how global uncertainty transmits to domestic markets (Duan et al., 2021). This makes it imperative to understand the mechanisms by which uncertainty and exchange rate regimes interact to affect energy prices.

This paper builds on the theoretical foundation that uncertainty shocks influence energy prices through both demand and supply channels. For instance, heightened uncertainty may reduce investment in energy infrastructure and exploration, leading to constrained supply (Joëts et al., 2017). On the demand side, economic policy uncertainty can reduce energy consumption as businesses and consumers delay spending (Bakas and Triantafyllou, 2018). Moreover, exchange rate regimes mediate the impact of these shocks on energy prices. Under flexible exchange rate regimes, currency adjustments can absorb some external shocks, whereas fixed regimes may exacerbate their effects by preventing exchange rate adjustments. Hence, this paper explores how different exchange rate policies influence the transmission of global uncertainty to local energy markets (Kang and Ratti, 2013; Elder and Serletis, 2009).

The central research question of our paper is: how do uncertainty shocks impact energy prices under different exchange rate regimes, and how do these effects vary across countries? Specifically, the paper aims to determine whether the flexibility or rigidity of exchange rate regimes influences the transmission of uncertainty shocks to domestic energy markets. By addressing this question, we contribute to the literature on the interaction between macroeconomic uncertainty, energy prices, and exchange rate policies (Van Robays, 2016).

To address this research question, we rely on Ordinary Least Squares (OLS) panel regressions with country and time fixed effects. This approach allows us to estimate the impact of uncertainty shocks on energy prices while controlling for both country-specific and time-specific unobserved heterogeneity. Country fixed effects account for time-invariant characteristics unique to each country, such as institutional quality and long-term energy policies, while time fixed effects control for global shocks that affect all countries in a given period, such as global oil price spikes or geopolitical tensions (Caldara and Iacoviello, 2022). The general specification includes interaction terms between uncertainty shocks and exchange rate regimes to analyse how different regimes modify the transmission of uncertainty to energy prices. Further, we employed a Panel Vector Autoregressive Model (PVAR) approach to directly analyse the response reaction of energy prices to uncertainty. The analysis is based on a comprehensive dataset covering 185 countries over 1980-2023. Additionally, we also examine how these dynamics affect different country groups, including emerging markets, OPEC, and oil-exporting nations.

Our results reveal that uncertainty shocks significantly raise energy prices through both demand and supply channels, as heightened uncertainty leads firms and consumers to stockpile resources while constraining investment in energy infrastructure. Additionally, countries with flexible exchange rate regimes tend to have higher energy prices, even without uncertainty shocks, primarily due to currency depreciation during global shocks. This flexibility allows for a greater pass-through of global oil price fluctuations, amplifying the effects of external price shocks. Asymmetric results are also found regarding emerging markets, with flexible exchange rates, which often have lower energy prices compared to non-emerging markets, attributed to reduced energy demand and lower costs. Conversely, oil-exporting countries generally face higher energy prices vis-à-vis the non-exporting countries, while OPEC members benefit from policies that stabilize prices and subsidize domestic energy, resulting in lower prices. Overall, results suggest that energy-importing countries should carefully evaluate their exchange rate policies amid global uncertainty. While flexible exchange rates can enhance economic stability, they may increase energy market volatility during uncertain times. Policymakers might need to implement strategies, such as hedging or maintaining strategic reserves, to mitigate the negative impacts of global uncertainty on energy prices.

The remainder of this paper is organized as follows: Section 2 provides a comprehensive review of the relevant literature on uncertainty shocks, energy price volatility, and exchange rate regimes. Section 3 outlines the data sources, and the methodology used for the empirical analysis in greater detail. Section 4 presents the empirical results, discussing the differential impacts of uncertainty shocks on energy prices under various exchange rate regimes. Section 5 concludes the paper and elaborates on the policy implications.

2. Literature Review

Energy markets are known to be highly sensitive to macroeconomic conditions, with a considerable amount of research emphasizing the role of uncertainty in driving price fluctuations. For instance, Van Robays (2016) highlighted the relationship between macroeconomic uncertainty and oil price volatility, showing that both demand - and supply-side uncertainties increase oil price fluctuations, with demand uncertainty having a more direct impact by influencing consumption. Similarly, Joëts et al. (2017) found that macroeconomic uncertainty affects energy prices, particularly by influencing investor behaviour and increasing risk premiums, which subsequently heightens volatility. These studies underscore the significant role that uncertainty plays in destabilizing energy prices by affecting both demand and supply factors.

Extending these findings, Bakas and Triantafyllou (2018) examined the persistent effects of uncertainty shocks on commodity prices, including oil, demonstrating that such shocks have long-lasting impacts on markets. Shi and Shen (2021) investigated the relationship between uncertainty and natural gas prices, finding a similar volatility-inducing effect. Notably, they identified an "Asian Premium," suggesting that uncertainty disproportionately affects energy prices in Asia due to the region's supply dependency and market structure. These works reveal that while macroeconomic uncertainty raises energy price volatility, the specific effects vary based on the type of energy commodity and the region.

Although this body of work has laid a solid foundation for understanding how uncertainty impacts energy prices, most of these studies focus on macroeconomic or geopolitical uncertainties without fully addressing the role of exchange rate regimes in shaping these dynamics. This gap is particularly important given that energy prices are typically denominated in major currencies like the U.S. dollar, making currency fluctuations a critical factor in determining the domestic cost of energy in various countries.

Recent studies have begun to address this gap by examining the role of exchange rate regimes in mediating the transmission of uncertainty shocks to energy prices. Duan et al. (2021)

explored how exchange rate fluctuations affect oil prices, demonstrating that flexible exchange rate regimes, in particular, amplify the effects of global uncertainty on domestic energy prices. In countries with flexible exchange rates, currency depreciation during periods of uncertainty leads to sharp increases in the domestic cost of energy imports. This underscores the importance of exchange rate policy as a key factor in the energy price-uncertainty dynamic.

Further elaborating on this, Salisu et al. (2022) examined the interaction between geopolitical risks and exchange rate regimes in BRICS countries. Their study revealed that geopolitical risks, combined with flexible exchange rates, lead to heightened energy price volatility. They found that flexible regimes amplify the effects of uncertainty shocks by allowing rapid exchange rate adjustments, which directly influence the domestic cost of energy imports. This demonstrates that exchange rate regimes play a crucial role in determining how uncertainty translates into energy price volatility, particularly in emerging markets.

Van Robays (2016) contributed to this discussion by showing that flexible exchange rates, while helpful for absorbing broader macroeconomic shocks, can increase energy price volatility. This occurs because energy commodities like oil are traded internationally in major currencies, making countries with flexible exchange rates more exposed to currency-induced fluctuations in energy costs. These findings highlight the dual role of exchange rate flexibility: while it stabilizes macroeconomic variables, it can intensify sector-specific volatility, especially in energy markets.

Despite these insights, the existing literature has not fully explored how exchange rate regimes interact with uncertainty shocks across a broad range of countries and energy markets. Most studies, such as those by Kang and Ratti (2013) and Antonakakis et al. (2014), have focused on oil markets and their link to economic policy uncertainty (EPU), primarily in advanced economies like the U.S. Kang and Ratti (2013) showed that EPU raises oil price volatility by delaying investment in energy infrastructure and constraining supply, while Antonakakis et al. (2014) found that EPU amplifies the spillover effects of oil price shocks on the broader economy. However, these studies do not fully consider the role of exchange rate regimes in mediating the transmission of global uncertainty shocks to domestic energy prices.

Moreover, much of the literature on geopolitical tensions and energy markets has concentrated on specific geopolitical risks without accounting for how exchange rate regimes might influence the transmission of these risks. For example, Antonakakis et al. (2017) and Ramiah et al. (2018) showed that geopolitical tensions, such as international conflicts or terrorist attacks, significantly impact energy price volatility, especially for oil. However, they did not explore how exchange rate regimes mediate the effects of geopolitical shocks on energy prices.

Brogaard et al. (2020) expanded on this by investigating global political uncertainty and its impact on asset prices, including energy commodities. Their study highlighted that political uncertainty drives energy price volatility by increasing concerns over supply disruptions and demand-side reactions. Similarly, Xu et al. (2021) demonstrated that regulatory uncertainty surrounding energy transitions, such as shifts toward renewable energy, exacerbates volatility in crude oil prices. Although these studies broaden the scope of uncertainty beyond economic policy, they still do not address the critical role of exchange rate regimes in shaping these outcomes.

Our contribution builds on these studies by providing a broader and more comprehensive analysis of how exchange rate regimes influence the relationship between uncertainty shocks and energy prices. While previous research has identified the impact of uncertainty on energy markets and the role of exchange rate fluctuations, we integrate these elements into a cross-country framework, examining how different exchange rate regimes mediate the effects of global uncertainty on energy prices across a large sample of 185 economies. This approach fills a gap in the literature by explicitly focusing on the interaction between exchange rate regimes and uncertainty shocks, offering new insights into how policy choices influence energy market dynamics. Additionally, our paper provides a more detailed exploration of the heterogeneity of energy price responses across different commodities and regions. Whereas most studies focus on oil, we extend the analysis to other energy commodities, providing a fuller picture of how uncertainty and exchange rate policies interact to shape energy price volatility. By doing so, our study advances the understanding of how global uncertainty affects energy prices across different markets and policy environments, offering a more nuanced perspective on the role of exchange rate regimes in mitigating or amplifying these effects.

3. Data and Methodology

3.1. Data

This paper employs yearly data from 185 economies, spanning the period from 1980 to 2023[5]. The selection of these countries is dictated by the data availability.

[5] We highlight that some countries report missing observations in some variables; therefore, it has to be taken into consideration that the maximum number of countries analysed in each step of our paper is equal to 185.

Our main variable of interest is the annual Energy price inflation, collected from the World Bank Webpage (Ha et al., 2023). We employed the Logarithm throughout all the estimations.

The primary independent variable in this paper is geopolitical risk, assessed using two key indices: the Geopolitical Risk Index (GPR) developed by Caldara and Iacoviello (2022) and the World Uncertainty Index (WUI) by Ahir et al. (2022). The GPR index is constructed based on news coverage by counting the frequency of terms related to geopolitical risk in a monthly basis. The data is sourced from 11 leading international newspapers, including The Boston Globe, The Chicago Tribune, The Daily Telegraph, the Financial Times, The Globe and Mail, The Guardian, the Los Angeles Times, The New York Times, The Times, The Wall Street Journal, and The Washington Post (Caldara & Iacoviello, 2022). This index captures a broad range of global uncertainties, such as military conflicts, wars, terrorism, and trade disputes, as highlighted by Balcilar et al. (2018). We use data from the final month of the year[6] and collected data for the Country specific GPR and the Total Global GPR, from 1985 to 2023.

The WUI index measures global uncertainty by analyzing the text of country reports from the Economist Intelligence Unit. It is calculated by determining the percentage of the word "uncertain" (and its variants) appearing in these reports on a quarterly basis, and then scaled by multiplying by 1,000,000. Higher values indicate greater levels of uncertainty. We report data from 1980 to 2023.

In this paper, we included as control variables the current account balance, the logarithm of GDP and the output gap. The current account balance is the sum of net exports of goods and services, net primary income, and net secondary income collected from the International Monetary Fund Web Database. The output gap was calculated as actual GDP less potential GDP as a percent of potential GDP and was retrieved form the World Economic Outlook. The GDP is the logarithm of the GDP per capita based on purchasing power parity (PPP). PPP GDP is gross domestic product converted to international dollars using purchasing power parity rates extracted from the International Monetary Fund Web Database.

Lastly, we emphasize that we are interested in analysing the response of Energy prices to uncertainty variables with conditioning of different exchange rate regimes. Therefore, data for each country exchange rate classification is from Ilzetzki et al. (2021).[7]

[6] We also explore alternative transformations of the GPR monthly data, including aggregating it into annual values by averaging over twelve months and using only the value from the first month of each year. The estimation results remained similar and consistent across these approaches.

[7] We gathered data on Coarse classification codes, which range from 1 to 6 (no separate legal tender to dual market). This data was then converted into a binary variable, with 1 representing the flexible/fluctuating classifications regimes and 0 encompassing all other classifications.

Table 1 presents the summary statistics for all variables used in this study. Notably, the logarithm of energy prices (inflation) exhibits both positive and negative values, although its mean and median are positive. The uncertainty variables, represented by Total GPR, Country-Specific GPR, and the World Uncertainty Index, only show positive and small values. Meanwhile, the Current Account balance and Output Gap have negative average values, while the logarithm of GDP per capita reflects a positive average.

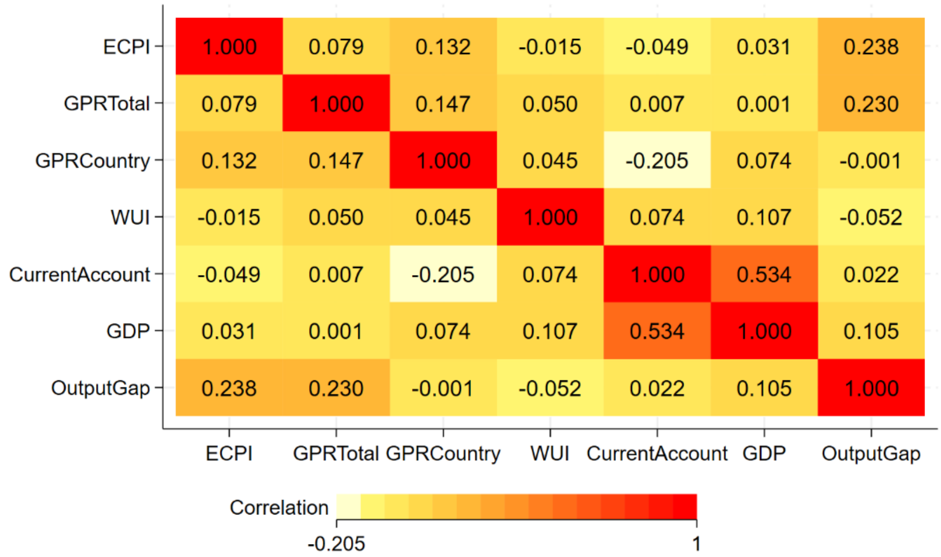
Table 1: Summary statistics

	Mean	Median	SD	Min	Max
ECPI	1.739	1.723	1.451	-4.838	11.46
Total GPR	0.989	0.924	0.346	0.440	2.361
Country GPR	0.207	0.071	0.434	0.000	6.048
WUI	0.241	0.189	0.191	0.021	1.924
Current Account	-2.892	-2.925	13.173	-240.495 (Kuwait in 1990)	311.746 (Timor-Leste in 2008)
GDP	9.318	9.406	1.193	6.221	12.066
Output Gap	-0.362	-0.306	3.003	-18.392	12.276

Notes: This table reports the summary statistics (Mean, Median, Standard Deviation (SD), Minimum (Min) and Maximum values (Max) for the Energy CPI (ECPI), Total Geopolitical Risk Index, Country specific GPR, World Uncertainty Index (WUI), Current account balance, Gross Domestic Product (GDP) and Output Gap Ratio.

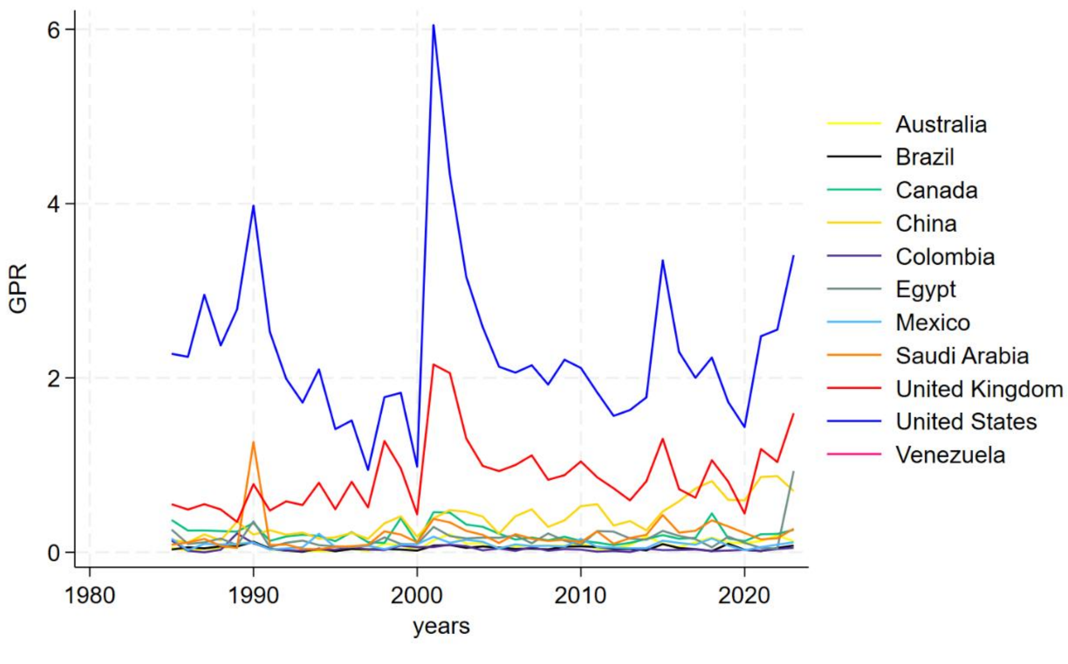
Figure 1 illustrates the correlation map of the variables analysed in this study. In this map, warmer colours (red) indicate stronger positive correlations, while lighter colours (yellow) represent more negative correlations. Upon reviewing the correlation matrix, distinct colour gradients become apparent, with certain blocks showing deeper red shades and others lighter yellow tones. The correlation coefficient between ECPI and Country-Specific GPR is positive, indicating that higher geopolitical tensions, as measured by the Country GPR, are associated with increased energy prices. In contrast, Total GPR and the World Uncertainty Index (WUI) show a weak correlation with ECPI. The strongest correlation, as anticipated, is observed between GDP and the Current Account, with a value of 0.534, followed by the ECPI and Output Gap, which have a correlation of 0.238.

Figure 1: Heatmap of Bivariate Correlations



Notes: This figure reports the correlation coefficients between the variables used in this paper. Since economies are susceptible to external shocks, this has an impact on countries' energy prices. A warmer colour means a correlation closer to 1 (red) and a lighter one closer to 1 (light yellow). The warmer the colour, the higher and positive is the correlation value. The maximum value observed is 1 and the minimum value is -0.205. Source: Author's own calculations.

Figure 2: Country Geopolitical Risk Index



Notes: This figure reports the Geopolitical Risk Index, for 11 nations from our sample, between 1985 and 2023. Each line represents one country. Source: Author's own calculations.

Figure 2 illustrates the evolution of GPR for nine countries in our sample from 1985 to 2023. The graph shows that GPR fluctuates for all countries throughout the period, though the overall values remain relatively low. Notable peaks are observed in 2002, reflecting the adjustment period following the introduction of the Euro; in 2014-2015, linked to the European sovereign debt crisis and the aftermath of the Global Financial Crisis; in 2020, driven by the COVID-19 pandemic; and in 2022, due to the war in Ukraine.

The United States, the United Kingdom exhibit the highest variability in GPR peaks, particularly in the 2000s years. This is expected, given their high level of openness to the global economy and their status as benchmarks for international markets. Additionally, these nations face more intense scrutiny, and events affecting their international partners have the potential to significantly impact their economies (Monteiro et al, 2023). Lastly, we highlight the large peak in Saudi Arabia in 1990 due to the Gulf War and the Chinese fluctuation throughout the all sample due to the increasing tensions with the US and other regions.

Figure 3: Geopolitical Risk Index and Energy CPI by Country

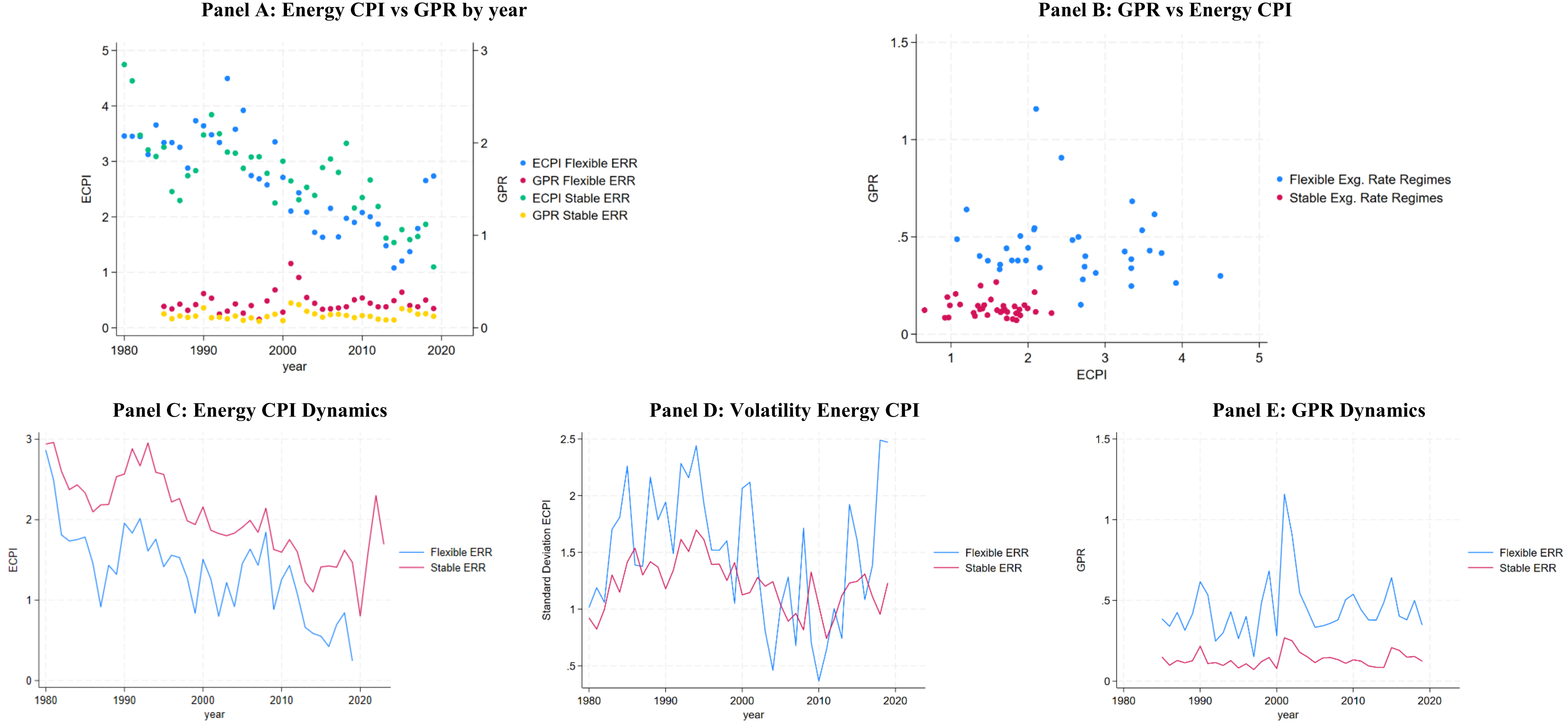
Notes: This figure presents the countries' energy prices (ECPI) against Countries' Geopolitical Risk index. Each point represents the country's average for the full sample period and the orange line is the trend line. Source: Author's own calculations.

Figure 3 presents the relationship between countries' energy prices (ECPI) against Countries' Geopolitical Risk index for the period from 1985 to 2023. The graph displays the average values for each variable, with the axes intersecting at median values of 1.723 for ECPI and 0.071 for GPR. A closer analysis reveals that the US, Russia, Ukraine and India exhibit above-median levels of both GPR and energy prices. In contrast, a notable trend emerges, where most countries demonstrate below-median geopolitical risk uncertainty but very disperse energy prices, a pattern that is most apparent in the third and fourth quadrant of the graph.

As mentioned earlier, our focus is on examining the relationship between energy prices and uncertainty under different exchange rate regimes. Figure 4 presents five panels that provide a graphical representation of this analysis: Panel A shows the annual average ECPI and GPR for flexible and stable exchange rate regimes across all countries in the sample from 1985 to 2023. Panel B illustrates the overall average relationship between GPR and ECPI. Panels C and D display the mean ECPI and GPR for flexible and stable/non-flexible exchange rate regimes, respectively, on a year-by-year basis. Panel E reports the GPR.

Panels A and C illustrate that energy prices in countries with both flexible and stable exchange rate regimes exhibit a downward trend. However, countries with stable exchange rate regimes consistently have higher energy prices. A closer examination of Panel C reveals notable price increases during specific events: the Gulf War in 1990, a modest rise during the 2008 GFC, and significant spikes during the global energy crisis triggered by the COVID-19 pandemic in 2021, followed by the Russian invasion of Ukraine. Panel B shows the relationship between energy prices and the Geopolitical Risk (GPR) index, conditioned by exchange rate regimes. It is evident that countries with flexible exchange rate regimes have higher values, which can be attributed to the fact they have higher volatility (Panel D) and that GPR levels and are also higher in these countries, as shown in Panel E. In conclusion, while countries with stable exchange rate regimes face higher overall energy prices, flexible exchange rate regimes experience greater price volatility driven by higher geopolitical risk. This suggests that flexible exchange rate regimes may be more exposed to external geopolitical shocks, leading to greater fluctuations in energy prices. Stable exchange rate regimes, on the other hand, may provide a buffer against such volatility but at the cost of maintaining higher baseline energy prices.

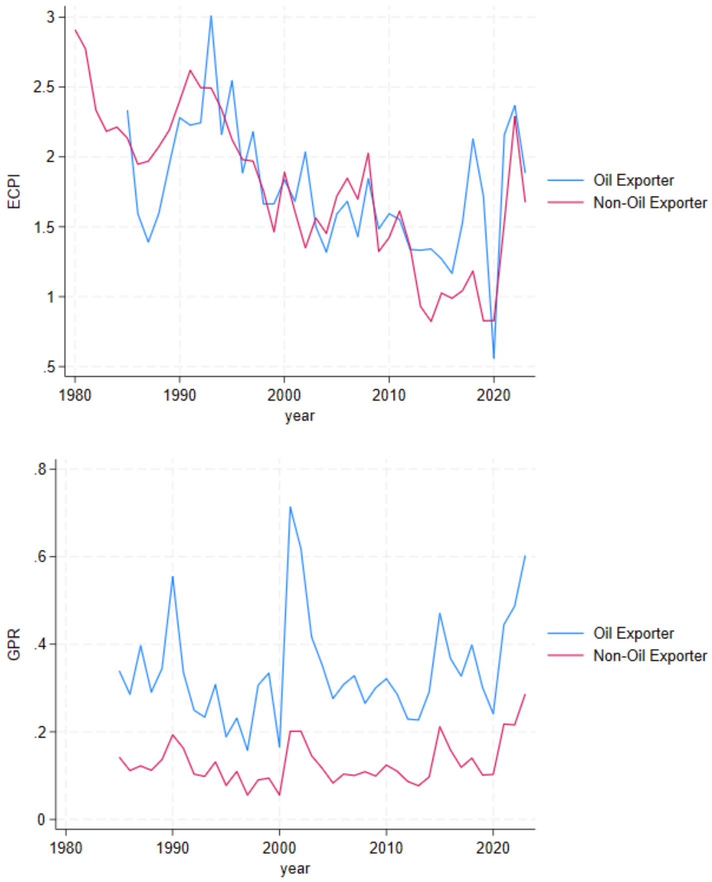
Figure 4: Energy CPI and Geopolitical Risk Index (GPR) for Flexible vs Stable Exchange Rate Regimes



Notes: Panel A shows the scatter plot of the annual averages for all countries, comparing the Energy Commodity Price Index, the ECPI (left axis), and Geopolitical Risk , the GPR (right axis). Panel B displays the overall average values of GPR and ECPI for countries with flexible and stable exchange rate regimes. Panel C shows the year-by-year evolution of the average ECPI across all countries. Panel D, similar to Panel C, illustrates the annual standard deviation of the ECPI across all countries. Panel E depicts the annual GPR averages across all countries. The sample period spans from 1980 to 2023. Source: Author's calculations.

Figure 5 displays the Geopolitical risk and Energy prices for both oil and non-oil exporters. We can see clear that the ECPI has a fairly similar descending trajectory while the GPR is much higher and more volatile for Oil exporters.

Figure 5: Geopolitical Risk Index and Energy CPI for oil exporters and non-oil exporters



Notes: The first graph shows the year-by-year evolution of the average ECPI across all countries, divided by oil and non-oil exporters. The second graph shows the Geopolitical Risk index evolution for the same division of the sample (oil vs non-oil exporters. The sample period spans from 1980 to 2023. Source: Author's calculations.

3.2 Methodology

We examine the impact of uncertainty shocks on energy prices and how exchange rate regimes mediate this relationship. To do so, we employ a panel data approach using Ordinary Least Squares (OLS) regressions with country and time fixed effects. This methodology allows us to control for both unobserved heterogeneity across countries and global shocks that may affect all countries in the same time period. By including interaction terms between uncertainty measures and exchange rate regimes, we aim to identify how flexible or fixed exchange rate policies influence the transmission of uncertainty shocks to energy prices. The primary equation we estimate is as follows:

$$EnergyPrice_{it} = \alpha + \beta_1 \cdot Uncertainty_{it-1} + \beta_2 \cdot ERR_{it} + \beta_3 \cdot (Uncertainty_{it-1} \times ERR_{it}) + \gamma X_{it-1} + \mu_i + \lambda_t + \epsilon_{it} \quad (1)$$

where:

- $EnergyPrice_{it}$ is the logarithm of the energy price index - ECPI (e.g., oil or natural gas prices) in country *i* at time *t*,
- $Uncertainty_{it}$ is a measure of uncertainty, which can include geopolitical risk (GPR) and World Uncertainty Index (WUI).
- ERR_{it} is a dummy variable indicating whether country *i* has a flexible (*ERR=1*) or fixed (*ERR=0*) exchange rate regime at time *t*,
- $Uncertainty_{it} \times ERR_{it}$ is the interaction term that captures the conditional effect of exchange rate regimes on the relationship between uncertainty and energy prices,
- X_{it} represents a set of control variables such as the logarithm of GDP per capita, current account balance and output Gap which account for other macroeconomic factors that influence energy prices,
- μ_i are the country fixed effects, controlling for time-invariant country-specific characteristics such as institutional quality or long-term energy policies. For example, oil-exporting countries might have systematically different energy price dynamics than oil-importing countries, and these differences are captured by the fixed effects.
- λ_t are the time fixed effects, capturing global shocks or trends common across all countries in a given year, such as such as global financial crises or major geopolitical events, which could simultaneously affect all countries in the sample.
- ϵ_{it} is an i.i.d. error term.

This model specification allows us to analyze the direct effects of uncertainty shocks (β_1) and exchange rate regimes (β_2) on energy prices, as well as the interaction between the two (β_3). The interaction term is crucial because it tests whether the effect of uncertainty shocks on energy prices differs between countries with flexible and fixed exchange rate regimes. A positive and significant interaction term would suggest that the exchange rate regime amplifies the impact of uncertainty shocks, while a negative interaction term would indicate that flexible exchange rates dampen this effect. We estimate the model using robust standard errors at the country level to account for heteroscedasticity and potential autocorrelation within each country over time. To address potential endogeneity concerns – such as the possibility that changes in exchange rate regimes or world uncertainty are endogenous to energy price fluctuations – we include lagged values of uncertainty and exchange rate regime variables as robustness checks, following the approach of Joëts et al. (2017), who also investigated the relationship between macroeconomic uncertainty and commodity prices.

This methodological framework is consistent with previous studies that investigate the effects of uncertainty on macroeconomic variables. Kang and Ratti (2013) employed a similar framework to study the impact of economic policy uncertainty on oil prices, finding that higher EPU leads to greater oil price volatility. Our study extends this approach by incorporating the role of exchange rate regimes in moderating the impact of uncertainty shocks on energy prices. Additionally, Bakas and Triantafyllou (2018) used uncertainty measures to analyse the volatility of commodity prices, finding a positive relationship between uncertainty and price volatility. However, they did not explore the role of exchange rate regimes, which is a key innovation in our study. By including an interaction term between uncertainty and exchange rate regimes, we contribute to the literature by showing how countries with different exchange rate policies experience different responses to uncertainty shocks. Moreover, the use of time fixed effects to control for global shocks aligns with the approach taken by Caldara and Iacoviello (2022) in their study of geopolitical risk and its impact on energy markets. They found that geopolitical tensions increase oil price volatility globally, which is consistent with our findings of a significant relationship between uncertainty and energy prices.

Furthermore, we have employed a Panel Vector Autoregressive Model (Panel VAR), which is appropriate to complementary capture the dynamic relationships between our variables of interest – such as uncertainty shocks, energy prices, and exchange rates – across multiple countries over time. The key advantage of the Panel VAR is its ability to account for both temporal and cross-sectional dependencies, which are crucial for understanding how global uncertainty transmits across different countries and energy markets. Given the potential interdependence among variables, a Cholesky decomposition is employed to orthogonalize the shocks, ensuring that contemporaneous effects between variables are properly identified. This is particularly important in cases where shocks to energy prices or exchange rates may not be independent. Impulse-Response Functions (IRFs) derived from this method allow us to trace the effects of a shock, such as an uncertainty event, over time, revealing both the immediate and persistent impacts on energy prices and exchange rates. The Panel VAR approach has been widely used in macroeconomic and financial literature. For example, Kang and Ratti

(2013) applied Panel VAR to assess the relationship between oil price shocks and policy uncertainty, showing how uncertainty exacerbates oil price volatility. Similarly, Salisu et al. (2022) used Panel VAR to study the interaction between geopolitical risk and exchange rate dynamics in BRICS countries, highlighting how uncertainty shocks propagate through energy prices in countries with flexible exchange rates. Apergis and Payne (2014) also employed Panel VAR to examine energy price dynamics, emphasizing the role of intertemporal feedback effects that this method captures.

4. Empirical Analysis

4.1. Main Results

Our initial empirical findings reveal three key insights: (i) uncertainty shocks have a positive and significant effect on energy prices, (ii) the effect of the flexible exchange rate regime dummy is positive and significant, and (iii) the interaction between uncertainty shocks and the flexible exchange rate regime is also positive and significant (see Table 2).

First, the positive and significant effect of uncertainty shocks on energy prices confirms findings from prior studies that highlight the sensitivity of energy markets to economic and geopolitical uncertainty. For instance, Bakas and Triantafyllou (2018) reported that uncertainty shocks significantly increase the volatility of commodity prices, including energy commodities like oil and natural gas. Similarly, Kang and Ratti (2013) showed that economic policy uncertainty has a notable impact on oil price dynamics, indicating that during periods of heightened uncertainty, market participants expect supply disruptions or changes in demand, driving up prices. This result can be interpreted through both demand and supply-side channels. On the demand side, heightened uncertainty can lead to a precautionary increase in the demand for energy, as firms and consumers stockpile resources in anticipation of potential disruptions or future price increases. On the supply side, uncertainty may reduce investment in energy infrastructure and exploration, particularly for oil and gas, leading to constrained supply and upward pressure on prices. These channels were also highlighted by Joëts et al. (2017), who found that macroeconomic uncertainty exacerbates energy price volatility due to both reduced investment in supply and shifts in consumer demand.

Table 2. Estimation Results for the effect of Uncertainty on Energy Prices

Variables	Total GPR						Country GPR					
Uncertainty	0.133*	0.220***	0.027***	0.148**	0.020**	0.019**	0.552***	0.205**	0.487**	0.527**	0.182*	0.010*
	(0.075)	(0.064)	(0.005)	(0.070)	(0.008)	(0.008)	(0.203)	(0.226)	(0.231)	(0.204)	(0.241)	(0.234)
Exg. Dummy (ER)	0.837***	0.338***	0.485***	0.702***	0.245*	-0.037	0.828***	0.339***	0.485***	0.700***	0.251*	-0.028
	(0.136)	(0.122)	(0.114)	(0.135)	(0.129)	(0.275)	(0.135)	(0.123)	(0.112)	(0.134)	(0.129)	(0.192)
Current Account				-0.008*	0.008	0.007				-0.008*	0.008	0.008
				(0.010)	(0.014)	(0.015)				(0.010)	(0.014)	(0.014)
GDP			-0.104*		0.151	0.154			-0.182*		0.088	0.121
			(0.190)		(0.606)	(0.608)			(0.195)		(0.610)	(0.595)
Output Gap		0.060***			0.088***	0.089***		0.060***			0.087***	0.090***
		(0.021)			(0.029)	(0.029)		(0.021)			(0.029)	(0.028)
Uncertainty x ER						0.003*						0.642**
						(0.002)						(0.282)
Observations	1132	458	959	1,080	381	381	1132	458	959	1080	381	381
R-squared	0.515	0.456	0.541	0.523	0.508	0.510	0.517	0.457	0.544	0.525	0.509	0.513

Table 2. Estimation Results for the effect of Uncertainty on Energy Prices (Cont.)

Variables	WUI		
Uncertainty	0.141	0.089	0.224*
	(0.293)	(0.285)	(0.135)
Exg. Dummy (ER)	0.605***	0.698***	0.952***
	(0.220)	(0.189)	(0.116)
Current Account	-0.008		
	(0.016)		
GDP	-0.515		
	(0.657)		
Output Gap	0.075***	0.056**	
	(0.029)	(0.023)	
Uncertainty x ER	1.166*	1.366**	
	(0.663)	(0.631)	
Observations	381	493	2300
R-squared	0.526	0.516	0.480

Notes: Table 2 displays the estimation results for each *Uncertainty* variable (Total Geopolitical Risk, Country specific Geopolitical Risk, and World Uncertainty Index, WUI) which represents the risk measure for the independent variable labelled at the top row of each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes, *Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *Output Gap* is the lagged ratio of outputs, *Uncertainty x ER* is the interactive term of the measure of risk and the Exchange Rate regimes dummy. *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

Further, we highlight that the lagged Total and Country specific GPR present consistent results, emphasizing that both the global and specific country geopolitical tensions have a significant impact on Energy prices. The lagged World Uncertainty measure of risk (WUI) only reports a significant coefficient in the simplest regression.

Second, the positive and significant coefficient on the flexible exchange rate dummy suggests that countries with flexible exchange rate regimes experience higher energy prices, even in the absence of uncertainty shocks. This result may seem counterintuitive at first, given that flexible exchange rates are typically expected to absorb external shocks, thus stabilizing domestic prices (Caldara and Iacoviello, 2022). However, the increase in energy prices in countries with flexible exchange rates could reflect exchange rate depreciation in response to global shocks, particularly in energy-importing countries. When uncertainty or other global shocks hit, countries with flexible regimes may see their currencies depreciate, which in turn raises the cost of energy imports denominated in foreign currencies (e.g., oil prices in U.S. dollars), thereby driving up domestic energy prices. This result aligns with the findings of Duan et al. (2021), who showed that exchange rate fluctuations play a critical role in determining energy prices, particularly in emerging markets. Countries with flexible exchange rates may also experience greater pass-through of global oil price fluctuations to domestic market prices, given that their exchange rates adjust more rapidly to external shocks. Therefore, while flexible regimes provide a buffer against certain types of economic uncertainty, they may also exacerbate the effects of external price shocks, particularly in the energy sector.

Third, the positive and significant interaction term between uncertainty shocks and the flexible exchange rate regime underscores the importance of exchange rate flexibility in magnifying the impact of uncertainty on energy prices. Specifically, our results suggest that while flexible exchange rates may help absorb shocks in the broader economy, they amplify the effect of uncertainty on energy prices. This amplification may be due to the fact that uncertainty shocks lead to currency depreciation, which in turn drives up the cost of energy imports, as previously noted. This finding is consistent with the literature that highlights the dual role of flexible exchange rates in absorbing shocks and transmitting external volatility. For example, Van Robays (2016) noted that while flexible exchange rates can mitigate the impact of global financial shocks on domestic economic activity, they may amplify sector-specific shocks, particularly in energy markets. Similarly, Salisu et al. (2022) found that geopolitical risks and uncertainty shocks tend to have a stronger impact on oil prices in countries with flexible exchange rates, largely due to the exchange rate channel.

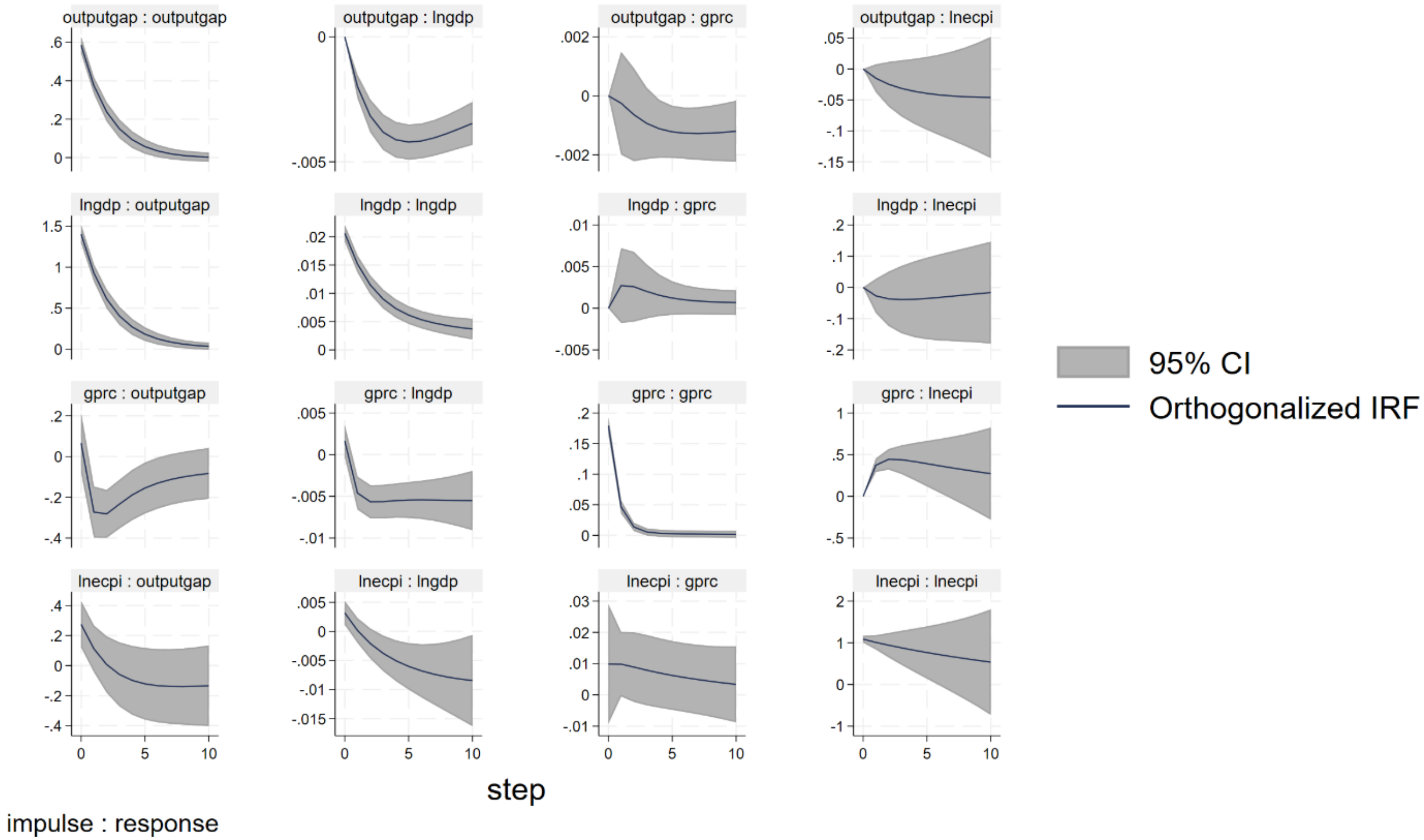
In contrast to some earlier studies that suggest flexible exchange rates help mitigate price volatility (e.g., Joëts et al., 2017), our findings highlight a more nuanced role for exchange rate regimes. While flexible exchange rate regimes can shield broader economic variables from uncertainty shocks, they may leave energy prices exposed, particularly in countries dependent on energy imports. Moreover, our findings extend the work of Bakas and Triantafyllou (2018) and Salisu et al. (2022) by demonstrating that the interaction between exchange rate regimes and uncertainty shocks is not uniform across sectors. The energy sector, due to its heavy reliance on global commodities priced in foreign currencies, responds differently to uncertainty compared to other sectors, which are more insulated from global price fluctuations.

Lastly, it is important to highlight that the lagged logarithm of GDP shows negative and statistically significant coefficients, indicating that higher levels of economic development are associated with lower energy prices. This suggests that as economies grow, they may benefit from greater efficiency, innovation, or policy measures that reduce energy costs. Similarly, the current account balance also reports negative values, further supporting the notion that stronger economic fundamentals contribute to lower energy prices. Conversely, the output gap exerts a positive influence on energy commodity prices, suggesting that periods of above-trend economic activity drive up demand, leading to higher energy costs. These findings underscore the complex interplay between macroeconomic variables and energy prices. Policymakers should consider the potential long-term benefits of economic growth in moderating energy prices, while recognizing that short-term fluctuations in output can introduce volatility. Additionally, maintaining a healthy current account balance may further help stabilize or reduce energy costs.

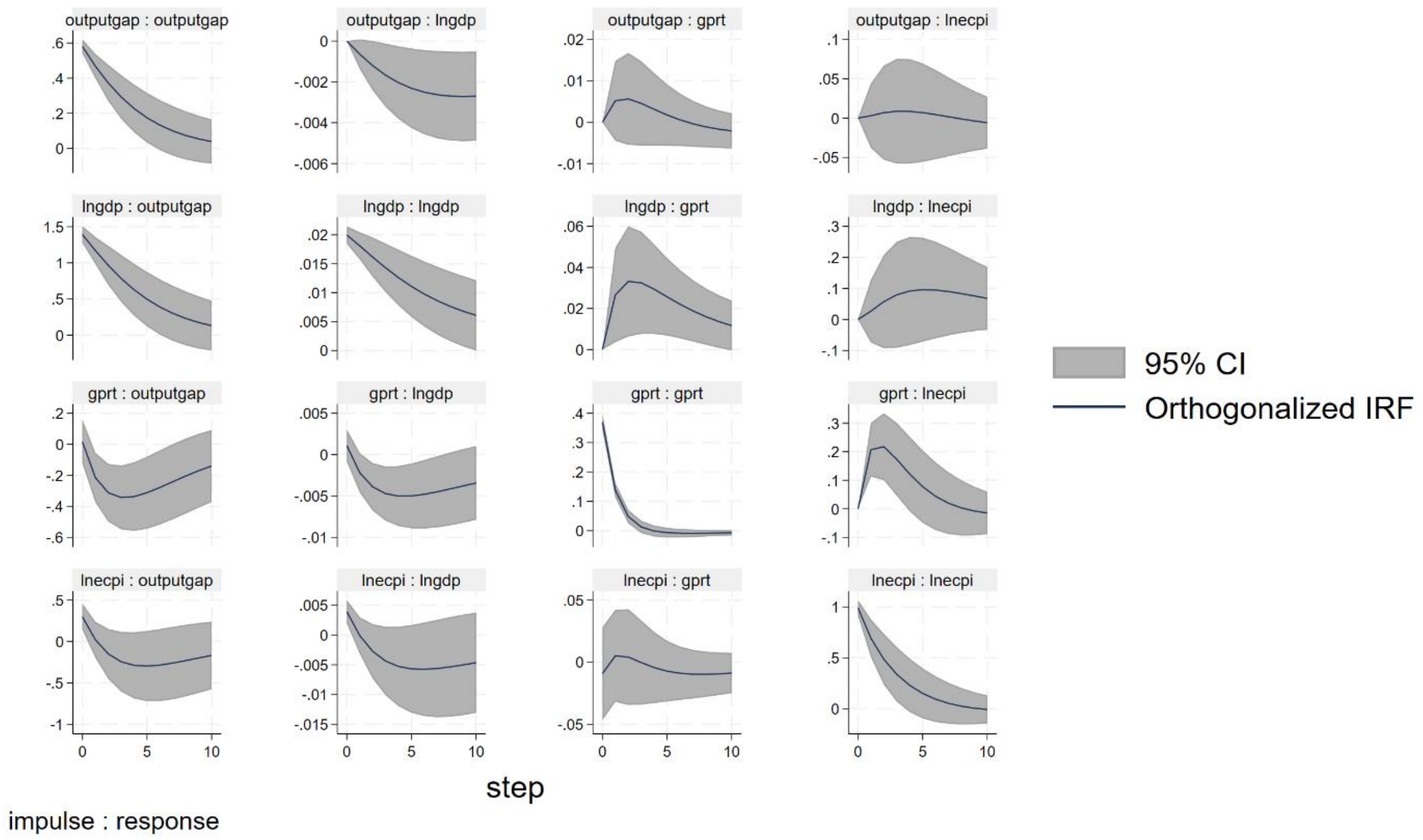
Figure 6 presents the results of the PVAR stability analysis, specifically the impulse response functions of the Geopolitical Risk (GPR) index – both total and country-specific – on the Energy Commodity Price Index (ECPI). The VAR is ordered from the most exogenous variable to the least exogenous one, with ECPI ordered first. As a result, a shock in ECPI may have an instantaneous effect on all the other variables. However, ECPI does not respond contemporaneously to any structural disturbances to the remaining variables due, for instance, to lags. Additionally, we use a Cholesky decomposition of the matrix of covariances of the residuals, requiring that all elements above the principal diagonal to be zero, and providing the additional six restrictions to exactly identify the system. Interestingly, our findings indicate that a positive shock in GPR, whether total or country-specific, leads to a short-term increase in energy prices, confirming our baseline panel analysis results.

Figure 6: PVAR Impulse Responses

Panel A



Panel B



Notes: The first four graphs in Panel A are referred to Country specific GPR while the last four in Panel B report the Total GPR. Further, the gray area represents the 95% confidence interval, while the blue line is the orthogonalized IRF. *Lngdp* is the logarithm of the GDP, *lnecpi* is the logarithm of the Energy CPI, *gprc* and *gprt* are the GPR of the specific Country and Total, respectively.

4.2. Robustness Analysis

In this subsection, we present a robustness analysis, with results for emerging markets, oil-exporting countries, and OPEC (Organization of the Petroleum Exporting Countries) members, as shown in Tables 3-5. These classifications are based on the World Bank's World Development Indicators and OPEC data, with the specific countries listed in the appendix. Additionally, we constructed two composite variables for geopolitical risk (GPR) measures: one for emerging markets and one for oil-exporting countries, calculated as the simple average of their annual GPR. The results for these composite measures are presented in Tables 6 and 7.

Table 3 reports findings for emerging markets. In comparison to studies focusing solely on advanced economies (e.g., Kang and Ratti, 2013; Caldara and Iacoviello, 2022), our analysis provides a broader perspective by including both advanced and emerging markets. The results show that when a country is classified as an emerging market and operates under a flexible exchange rate regime, this tends to reduce energy prices relative to non-emerging market countries. This could be attributed to the lower energy demand in emerging markets, which helps keep domestic prices lower. Additionally, flexible exchange rate regimes may help reduce the cost of energy commodities, while domestic policies may also artificially suppress energy prices.

Furthermore, Table 4 shows that oil-exporting countries tend to report an increase in energy prices compared to non-exporting countries, while Table 5 demonstrates that OPEC membership leads to lower energy prices. These findings can be justified by several underlying factors.

First, oil-exporting countries are often heavily exposed to global oil prices, which are driven by international supply and demand dynamics. These countries tend to price their domestic energy in line with global market prices, leading to higher domestic energy prices, particularly when global oil prices are high. As oil exporters are more integrated into global energy markets, price volatility in these markets tends to have a direct impact on domestic energy prices. Periods of high global oil prices will naturally result in higher prices at home.

Second, OPEC member states often have policies designed to stabilize oil prices through coordinated production targets and supply management. These efforts can result in lower domestic energy prices for OPEC members, as they seek to protect their economies from price volatility and keep energy affordable for their populations.

Furthermore, many OPEC members subsidize energy for domestic use, keeping energy prices artificially low.

Table 3. Estimation Results for the Emerging Markets

Variables	Total GPR				Country GPR			
Uncertainty	0.020**	0.023***	0.033***	0.203***	0.182	0.568***	0.509**	0.145
	(0.933)	(0.633)	(0.592)	(7.187)	(0.241)	(0.209)	(0.202)	(0.228)
Exg. Dummy (ER)	0.245*	0.339***	-1.969	0.362***	0.251*	0.271*	0.361**	0.179
	(0.129)	(0.112)	(2.043)	(0.126)	(0.129)	(0.147)	(0.142)	(0.193)
Emerg. Dummy (EM)	-1.597***	-0.926**	2.607*	-1.606***	-1.289*	0.829	1.456**	-0.384
	(0.557)	(0.437)	(1.499)	(0.322)	(0.749)	(0.683)	(0.616)	(0.623)
Current Account	0.008*	-0.026**		0.013*	0.008	-0.025**		0.013
	(0.014)	(0.011)		(0.013)	(0.014)	(0.011)		(0.013)
GDP	0.151*	-0.395**	-0.135*		0.088	-0.416**	-0.143*	
	(0.606)	(0.196)	(0.188)		(0.610)	(0.204)	(0.200)	
Output Gap	0.088***			0.069***	0.087***			0.071***
	(0.029)			(0.022)	(0.029)			(0.022)
Uncertainty x ER			0.270			0.268	0.460*	0.420
			(0.224)			(0.256)	(0.269)	(0.295)
Uncertainty x EM			-0.345**			-0.515	-0.471	-0.791
			(0.157)			(0.601)	(0.582)	(0.629)
Observations	381	935	959	426	381	935	959	426
R-squared	0.508	0.535	0.544	0.491	0.509	0.539	0.546	0.495

Notes: This displays the estimation results for each *Uncertainty* variable (Total Geopolitical Risk and Country specific Geopolitical Risk) which represents the risk measure for the independent variable labelled at the top row of each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes, *Emerg. Dummy* is the Emerging markets dummy that takes the value 1 if the country in an Emerging market, *Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *Output Gap* is the lagged ratio of outputs, *Uncertainty x ER* is the interactive term of the measure of risk and the Exchange Rate regimes dummy, *Uncertainty x EM* is the interactive term of the measure of risk and the Emerging Market dummy *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

Table 4. Estimation Results for the Oil Exporters

Variables	Total GPR				Country GPR			
Uncertainty	0.020**	0.023***	0.201***	0.203***	0.153*	0.923***	0.848***	-0.026
	(0.008)	(0.005)	(0.077)	(0.077)	(0.482)	(0.305)	(0.295)	(0.473)
Exg. Dummy (ER)	0.235*	0.215	0.348	0.343*	0.020*	0.241	0.339**	0.166
	(0.323)	(0.219)	(0.215)	(0.322)	(0.194)	(0.147)	(0.142)	(0.194)
Oil Exporter Dummy (OIL)	1.181**	0.768*	0.381	1.192***	0.298*	-0.026	-0.601	0.658
	(0.588)	(0.458)	(0.443)	(0.390)	(0.688)	(0.818)	(0.763)	(0.616)
Current Account	0.006	-0.026**		0.012	0.008	-0.026**		0.013
	(0.015)	(0.011)		(0.013)	(0.014)	(0.011)		(0.013)
GDP	0.130	-0.381*	-0.094		0.169	-0.441**	-0.172	
	(0.610)	(0.197)	(0.190)		(0.572)	(0.199)	(0.196)	
Output Gap	0.093***			0.072***	0.089***			0.070***
	(0.028)			(0.022)	(0.028)			(0.022)
Uncertainty x ER	-0.013	0.133	0.146	0.008	0.624**	0.377	0.529*	0.468
	(0.302)	(0.194)	(0.185)	(0.302)	(0.288)	(0.268)	(0.270)	(0.298)
Uncertainty x OIL	0.476*	0.151	0.141	0.443*	0.218	-0.780*	-0.752**	0.078
	(0.246)	(0.159)	(0.154)	(0.238)	(0.495)	(0.404)	(0.377)	(0.488)
Observations	381	935	959	426	381	935	959	426
R-squared	0.515	0.536	0.542	0.496	0.513	0.540	0.547	0.494

Notes: This displays the estimation results for each *Uncertainty* variable (Total Geopolitical Risk and Country specific Geopolitical Risk) which represents the risk measure for the independent variable labelled at the top row of each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes, *Oil Exporter. Dummy* is the Emerging markets dummy that takes the value 1 if the country in an Oil Exporter, *Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *Output Gap* is the lagged ratio of outputs, *Uncertainty x ER* is the interactive term of the measure of risk and the Exchange Rate regimes dummy, *Uncertainty x OIL* is the interactive term of the measure of risk and the Oil Exporter dummy *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

Table 5. Estimation Results for the OPEC countries

Variables	Total GPR				Country GPR			
Uncertainty	0.023***	0.024***	0.148**	0.028***	0.682***	0.475*	0.723***	0.611***
	(0.005)	(0.005)	(0.070)	(0.004)	(0.205)	(0.244)	(0.202)	(0.200)
Exg. Dummy (ER)	0.203*	0.339***	0.397*	0.368*	0.279*	0.341***	0.759***	0.374***
	(0.216)	(0.112)	(0.241)	(0.211)	(0.146)	(0.110)	(0.177)	(0.141)
OPEC Dummy	2.709**	-1.191*	-0.061	1.937	1.663**	-0.300*	-0.232*	1.680**
	(1.252)	(0.679)	(0.863)	(1.268)	(0.819)	(0.898)	(0.937)	(0.757)
Current Account	-0.034***	-0.026**	-0.010		-0.030***	-0.025**	-0.008	
	(0.011)	(0.011)	(0.010)		(0.010)	(0.011)	(0.010)	
GDP	-0.392**	-0.395**		-0.084	-0.436**	-0.461**		-0.156
	(0.193)	(0.196)		(0.187)	(0.197)	(0.198)		(0.193)
Uncertainty x ER	0.001		0.003	0.001	0.221		-0.244	0.412
	(0.192)		(0.224)	(0.181)	(0.258)		(0.290)	(0.266)
Uncertainty x OPEC	-0.035**		-0.015**	-0.030**	-3.547***		-1.948**	-3.182***
	(0.011)		(0.006)	(0.015)	(0.665)		(0.771)	(0.648)
Observations	935	935	1080	959	935	935	1080	959
R-squared	0.547	0.535	0.529	0.549	0.548	0.537	0.528	0.552

Notes: This displays the estimation results for each *Uncertainty* variable (Total Geopolitical Risk and Country specific Geopolitical Risk) which represents the risk measure for the independent variable labelled at the top row of each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes*, OPEC. Dummy* is the OPEC dummy that takes the value 1 if the country in an OPEC country, *Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *Uncertainty x ER* is the interactive term of the measure of risk and the Exchange Rate regimes dummy, *Uncertainty x OPEC* is the interactive term of the measure of risk and the OPEC dummy *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

Tables 6 and 7 present the impact of composite geopolitical risk (GPR) variables for emerging markets and oil-exporting countries on the energy prices of all countries in our sample. The results indicate that elevated GPR levels in both emerging markets and oil-exporting countries lead to an increase in energy prices globally. This suggests that geopolitical instability in these regions amplifies energy prices in other parts of the world, highlighting a contagion effect in energy markets. When these regions face heightened instability, the repercussions are felt broadly, driving up energy prices across the globe.

Table 6: Results for GPR of Emerging Markets

Variables	(1)	(2)	(3)	(4)
GPR Emerging Markets	0.484***	0.485***	0.509***	0.511***
	(0.012)	(0.013)	(0.012)	(0.012)
Exg. Dummy (ER)	0.109	0.279*	0.201	0.291**
	(0.346)	(0.147)	(0.337)	(0.143)
Current Account	-0.039**	-0.039**		
	(0.017)	(0.017)		
GDP	-0.101	-0.111	0.007	0.002
	(0.220)	(0.218)	(0.227)	(0.226)
GPR EM * ER	1.522		0.803	
	(3.072)		(2.932)	
Observations	429	429	429	429
R-squared	0.513	0.513	0.498	0.498

Notes: This displays the estimation results for the composite GPR of the Emerging Markets which represents the average risk measure for all countries classified as Emerging Markets and is the independent variable for each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes*, Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *GPR EM x ER* is the interactive term of the measure of risk GPR of the Emerging markets and the Exchange Rate regimes dummy. *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

Table 7: Results for GPR of Oil Exporters

Variables	(1)	(2)	(3)	(4)
GPR Oil Exporters	0.086***	0.085***	0.098***	0.097***
	(3.198)	(3.180)	(3.382)	(3.372)
Exg. Dummy (ER)	-0.019	0.257	0.296	0.461**
	(0.396)	(0.160)	(0.423)	(0.196)
Current Account	0.009	0.010		
	(0.014)	(0.014)		
GDP	-0.254	-0.244	-0.067	-0.064
	(0.237)	(0.237)	(0.280)	(0.279)
GPR Oil Exporters * ER	0.865		0.525	
	(1.072)		(1.070)	
Observations	334	334	336	336
R-squared	0.499	0.498	0.523	0.522

Notes: This displays the estimation results for the composite GPR of the Oil exporters which represents the average risk measure for all countries classified as Oil Exporters and is the independent variable for each regression. *Exg, Dummy* is the Exchange Rate Regime dummy that takes the value 1 for flexible regimes, *Current Account* is the lagged Current account balance, *GDP* is the logarithm of the lagged GDP per capita, *GPR Oil Exporters x ER* is the interactive term of the measure of risk GPR of the Oil Exporters and the Exchange Rate regimes dummy. *, **, and *** represent statistical significance at levels of 10%, 5% and 1%, respectively (robust standard errors in brackets).

5. Conclusion and Policy Implications

This paper analyzed the impact of geopolitical tensions and global uncertainty on energy prices, conditioned by different exchange rate regimes, for a sample of 185 economies from 1980 to 2023. Utilizing both a Panel OLS Fixed Effects model and a Panel Vector Autoregressive Model (PVAR), we examined how geopolitical risk and uncertainty affect energy prices, with particular attention to specific country groups such as emerging markets, OPEC members, and oil-exporting nations.

Our empirical findings reveal several important dynamics. First, uncertainty shocks have a positive and significant effect on energy prices, driven by both demand and supply-side channels. Heightened uncertainty tends to boost demand as firms and consumers stockpile resources, while simultaneously reducing investment in energy infrastructure, particularly in oil and gas, which constrains supply and drives up prices. Second, countries with flexible exchange rate regimes experience higher energy prices even in the absence of uncertainty shocks. This can be attributed to currency depreciation triggered by global shocks, especially in energy-importing nations, as well as the greater pass-through of global oil price fluctuations to domestic markets. Additionally, the interaction between uncertainty shocks and flexible exchange rate regimes is also positive and significant, indicating that while flexible exchange rates help absorb broader macroeconomic shocks, they amplify the effects of uncertainty on energy prices. This amplification is likely driven by currency depreciation, which increases the cost of energy imports.

Our analysis of both advanced and emerging markets highlights that emerging markets with flexible exchange rates often experience lower energy prices compared to non-emerging markets, likely due to lower overall energy demand and domestic policies that may suppress prices. In contrast, oil-exporting countries generally experience higher energy prices as they align domestic prices with global prices. OPEC members, however, tend to have lower domestic energy prices due to policies aimed at stabilizing oil prices and providing subsidies.

While this paper provides valuable insights, it is not without limitations. Our dataset spans from 1980 to 2023, but data availability and quality may vary across countries and time periods, particularly for emerging markets. Additionally, our model focuses primarily on geopolitical risks and uncertainty shocks, but other factors such as technological advancements, climate change policies, or shifts in global energy demand are not explicitly incorporated into the analysis.

Furthermore, the reliance on Panel VAR and Cholesky decomposition assumes that the structural relationships between variables remain stable over time, which may not always be the case given the evolving nature of energy markets. Future research could explore several promising avenues. Incorporating alternative measures of uncertainty, such as climate-related uncertainty or sector-specific risks, could provide a more comprehensive view of how uncertainty affects energy prices. Future studies could also assess the role of fiscal policy or domestic energy policy interventions in moderating the impact of uncertainty shocks on energy markets. Moreover, expanding the analysis to include renewable energy markets could shed light on how uncertainty influences the transition to cleaner energy sources, which is an increasingly critical issue for policymakers.

Finally, our findings underscore the importance of exchange rate policy in mitigating the effects of global uncertainty on energy prices. While flexible exchange rates may offer macroeconomic benefits, they expose domestic energy markets to heightened volatility. Policymakers should consider complementary measures, such as hedging strategies or strategic energy reserves, to shield their economies from the adverse effects of global uncertainty.

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Appendix

Table A1: Countries Classification

Emerging Markets	***OPEC***	***Oil Exporters***
Brazil	Algeria	Algeria
Chile	Congo	Angola
China	Equatorial Guinea	Australia
Colombia	Gabon	Azerbaijan
Egypt, Arab Rep.	Iran, Islamic Rep.	Bahrain
Hungary	Iraq	Brazil
India	Kuwait	Brunei Darussalam
Indonesia	Libya	Canada
Korea, Rep.	Nigeria	China
Malaysia	Saudi Arabia	Colombia
Mexico	United Arab Emirates	Congo
Peru	Venezuela, RB	Ecuador
Philippines		Egypt, Arab Rep.
Poland		Equatorial Guinea
Saudi Arabia		Gabon
South Africa		Indonesia
Thailand		Iran, Islamic Rep.
Turkey		Iraq
		Kazakhstan
		Kuwait
		Libya
		Malaysia
		Mexico
		Nigeria
		Norway
		Oman
		Qatar
		Russian Federation
		Saudi Arabia
		Solomon Islands
		Sudan
		Trinidad and Tobago
		United Arab Emirates
		United Kingdom
		United States
		Venezuela, RB
		Vietnam

Figure A1: GPR vs ECPI by Country (some examples)