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DOES CRUDE OIL PRODUCTION AFFECT CHINA'S HISTORICAL GEOPOLITICAL RISK?*

Abstract

Growing empirical research confirmed that geopolitical risk has significantly affected various economic variables. This study focuses on understanding geopolitical risk in-depth and exploring its determinants. It investigates if crude oil production affects China's historical geopolitical risk. The current study constructs and estimates an empirical model using the bounds testing approach to cointegration in order to compute the ARDL model parameters over the period 1986: q1-2022: q1. It finds that crude oil production and prices are significant sources of China's historical geopolitical risk. Moreover, a deterioration in the US economic competitiveness and growth rate will boost China's historical geopolitical risk. From a policy implication standpoint, the race to control and lead the world will be a significant source of adverse shocks to the world economy. The economic variables, either quantitative or price indices, become a significant source of geopolitical risk among nations. Thus, it is necessary to establish a strong connection between nations worldwide. This is to ensure that the rivals reach a compromise.

Keywords: China Economy; Crude Oil Production; Economic Competitiveness; Geopolitical Risk; The ARDL Model
Jel Classification: C22; E02; F51; Q43

Riassunto

La produzione di petrolio greggio influenza il rischio storico-geopolitico della Cina?

Un crescente filone di ricerca empirica ha confermato che il rischio geopolitico influenza significativamente le diverse variabili economiche. Questo studio è incentrato sulla comprensione dettagliata del rischio geopolitico e sull'esplorazione delle sue determinanti. Si esamina se la produzione di greggio ha riflessi sul rischio storico-geopolitico della Cina. In questo

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contributo si usa e stima un modello empirico basato su un approccio ARDL, relativamente al periodo 1986-2022. Dalle stime emerge che la produzione e il prezzo del greggio sono significative fonti di rischio storico-geopolitico per la Cina. Inoltre, un deterioramento della competitività e del tasso di crescita dell'economia USA renderebbe esplosivo questo rischio. Quanto alle implicazioni politiche, la corsa al controllo e alla guida del mondo rappresenta una fonte significativa di shock avversi per l'economia internazionale. Le variabili economiche, sia in termini quantitativi che di prezzi, rappresentano quindi un'importante motivo di rischio geopolitico tra le nazioni. Pertanto, diventa necessario stabilire una forte connessione tra le nazioni. Ciò affinché paesi rivali raggiungano un compromesso.

1. INTRODUCTION

In 1991, after the collapse of the former Soviet Union, the world order system moved to unipolar system, and thus the US became the sole leading international superpower. Nevertheless, the Asian financial crisis of 1997-98, the rise of the BRICS, and the Great Recession of 2007-2008 shifted the world back to the multipolar system. Ever since, the international economic system has been witnessing severe competition between the West and the East, mainly the US and China. Hence, China has become a geopolitical competitor rather than a partner in the US hegemonic arrangements[1]. According to Onafowora (2020), the retaliatory trade conflicts between the US and China are cited as a contributing factor to the onset of the global COVID-19 pandemic. Moreover, these trade disputes impeded collaboration, coordination, and the exchange of information regarding the disease. Accordingly, the international geopolitical tension cannot be ignored. For this reason, the consulting and financial services companies view geopolitical risk as a growing phenomenon which is expected to persist. Under these conditions, investors and agents in the economy should pay attention to this vital risk and carefully consider their investment decisions. Explaining the geopolitical risk determinants will help individuals and investment companies to analyze the geopolitical events accurately and forecast the next step more efficiently (Sweidan, 2022).

Dijkink (2009, P. 453) defines geopolitics as

[1] China adopted serious restructuring steps and development policies, for more details refer to Soofi (2021).

"traditionally the study of how political power is reinforced or undermined by geographical arrangements (boundaries, coalitions, spatial networks, natural resources, etc.)".

The geographical arrangements are set by the political and social leaders of the nations. These choices are motivated by political, socio-economic, and religious reasons. Recently, Caldara and Iacoviello (2022, p. 1197) define geopolitical risk as

"the threat, realization, and escalation of adverse events associated with wars, terrorism, and any tensions among states and political actors that affect the peaceful course of international relations".

Their definition focuses on the global institutional uncertainty and country's risk arising from economic disputes, wars, tensions, conflict, and military-like activities. Within the context of economic analysis, such a comprehensive uncertainty concept defers consumption, postpones investment, determines cross-border economic activity, discourages capital accumulation, erodes foreign direct investment, and diminishes monetary and fiscal policies' effectiveness (Baker *et al.*, 2016; Bhattarai *et al.*, 2020; Choi , 2018; Erzurumlu and Gozgor, 2022; Gavras *et al.* 2016; Stockhammar and Österholm, 2017).

The different agents in the economy, i.e., buyers, sellers, entrepreneurs, and policymakers, view geopolitical risk as a critical factor behind the various economic transactions, such as consumption, investment, trade, and economic policy effectiveness. Likewise, the international organizations, i.e., the International Monetary Fund and World Bank, follow up and monitor this type of risk to accurately predict the current and future international economic outcomes (Caldara and Iacoviello, 2022). Technically, geopolitical risk generates uncertainty inside an economy, a region, or the world. Thus, policymakers and other economic agents cannot predict the probability of the occurrence of various events (Jurado *et al.*, 2015). The geopolitical risk index developed by Caldara and Iacoviello (2022), along with previous iterations of their research, has inspired numerous scholars to investigate its impacts on a range of economic activities and indicators (Sweidan, 2023a).

Literature reveals very limited empirical studies that investigated the determinants of geopolitical risk. The general research trend in this area considers geopolitical risk as an exogenous variable, and thus it concentrates on exploring and identifying the impacts of geopolitical tension on various financial indices and economic sectors. Recently, a couple of empirical studies inspected the geopolitical risk determinants. In a recent study, Sweidan (2023f) investigated if the US major macroeconomic indicators affect international geopolitical risk. He found that the results from the influence of the US macroeconomic variables on international geopolitical risk were statistically significant. Likewise, Lee *et al.* (2022) examined the association among geopolitical uncertainties, oil shocks, and green bond returns. They noted that an unexpected positive adjustment in oil prices increases geopolitical risks. Moreover, Faruk *et al.* (2022) investigated the cross-countries' pairwise transmission of international geopolitical risk. They employed Diebold and Yilmaz (2012) spillover mode on a sample of 19 countries during January 1985 to December 2016. They found a substantial amount of pairwise geopolitical transmission across their sample. The overflow can be explained by fiscal imbalance, geographical closeness, bilateral trade, geographical sizes, debt burdens, and economic size. Likewise, Sweidan (2023b) concluded that geopolitical risks have a spillover effect, extending beyond national borders between nations.

Accordingly, this study aims to explain the fluctuations in China's historical geopolitical risk. Based on our knowledge, there is no literature on whether crude oil production influences geopolitical risk either for China or any other country worldwide. China is the world's second-largest economy and can easily compete with other advanced economies despite having a different economic mind set (Sweidan, 2021b). Moreover, China is the largest primary energy consumer in the world. It consumes around 26.5% of the world's primary energy compared with 15.6% for the US in 2021 (The British Petroleum Report, 2022). The unstable international oil market in terms of quantity and prices may be a significant factor towards justifying China's geopolitical tension. For this reason, the specific goal of the current study is to investigate if crude oil production of the five major exporters to China affects China's historical geopolitical risk. Alternatively, it seeks to measure response of China's historical geopolitical risk to the quantity of crude oil production in the market. Hence, this study adds to the existing literature by addressing this void and answering the research question at hand. Undoubtedly, crude oil is a significant source of national economic development and a vital tool that fuels geopolitical tension among nations. Therefore, many studies, (Bigerna *et al.*, 2021; Wang *et al.*, 2021, Pan *et al.*, 2017, Krishnan, 2016) warned that crude oil supply interruption severely harms the energy security and economic growth of a nation. In the same vein, many other studies, (Yang *et al.*, 2022; Mohsin *et al.*, 2018) proposed to set up a strategic petroleum reserve as a valuable and efficient tool against the adverse effects caused when crude oil distribution gets disrupted.

In sum, the motivation behind this study involves three important factors. First, there is not much empirical research which can help to understand the geopolitical risk involved. Further, literature lacks evidence on the nexus between crude oil production and geopolitical risk. Therefore, this study aims to fill this gap, by focusing on China as it is one of the largest economies in the world. We seek evidence on whether crude oil production explains the fluctuations in China's historical geopolitical risk. As far as our knowledge goes, this study is the first to investigate such a link. An investigation of this connection contributes and highlights the need for the tools to lower geopolitical risk and improves economic coordination. Besides, it calls attention to the other sources of energy, such as renewable energy. Second, China is the world's second-largest economic system, and it experiences a severe rivalry from the Western economies, mainly the US. Third, the quantity of crude oil in the market could be a tool to pressure Chinese economy. The intervention in the international crude oil market by altering the amount of oil and price may impact international geopolitical risk significantly. The oil and gas prices are crucial elements in distributing resources and accomplishing balance inside one country and among all nations. Besides, it is a powerful source signaling the cost of production.

The rest of this research is organized as follows. Section 2 presents the relevant literature review on the topic and the paper's theoretical framework. Section 3 introduces the data and methodology of the current study. Section 4 shows the empirical results and analysis. Conclusions and policy implications are presented in Section 5.

2. Literature review and theoretical framework

During the past four years, a large number of empirical studies examined the effect of geopolitical risk on several economic variables and sectors. It was stimulated by the geopolitical risk index constructed by Caldara and Iacoviello (2022) and the earlier versions of their study. For example, these empirical works include but are not limited to: bank stability (Phan *et al.*, 2022), the energy sector (Sweidan, 2021a, Liu *et al.*, 2023), environmental degradation (Riti *et al.*, 2022), tourism sector (Hailemariam and Ivanovski, 2021), oil price volatility (Qian *et al.*, 2022), income inequality (Sweidan 2023c,d), exchange rate (Duan et al., 2021), stock market (Abbass *et al.*, 2022), natural resources rents (Sweidan and Elbargathi, 2022), commodity markets (Gong and Xu, 2020), economic fluctuations (Akadiri *et al.*, 2020), government investment (Bilgin *et al.*, 2020), green finance development (Dong *et al.*, 2023), military expenditures (Sweidan, 2023e) and Trade flows (Gupta *et al.,* 2019). These empirical studies proved that geopolitical risk does not always have permanent adverse effects. It can stimulate and enhance some economic sectors, such as renewable energy and energy returns. On the other hand, many studies confirmed that geopolitical risk could weaken other sectors, such as tourism, trade flows, and stock markets. Hence, it is vital to have an in-depth understanding of geopolitical risk, focus on the geopolitical risk determinants, and recognize the factors that can explain this significant international variable. As stated above, few studies have explored the factors affecting geopolitical risk.

Recently, in his empirical model, Sweidan (2023f) examined the effect of US major macroeconomic indicators on the international geopolitical risk. He noted that four factors can influence the international geopolitical risk. Two of those factors are quantitative indices (the US economic growth and unemployment rate)[2], and the other two variables are price indices (crude oil prices and trade-weighted US dollar index)[3]. All these quantitative and price indices are under the control of the US policymakers and external powers. Therefore, in accordance, the current research develops the empirical model of the current study. Similarly, this work's theoretical model presumes that the Chinese historical geopolitical risk ($GPRHC_t$) can be affected by five independent variables. These factors are exogenous to the Chinese economy, and thus they are not controlled by the Chinese government. The first two core explanatory variables are the crude oil production share ($OILPS_t$) of the major exporters to China, Saudi Arabia, Russia, Iraq, Oman, and Angola, and the crude oil price (OP_t). These five countries are among China's largest crude oil exporters (Chen *et al.,* 2020). Besides, they produce around 24.9% of the world's crude oil.

The crude oil market is highly sensitive to the disagreements among nations, mainly the crude oil producing countries. For instance, in March/April 2020, the geopolitical tension between Saudi Arabia and Russia got inflated because of the dispute between the oil prices and production cut during the meetings of the Organization of the Petroleum Exporting Countries and Russia (OPEC) (Issaev and Kozhanov, 2021). Undoubtedly, these discrepancies generated an unstable crude oil market, and China was severely affected. Within this context, Wang *et al.* (2021) recommended that China should adopt varied strategies such as equity acquisition and oil field investment, to guarantee a stable crude oil supply. Besides, China should establish a permanent friendly relationship with oil-exporting countries.

[2] Economic growth is measured by the change in the logarithm of real income *per capita*.
[3] Crude oil prices of West Texas Intermediate.

Those two independent variables ($OILPS_t$ and OP_t) illustrate how $GPRHC_t$ reacts to their movements, the investigation of which is the main objective of the current study. Technically, it assumes that a decrease in the supply of crude oil production increases oil prices, and therefore, the cost of producing goods and services. This in turn, raises the cost of living and lowers the competitiveness of the Chinese economy. Besides, this cut in crude oil production triggers the geopolitical tension or uncertainty for China. Alternatively, this theoretical analysis may involve a large flow of crude oil into China at a reasonable price reducing the production cost and increasing competitiveness of the Chinese economy. In this context, the expected effect of crude oil production on $GPRHC_t$ is negative, while the opposite is positive. The response of oil prices to the change in crude oil production plays a significant role in shaping the link between crude oil production and $GPRHC_t$. The above-mentioned analysis assumes an increase in crude oil production and thus reduces oil prices. However, the crude oil market is unstable and vulnerable to simultaneous shocks from the demand and supply sides. In such a case, the anticipated influence of crude oil production on $GPRHC_t$ might turn out to be positive. Alternately, if the increase in crude oil production is unable to satisfy the market and cut crude oil prices, then this might increase geopolitical tensions.

For the other three independent variables, the current work assumes that $GPRHC_t$ relies heavily on the competitiveness of the US and China's economies. Thus, these three variables contribute and support this critical assumption. These three explanatory variables include the US economic growth ($GWUS_t$), the competitiveness of the US and Chinese economies ($REERUS_t$ and $REERCH_t$). This study presumes that improvements in the performance of US economy either measured by its economic growth or its competitiveness will reduce the race between China and the US, and thus, decrease the level of $GPRHC_t$. It means that China will not retaliate by generating geopolitical tension when the US economy achieves progress and dominate the world economy. An increase in the competitiveness of the Chinese economy is expected to reduce the $GPRHC_t$. This research also assumes that China has a partial control on its competitiveness.

The US international hegemonic strategy for the 21st century is designed to intervene in the global crude oil and gas and foreign exchange markets. It will reallocate the income among nations. This redistribution impact will benefit some nations and harm others. Therefore, it is expected to give rise to geopolitical tensions and conflicts (Iseri, 2009). In the same vein, the Brazilian Minister for Finance, Mr. Guido Mantega, alerted the world from launching a currency war in order to tune the nations' competitiveness. He clearly said:

"We're in the midst of an international currency war, a general weakening of currency. This threatens us because it takes away our competitiveness"[4].

He pointed to several government interventions in the foreign exchange market following the 2008 financial crisis, in order to weaken their currencies and enhance export competitiveness. His statement is a significant evidence to how government interventions in the international markets boost international geopolitical tension. Likewise, Triggs and McKibbin (2021) and Thornton and di Tommaso (2018) empirically demonstrated the validity of the currency war hypothesis. Further, Blanchard (2017) stated that the advanced economies' monetary policies, i.e., the US and European Union, have had substantial spillover effects on the emerging market economies. The exchange rate fluctuations will affect the competitiveness of these nations.

3. DATA AND METHODOLOGY

3.1 Data

The general functional form of the current study's empirical model is as follows:

$$GPRCH_t = F(OILPS_t, OP_t, GWUS_t, REERUS_t, REERCH_t\ ) \quad (1)$$

The $GPRCH_t$ is taken from Caldara and Iacoviello (2022). $OILPS_t$ is the share of the crude oil production of the five largest oil exporters to China (US Energy Information Administration (EIA))[5]. OP_t is measured by crude oil prices of West Texas Intermediate, and $GWUS_t$ is computed by the change in the US real gross domestic product *per capita* (Federal Reserve Bank of Saint Louis[6]). $REERUS_t\ and\ REERCH_t$ measure the real effective exchange of the US dollar and the Chinese Yuan, respectively (Darvas, 2012[7]). All the variables in this study are transformed by

[4] Financial Times, September 27, 2010, available at: https://www.ft.com/content/33ff9624-ca48-11df-a860-00144feab49a.

[5] https://www.eia.gov/.

[6] Available at https://www.stlouisfed.org.

[7] $REER_t = \frac{NEER_t * CPI_t^{under\ study}}{CPI_t^{foreign}}$, where $REER_t$ is the real effective exchange rate of the country under study. $NEER_t$ represents the nominal effective exchange rate of the country under study. CPI_t is the consumer price index. A rise in $REER_t$ means an appreciation in the home currency against the basket of trading partners' currencies. An increase in a

using the natural logarithm. Table 1 displays the descriptive statistics and the correlation coefficients of the current study's data sample 1986q1-2022q1. The correlation coefficients among the independent variables are low or within the acceptable range. It is a good indicator that the data in the current study does not exhibit multicollinearity. Equation (1) can be written in a linear regression form as follows:

$$LnGPRCH_t = \alpha_0 + \alpha_1 LnOILPS_t + \alpha_2 LnOP_t + \alpha_3 LnGWUS_t + \alpha_4 LnREERUS_t + \alpha_5 LnREERCH_t + U_t \quad (2)$$

where $\alpha_0, \alpha_1, \alpha_2, \alpha_3, \alpha_4$, and α_5 are the model's coefficients, U_t is the white noise. Figure 1 presents China's historical geopolitical risk index during the period 1986: q1-2022: q1. It reveals that the index fluctuates constantly with a clear upward trend over the whole sample. It reflects the amount of geopolitical tension in China and the considerable rivalry on the international scene. Recall that the geopolitical risk index denotes the institutional uncertainty that arises because of economic disputes, wars, tensions, conflict, and military-like activities.

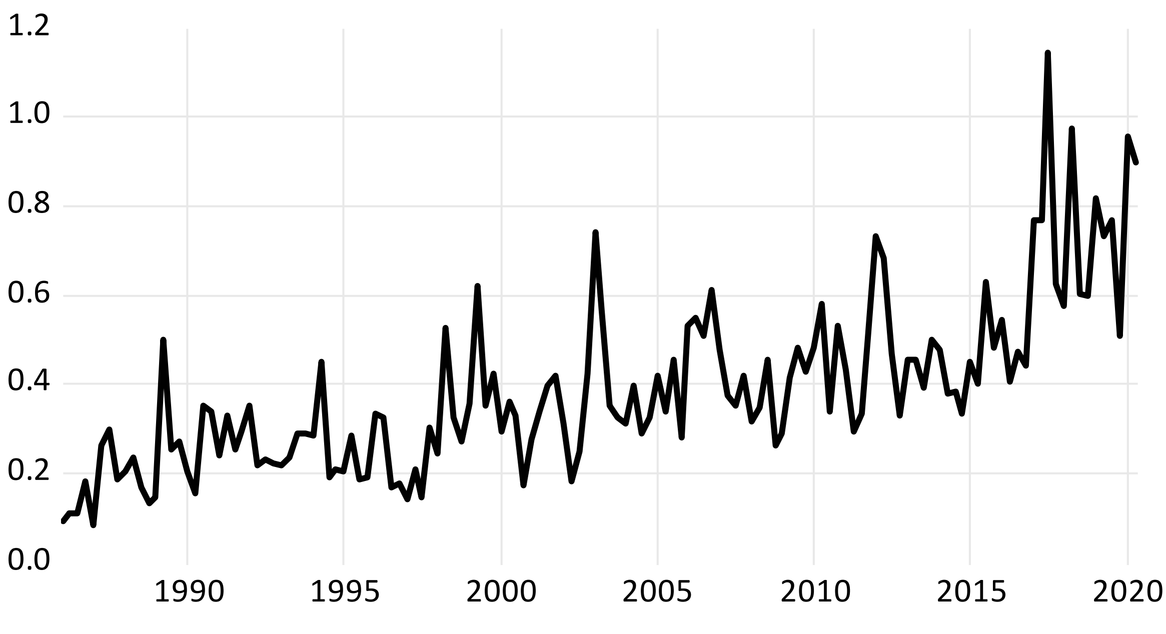
country's $REER_t$ implies that its exports are becoming more expensive and its imports are becoming cheaper. It is losing its trade competitiveness.

TABLE 1 - *The Descriptive Statistics and the Variables' Correlation Coefficients*

Panel A: Descriptive Statistics						
	$LnGPRCH_t$	$LnOILPS_t$	$LnOP_t$	$LnGWUS_t$	$LnREERUS_t$	$LnREERCH_t$
Mean	-1.040	3.279	3.602	0.389	4.702	4.689
S. Dev.	0.503	0.319	0.646	1.159	0.093	0.173
Min	-2.456	2.341	2.553	-9.410	4.538	4.2503
Max	0.204	3.566	4.820	7.231	4.886	4.988
Obs.	145	145	145	145	145	145
Panel B: Correlation Coefficients						
$LnGPRCH_t$	1.00					
$LnOILPS_t$	0.64	1.00				
$LnOP_t$	0.60	0.64	1.00			
$LnGWUS_t$	-0.08	-0.04	-0.06	1.00		
$LnREERUS_t$	0.37	0.22	0.02	-0.02	1.00	
$LnREERCH_t$	0.40	0.17	0.41	-0.03	0.56	1.00

Source: Author's calculations.

FIGURE 1 - *China Historical Geopolitical Risk Index during the Period 1986: Q1-2022: Q1*



Source: Caldara and Iacoviello (2022).

3.1.1 Structural Break Tests

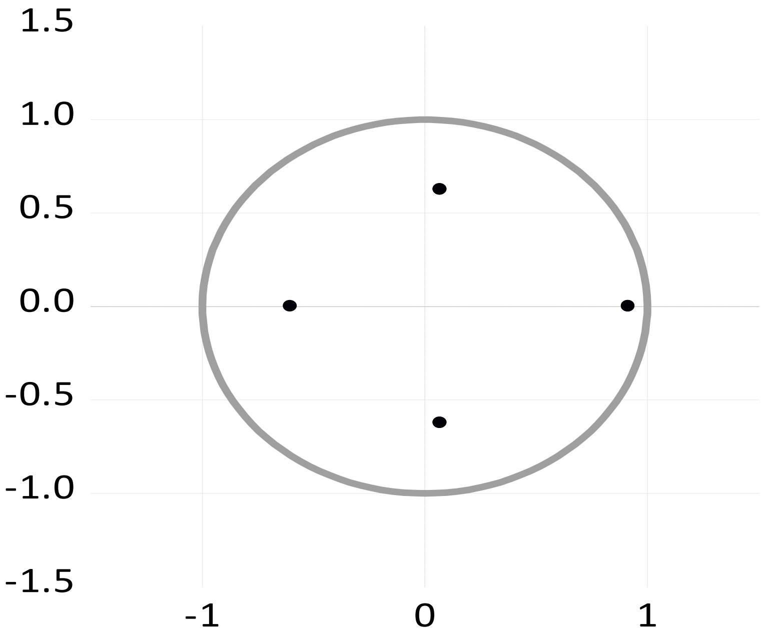
As stated above, Figure 1 includes the current study's dependent variable, $GPRCH_t$. It has an upward trend, however, with sharp swings. This behavior motivated us to test the existence of structural breaks of the dependent variable used in this study. Consequently, this study estimates a vector autoregressive (AR) model with four lags. Figure 2 illustrates that the AR roots specify that no root lies outside the unit circle. Hence, the AR model satisfies a stable condition. By proposing 16 lags, the results of the optimum lag length tests are mixed. The current research follows the recommendation of Akaike information criterion (AIC) and constructs an AR model with eight lags. The general form of the AR model is as:

$$LnGPRCH_t = \rho_0 + \rho_1 LnGPRCH_{t-1} + \rho_2 LnGPRCH_{t-2} \dots \dots + \rho_8 LnGPRCH_{t-8} + \nu_t \qquad (3)$$

Then, this work conducts five Multiple Break Point Tests (MBPTs)[8]. AIC recommends using 8 lags, the five MBPTs illustrate that $GPRCH_t$ has no structural breaks over the period 1986: q1–2022: q1. As a sample result of the five tests, Table 2 introduces the outcomes of the Bai-Perron test (L+1 breaks vs. global L), which confirms zero structural break in $GPRCH_t$.

[8] For more details refer to Bai and Perron (2003).

FIGURE 2 - *Inverse Roots of AR Characteristic Polynomial*



Source: Author's calculations.

TABLE 2 - *The Results of the Bai-Perron Test*
(L+1 breaks vs. global L)

Sequential F-statistic determined breaks:	0		
Significant F-statistic largest breaks:	0		
Break Test	F-statistic	Scaled F-statistic	Critical Value**
0 vs. 1*	1.544	13.893	25.65
1 vs. 2	1.981	17.831	27.66
2 vs. 3	1.620	14.583	28.91
3 vs. 4	1.173	10.561	29.67
4 vs. 5	0.982	8.840	30.52

Estimated break dates:
1: 2017Q1
2: 1998Q2, 2017Q1
3: 1998Q2, 2006Q1, 2017Q1
4: 1998Q2, 2006Q1, 2011Q4, 2017Q1
5: 1993Q1, 1998Q2, 2006Q1, 2011Q4, 2017Q1

* Significant at the 0.05 level.
** Bai and Perron (2003) critical values.
Source: Author's calculations.

3.1.2 Unit Root Tests

The current study uses the bounds testing approach to cointegration, to approximate the parameters of the Autoregressive Distributed Lag (ARDL) model. It can employ variables with different integration orders. It is appropriate if the variables are integrated of an order zero (I(0)) or integrated of an order one (I(1)) or group them, but not integrated of order two (I(2)). For this reason, it is a crucial step to examine the stationarity of the sample variables. This study computes the Augmented Dickey-Fuller (1981) (ADF) and Phillips-Perron (1988) (PP) unit root test. Each test is estimated by its standard version and with a structural break. The null hypothesis for these tests state that the series has a unit root. Table 3 reports the results of the four tests and illustrates that the sample data is stationary either at the level or at the first difference. Hence, the ARDL approach is appropriate for evaluating the current data and calculating its model's parameters.

TABLE 3 - *Unit Root Tests*

Data on the level				
	ADF	PP	ADF with break	PP with break
$LnGPRCH_t$	-8.743***	-8.627***	-9.101***	-9.101***
$LnOILPS_t$	-2.605	-2.546	17.170***	-13.811***
$LnOP_t$	-2.451	-2.614	-4.524	-4.524
$LnGWUS_t$	-13.777***	-13.811***	-24.319***	-14.191***
$LnREERUS_t$	-2.496	-2.471	-3.736	-3.376
$LnREERCH_t$	-3.003	-3.094	-5.347**	-3.342
Data with the first difference				
$LnGPRCH_t$	-	-	-	-
$LnOILPS_t$	-12.764***	-12.783***	-	-
$LnOP_t$	-10.580***	-10.523***	-11.662***	-9.533***
$LnGWUS_t$	-	-	-	-
$LnREERUS_t$	-9.649***	-9.655***	-10.490***	-10.482***
$LnREERCH_t$	-10.533***	-10.532***	-	-13.212***

A note: *** P < 0.01, and ** P < 0.05.
Source: Author's calculations.

3.2 Methodology

The present study applies the ARDL bound testing approach to cointegration analysis. It is a well-known methodology in economics and was proposed by Pesaran *et al.* (2001) to approximate the empirical model. This method examines if a long-run relationship among the model's variables is valid or not. If this long run relationship exists, it denotes that there is the presence of a shared stochastic trend among the variables and confirms a persistent correlation. Despite short-term oscillations, they tend to converge to this common trend over time, underscoring their interconnected nature. In such a case, short-run and long-run coefficients and the speed of adjustment or the error correction term (ECM_t) toward the long-run equilibrium will be computed. Those parameters are the primary tool for determining the link between the dependent and explanatory variables. Moreover, the ARDL approach works well on small sample data. The general specification form of the ARDL (p, q) is as follows:

$$Y_t = \alpha_0 + \sum_{k=1}^{p} \alpha_1 Y_{t-k} + \sum_{j=0}^{q} \alpha_2 X_{t-j} + \varepsilon_t \tag{4}$$

where Y_t represents the dependent variable, X_t denotes a group of explanatory variables, α_0, α_1, and α_2 are the model's evaluated parameters, ε_t is the random disturbance. Equation (2) can be re-written to adapt the ARDL model as shown in equation (4) and as follows:

$$\Delta lnGPRCH_t = \alpha_0 + \sum_{k=1}^{8} \alpha_1 \Delta lnGPRCH_{t-k} + \sum_{k=0}^{8} \alpha_2 \Delta lnOILPS_{t-k} + \sum_{k=0}^{8} \alpha_3 \Delta lnOP_{t-k} + \sum_{k=0}^{8} \alpha_4 \Delta lnGWUS_{t-k} + \sum_{k=0}^{8} \alpha_5 \Delta lnREERUS_{t-k} + \sum_{k=0}^{8} \alpha_6 \Delta LnREERCH_{t-k} + \beta_1 lnGPRCH_{t-1} + \beta_2 lnOILPS_{t-1} + \beta_3 lnOP_{t-1} + \beta_4 lnGWUS_{t-1} + \beta_5 lnREERUS_{t-1} + \beta_6 lnREERCH_{t-1} + \varepsilon_t \tag{5}$$

where Δ means the first difference estimation. The coefficients α_1 to α_6 are the short-run parameters in Equation (5), while the long-run coefficients are introduced by the coefficients β_2 and β_6 normalized by the parameter β_1. While computing Equation (5) coefficients, the current research sets a maximum of 8 lags and used the automatic selection option. After that, the econometrics package will choose the optimum lags that minimize AIC. To guarantee robust results, this study performs diagnostic and stability tests.

The current study conducts two methods to assure the existence of a cointegration relationship among the variables. First, this research computes and compares the upper and lower critical F-values of Pesaran *et al.* (2001). If the measured F-statistic is less than the lower bound critical values, the null hypothesis of no cointegration cannot be rejected. On the contrary, if the estimated F-statistic is higher than the upper bound critical values, the null hypothesis can be rejected, and the long-run relationship is confirmed among the model's variables. If the measured F-statistic is in-between the lower and upper bound critical values, then the outcome will be uncertain. Second, the ECM_t is computed and replaced by the long-run variables in equation (5). If the ECM_t parameter is statistically significant, negative, and less than one, then the long-run movement among the model's variables is affirmed.

4. Empirical results

After completing all the preliminary tests, the current study estimates the ARDL bound testing model to cointegration over the period 1986: q1-2022: q1. As explained above, this work applies the two methods to inspect if a cointegration relationship exists among the variables in this study.

The first method is presented in Table 4. It displays the results of the ARDL cointegration test or the F-test statistics. The computed F-statistic (10.297) is larger than the upper critical values by comparing those from Pesaran *et al.* (2001) and Narayan (2005) critical values[9]. Accordingly, the null hypothesis of no cointegration is rejected. The second method is reported in Table 5, the ECM_t is statistically significant, negative, and less than one. The data sample accomplished the two conditions of cointegration validity and thus the results assured the occurrence of a long-run relationship among the variables over the period 1986: q1-2022: q1.

[9] The upper and lower critical bound values generated by Narayan (2005) are relevant for a small sample, number of observations around 80. All the critical values are reported under Table 4.

TABLE 4 - *The ARDL Cointegration Test*

Cointegration hypothesis	F-Statistics
$LnGPRCH_t =$ F(Ln$OILPS_t, LnOP_t, LnGWUS_t, LnREERUS_t, LnREERCH_t$)	10.297^{***}

Notes: *** means significance at 1% level. The critical values of the upper bound by Pesaran *et al.* (2001) for a sample of 1000 observations are 3.73 and 4.15 at 2.5% and 1% significant levels, respectively, and by Narayan (2005) test for a sample of 80 observations are 3.606 and 4.587 at 5% and 1% significant levels, respectively.
Source: Author's calculations.

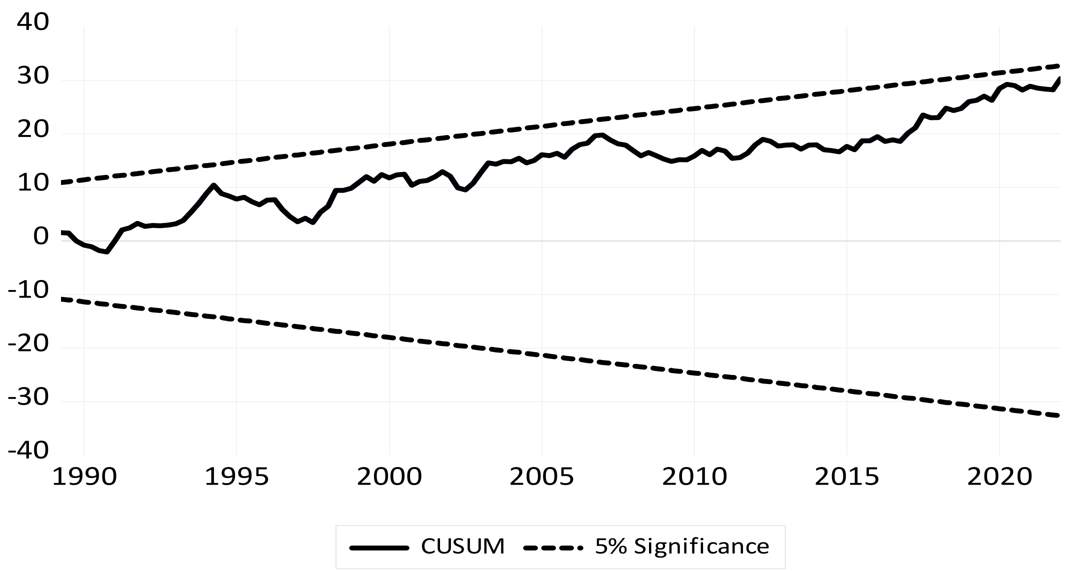
TABLE 5 - *The ARDL Model Estimation*

	Coefficients	Standard errors
A) Short-run parameters		
Constant	-12.237^{***}	2.095
$\Delta LnGPHCH_{t-1}$	-0.641^{***}	0.078
$\Delta LnOIPS_t$	0.904^{**}	0.427
$\Delta LnOIPS_{t-1}$	-0.747^{*}	0.418
$\Delta LnOP_t$	0.477^{**}	0.187
$\Delta LnGWUS_t$	-0.037	0.025
$\Delta LnREERUS_t$	0.988^{**}	0.414
$\Delta LnREERCH_t$	0.235	0.230
B) Long-run parameters		
$LnOILPS_{t-1}$	0.444^{**}	0.200
$LnOP_{t-1}$	0.233^{**}	0.109
$LnGWUS_{t-1}$	-0.105^{*}	0.058
$LnREERUS_{t-1}$	1.540^{**}	0.626
$LnREERCH_{t-1}$	0.367	0.359
ECM_{t-1}	-0.641^{***}	0.074
C) Diagnostics tests		**Probability**
$AdjR^2$	0.389	
Jarque-Bera	0.191	0.909
LM − Stat. (BG test), F (2, 130)	1.063	0.348
Heteroskedasticity (Harvey-test) F (10,132)	0.933	0.505
Heteroskedasticity (ARCH-test) F (1, 140)	2.195	0.141
Ramsey RESET (F-test), F (2, 130)	0.362	0.697
CUSUM	Stable	
CUCUMSQ	Stable	

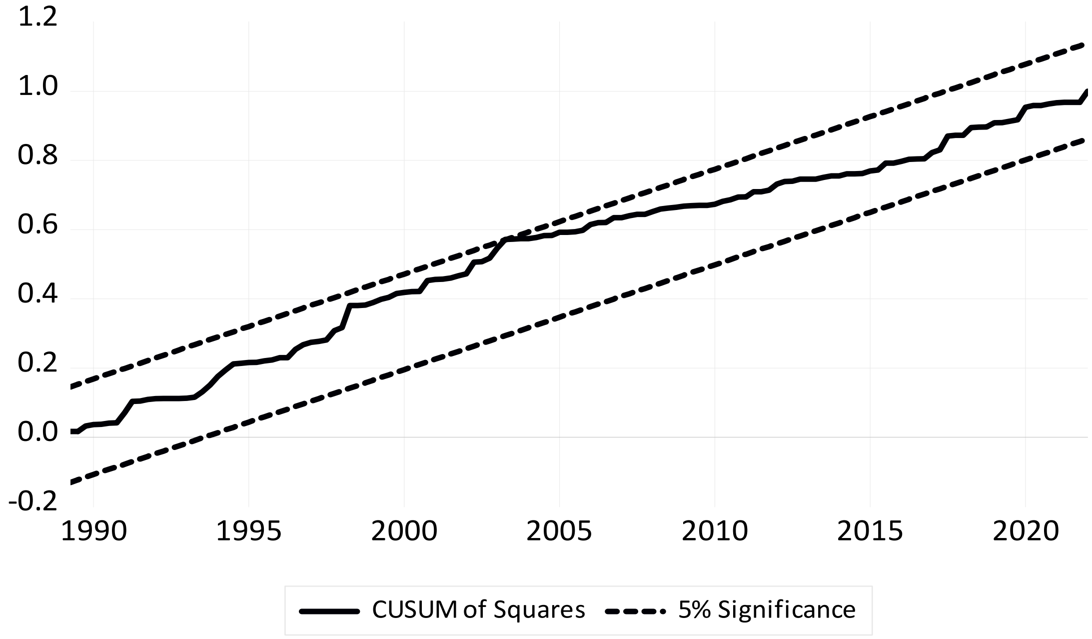
A Note: *** P < 0.01, ** P < 0.05, and *P < 0.10.
Source: Author's calculations.

While estimating the ARDL model's parameters and the cointegration test, this study imposes a maximum of 8 lags. Then, it documents the results in Table 5 within three panels: the short-run coefficients, the long-run parameters normalized by the lagged coefficient of the dependent variable ($LnGPRCH_{t-1}$), and the diagnostics and stability tests. In this study, the current research conductes diagnostic and stability tests to guarantee that the estimation process did not violate the assumptions of the classical linear regression such as autocorrelation and heteroskedasticity. These tests comprise the error terms normality, autocorrelation, white heteroscedasticity, autoregressive conditional heteroscedasticity, the model's functional form, and the parameters' stability. Figure 3 introduces the two stability tests[10]. Moreover, the computed correlation coefficients among the explanatory variables in Table 1 are low and within the acceptable range. Hence, it confirms that multicollinearity is not an issue in the current study. The diagnostic and stability tests prove that the assumptions of the classical linear regression model have been fulfilled.

FIGURE 3 - *The CUCUM and CUCUMSQ of the ARDL Model*



[10] Those two tests are the cumulative sum of the recursive residuals (CUSUM) and the cumulative sum of the squared recursive residuals (CUSUMSQ).



Source: Author's calculations.

In the short run, the findings show that the instantaneous effect of crude oil price on China's historical geopolitical risk is statistically significant and positive, the same effect continues in the long run. It is an expected conclusion, and it confirms the crucial role of oil prices in explaining China's historical geopolitical risk. This finding is consistent with that of Lee *et al.* (2022). However, crude oil production is a different story. This study finds that its immediate influence on China's historical geopolitical risk is statistically significant and positive, but the impact of one-quarter lag is statistically significant and negative. The short-run influence of crude oil production on China's historical geopolitical risk is swinging between positive and negative. The swing in the sign could reflect the instability of the crude oil market. The relationship between crude oil production and China's geopolitical risk prevails in the long run with a statistically significant and positive sign. This outcome contradicts with the current study's logical assumption, which states that a sufficient flow of crude oil to the economy of China will reduce the price of oil, relax the markets, and decrease geopolitical risk. Nevertheless, this finding says that this is not the case. From the above-mentioned two findings, it can be concluded that the crude oil market suffers from an unstable situation. This instability in the oil market due to various simultaneous shocks in the demand and supply undergoes a permanent decline in oil prices even when there is an increase in crude oil production, both in magnitude and duration. It seems the crude oil production is unable to push the oil prices to the threshold where the market is relaxed. The general rule to guarantee a decline in oil prices, due to an increase in oil production, is to push the market to a surplus status or close to this saturation standing. This is not always viable. With such an unstable crude oil market, crude oil production leads to a rise in China's geopolitical risk. This finding opens the channel for seeking alternative energy resources, i.e., renewable energy, as a significant tool to diminishing geopolitical tension.

Literature has many illustrations on the instability of the crude oil market. Olanipekun and Alola (2020) pointed to the instability in the crude oil market by stating that the shocks to crude oil supply are unavoidable. This disruption relies on many factors and can be classified under major titles, such as economic, political, environmental, and geopolitical factors. The best recent example of simultaneous severe shocks in the demand and supply of crude oil is the effect of the pandemic (COVID-19) and the end of constraints on production from OPEC producers and Russia (OPEC). Baumeister and Kilian (2016) explained the considerable increase in the oil price between mid-2003 and mid-2008 as the fact that crude oil producers could not satisfy the increase in oil demand during this period. These additional demand changes were linked to unforeseen global economic growth and were motivated by additional demand for oil from emerging Asia. Further, Baumeister and Kilian (2016) pointed to the additional demand driven by inventory demand in times of geopolitical tension in the Middle East. Evidence confirms that inventory demand tends to boost only when tight oil supplies coincide with anticipated strong demand for crude oil. Moreover, Kisswani *et al.* (2022) found that OPEC production decreases significantly for an upsurge in non-OPEC production in the short-run, while in the long-run, OPEC production rises with an increase in non-OPEC production. Therefore, the expected effect on the crude oil prices for an increase in oil production in the short and long run will not be the same and it could be in the opposite direction.

Further, the statistically significant negative parameter of ECM_t approves the existence of a long-run Granger causality from the explanatory variables to China's historical geopolitical risk. Moreover, the statistical significance of some short-run parameters confirms Granger causality relationship from the explanatory variables to China's historical geopolitical risk. As stated above, the ECM_t is calculated and substituted the long-run variables in equation (5). If the ECM_t parameter is statistically significant, negative, and less than one, then the long-run movement among the model's variables is acknowledged. The ECM_t multiplier has a relatively modest adjustment speed that reaches an average of 64 percent. It displays the rate at which errors from previous years are corrected in the current time.

Further, in the short run, the impact of the US economic competitiveness on China's historical geopolitical risk is statistically significant and positive. This means that when the US loses its competitiveness, China's geopolitical risk increases. In contrast, the effect of the US economic growth and China's economic competitiveness is statistically insignificant. These effects continue in the long run with some significant changes. The impact of China's economic competitiveness on China's historical geopolitical risk remains statistically insignificant. While the effect of the US economic competitiveness continues to have a significant and positive influence, the influence of the US economic growth became statistically significant and negative. These findings imply that the deterioration in the US economic competitiveness and growth will spill over to the Chinese economy in the form of rising geopolitical risk. It indicates that the existence of US as an economic power reduces China's geopolitical risk, but once the US economic dominance deteriorates, there will be a boost in China's geopolitical risk. In contrast, the weakness in China's economic competitiveness will not generate a similar outcome. This conclusion is consistent with the finding of Sweidan (2023f), who provided empirical evidence that the US, as a dominant country with economic and political powers, will be able to affect the international geopolitical risk. The empirical evidence can be viewed as a consequence of the US strategy to preserve its international hegemonic power. Literature has many analytical studies that confirm this trend when analyzing and concluding.

From an offensive realist theoretical approach, the US hegemonic power constantly searches for opportunities and circumstances to earn more power in order to gain more security for an apparently vague future. Using this kind of power US can maximize their chances to survive. Since the US is a hegemonic capitalist power and has the largest economy worldwide, its interest is to expand and control the international market for goods and services. Thus, deterring potential economic competitors, such as China, from playing a significant international role is necessary (Iseri, 2009). During the past twenty-five years, the US strategy of engaging China under its hegemony in the global economy relied on bargains and partnerships to change its domestic politics and foreign policies. Over time, China became the hub of the world's manufacturing economy. Besides, it also became the US indispensable bilateral economic partner. The current speed with which China is rising, might one day become a substitute for the US, or perhaps they could even lead the world together. Thus, over time, China has become a viable threat to US dominance and its global lead power (Mastanduno, 2019). Unquestionably, after World War II, the US established the current world order system that admitted world leadership to the American nation. During the past eight decades, the international economic development promoted a neo-liberal economy or globalization that includes free markets, deregulated forms of capitalism, and government intervention in the economy. These developments have two crucial outcomes. First, a high and rapid economic growth in Asia, mainly in China. Second, the US suffers from considerable income inequality and wage sluggishness. Thus, the American policymakers have a severe problem in combining their international active role with the contradictions and domestic costs created by this role (Stokes, 2018). The finding of the current study suggests that the China does not raise the rhythm of its geopolitical tension when the US economic power is valid. However, this status will change if this condition is relaxed.

5. Conclusions and policy implications

During the past four years, a large number of empirical works examined the influence of geopolitical risk on various economic variables and financial indicators. This group of interesting works is stimulated by the geopolitical risk index developed by Caldara and Iacoviello (2022) and the earlier versions of their study. The theme of the current research brings a new dimension and centers on exploring the geopolitical risk determinants. Specifically, it investigates if the crude oil production of the five major exporters to China influences China's historical geopolitical risk. Literature shows very limited empirical works on the geopolitical risk determinants, and this work claims, based on our knowledge, that it does not answer the question raised in the current study: does crude oil production affect China historical geopolitical risk?

This research work designed an econometric model that links crude oil production to China's historical geopolitical risk. Then, it used the ARDL approach for cointegration analysis to estimate the model's parameters. The results showed that the impact of crude oil production and oil prices on China's historical geopolitical risk is statistically significant and positive. It also proved that the crude oil production and oil prices Granger-cause China's historical geopolitical risk in the short and long run. Hence, the current paper concludes that the unstable oil market considers a significant source to explain the movements in China's historical geopolitical risk.

Further, the results illustrate that a slump in the US economic competitiveness and growth will lead to a rise in China's geopolitical risk.

From a policy implication perspective, analyzing the international scene tells that the world is witnessing the labors of a newborn world economic order. The main sign of reshaping the new global era is the rising of China as a new international economic polar. The current period is critical in history because geopolitical tension among nations is rising too. Significant portion of geopolitical tension among nations is related to competing for limited resources, mainly energy. The results of this study confirm the importance of energy to international stability. It assures that stabilizing the energy market and finding new sources of energy, such as renewable energy, will have a positive impact on geopolitical risk worldwide.

The international scene shows that different nations are in serious race to guarantee maximum gains. It implies that the economic weakness of a current dominant nation will boost international geopolitical risk worldwide. It is because a nation or group of countries will generate a new world order. Within this international rival environment, the economic variables, either quantitative or price indices, become a significant source or criteria of geopolitical risk among countries. The world is deeply connected and a severe shock to any part will spill over to the rest of the world in the shape of inflation, economic crisis, and recession. The recent consequences of the global supply chain crisis and the war in Ukraine are the best examples of significant adverse impacts on global economy. Hence, the current research confirms the importance of coordination, collaboration, and cooperation among world nations to resolve economic and political glitches. Undoubtedly, the international polarization and rising geopolitical tension among nations will worsen the international economic performance.

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