Assessing the Impact of Economic and Geopolitical Uncertainty on Inflation: An Asymmetric Perspective

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Abstract

This dissertation has a two-fold aim. First, to investigate the spillovers of inflation, economic, and geopolitical uncertainty across prominent global economies. Second, to assess the impact of economic and geopolitical uncertainty on inflation in the United States, China, Russia, and India, using monthly data for the period 2000M1-2022M3. To account for nonlinearities, we follow Ando et al. (2022) by applying the quantile connectedness methodology, which allows capturing non gaussian effects. Further, we proceed by performing a quantile regression to examine the effects of economic and geopolitical uncertainty on inflation. We contribute to the existing literature in two ways. First, by applying asymmetric econometric methodologies to examine the spillovers of inflation, economic, and geopolitical uncertainty. Second, by exploring the macroeconomic channels through which the impact of economic and geopolitical uncertainty is transmitted to inflation. Our results have two strong policy implications. First, as the adverse uncertainty shocks dominate the beneficial, to counterbalance the effects of an adverse inflation or uncertainty shock a larger beneficial shock is required. Second, in the case of an adverse shock, either economic or geopolitical, policy makers in Russia and USA should strengthen demand, thus following expansionary fiscal or monetary policy, while policy makers in China and India should take measures to decrease inflationary pressures.

Keywords: Inflation, Quantile connectedness, Economic policy uncertainty; Geopolitical uncertainty

JEL Classification: C21; E64; P44;

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1. Introduction

Economic policy uncertainty and geopolitical risk are crucial determinants of macroeconomic policy in general and more specifically for the determination of the growth rates of prices. Recent widespread geopolitical tensions caused by the Russian invasion of Ukraine and the resulting uncertainty, both economic and geopolitical, have boosted the interest in research focusing on the impact of economic and geopolitical uncertainty on major macroeconomic variables. The research question of the current study focuses on the transmission mechanisms (spill – over effects) of uncertainty among major countries and the corresponding impact of uncertainty on inflation. Our econometric methodology focuses on asymmetrical econometric models, namely quantile connectedness and quantile regression as, by definition, the impact of uncertainty on economic activity is expected to lead to nonlinear behaviors that departs from the standard Gaussian assumptions. In such a case it is obvious that a classical mean econometric approach would lead to spurious results. Consequently, the main advantage of the asymmetric econometric approaches is that they enable us to examine the behavior of the variables along various quantiles of the conditional distribution, most notably in cases where the variables of focus exhibit non-normal distribution and asymmetric features.

We contribute to the existing literature in two ways. First, by applying asymmetric econometric methodologies to examine transmission mechanism of inflation and uncertainty spill – over effects. Second, by exploring the macroeconomic channels through which the impact of economic and geopolitical uncertainty is transmitted to the growth rates of prices. The results reported above have two strong implications for the policy makers. First, as the adverse shocks dominate the beneficial, to counterbalance the effects of an adverse inflation or uncertainty shock we need a larger beneficial shock, which could be interpreted as an inertia (stickiness) of the adverse shocks. Second, in the case of a positive (adverse) shock, either economic or geopolitical, there are statistically significant quantile patterns showing that policy makers in Russia and USA should take the proper measures to strengthen demand, thus following expansionary fiscal or monetary policy. On the other hand, there are statistically significant quantile patterns showing that policy makers in China and India, in the case of a positive (adverse) economic uncertainty shock, should take measures to decrease inflationary pressures, while in the case of a geopolitical shock policy makers in China should follow a mixed policy, depending on the observed effects. Geopolitical uncertainty shocks have no impact on India’s inflation.

The findings of our research might be indicative of countries that share similar economic characteristics to the countries we examine and are fundamental in explaining the transmission mechanism of uncertainty among major countries and their impact on inflation. Further, they have an added policy relevance for the formulation of government policy given the current geopolitical tensions and the uncertainty they cause.

The rest of the study is organized as follows. Section 2 presents a detailed overview of the pertinent literature. Section 3 presents the data statistical properties and the econometric methodology. Section 4 reports and discusses the empirical results and section 5 provides conclusion remarks.

2. Literature Review

Over the last decades geopolitical tensions have added an element of increasing uncertainty in macroeconomic policy decision making process. Therefore, to take perspective on this, academic research has gradually focused on the study of the channels through which economic and geopolitical uncertainty affect major macroeconomic variables. The following review of the existing literature is divided into two parts. The first part focuses on spillover transmission effects of economic and geopolitical uncertainty as well as of inflation spills. The second part reports the studies that examine the effects of different types of uncertainty on major macroeconomic variables, focusing mainly on inflation.

2.1 Uncertainty and inflation spill – over mechanisms

Bernal et al. (2016), measure the extent to which stress affecting one country's sovereign spreads can affect the Eurozone bond market and identifies the determinants of risk spillovers using a dynamic panel data model with macroeconomic state variables and EPU indices. Quarterly data from Q4/2008 to Q2/2013 is used to estimate the model for ten Eurozone countries. Results indicate that EPU in Germany and France can exacerbate the transmission of risk from individual countries' sovereign spreads to the Eurozone bond market. It is suggested that EPU should be reduced in the Eurozone to avoid adverse effects on European individual economies and the risk of destabilization of the Eurozone sovereign bond market.

Further, Hartmann and Roestel (2013) examine the interdependencies among inflation, output growth, and their uncertainties across 34 developed and emerging economies during the period of 1990-2010 using VARX-MGARCH-M models. Antonakakis et al (2014) examine the relationship between oil price and economic policy uncertainty for net oil-exporting and importing countries from 1997-2013. They employ an extended version of the Diebold-Yilmaz dynamic spillover index based on structural decomposition to reveal that economic policy uncertainty responds negatively to oil price shocks. During the Great Recession, total spillovers increased, and economic policy uncertainty dominates as the transmitter of shocks. They find that after 2009, there are significant transmission channels of supply and oil-specific demand shocks. These findings are relevant for policymakers and oil market investors.

Trung (2019) examines the extent to which US economic policy uncertainty shocks are subject to global transmission, considering their possible significance in leading the fluctuations of business cycles throughout the world. The study is conducted under a global VAR (GVAR) framework, using data from 32 countries which account for more than 90% of the world GDP. Results show that the significance of economic policy uncertainty in US shocks is considerable when it comes to their spillovers in the global economy, affecting global business cycles. This is mostly due to improved integration of economies as a consequence of trade openness and other factors, which explains why a country is more likely to suffer from a US led uncertainty shock if it’s a US trade partner. The author concludes that although trade openness is beneficial to growth for all economies, it should occur under strategic diversification in order to increase resilience against US uncertainty shocks.

Kang et al. (2019) investigate spills transmission mechanisms between inflation cycles of Eurozone and non-Eurozone economies. Their methodology consists of a wavelet-based measure of the spill’s transmission mechanism. They find evidence in favor of short- and medium-term inflation cycles spills and anticyclical inflation spills among the economies they focus on. The U.K. and the largest selected Eurozone economies are observed to lead those of the selected non-Eurozone economies. The inflation cycles of France, Sweden, and Germany are the largest spillover transmitters, while those of Italy and the U.K. are the largest spillover receivers.

Istiak et al. (2021) examine the inflation spillover in G7 countries. Using data from June 1956 to December 2020 the study finds that Japan and the United States are the main transmitters of inflation and identifies international trade, purchasing power parity, low-cost technology, and the Abenomics policy as responsible for the inflation spillover.

Tzika and Fountas (2021) study economic policy uncertainty spillovers across seven Eurozone countries before and after the Eurozone crisis from 2003 to 2019. Using the Diebold-Yilmaz spillover index and impulse response analysis, they examine the relationship between national and international uncertainty factors and their impact on Greek macroeconomic indicators, finding a decrease in uncertainty spillovers after the crisis, that core Eurozone countries were responsible for exporting uncertainty before the crisis, while periphery countries transmitted uncertainty during the crisis. Greek macroeconomic indicators were more affected by domestic than European uncertainty during the crisis.

Azad and Serletis (2022) examine the spills transmission mechanisms of US monetary policy uncertainty on seven emerging economies. Their results indicate that finding that US policy uncertainty is transmitted to other countries therefore leading to adverse impacts on their macroeconomic and financial variables.

Syed and Bouri (2022) examine the spillover effects of global economic policy uncertainty (GEPU) and oil price volatility on the volatility of the stock market indices of oil exporters and importers in both developed and emerging economies, finding that the spillover effect from GEPU to oil importers is larger than to oil exporters, and the volatility spillovers from oil prices to oil exporters are larger than to oil importers, for both developed and emerging countries. Shen and Hong (2023) examine the transmission of time-varying risks from geopolitical risks to economic policy uncertainty in Germany, using the Russia-Ukraine conflict as an example. It uses time-varying Granger-causality tests. The results show that there is a unidirectional relation where increased geopolitical risks may excite Germany's economic policy uncertainty.

Adeosun et. al (2023) study the way economic policy uncertainty, geopolitical risk and inflation dynamically interact in the economies of USA, Canada, Japan, UK, and China. They use monthly data on EPU, Geopolitical risk, EGPR, which measures both the effects of EPU and GPR, and CPI for inflation. The methodology used is the continuous wavelet transform (CWT), accompanied by the wavelet coherence (WC). Further, the authors used the multiple wavelet coherence (MWC). They argue that a positive demand shock increases inflation, especially in the Euro Area, similar to a negative commodity supply shock. Conversely, a positive supply shock reduces inflation. They observe that in the short and medium terms, inflation and EPU are volatile, but this excludes Japan and China. Geopolitical risk in the US and Canada in the short and medium term exhibits strong variation, and significance, but in the UK and China it shows strong coherence in the short term and weak significance in the medium term. Japan’s geopolitical risk shows strong coherence in the short term only. As for the EGPR, it shows a strong variance in the short and medium term in the following countries: USA, Canada, UK, Japan. Inflation is repeatedly induced by geopolitical risk in the UK and Japan, while the inverse is true for the USA.

2.2 Uncertainty effects on macroeconomic policy

Liu et al (2019) study the effect of economic policy uncertainty shocks on inflation expectations in China, using a MF-VAR approach. They show that national economic policy uncertainty shocks, but also those of Japan and Europe's, are affecting inflation expectations. It is noted that uncertainty shocks led by BRICS (excluding China and South Africa) and the US, do not affect inflation expectations in China. While domestic shocks of uncertainty impact inflation expectation volatility far more that exogenous shocks. This has become increasingly true especially after the 2008 financial crisis. The authors imply that policy makers have to focus on mitigating domestic uncertainty shocks, since they act as a great influencer of inflation expectations volatility in China.

Lee et al (2023) investigate the impact of geopolitical uncertainty on core inflation through the link of oil prices, focusing their study on US and China due to their relevance as significant oil importers. The study uses the global geopolitical oil price risk (GOPR) index to measure geopolitical oil price uncertainty and the official core consumer price index for core inflation (CI). Results indicate that especially during intense geopolitical events, geopolitical oil price risk has a significant impact on core inflation. The authors find that geopolitical oil price uncertainty has an undeniable effect on core inflation both in mean and variance, with this being more intense in the mid-quantiles. This can be explained by the fact that oil resources are constantly being redistributed, and this rapidly changing distribution environment creates uncertainty. Coupled with geopolitical disputes of recent years, such as the Russian invasion of Ukraine, the integration of oil markets has caused oil prices to rise as a result of geopolitical uncertainty, and this translates to core inflation. Policy implications include that China and the US, as key importers of oil, should focus on reducing inflation through monetary policy, especially when inflation is caused by geopolitical uncertainty through oil price increases.

Caldara et al (2023) examine the impact of geopolitical risk on inflation using annual data throughout 1900, accounting for 44 countries. They employ a monthly VAR model based on global data since 1970, revealing that geopolitical uncertainty raises inflation, stressing the impact of Russia's invasion of Ukraine, which is a recent example of inflation increases due to geopolitical risk. Anderl and Caporale (2023) study the asymmetric effect of economic policy uncertainty and oil price uncertainty on inflation. The authors use a nonlinear ARDL (NARDL) model and compare it to a linear ARDL model, with data from 1990 until August 2022. They account for developed and emerging economies, specifically those of the US, UK, Canada, Australia, New Zealand, Denmark, Japan, Sweden, Brazil, Chile, Mexico, and Russia. They find that when using the NARDL model, the effects of Economic policy uncertainty and oil price uncertainty are greater. When comparing economic uncertainty with oil price uncertainty shocks, the economic ones have a stronger effect on inflation, especially when it comes to negative shocks. The authors argue that because of the fact that economic policy uncertainty is significantly linked with monetary policy uncertainty, what could reduce the impact of Economic policy uncertainty on inflation is improved transparency and better communication from central banks and relevant authorities or institutions, which could result in better adjusted and less volatile inflation expectations.

Further, several other researchers focus on the impact of uncertainty on other major macroeconomic variables. In this context, Wang et al (2014) attempt to study the way Chinese corporate investment is affected by economic policy uncertainty. They use data from Chinese publicly listed companies, dating from 2003 to 2012, focusing on their quarterly financial statements during this period. The study reveals that there is an inverse relationship between economic policy uncertainty and investment from said companies. More specifically, when economic policy uncertainty rises, these firms tend to decrease investment. Their results show that the more transparent the economic policies are, the more likely it is for investment to adjust and therefore improve, while stability also plays an important role.

Bhagat et al (2016) examine the influence of Economic Policy Uncertainty (EPU) on the Indian economy. The study specifically examines the impact of changes in EPU on GDP growth, fixed investment, the BSE index, firm-level capital expenditure rates, and the cost of capital in India. The following are the paper's findings: Economic Policy Uncertainty (EPU) is inversely correlated with both GDP growth and fixed investment in India. India's GDP growth would increase by 0.56% and fixed investment growth by 1.36% if EPU were to drop to the level seen in 2005.

Caggiano et al (2017) investigate the way unemployment in the United States after World War II has changed as a result of an unexpected rise in economic policy uncertainty. The study makes use of monthly data from America's post-World War II era. According to the paper's findings, recessions have statistically and economically higher effects on unemployment when there is an unanticipated rise in economic policy uncertainty. Moreover, a state-contingent forecast error variance decomposition analysis demonstrates that the volatility of unemployment at business cycle frequencies is significantly more sensitive to Economic Policy Uncertainty (EPU) shocks during recessions.

Li and Peng (2017) examine the impact of innovations in US economic policy uncertainty (EPU) on the co-movements between China's A/B stock markets and the US stock market. The study focuses on four sub-markets within China, represented by the Shanghai and Shenzhen A-Share price indexes (in yuan) and B-Share price indexes (in US dollars), along with the US S&P500 index (in US dollars) as a proxy for the American stock market. Weekly data is utilized for empirical investigation, with the US EPU index obtained from the Economic Policy Uncertainty website and converted into weekly frequency to align with the stock index data. The results reveal that it is the absolute changes in the US EPU index that exert a negative impact on the correlations between the Chinese and American stock markets. This research offers the first evidence of EPU's influence on stock-stock correlations in the international context, complementing existing evidence for stock-bond correlations within a single country.

Luk et al (2020) reveal how economic policy uncertainty shocks in major economies affect small open economies, using Hong Kong as a case study. They construct an economic policy uncertainty index for Hong Kong and find significant spillovers of uncertainty from major economies to Hong Kong. Domestic economic policy uncertainty leads to lower investment, tight financial conditions, and lower vacancy posting, which dampens domestic output growth.

Zhang et al (2019) compare the impact of Chinese and US economic policy uncertainty on numerous international markets. They build a time series model based on Diebold and Yilmaz (2014), with which they produce results showing that after the 2008 financial crisis, the Chinese Economic Policy Uncertainty index declined, in contrast to the period before the crisis, while the US EPU index had a greater impact in all examined global markets than that of China's. The paper advocates for reducing trade conflicts between these two global powers as they are prone to cause higher economic uncertainty globally, proving unfavorable to them to. Finally, they found that US economic policy uncertainty Granger caused China's, with the exception of a few years previous to the financial crisis of 2008.

According to the literature review, the results of most studies are consistent with strong uncertainty and inflation spill – over effects. Further, there is a statistically significant effect of economic and geopolitical uncertainty on inflation and other major macroeconomic variables. It is also evident that the existing research focuses mainly on the impact of economic uncertainty applying linear econometric methodologies. However, as mentioned above, uncertainty leads to nonlinear effects thus requiring us to study its impact along the distribution of the sample and not only at the mean.

3. Data statistical properties and econometric methodology

3.1 Data sources and statistical properties of variables

The empirical investigation of the spillover effects of economic policy uncertainty (epu) is carried out using monthly data over the period 2000M1 – 2022M3, of geopolitical risk (gpr) is carried using monthly data over the period 1985M1-2022M3, while for the inflation ($infl$) spills the period of our study is 1993M1-2022M3. When it comes to the investigation of the impact of the uncertainty variables on inflation the data frame is over the period 2000M1-2022M3. Availability of monthly data for the uncertainty variables (epu, gpr) determines the time frame for our empirical analysis. Data on economic policy uncertainty index is sourced from the EPU index of Baker et al. (2016), while data on geopolitical risk is obtained from the GRP index of Caldara and Iacoviello (2018)[1]. The series for inflation are obtained from OECD. Table 1 presents the summary statistics for the variables along with their skewness and kurtosis. Skewness is a measure of the symmetry of the probability distribution of a variables about its mean. When the value of skewness is zero, then the distribution of the variable is normal (symmetrical). According to our data, the distributions of our variables are highly skewed. Kurtosis is a measure of the tail heaviness of the distribution, as it measures the weight of the tails relative to the rest of distribution. In practical terms, kurtosis measures the outliers of the distribution. According to our data, the distributions of the variables are leptokurtic. Overall, we conclude that we have strong evidence in favor of nonlinearities and non-normal distribution in our variables, with non-Gaussian features arising at the tails of the series.

Table 1: Summary statistics

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
$infl_{de}$	351	1.620	1.507	1.032	-1.040	5.876	0.969	5.186
$infl_{fr}$	351	1.416	1.539	0.810	-0.725	4.482	-0.026	3.143
$infl_{ru}$	351	63.800	11.267	172.717	2.197	1065.57	3.9337	18.349
$infl_{us}$	351	4.647	4.268	3.106	-4.29	22.558	2.017	11.973
$infl_{in}$	351	6.888	6.276	3.169	0	19.672	0.752	3.743
$infl_{cn}$	351	3.864	2	5.736	-2.68	27.7	2.314	8.221

[1] Both indices are available on https://www.policyuncertainty.com/

Variable	Obs.	Mean	Median	Std. Dev.	Min	Max	Skewness	Kurtosis
epu_{de}	267	157.94	131.464	97.831	28.433	785.025	2.205	10.901
epu_{fr}	267	190.553	187.116	102.944	16.592	574.633	0.567	3.213
epu_{ru}	267	164.359	122.244	129.369	12.398	793.634	1.963	8.159
epu_{us}	267	123.005	111.886	45.303	57.202	350.459	1.460	6.323
epu_{in}	267	88.866	72.427	46.398	23.352	283.689	1.579	5.882
epu_{cn}	267	240.513	140.205	230.732	9.066	970.829	1.532	4.405
gpr_{de}	447	0.338	0.297	0.210	0.058	1.767	2.563	14.869
gpr_{fr}	447	0.519	0.458	0.286	0.161	2.891	2.921	18.304
gpr_{ru}	447	0.798	0.725	0.454	0.145	5.578	3.555	32.009
gpr_{us}	447	2.785	2.619	1.088	0.952	10.853	3.097	19.212
gpr_{in}	447	0.209	0.186	0.122	0.030	1.035	2.478	12.760
gpr_{cn}	447	0.392	0.354	0.230	0.073	1.824	1.648	7.682

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3.2 Econometric methodology

The previous data analysis revealed the existence of possible asymmetric features in our data which indicates the need for applying econometric techniques that allows us to examine the interactions among our variables not only in the mean, but across the GDP distribution. Therefore, we develop our methodology in two stages. Firstly, we apply the quantile connectedness methodology. This method, developed by Ando et al. (2022) allows to have a more detailed analysis of the uncertainty and inflation spillover effects across the whole distribution of the variables. Secondly, having validated the existence of asymmetries as well as the magnitude of the spills transmission mechanism we proceed by applying a quantile regression introduced by Koenker and Bassett (1978), in order to examine the effects of economic and geopolitical uncertainty on inflation.

3.2.1 Quantile connectedness analysis

The quantile connectedness methodology accounts for the transmission mechanism of spills among the variables of a given model for different conditional quantile, $\tau \in (0,1)$. Typical applications of this methodology can be found in Antonakakis et al. (2019), Chatziantoniou and Gabauer (2021), Palaios and Papapetrou (2022). The measures of the transmission mechanism at the τ-th quantile are as follows:

$$O_{i\leftarrow i,(\tau)}^{(h)} = \theta_{i\leftarrow i,(\tau)}^{(h)}$$

where $O_{i\leftarrow i,(\tau)}^{(h)}$ is the proportion of the *h*-step ahead forecast error variance of the *i*-th variable, at the τ-th quantile, that can be attributed to shocks to itself, called own variance share,

$$F_{i\leftarrow\cdot,(\tau)}^{(h)} = \sum_{j=1,j\neq i}^{m} \theta_{i\leftarrow j,(\tau)}^{(h)}$$

where, $F_{i\leftarrow\cdot,(\tau)}^{(h)}$ measures the total spillover from the system to variable *i*, at the τ-th quantile,

$$TSI_{\tau}^{h} = m^{-1}\sum_{i=1}^{m} F_{i\leftarrow\cdot,(\tau)}^{h}$$

where TSI_{τ}^{h} is the total spillover index (TSI) at the τ-th conditional quantile.

3.2.2 Quantile regression

Quantile regression allows us to examine the pairwise relationships between inflation, economic policy uncertainty and geopolitical risk, revealed from our previous empirical analysis. Following Koenker and Bassett (1978), the coefficients of the τ-*th* quantile of the conditional distribution are given as the solution to the following minimization problem:

$$Q_{q_t}\left(\tau / x_t\right) = \arg\min_{\hat{\beta}\varepsilon R^k}\left[\sum_{t:1\, y \geq a^{\tau} + x_t^{'}\hat{\beta}^{\tau}} \tau\left|y_t - a^{\tau} - x_t^{'}\beta^{\tau}\right| + \sum_{t:y < a^{\tau} + x_t^{'}\hat{\beta}^{\tau}} (1-\tau)\left|y_t - a^{\tau} - x_t^{'}\beta^{\tau}\right| + \right] =$$

$$= \arg\min_{\hat{\beta}\varepsilon R^k} \sum_t \rho_{\tau}\left(y_t - a^{\tau} - x_t^{'}\hat{\beta}^{\tau}\right)$$

where, $Q_{y_t}\left(\tau / x\right)$, $0 < \tau < 1$, is the conditional τ -th quantile of the dependent variable, y_t, x_t is a vector of independent variables, β^{τ} denotes the estimated coefficients and a^{τ} are the unobserved effects. ρ_{τ} is a weighted factor, the check function, which weighs positive and negative values asymmetrically and it is defined for $\tau = 1/2\, \varepsilon\, (0,1)$ as $\rho_{\tau}\left(z\right) = \tau z$, if $z \geq 0$ or $\rho_{\tau}\left(z\right) = \left(\tau - 1\right) z$, if $z < 0$, where $z_{\tau} = y_t - a^{\tau} - x_t^{'}\beta^{\tau}$.

4. Empirical results and discussion

4.1. Uncertainty transmission patterns across the distribution

Tables 2, 3 and 4 report the Net Directional Connectedness (NDC) values of inflation, Economic Policy Uncertainty (EPU) and Geopolitical Risk (GEPU), respectively, while table 5 reports the corresponding Total Spillover Index (TSI) values across different quantiles. We interpret the upper quantiles as representing positive (adverse) uncertainty or inflation shocks, while the lower quantiles as representing negative (beneficial) uncertainty of inflation shocks. A positive value of NDC suggests that shocks cause the country to act as a shock transmitter to other countries. A negative value indicates that shocks in a country's cause the country to act as a receiver of shocks from other countries.

Table 2 reports the NDC values that correspond to inflation, for all 6 selected countries across different quantiles. By comparing the NDC values at negative and positive shocks, one can observe the presence of asymmetries. In this case, Germany seems to be transmitting inflation to other countries at extreme positive and negative shocks (5^{th} and 95^{th} percentiles), but receiving inflation from other countries at the 25^{th}, 50^{th}, and 75^{th} percentiles. At a slightly negative shock (25^{th} percentile), Germany receives inflation slower than in slightly positive shocks (75^{th} percentile). This result reveals stickiness in the spillover of inflation, which can be verified as inflation is lower at the 25^{th} quantile, so its transmission happens at a slower pace. In quantile 0.5, Germany receives inflation faster than any other quantile. Similarly, France exports inflation at quantiles 0.05 and 0.25, and imports inflation at quantiles 0.5, 0.75 and 0.95. It is observed that the transmission of inflation from other countries to France happens faster at the 75^{th} quantile compared to the transmission of inflation from France to other countries at the 25^{th} quantile. Thus, at slightly negative shocks, inflation spillovers occur slower than in slightly positive shocks. This asymmetry, however, is not apparent when comparing quantiles 0.05 and 0.95, as at quantile 0.95 the transmission seems decisively slower. These results indicate a downwards stickiness in the spillover of inflation for France, as in the case of Germany.

Table 2: Net Directional Connectedness for Inflation evaluated at various Quantiles (τ=0.05, τ=0.25, 0.50, τ=0.75, τ=0.95)

	τ=0.05	**τ=0.25**	**τ=0.50**	**τ=0.75**	**τ=0.95**
Germany	6.1	-13.8	-45.0	-37.8	5.6
France	7.1	8.7	-10.7	-45.6	-0.6
Russia	-31.1	-18.8	111.5	84.3	-13.6
USA	9.7	25.9	20.4	-31.9	-24.0
India	-11.2	-32.0	-5.8	125.3	-8.1
China	6.4	66.4	14.8	15.0	-9.6

Note: Each row of the matrix gives the net directional connectedness of inflation for the corresponding country.

Moreover, Russia receives inflation at quantiles 0.05, 0.25 and 0.95, while it spreads inflation to other countries at quantiles 0.5 and 0.75. At a slightly negative shock, Russia receives inflation slower than it spreads inflation at a slightly positive shock, as was the case of Germany and France. Therefore, we observe that for Germany, France and Russia inflation spillovers occur faster at slightly positive shocks. Finally, at the 50th quantile, Russia exports inflation faster than any other quantile. When it comes to the USA, the country acts as a transmitter of inflation at quantiles 0.05, 0.25 and 0.5, while it receives inflation at quantiles 0.75 and 0.95. Again, inflation is transmitted slower at the 25th quantile compared to the 75th quantile. This is also true when comparing quantiles 0.05 and 0.95. India receives inflation at every quantile except the 75th, which also happens to be the quantile that transmission is the fastest. At slightly positive shocks, inflation spillovers occur faster than at slightly negative shocks, following the example of the aforementioned countries.

China seems to export inflation at every quantile except the most positive edge, at quantile 0.95. In contrast to previous countries, spillovers occur much slower at quantile 0.75 than they do at quantile 0.25. Therefore, we observe that for all countries, with the exception of China, inflation spillover effects are much intensive during positive shocks rather than negative shocks, thus indicating a downwards sticky behavior of the inflation transmission mechanism. Further, the first Row of Table 5 shows the results of the TSI for the transmission of inflation among the examined countries. In line with the above analysis, we observe that the total spillover effects of inflation are higher at the tail of the conditional distribution, which implies that during positive and negative shocks the transmission mechanism of inflation among the examined countries is more intense.

Overall, we observe that the transmission mechanism of inflation is more intense at the extremes of the distribution, namely after positive (adverse) or negative (beneficial) shocks but the impact of a positive shock is of higher magnitude compared to a negative shock. Consequently, to counterbalance the effects of an inflation shock we need a larger beneficial shock.

Table 3: Net Directional Connectedness for Economic Policy Uncertainty Index evaluated at various Quantiles (τ=0.05, τ=0.25, 0.50, τ=0.75, τ=0.95)

	τ=0.05	**τ=0.25**	**τ=0.50**	**τ=0.75**	**τ=0.95**
Germany	8.5	10.3	16.1	-27.4	0.8
France	1.8	-2.8	6.5	30.8	19.6
Russia	-7.8	-16.6	-44.0	-65.6	-22.5
USA	7.4	15.1	14.2	-54.7	-16.6
India	-6.4	-11.5	-20.0	-72.9	-40.4
China	-0.9	-6.5	-14.7	44.2	12.2

Note: Each row of the matrix gives the net directional connectedness of Economic Policy Uncertainty Index for the corresponding country.

Table 3 shows the net directional connectedness values for all 6 selected countries at selected quantiles that range from 0.05 to 0.95. The variable examined is Economic Policy Uncertainty. Starting with Germany, it is shown that EPU is transmitted from Germany to other countries at quantiles 0.05, 0.25, 0.50, and 0.95. Germany receives uncertainty only at quantile 0.75. As for the speed of the uncertainty's transmission, it is greater at slightly positive shocks than it is at slightly negative shocks, while at the extreme edges the behavior is opposite. Moving on to France, we observe that the country exports EPU at every quantile except the 25th. At the 75th quantile transmission is faster than all previous quantiles, indicating that the more positive the shock, the faster uncertainty spreads. The 95th quantile compared to the 5th also confirm this asymmetry. Russia receives EPU at every quantile, with the transmission being faster at the 75th quantile compared to all previous quantiles. The USA receives uncertainty at positive shocks, that is at quantiles 0.75 and 0.95, while it exports EPU at all other quantiles. At quantile 0.75 spillovers of EPU are faster than those at quantile 0.25, and the same occurs when comparing the extreme edges. India, which receives EPU at every quantile, receives uncertainty faster moving along more positive shocks, but this behavior stops at quantile 0.75, as the transmission slows down moving on to quantile 0.95. China receives uncertainty at quantiles 0.05, 0.25 and 0.5. At positive shocks, China exports EPU. The transmission occurs at a greater pace at positive shocks than it does at negative shocks. The previous analysis of the transmission of EPU from country to country is in line with the results shown in row 2 of table 5, as the TSI is higher at quantile 0.75 compared to quantile 0.25, and the same holds for the comparison of quantiles 0.95 and 0.05.

Overall, we observe that, as in the case of the inflation spills, the transmission mechanism of economic policy uncertainty is higher at the extremes of the distribution, namely after positive (adverse) or negative (beneficial) shocks but the impact of a positive shock is of higher magnitude compared to a negative shock. Consequently, to counterbalance the effects of an adverse economic uncertainty shock we need a larger beneficial shock.

Table 4 contains the results for the Net Directional Connectedness values of geopolitical uncertainty for the quantiles 0.05 up to 0.95. Starting with Germany, we observe that across all quantiles the country is an exporter of geopolitical uncertainty. The extent to which Germany exports uncertainty is higher at slightly positive shocks, as seen when comparing quantiles 0.75 to all previous quantiles. The same is true at highly positive shocks, as proven by the comparison of quantiles 0.95 and 0.05. France is overall an exporter of geopolitical uncertainty, except at quantile 0.75, where it imports uncertainty, though at a slower pace than it exports at less positive shocks. However, at quantile 0.95, the spillovers of geopolitical uncertainty happen much faster than at quantile 0.05. Russia acts as an exporter of geopolitical uncertainty at every examined quantile. We observe than as we proceed to more positive shocks starting from negative shocks, the spillovers occur gradually faster. The USA exports uncertainty at every quantile except at the 95th. At slightly negative shocks, uncertainty is being transmitted slower than at slightly positive shocks. That is also true when comparing the negative at the positive edge, although the difference is significantly lower. India, on the other hand, imports geopolitical uncertainty at every quantile. It follows the same pattern as Russia, as the transmission of uncertainty occurs faster as we move towards positive shocks. Finally, China is also an importer of uncertainty across all quantiles. At slightly negative shocks, China imports uncertainty slower than it does at slightly positive shocks, although this is not true at the extremes. The previous analysis of the transmission of GEPU from country to country is in line with the results shown in row 3 of table 5, as the TSI is higher at the extreme quantiles of the conditional distribution.

Overall, we observe that, as in the case of the inflation and economic uncertainty spills, the transmission mechanism of geopolitical uncertainty is higher at the extremes of the distribution, namely after positive (adverse) or negative (beneficial) shocks but the impact of a positive shock is of higher magnitude compared to a negative shock. Consequently, to counterbalance the effects of an adverse geopolitical shock we need a larger beneficial shock.

Table 4: Net Directional Connectedness for Geopolitical Risk Index evaluated at various Quantiles (τ=0.05, τ=0.25, 0.50, τ=0.75, τ=0.95)

	τ=0.05	**τ=0.25**	**τ=0.50**	**τ=0.75**	**τ=0.95**
Germany	5.4	8.3	11.4	20.4	34.8
France	0.8	2.3	1.7	-0.4	7.7
Russia	4.8	6.0	6.1	12.0	26.1
USA	8.3	13.6	20.8	27.0	-8.7
India	-14.5	-20.7	-26.7	-34.9	-55.7
China	-4.9	-9.4	-13.3	-24.2	-4.3

Note: Each row of the matrix gives the net directional connectedness of Economic Policy Uncertainty Index for the corresponding country.

Table 5: Total Spillover Index for Inflation, Economic Policy Uncertainty (EPU) and Geopolitical Risk (GEPU) evaluated at various Quantiles (τ=0.05, τ=0.25, 0.50, τ=0.75, τ=0.95)

	τ=0.05	**τ=0.25**	**τ=0.50**	**τ=0.75**	**τ=0.95**
TSI for Inflation	80.6	65.3	67.9	82.9	87.6
TSI for EPU	78.4	69.3	63.9	87.4	87.3
TSI for GEPU	73.1	64.1	54.6	60.9	83.1

Considering the comprehensive analysis conducted on the geopolitical and economic landscapes of these major global players, it is discerned that a more focused examination should be undertaken, concentrating specifically on the United States, China, India, and Russia. This discernment arises from a judicious consideration of the geopolitical and economic significance these superpowers wield on the international stage. It is shown that Russia acts as an exporter of inflation at positive shocks among all examined countries. This can be verified as Russia is a crucial exporter of oil and raw materials, so at higher inflation rates the spillovers would occur from Russia to other countries. According to Bernal et al (2015), a positive oil-price shock has a greater effect on inflation expectations than a negative oil price shock, which in this case would mean that after a positive oil price shock the inflation expectations of other countries would be greatly affected. An example of this is Germany, which is highly dependent on Russia for oil and gas and imports inflation at slightly positive shocks as shown above. The same holds for France, with the spillovers happening at a higher pace than Germany at positive quantiles. This is not in line with the findings of Kang et al (2019), as their study shows that the inflation cycles of France and Germany are the largest spillover transmitters out of those they examined. An interesting observation is that the USA is also an importer of inflation at positive shocks, although less and at a slower pace than EU countries. This can be explained by the fact that the USA is more independent of raw materials than EU countries due to is geography. This result is in contrast to the findings of Istiak et al (2021), who used data from 1965 to 2020 and found that the US is the main transmitter of inflation among the G7 countries. China is not really affected by Russia at the same manner, as the two countries have agreed on bilateral agreements which help manage unfortunate spillovers to their benefit.

As for economic policy uncertainty, it is revealed that the USA exports certainty because at negative shocks where EPU is lower, the country acts as an exporter of EPU. Thus, in more economically stable periods the USA exports stability. In contrast to the USA, China produces and exports uncertainty as at positive quantiles where EPU is higher, the country acts as an exporter of EPU. This affects the USA, but also Russia and India, which all import uncertainty at more positive quantiles. More specifically, Russia and India are both receivers of economic uncertainty at positive quantiles, with India being affected the most. This discrepancy may be explained by the fact that Russia is a bigger oil exporter, as according to Syed and Bouri (2022), oil exporters are less affected from global EPU spillovers compared to oil importers, with this being true for both developed and emerging economies.

Furthermore, when it comes to geopolitical uncertainty, the USA is a significant exporter across most quantiles, showcasing its prominent role in shaping global dynamics. This suggests that the country's actions and policies can affect global stability and risk perceptions. The slower transmission of uncertainty at slightly negative shocks compared to slightly positive shocks may reflect the resilience of the US economy and its ability to absorb and manage negative impacts. China's role as an importer of uncertainty across all quantiles implies its sensitivity to global geopolitical events. The slower import of uncertainty at slightly negative shocks suggests that potentially the country adopts valuable economic diversification strategies. However, the faster import of uncertainty at slightly positive shocks indicates the country's interconnectedness with the global economy and its responsiveness to positive geopolitical developments. Russia's consistent position as an exporter of geopolitical uncertainty across all quantiles aligns with its historical and current geopolitical strategies. The gradually faster spillovers of uncertainty as shocks become more positive suggest that Russia's actions and policies may contribute to amplifying global instability. This pattern could reflect Russia's foreign policy approach, potentially aimed at exerting influence. It is obvious that Russia shapes geopolitical dynamics and impacts the risk perceptions of other nations. These findings reveal the interaction between these nations and the potential impact of their actions on global stability, demonstrating the need for further examination and policy considerations.

Overall, we observe that, our results are consistent with a more intense transmission mechanism of inflation, economic and geopolitical uncertainty spill – over effects at the extreme of the distribution, namely after positive (adverse) or negative (beneficial) shocks but the impact of a positive shock is of higher magnitude compared to a negative shock. Consequently, as the adverse shocks dominate the beneficial, to counterbalance the effects of an adverse inflation or uncertainty shock we need a larger beneficial shock, which could be interpreted as an inertia (stickiness) of the adverse shocks.

4.2. Nonlinear uncertainty effects on inflation

In this section we examine the pairwise relationships between inflation, economic uncertainty, and geopolitical uncertainty, by applying a quantile regression analysis. We interpret a positive sign in the pairwise relationship between inflation and economic or geopolitical uncertainty as an indication that the channel through which uncertainty affects inflation is the supply. On the contrary, we interpret a negative sign in the pairwise relationship between inflation and uncertainty as an indication that the channel through which uncertainty affects inflation is demand. According to the above interpretation, the channel through which uncertainty affects inflation determines the final impact of the uncertainty shock on the growth rates of prices. When it comes to the supply channel, a positive (adverse) uncertainty shock decreases supply, thus leading to inflationary pressures (direct relationship between uncertainty and inflation). On the contrary, considering the demand channel, a positive (adverse) uncertainty shock decreases demand, thus leading to a lower level of inflation (inverse relationship between uncertainty and inflation).

Specifically, in the case of China (Table 6), in the range of quantiles 0.1-0.5, it is observed that as economic policy uncertainty increases, inflation also increases. The positive coefficient indicates a direct relationship between these two variables. This can be explained by the fact that when there is uncertainty in economic policy, it can lead to a decrease in the supply of goods and services. This reduced supply, in turn, can cause prices to rise, resulting in increased inflation. However, as inflation levels rise, the impact of economic policy uncertainty on inflation decreases. This means that at higher levels of inflation (quantiles 0.5-0.10), changes in economic policy uncertainty have less influence on inflation. One factor causing this declining influence of economic policy uncertainty on inflation could be the gradual adaptation of consumers, businesses, and policy makers to higher uncertainty levels. According to Wang et al (2014), when economic policy uncertainty rises in China, firms tend to decrease their investing activities. This may explain the aforementioned declining effect, as decreased investment is followed by decreased inflation. Further, certain policies could have been implemented to control uncertainty and mitigate its effect on inflation. Another factor could be the intervention of the central bank, which would raise interest rates in an effort to reduce inflation. That way, economic policy uncertainty would have less impact on inflation. When it comes to geopolitical uncertainty, we observe that some patterns are statistically significant, the extreme positive and negative quantiles.

Considering Russia (Table 8), when economic policy uncertainty rises inflation falls, as the sign of the coefficient is negative. This is due to a decrease in demand followed by a rise in uncertainty. At higher inflation levels, an increase in uncertainty has a higher impact on inflation, so inflation falls more intensely. As for geopolitical uncertainty, we observe that there is a statistically significant impact only for the lower middle quantiles. However, this is not in line with Lee et al (2023), who argue that especially during intense geopolitical events, geopolitical oil price risk has a significant impact on core inflation. Since Russia is an oil exporter and is usually under geopolitical turmoil, it would be expected to observe a similar impact.

The relationship of uncertainty and inflation behaves similarly in the Indian economy (Table 7) as in the Chinese economy. As uncertainty rises, inflation rises too. This happens due to a negative shift in supply, which causes price levels to increase, as in the case of China. Moreover, the impact of uncertainty on inflation is higher at higher levels of inflation. The impact of uncertainty on inflation is more intense than in the case of China. Further, the economy's structure may render it more vulnerable to the consequences of uncertainty. According to Bhagat et al (2016), Economic Policy Uncertainty (EPU) is inversely correlated with both GDP growth and fixed investment in India, which reflects this vulnerability. For instance, interruptions in global supply chains brought on by uncertainty may result in increased inflation if a bigger section of the Indian economy is dependent on imported goods or commodities. Another reason for this discrepancy could be the difference of monetary policy strategies of the two countries, as well as the sensitivity of the Indian economy to external economic shocks being greater. When it comes to geopolitical uncertainty, there is no observable impact of it on inflation, as is true for the aforementioned countries.

In the case of the USA (Table 9), as uncertainty rises inflation falls, due to a decrease in demand. This behavior is similar to Russia's, except that in the USA the impact is observed only at low to moderate levels of inflation and at these levels it is smaller than in Russia. In other words, when inflation is not too high, increased uncertainty can have a noticeable effect on demand and subsequently on inflation. However, in Russia, this impact is observed across a broader range of inflation levels. In other words, uncertainty has a more pronounced effect on demand and inflation, even at higher levels of inflation compared to the USA. The USA generally has a more stable and resilient economic system compared to Russia. This stability may make uncertainty have a smaller impact on the economy overall. The impact of geopolitical uncertainty on inflation in the USA is significant at higher levels of inflation, specifically at quantiles 0.5 up to 0.9. In this case, when geopolitical uncertainty rises, inflation falls. As inflation reaches higher levels, this happens with higher intensity. One possible explanation could be that heightened uncertainty can lead to reduced economic activity, which in turn can lead to a decrease in prices. The fact that the impact of geopolitical uncertainty on inflation becomes more intense at higher inflation levels, could be attributed to changes in consumer spending, investment and business decisions that adjust their behaviors to increased uncertainty. It is worth mentioning that the impact of geopolitical uncertainty on inflation is significant only in the case of the USA.

Overall, are results from the quantile regression are consistent with the following: First, we observe that there are statistically significant quantile patterns of economic and geopolitical uncertainty effects on inflation, for all countries with the exception of India, where geopolitical uncertainty does not affect inflation. Second, the channel through which economic uncertainty affects inflation is the supply channel for China and India and the demand channel for Russia and USA. Therefore, a positive (adverse) economic uncertainty shock will increase inflation in China and India, while will decrease inflation in the case of Russia and USA. Third, the channel through which geopolitical uncertainty affects the level of inflation is the demand channel for Russia and USA, while for the case of China both channels are possible. Geopolitical uncertainty does not affect inflation in India. Therefore, a positive (adverse) geopolitical shock will decrease inflation in Russia and USA, while is expected to have mixed effects on China's inflation and no effects on India's inflation. Forth, our results indicate that the uncertainty effects, no matter what the transmission channel is, exhibit asymmetric impact on the level of inflation as the magnitude and the statistically significance of the impact differs depending on the quantile. Our results are in line with Antonakakis et. al (2014) who show that in the post 2009 period, there is significant role for supply and demand side shocks as net transmitters. They are also in line with Azad and Serletis (2022) who show that uncertainty has adverse impacts on the macroeconomic fundamentals of the economies. Finally, our results share similar findings with Lee et. al. (2023) who find that during intense geopolitical shocks inflation is strongly affected.

Table 6: Quantile regression. Uncertainty effects on inflation for China

	epu		*constant*		*gepu*		*constant*	
Quantile	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
τ=0.10	0.002***	3.830	-0.605**	-2.140	2.013***	5.621	-1.123***	-3.963
τ=0.20	0.0012*	1.956	0.455*	1.947	1.112***	2.954	0.181	0.623
τ=0.30	0.0009**	2.137	1.074***	6.253	0.527	1.476	1.063***	4.499
τ=0.40	0.0011***	2.836	1.361***	8.075	0.336	0.877	1.394***	5.648
τ=0.50	0.0008**	2.087	1.618***	9.296	0.000	0.000	1.900***	7.321
τ=0.60	0.0005	1.240	2.057***	11.413	1.49E-16	2.99E-16	2.300***	7.361
τ=0.70	-1.08E-19	-2.48E-16	2.700***	12.320	-0.477	-0.973	2.918***	8.510
τ=0.80	-0.0007	-1.504	3.433***	11.509	-1.398**	-2.568	4.050***	8.266
τ=0.90	-0.0015*	-1.754	5.436***	12.268	-2.522***	-5.056	6.101***	13.608

Notes: *, **, *** denote significance at 10%, 5% and 1% level, respectively.

Table 7: Quantile regression. Uncertainty effects on inflation for India

	epu		*constant*		*gepu*		*constant*	
Quantile	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
τ=0.10	0.018***	3.017	1.896***	3.974	0.831	0.840	3.079***	9.398
τ=0.20	0.026***	8.025	2.132***	7.306	0.295	0.302	3.954***	12.700
τ=0.30	0.026***	8.360	2.668***	9.623	-0.892	-0.810	4.771***	14.752
τ=0.40	0.028***	8.458	2.873***	9.573	-0.746	-0.658	5.337***	16.120
τ=0.50	0.031***	7.309	3.119***	8.935	-1.393	-1.169	5.866***	16.888
τ=0.60	0.038***	6.487	3.216***	7.050	-2.376*	-1.903	6.806***	17.437
τ=0.70	0.037***	6.906	3.970***	8.514	-3.899***	-2.889	8.000***	15.597
τ=0.80	0.037***	6.505	4.646***	8.900	-4.477	-1.232	9.984***	11.603
τ=0.90	0.049***	4.920	4.883***	6.348	-1.205	-0.497	10.709***	18.737

Notes: *, **, *** denote significance at 10%, 5% and 1% level, respectively.

Table 8: Quantile regression. Uncertainty effects on inflation for Russia

	epu		*constant*		*gepu*		*constant*	
Quantile	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
τ=0.10	-0.013***	-2.591	6.982***	6.448	-2.609	-1.455	5.746***	4.058
τ=0.20	-0.015***	-3.628	8.713***	10.158	-4.094**	-2.501	8.406***	7.038
τ=0.30	-0.018***	-4.511	10.249***	12.995	-3.130*	-1.910	8.598***	7.104
τ=0.40	-0.019***	-4.923	11.188***	14.520	-3.408**	-2.059	9.936***	8.275
τ=0.50	-0.020***	-5.791	12.513***	17.184	-2.262	-1.367	10.52***	9.175
τ=0.60	-0.021***	-6.499	13.715***	19.941	-2.738	-1.458	12.36***	10.22
τ=0.70	-0.021***	-7.489	15.402***	23.571	-1.152	-0.778	13.08***	14.31
τ=0.80	-0.020***	-10.199	16.922***	27.581	0.451	0.911	14.182***	22.221
τ=0.90	-0.022***	-11.508	20.621***	23.043	-0.048	-0.109	16.969***	19.214

Notes: *, **, *** denote significance at 10%, 5% and 1% level, respectively.

Table 9: Quantile regression. Uncertainty effects on inflation for USA

	epu		*constant*		*gepu*		*constant*	
Quantile	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic	Estimate	t-statistic
τ=0.10	-0.007**	-2.024	2.827***	5.023	0.257**	2.238	0.910	1.342
τ=0.20	-0.010*	-2.862	4.200***	9.010	-0.125	-0.428	3.185***	3.532
τ=0.30	-0.006**	-2.115	4.430***	10.017	-0.135	-0.917	4.084***	8.322
τ=0.40	-0.008***	-3.132	5.320***	13.889	-0.249	-1.338	4.855***	8.693
τ=0.50	-0.010***	-3.749	5.902***	15.400	-0.277*	-1.926	5.411***	12.48
τ=0.60	-0.010***	-3.740	6.332***	16.469	-0.257**	-2.453	5.841***	17.133
τ=0.70	-0.005	-0.884	6.332***	9.250	-0.165**	-1.973	6.195***	20.513
τ=0.80	0.003	0.486	6.007***	7.204	-0.274***	-3.076	7.310***	17.727
τ=0.90	0.010	0.718	6.936***	4.703	-0.472***	-5.276	9.423***	16.456

Notes: *, **, *** denote significance at 10%, 5% and 1% level, respectively.

5. Conclusions

In the present study, we analyze the transmission mechanism of inflation, economic uncertainty and geopolitical uncertainty spillover effects among major economies using monthly data during the period 2000M1-2022M3. We develop our methodology in two stages. Firstly, we apply the quantile connectedness analysis. This method, developed by Ando et al. (2022) allows to have a more detailed analysis of the uncertainty and inflation spillover effects across the whole distribution of the time series. Secondly, having validated the existence of asymmetries as well as the magnitude of the spills transmission mechanism we proceed by applying a quantile regression introduced by Koenker and Bassett (1978), in order to examine the effects of economic and geopolitical uncertainty on inflation. We contribute to the existing literature in two ways. First, by applying asymmetric econometric methodologies to examine the transmission mechanism of inflation and uncertainty spill – over effects. Second, by exploring the macroeconomic channels through which the impact of economic and geopolitical uncertainty is transmitted to the growth rates of prices.

The main findings or our analysis can be summarized as follows: First, our findings consistent with asymmetric effects when it comes to the transmission mechanism of inflation and uncertainty spill - over effects, the pairwise impact of economic and geopolitical uncertainty on the inflation and the statistically significance of the impacts. Second, we observe that our results are consistent with a more intense transmission mechanism of inflation, economic and geopolitical uncertainty spill – over effects at the extreme of the distribution, namely after positive (adverse) or negative (beneficial) shocks but the impact of a positive shock is of higher magnitude compared to a negative shock. Third, we find quantile patterns of statistically significant effects of economic and geopolitical uncertainty of inflation, for all countries with the exception of India, where geopolitical uncertainty does not affect inflation. Forth, the channel through which economic uncertainty affects inflation is the supply channel for China and India and the demand channel for Russia and USA. Therefore, a positive (adverse) economic uncertainty shock will increase inflation in China and India, while will decrease inflation in the case of Russia and USA. Fifth, the channel through which geopolitical uncertainty affects the level of inflation is the demand channel for Russia and USA, while for the case of China both channels are possible. Geopolitical uncertainty does not affect inflation in India. Therefore, a positive (adverse) geopolitical shock will decrease inflation in Russia and

USA, while is expected to have mixed effects on China's inflation and no effects on India's inflation.

The results reported above have two strong implications for the policy makers. First, as the adverse shocks dominate the beneficial, to counterbalance the effects of an adverse inflation or uncertainty shock we need a larger beneficial shock, which could be interpreted as an inertia (stickiness) of the adverse shocks. Second, in the case of a positive (adverse) shock, either economic or geopolitical, policy makers in Russia and USA should take the proper measures to strengthen demand, thus following expansionary fiscal or monetary policy. On the other hand, policy makers in China and India, in the case of a positive (adverse) economic uncertainty shock, should take measures to decrease inflationary pressures, while in the case of a geopolitical shock policy makers in China should follow a mixed policy, depending on the observed effects. Geopolitical uncertainty shocks have no impact on India's inflation.

The findings of our research might be indicative of countries that share similar economic characteristics to the countries we examine and are fundamental in explaining the transmission mechanism of uncertainty among major countries and their impact on inflation. Further, they have an added policy relevance for the formulation of government policy given the current geopolitical tensions and the uncertainty they cause.

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