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Geopolitical risk, economic policy uncertainty, and bank stability in BRICS countries

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Abstract: Global tensions and uncertainty in economic policy can cause structural change and disruption in the volatile sector of the economy. This study investigates the effects of geopolitical risk on bank stability and the role of economic policy uncertainty in this relationship in BRICS countries. We use the panel VAR and the two-step System GMM estimation technique. The study uses bank-level data from 105 commercial banks during 2009–2021, totaling 1,365 observations. The empirical results revealed that increased geopolitical risk and economic policy uncertainty reduce bank stability once other traditional drivers are controlled for. We found that geopolitical events tend to adversely influence the stability of banks. The results also reveal that the interaction between economic policy uncertainty and geopolitical risk has a negative significant impact on bank stability. More importantly, our findings are robust and offer critical policy interventions and implications for managers, policymakers, and investors in emerging markets.

Subjects: Political Economy; Corporate Finance; Banking; Economics

Keywords: bank stability; geopolitical risk; economic policy uncertainty; panel VAR; GMM estimate

1. Introduction

Banks are closely tied to global financial markets and economies, which makes them highly susceptible to geopolitical risk (GPR). Disruptive events such as military conflicts, terrorist attacks, and major global crises all contribute to this GPR, increasing the likelihood of resources being misallocated. It plays a substantial role in influencing how the economy functions, which raises concerns about potential changes in market policies and the potential effects that these shifts may have on the future economic climate. Simply put, geopolitical risk can increase financial frictions and make the market vulnerable, which can have a negative impact on firm policy. Not only does geopolitical risk (GPR) affect the way countries trade with one another, but it also has an impact on a country's financial system, managerial investment choices, and the general state of its economy (Baur & Smales, 2020; Khoo & Cheung, 2021; Lee & Wang, 2021; Pan, 2019; Shen et al., 2021). There has been a lot of focus on emerging markets in recent years because of the technological limits brought on by bilateral conflicts. The question of whether GPR affects bank stability under economic policy uncertainty (EPU) in emerging nations is the subject of a few studies.

Geopolitical events have made the competition in markets more complicated and have wide-ranging impacts on regional economies, financial markets, individuals, and businesses (Cohen, 2003; Salleh & Yusoff, 2017). Policymakers and investors believe that GPR is a critical factor when

making investment decisions and plays a significant role in the dynamics of stock markets (Bouras et al., 2019; Brogaard & Detzel, 2015; Guo et al., 2018). The impact of GPR is particularly severe in regions where there are ongoing significant geopolitical shocks. However, from a managerial perspective, the unpredictability of the market environment makes business decisions like investing in new products and commercializing them fraught with uncertainty. On the one hand, financial institutions may choose to invest more resources and take on more risk, or they might decide to wait until the uncertainty subsides to avoid the risk of making the wrong investment. On the other hand, the classical theory of Knight (1921) asserts that uncertainty assists financial institutions in accessing investment opportunities and generating revenue through resource integration. Thus, uncertainty drives corporate profitability but may threaten bank stability.

Existing literature emphasizes diverse perspectives on the subject. While some studies have examined how Geopolitical Risk (GPR) impacts corporate innovation (Jia et al., 2022), stock markets dynamics (Caldara & Iacoviello, 2018), macroeconomy (Clance et al., 2019), and corporate decisions (Lee & Wang, 2021), there is a notable gap in research when it comes to understanding how GPR influences stability. Prior studies have investigated the influence of EPU on stability and GPR on stability individually such as Nguyen (2021) and Phan et al. (2022). This study, in contrast, explores the influence of GPR on the banking sector's stability and the interaction between GPR and EPU on bank stability conditions. However, unlike Shabir et al. (2023) who examine how economic and geopolitical uncertainties affect bank risk, the objectives of our study are quite distinct.

There has been a lot of focus on various measures of macro-uncertainty (e.g., political risk and macroeconomic risk) (Biswas & Zhai, 2021; Bordo et al., 2016). GPR presents a clear distinction from other indicators of macroeconomic uncertainty and can, consequently, alter bank stability. First, it records unique yet catastrophic events that may remain hidden for years (Guttentag & Herring, 1997). Second, it integrates both domestic and foreign issues, unlike other political instability indices that just consider domestic political issues (Alsagr & Almazor, 2020). Third, the complexity of and difficulty in forecasting geopolitical events, such as terrorist attacks, makes them more difficult to compare to other types of macroeconomic events (Dissanayake et al., 2020).

This study focuses on the BRICS economies, considering the increasing pertinence of geopolitical uncertainties within these countries in recent years. The BRICS countries have been instrumental in the growth and development of the global economy (Tian et al., 2020). Given the growing importance of emerging markets, the stakes have never been higher. The BRICS countries have grown swiftly and are now more economically interdependent with the industrialized world (Lowe, 2016). In terms of population (40%), GDP (25% nominal and US$ 16.039 trillion), land covering (30%), international trade (18%), and foreign exchange (US$ 4 trillion), they play a key role and contribute significantly to the global economy (Iqbal, 2022). Hence, the objective of this study is well defined in addressing the impact of GPR on stability under EPU.

There are still many critical questions that have yet to be addressed, such as: What is the nexus between geopolitical risk and bank stability? Does the interaction between EPU and GPR impact bank stability? Consequently, this study is geared toward answering these fundamental questions. To the best of our knowledge, this is the first study to examine the effects of GPR on bank stability and the joint interaction between EPU and GPR on bank stability in BRICS economies. We employ both the panel VAR model and the two-step System GMM technique. Unlike other studies, we use the Panel VAR model to improve the knowledge of the dynamic relationship between GPR, EPU, and stability. We then estimate the IRFs in a GMM framework. The result of the study reveals that geopolitical risk has a negative and significant impact on bank stability. In addition, the EPU significantly moderates the nexus between GPR and bank stability. The remaining sections of this study are organized as follows. In Section 2, we conduct a literature review. Section 3 describes the data and empirical methodology. Section 4 contains our findings and conclusions. The study concludes in Section 5.

2. Literature review

2.1. Geopolitical risk and bank stability

The increased interdependence of global economies has made countries more vulnerable to the challenges and disruptions that come with GPR. This underscores the idea that the impacts of GPR and EPU are pervasive and extend beyond national borders, affecting a wide range of countries and their economic conditions. Zhang et al. (2022) assert that the influence of GPR on stock market volatility is particularly more pronounced in emerging economies. Several factors contribute to this phenomenon. First, rising GPR, according to the literature, can make it difficult for market participants to make economic decisions (Salisu et al., 2022), resulting in delays in investment by firms and delays in consumption by investors (Bloom, 2009). Second, rising GPR may result in a reduction in global trade and investment, thereby driving up costs for businesses (Eckstein & Tsiddon, 2004). Third, a higher GPR tends to dissuade investors from engaging in riskier financial assets, amplifying stock market volatility. Furthermore, Clance et al. (2019) indicated that despite the inability of aggregate GPRs to predict specific economic outcomes, geopolitical acts increase the likelihood of future recessions.

GPR has been widely investigated from multiple perspectives in the literature. It has been the focus of several of this study to determine how GPR affects corporate' financing (Carney et al., 2020; Khoo & Cheung, 2021), investment (Caldara & Iacoviello, 2018), and cash holdings (Wang et al., 2021), acquisitions (Shen et al., 2021), and so on. However, a notable gap exists in understanding how GPR affects bank stability. Some strands of literature postulate that GPR reduces stability—arguing that an increase in market uncertainty raises panic in the financial market because it reduces the overall amount of available liquidity (Brunnermeier & Pedersen, 2009; Nagel, 2012). These studies suggest that increased uncertainty leads to higher risk premiums, prompting banks to withdraw substantial liquidity from the market. The consequence of this liquidity withdrawal is a reduction in lending expansion, which, in turn, hampers the overall business growth. Hence, limited studies have delved into the influence of GPR on bank stability from multiple countries perspective.

The unstable banking theory, proposed by Shleifer and Vishny (2010), posits that investors' confidence influences banks. Investors recognize the pivotal role of banks in making loans, refinancing, allocating resources, issuing new loans, maintaining cash reserves, and raising funds using their securities portfolios as collateral. In their view, bank credit fluctuates as loan prices fluctuate, and any source of investor sentiment variations can significantly affect bank stability. In addition, GPR has a detrimental impact on investor confidence, prompting a shift in portfolios towards safer assets and away from riskier investments. Banks are particularly susceptible to instability when confronted with GPR. This is because GPR can reduce bank credit growth, increase volatility in profits and likelihood of default (Zhou et al., 2020). Similarly, Phan et al. (2022) posit that GPR can weaken the stability of banks and increase their fragility.

Agoraki et al. (2022) investigated the link between GPR, uncertainty, and stock market performance. The study reveals that the effect of GPRs on market performance is negative. Meanwhile, Ma et al. (2022) examine the link between GPR and excess stock returns predictability. The study highlights that the geopolitical threats index is adept at forecasting stock returns, particularly during periods of economic growth. Notably, the research establishes the superior predictive capability of the GPR index over traditional macroeconomic indicators, showcasing robust performance across diverse investor preferences and investment portfolios.

2.2. Economic policy uncertainty and bank stability

The study by Bernanke (1983) provided one of the earliest theoretical frameworks for understanding uncertainty, proposing that organizations delay investments in projects with high levels of uncertainty since doing so would be too costly to undo. In other words, businesses prefer to be cautious and postpone investments during periods of high uncertainty. However, when there is less

uncertainty, businesses are more willing to invest to meet rising demand. Because of this, having a solid grasp of the consequences that EPU has for the banking industry is essential, as it offers a glimpse into the ways in which unpredictability regarding the economic policies of the government affects firms, consumers, and individuals. The most important transmission route that EPU uses to influence the functioning of the banking system is the pricing of loans and the supply of bank credit. According to Bordo et al. (2016), when faced with substantial EPU, banks usually respond by modifying interest rates and limiting the quantity of loans issued to borrowers. This results in a drop in the amount of credit that is available. As a result, uncertainty creates new friction in the financing process, which either makes economic stability more difficult to achieve or at least makes it less likely.

The literature suggests that EPU could have negative consequences for banks, including lowering their profits and pushing bank managers to pursue larger returns from riskier activities, potentially leading to increased financial instability. EPU prompts firms to delay investment decisions (Bloom, 2009; Boumparis et al., 2017; Francis et al., 2014; Gulen & Ion, 2016; Tiwari et al., 2020). This happens because long-term investment projects are especially costly to reverse, which allows firms to employ a "cautious approach" by waiting for additional information and then easing up on their plans in periods of high uncertainty. The study by Phan et al. (2021) provides evidence that EPU has a negative and statistically significant impact on financial stability. Moreover, their study highlights that the detrimental effect of economic policy uncertainty on financial stability is more pronounced in countries characterized by greater competition, lower regulatory capital, and smaller financial systems. Caglayan and Xu (2019) also provide significant evidence, demonstrating that uncertainty not only diminishes credit availability but also leads to a rise in non-performing loans and loan loss provisions in banks, thereby disrupting sectoral stability.

Furthermore, Nguyen (2021) found that EPU has been consistently linked to a sharp decrease in bank stability. The adverse effects of EPU on various economic activities such as output losses, government deficit, employment, financial stress, and the volatility of equity price, cash flow, and exchange rate can make banks increasingly fragile (Nasir, 2020; Tiwari et al., 2020). Moreover, it emphasizes the predictive power of elevated economic policy uncertainty in anticipating economic recessions, attributing the heightened likelihood of corporate failures to worsening economic conditions. In addition, Shabir et al. (2021) found that EPU decreases bank stability, but the effect varies across the bank and market structure, and it is significantly higher during financial crisis periods.

2.3. The interaction between economic policy uncertainty and geopolitical risk

The interactive dynamics of GPR and EPU is integral to the concept of an "uncertainty trinity," posited as a substantial negative force on the economy (Carney, 2016). This perspective is rooted in theoretical studies and has been highlighted as a substantial threat to the economic environment (Caldara & Iacoviello, 2018). These uncertainties, arising from shifts in government structures, legislative frameworks, foreign policies, and changes in military power, are considered potential catalysts for economic instability. Consequently, the correlation between GPR and EPU is deemed plausible, especially in the context of significant policy changes that can disproportionately contribute to heightened geopolitical uncertainty (Arif et al., 2020). Hence, the bidirectional link between EPU and GPR is emphasized, suggesting that each factor influences the other. This mutual influence is graphically represented in Figure 1, which illustrates the daily trends in GPR and the EPU index spanning from January 1985 to December 2020.

Furthermore, Shen and Hong (2023) proposed a connection between rising GPRs and EPU, highlighting the essential nature of the time-varying influence of EPU on GPR, along with the asymmetry of this effect in assessing the significance of EPU's fluctuation characteristics over the years. Thus, evaluating the impact of GPR on bank stability and the role of EPU in this nexus serves as a valuable tool for policymakers and regulators, enabling ongoing risk assessments and preparing for shocks in vulnerable sectors of the economy.

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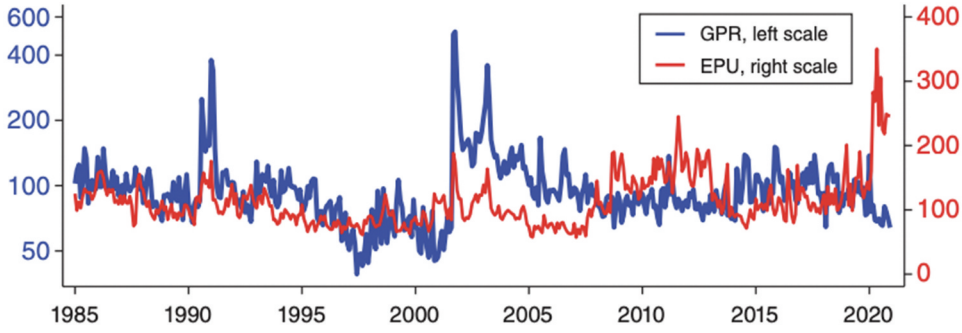

Figure 1. Comparison of the GPR index (plotted on a log scale) with the economic policy uncertainty (EPU) index constructed by Baker et al. (2016).

The structural changes in the economic policy of countries have always been a grave concern for policymakers. It is perceived that the economic and financial system upheavals in one country can easily be transmitted to other countries. The study by Arif et al. (2020) emphasized the link between EPU and GPR, highlighting the potential repercussions on stability and asset prices in many ways. First, when global financial shocks induce uncertainty, decision-making processes for firms and investors witness delays, causing ripple effects across various economic activities. Second, the uncertainty stemming from such shocks escalates production and financing costs, impacting both demand and supply channels and leading to disinvestments and economic contraction. Lastly, heightened uncertainty accentuates the risks linked to financial market investments, influencing asset prices.

3. Methodology

3.1. Data and variables

The study addresses the effect of GPR on bank stability under EPU. We employ data from a sample of banks covering the period from 2009 to 2021, specifically concentrating on normal economic conditions within the BRICS countries. Therefore, this study excludes data from the global financial crisis, allowing for a focused investigation into the specified time frame. The dataset utilized for this study comprises 1365 observations across 105 commercial banks in the BRICS countries, as detailed in Table 1. To ensure a robust and relevant sample, certain selection criteria were applied. Firstly, the banks considered are conventional banks. Secondly, the dataset includes complete financial statements spanning the years 2009 to 2021. Thirdly, only those banks with sufficient information were chosen to estimate a dynamic model. The sample selection criteria include (1) a conventional bank, (2) complete financial statements from 2009 to 2021, and (3) the bank's financial statements containing the necessary information to construct research variables.

Transparency in research is crucial. This study has clearly stated the criteria for selection (inclusion and exclusion) of samples, making it easier to identify and understand potential survivorship bias. The study has carefully presented the data by considering the financial data on financial institutions with sufficient information. We employ the most up-to-date information from each year to provide data on banks exclusively for that year. This shows an awareness of the potential limitations and the implications of this bias on the generalizability of the findings. However, our study argues that this survivorship bias is not

Table 1. The structure of panel data by country

	Brazil	Russia	India	China	South Africa	Obs. by years
No. of banks (2009–2021)	17	14	30	33	11	105
Total no. of obs.	221	182	390	429	143	1365

expected to significantly impact the critical results of our analysis for fewer reasons. First, our study also utilized country-level and macroeconomic data. Second, since the time period under consideration is relatively short, and the survivorship bias is consistent throughout, the impact on results might be minimized. Third, the dynamic model employed is robust and can mitigate the bias to some extent, suggesting that the results might be less susceptible to the impact of survivorship bias (Dargenidou et al., 2014; DeFond & Subramanyam, 1998; Wang & Li, 2018).

Furthermore, studies have argued that China and India play pivotal roles as leading contributors to global economic growth, representing substantial shares of the global GDP at 18.5% and 9.3%, respectively. India especially has been a significant driver, contributing over 14% to the total global economic growth, ranking second only to China between the years 2012 and 2022. Therefore, recognizing the unique economic positions of these two countries, the study adopts a constructed approach by dividing the sample into two panels of countries: Panel A, comprising China and India, and Panel B, encompassing the remaining BRICS countries. This segmentation aims to discern and analyze the differential impacts of geopolitical risk and policy uncertainty between these two distinct groups within the BRICS consortium.

The study employs the Geopolitical Risk (GPR) index variable developed by Caldara and Iacoviello in 2018, considering it as the primary independent variable. GPR indexes, well established in numerous research, have proven to be a reliable predictor of geopolitical instability. In addition, they offer reliable time-varying records of every country's GPR in the study. Therefore, to estimate the annual GPR, the study takes the average of the GPR for each month within a fiscal year, following the methodology suggested by Le and Phuong (2021) (Le & Phuong, 2021). The widely accepted EPU index constructed by Baker et al. (2016) is extracted from www.policyuncertainty.com to measure EPU. This index is instrumental in measuring EPU and is derived from newspaper inputs associated with economic policymaking and public perceptions of economic policy. Importantly, the EPU index serves as an interactive variable in the analysis, aiming to detect whether it amplifies or triggers the effect of GPR on bank stability. This approach considers both GPR and EPU as key variables, acknowledging their interplay and potential combined influence on the stability of banks.

Z-scores are employed as a metric to assess the stability of the banking sector. These scores provide insights into the likelihood of a bank facing bankruptcy, particularly when its levels of debt surpass its assets. The use of Z-scores offers an indication of the financial health and risk profile of a bank, and it is a valuable tool for gauging the potential vulnerability of a bank based on its capital structure and financial ratios. Generally, higher Z-scores are interpreted as indicating greater financial stability and a lower likelihood of bankruptcy, while lower scores may raise concerns about the financial health and risk exposure of the bank (Bakhouche et al., 2022; Nguyen & Le, 2022; Wang & Luo, 2022). It can be calculated as follows:

$$Z - score = \frac{ROA + CA}{\sigma ROA} \tag{1}$$

Where *ROA* denotes return on assets, *CA* represents the equity-to-assets ratio, and σROA indicates the standard deviation of *ROA*.

3.2. The panel VAR methodology

The PVAR method simultaneously treats all variables as endogenous (Canova & Ciccarelli, 2013), allowing endogenous interaction among variables. It is a powerful tool employed to address the transmission of shocks across borders and capture both static and dynamic interdependencies. This methodology provides a robust estimate by taking into account the cross-sectional dimension of our sample.

Formally, the PVAR model is illustrated in the equation below:

$$y_{i,t} = A_0 + A(L)y_{i,t} + f_i + \varepsilon_{i,t'} i = [1, \ldots .N]; t = [2009, \ldots ., 2021] \quad (2)$$

Hence, we rewrite equation (2) with the variables:

$$Bank\_Stability_{i,t} = \alpha_0 + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + \sum_j^p \beta_j GPR_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (3a)$$

$$GPR_{i,t} = \alpha_0 + \sum_j^p \beta_j GPR_{i,t-j} + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (3b)$$

$$Bank\_Stability_{i,t} = \alpha_0 + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + \sum_j^p \beta_j GPR_{i,t-j} + \sum_j^p \beta_j EPU_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (4a)$$

$$GPR_{i,t} = \alpha_0 + \sum_j^p \beta_j GPR_{i,t-j} + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + \sum_j^p \beta_j EPU_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (4b)$$

$$EPU_{i,t} = \alpha_0 + \sum_j^p \beta_j EPU_{i,t-j} + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + \sum_j^p \beta_j GPR_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (4c)$$

$$Bank\_Stability_{i,t} = \alpha_0 + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + \sum_j^p \beta_j GPREPU_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (5a)$$

$$GPREPU_{i,t} = \alpha_0 + \sum_j^p \beta_j GPREPU_{i,t-j} + \sum_j^p \beta_j Bank\_Stability_{i,t-j} + f_i + \varepsilon_{i,t'} \quad (5b)$$

3.3. Descriptive statistics

Table 2 presents descriptive statistics for all research variables. The stability has a mean value of 1.46, with the minimum and maximum values at −2.8084 and 5.3487, respectively. GPR has an

Table 2. Descriptive statistics of variables

Variable	Mean	Std Dev.	Min.	Max.
Stability	1.4687	0.8748	−2.8084	5.3487
GPR	6.9375	0.4550	5.5932	7.6169
EPU	6.8334	2.1293	−0.5256	9.1593
LEV	0.0928	0.0788	−0.8571	0.9836
ROA	0.1015	0.0727	−0.1468	1.1120
CAP INV	0.5760	4.2087	−6.05	78.66
INT	0.5974	0.1468	0.2154	0.9556
SIZE	0.1986	0.0235	0.0152	0.2438
GDP	0.4921	0.3660	−0.7799	1.4169
INFL	2.0910	1.1459	−0.7281	5.5538
POL	−0.6186	0.3958	−1.3555	0.1636
RQ	−0.2163	0.2392	−0.5599	0.4491

Note: Author's computation.

average value of 6.9375, with minimum and maximum values at 5.5932 and 7.6169, respectively. Furthermore, the EPU has a mean value of 6.8334 during the period. EPU has the minimum and maximum values at −0.5256 and 9,1593, respectively. In the same way, other control variables also demonstrate significant deviation around the sample means.

4. Discussion of panel VAR

Panel vector autoregression (PVAR) is used because it integrates both panel VAR and GMM estimation into the model (Abrigo & Love, 2015). The panel VAR is instrumental in addressing endogeneity concerns, providing a robust estimate for the model. We also exclude the control variables to analyze variations in bank stability through the effect of GPR under EPU. The study employs a panel unit root test to efficiently assess the stationary and stochastic characteristics of the variables (stability, GPR, and EPU) and determine their order of integration. The results, presented in Table 3, indicate that the variables are stationary at the level.

Furthermore, a cointegration test is conducted, and the results, as shown in Table 4, support the alternative hypothesis that stability, GPR, and EPU are cointegrated, suggesting a long-term relationship among them. To ensure the stability of the panel VAR model, eigenvalue stability and likelihood-based criteria are performed, following the approach outlined by Andrews and Lu (2001). The stability criterion is satisfied, as depicted in Figure 2, indicating that the eigenvalue comfortably resides within the unit circle. This confirms the stability of the panel VAR model used in the study.

4.1. Panel VAR estimation

The panel VAR result in Table 5 for Panel A and Panel B reveals a negative link between GPR and bank stability in BRICS countries. The empirical results show that GPR and bank stability influence each other. The coefficient of stability reveals that a reduction in GPR will improve the stability of banks by 6.3% and 10.9%, respectively. The finding is consistent with (Phan et al., 2022) and confirms the adverse effect of GPR on the stability of banks. The implication is that rising GPR reduces the creation of credit, potential investment, and economic activities, adversely influencing the financial system's stability. The seemingly interconnected world has made understanding geopolitical risks and economic policy uncertainties increasingly significant. This uncertainty has enormous implications and asymmetric policy response. Therefore, it is crucial to consider the asymmetric influence of the GPR on economic and financial systems, such as financial stability and macroeconomics (Al-Thaqeb & Algharabali, 2019). Studies argue that the objective of any financial institution is to ensure stability in times of uncertainty. Thus, they might reduce investments in

Table 3. Fisher-type unit-root test

	P	Z	L*	Pm
Stability	1335.4328***	−14.3794***	−31.1617***	54.9155***
GPR	381.9238***	−2.8362***	−4.6631***	8.3890***
EPU	394.9318***	−9.4499***	−9.1128***	9.0237***

Note: *** indicates significant at a 1% level.

Table 4. Pedroni test for cointegration

	Modified Phillips–Perron t	Phillips–Perron t	Augmented Dickey–Fuller t
Stability, GPR	−8.0243***	−11.9913***	−10.7363***
Stability, EPU	−5.4905***	−13.745***	−13.336***
GPR, EPU	−3.7479***	−8.5791***	−18.6448***

Note: *** indicates significant at a 1% level.

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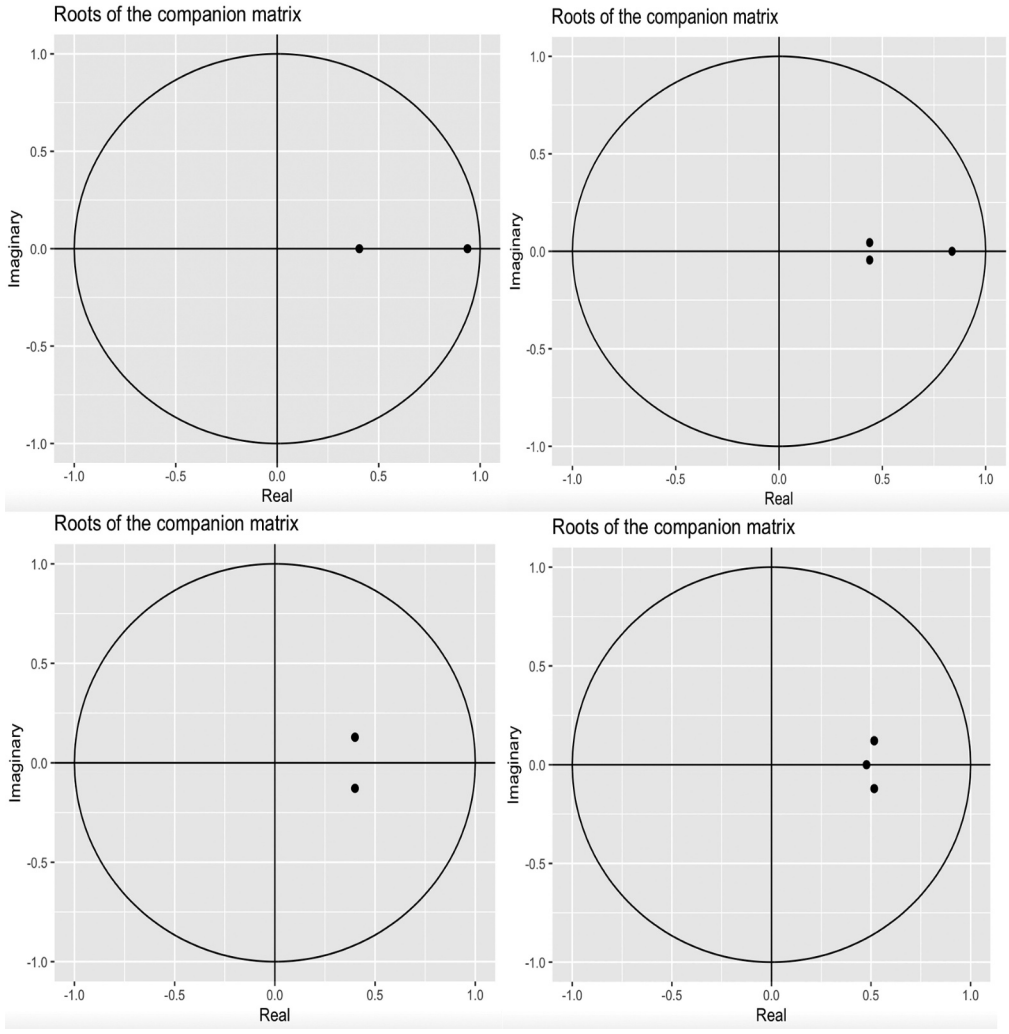
Figure 2. Graph of the eigenvalue (stability - GPR, stability – GPR - EPU).



production and capital formation, which would influence the final output and could cause a shock in demand. Baker et al. (2016) posit that the world has faced more and increasing uncertainties since the financial crisis of 2008, some of which include the unpredictability of currency, taxation, and monetary policy. The study also highlights that uncertainty disrupts the possibility of economic recovery.

Furthermore, forecast-error variance decomposition (FEVD) proposed by Abrigo and Love (2015) was used to estimate the impulse response functions (IRF). Using a fitted model and 1000 Monte Carlo simulations, the IRF confidence interval was computed. The result reveals the response of bank stability to shocks from GPR. The result suggests that GPR significantly influences bank stability. The IRFs show that a positive shock to stability triggers a negative response from GPR, while a positive shock to GPR triggers a negative response from stability, as shown in Figures 3 and 4. These results are in line with some previous studies (Phan et al., 2022; Shabir et al., 2023; Chi & Li, 2017; Phan, Iyke, et al., 2021). The IRF plot shows that a positive shock to GPR leads to a lower level of stability of banks—suggesting that GPR creates a negative downward slope but a significant effect on bank stability.

In addition, we include the EPU index in the model to determine any changes in GPR's effect on banks' stability. Studies argued that GPR and policy uncertainty are linked and increase financial

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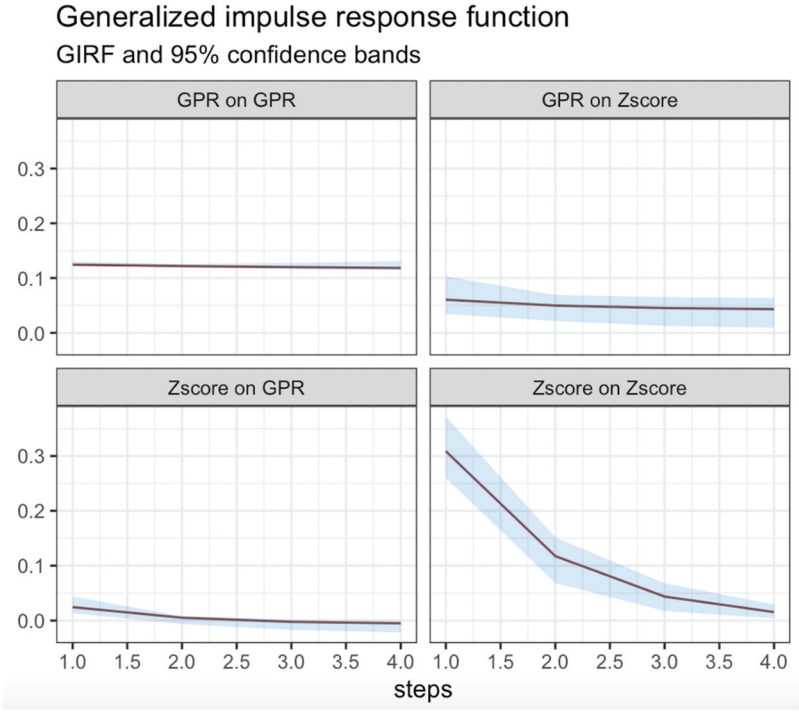
Table 5. Estimation result of the PVAR models: stability

		Coeff.	Std. Err.	z	*P* > z
Panel A					
Stability					
	Stability L1.	0.3627	0.0806	6.42	0.000***
	GPR L1.	−0.0633	0.0242	−3.79	0.000***
GPR					
	Stability L1.	−0.2236	0.0860	−4.87	0.000***
	GPR L1.	1.0104	0.0142	5.68	0.000***
Panel B					
Stability					
	Stability L1.	0.4619	0.1578	7.43	0.000***
	GPR L1.	−0.1095	0.0407	−4.72	0.000***
GPR					
	Stability L1.	−0.1860	0.0921	−5.23	0.000***
	GPR L1.	0.3378	0.0581	12.67	0.000***

Note: PVAR-GMM Estimation.

Figure 3. IRF of stability, GPR for panel A.



volatility, which disrupts banks' investment activities and exacerbates financial frictions (Khoo & Cheung, 2021). Our findings show that the response of bank stability to shocks from GPR significantly increases when EPU is introduced (see Figures 5 and 6). The result for Panel A and B also indicates that the response of GPR to shocks from EPU increases, which creates a positive upward slope. This implies that EPU significantly increases the effect of GPR. The study by Gholipour (2019); Lee et al. (2017) argued that GPR and EPU are the most important factors influencing investment

Figure 4. IRF of stability, GPR for panel B.

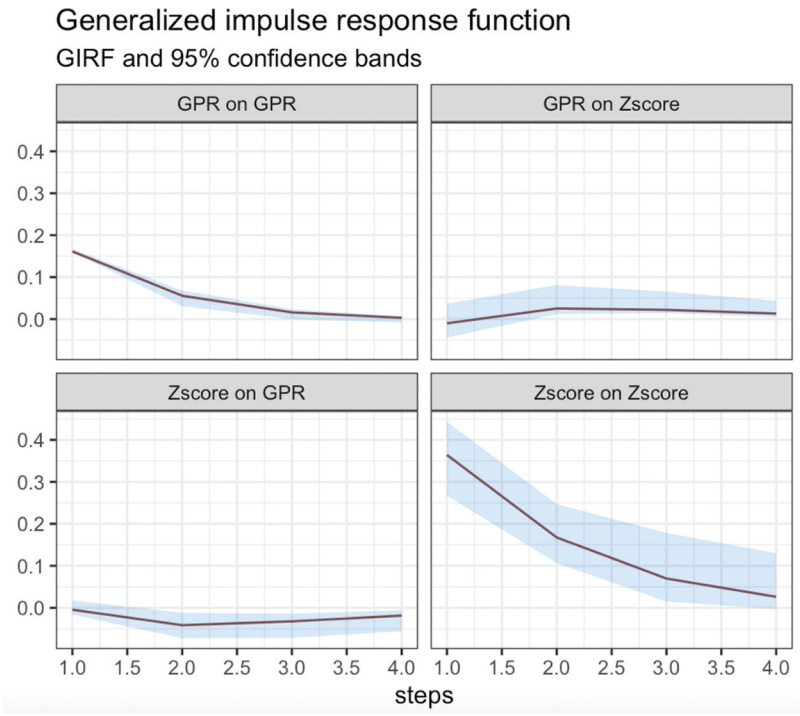
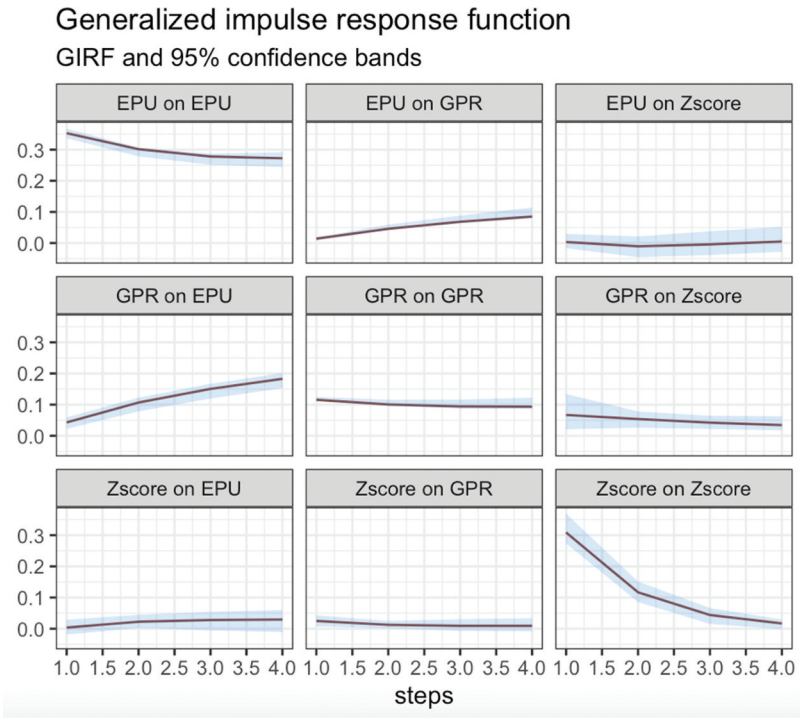


Figure 5. IRFs of stability, GPR, EPU for panel A.



decisions and risk-taking activities. The existing literature has shown that uncertainty regarding geopolitical tensions, military conflicts, political instability, and quality of policy formulation and execution increase bank credit defaults (Demir & Danisman, 2021).

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Figure 6. IRFs of stability, GPR, EPU for panel B.

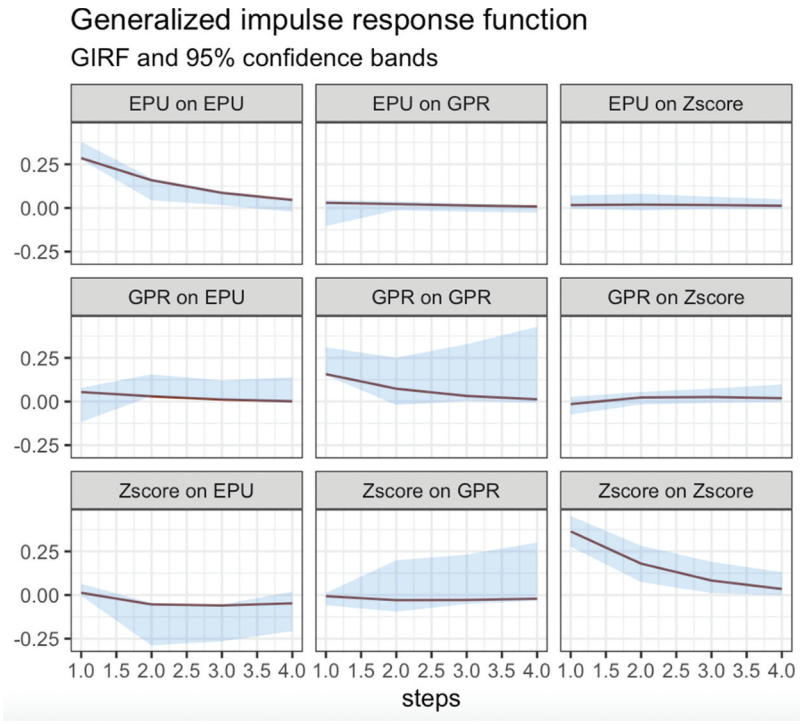


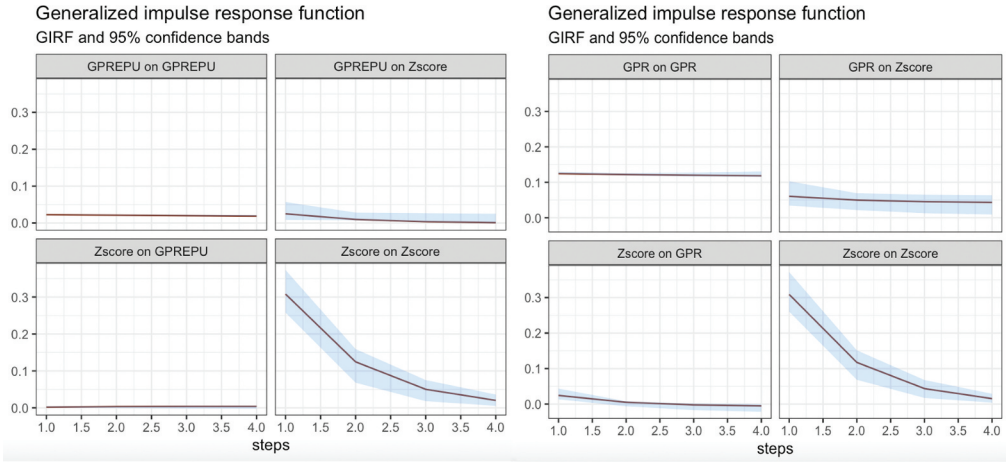
Table 6. Estimation result of the PVAR models: stability

		Coeff.	Std. Err.	z	*P* > z
Panel A					
Stability					
	Stability L1.	0.4044	0.0881	4.54	0.000***
	EPU*GPR L1.	−0.0058	0.0062	5.72	0.000***
EPU*GPR					
	Stability L1.	−0.0227	0.4900	6.78	0.000***
	EPU*GPR L1.	0.9379	0.0157	4.22	0.000***
Panel B					
Stability					
	Stability L1.	0.4797	0.1703	4.79	0.000***
	EPU*GPR L1.	−0.0176	0.0112	5.88	0.000***
EPU*GPR					
	Stability L1.	−0.6586	0.6380	5.18	0.000***
	EPU*GPR L1.	0.5960	0.0652	6.34	0.000***

Note: PVAR-GMM Estimation.

The result further shows the interactive effect of EPU*GPR on the stability of banks, as illustrated in Table 6. The coefficient of stability for Panel A and B indicates that the interactive term EPU*GPR has a negative and significant impact on the stability of banks—suggesting that a decline in EPU*GPR improves stability by 0.5% and 2%, respectively. The result indicates that EPU significantly increases the negative impact of GPR on bank stability. The result confirms the EPU and GPR

Figure 7. Impulse response of stability, GPR*EPU for panels A and B.



interaction. This implies that increased EPU may incite the impact of geopolitical risk on the banking sector. When there is a frequent change in economic policies targeted to maintain stability and development, the vulnerable sectors of the economies are exposed to increasingly difficult geopolitical uncertainties (Baker et al., 2016).

Studies have shown that high levels of geopolitical and economic uncertainty make it difficult to make accurate predictions of investment returns (Nguyen, 2021), reducing bank credit and profitability (Demir & Danisman, 2021). As a result, when the level of profits declines during high geopolitical and economic uncertainties, bank managers are motivated to pursue "high-risk, high-return" projects, which likely enhance the overall bank risk (Nguyen, 2021). Therefore, in this context, a highly uncertain economic environment and major policy shifts amidst recurrent geopolitical events could increase the probability of corporate failure and adversely influence the stability of banks. The IRF shown in Figure 7 confirms the findings of the panel VAR that EPU increases the effect of GPR on bank stability.

5. Additional empirical analysis

While we have already identified the disruptive impact of Geopolitical Risk (GPR) on bank stability under Economic Policy Uncertainty (EPU), it is imperative to delve into the alterations in this association when control variables are introduced. Therefore, we augment the model by incorporating various types of variables, encompassing bank-specific, macroeconomic, and institutional quality factors. These variables are recognized as pivotal determinants of bank stability, and their inclusion allows for a more comprehensive examination of the intricate interplay between GPR, EPU, and other influential factors. This extended analysis aims to capture the changes that arise when considering a broader set of elements that potentially shape the stability of banks in the face of geopolitical and economic uncertainties.

5.1. Control variables

We have discussed the stability, GPR, and EPU variables extensively in the prior section. The annual growth in real GDP (GDP) is used to measure the instability in economic activity, while the consumer price index (CPI) captures the monetary conditions. The bank size is measured using the natural logarithm of total assets, and the banks' profitability is calculated using the return on assets (ROA). We use the ratio of net interest income to average interest-earning assets to measure the interest rate (Ebenezer et al., 2019). Capital investment is estimated by capital expenditure/total assets (Gulen & Ion, 2016). The Institutional quality variables such as political stability and regulatory quality indicators were sourced from the Worldwide Governance Indicators (WGI).

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Table 7. Definitions of variables

Variable	Definition	Data source
Dependent variable		
Z-score	$Z-score = \frac{ROA+CA}{\sigma ROA}$	Authors' calculation based on Eikon data
Independent variable		
GPR	Geopolitical Risk Index	Caldara and Iacoviello (2022)
Moderating variable		
EPU	Economic Policy Uncertainty Index	Baker et al. (2016), Ahir et al. (2022).
Control variables		
LEV	Total debt/total assets	Eikon datastream
ROA	Ratio of net income/total assets	Eikon datastream
CAP INV	Ratio of capital expenditure to total assets	Eikon datastream
INT	Ratio of net interest income to average interest-earning assets	Eikon datastream
SIZE	Natural logarithm of bank assets	Eikon datastream
GDP	GDP growth rate	World Bank
INFL	Inflation based on the Consumer Price Index	World Bank
Institutional Quality		
POL	The likelihood that the government will be destabilized or overthrown by unconstitutional or violent means. Range −2.5 to +2.5	World Governance Indicators
Regulatory Quality	The perceptions of the ability of the government to formulate and implement sound policies and regulations	World Governance Indicators

Note: This table defines the variables used in both the PVAR and GMM estimations.

Political stability (POL) index evaluates views about how likely it is that the government would be overturned or disrupted through unlawful or violent means, such as terrorism and acts of political violence. Regulatory Quality measures the government's ability to create and enforce sound policies and regulations that encourage the development of the private sector (Bermpei et al., 2018). These indicators are pivotal in capturing the political and regulatory dimensions that can influence the stability of banks. Prior studies have also used these bank-specific and macroeconomic variables (Bermpei et al., 2018; Chandramohan et al., 2022; Phan et al., 2022; Yitayaw et al., 2023). Table 7 summarizes the definition of variables used in the study.

5.2. Generalized method of moments estimator

The study uses the two-step System GMM approach as an additional analysis to examine the role of EPU on the GPR and bank stability nexus. This approach addresses issues of endogeneity, heteroskedasticity, and autocorrelation, which can be present in other estimation methods such as ordinary least squares, fixed effects, or random effects estimates (Roodman, 2009). The two-step System GMM estimation technique is considered consistent and reliable as it specifically tackles serial correlation in lagged dependent variables. This addresses a crucial concern in dynamic panel data models. The Sargan test is performed under the assumption that the instrument is exogenous. It is conducted to assess over-identification restrictions and determine whether the model is adequately specified. The result shows that the model is valid and correctly specified. Furthermore, the Arellano–Bond test is conducted to check for serial correlation in the model, and the result shows no second-order autocorrelation (Arellano & Bond, 1991). This result

suggests that the instruments employed in the model are valid, reinforcing the robustness of the two-step System GMM estimation approach in analyzing the nexus between EPU, GPR, and bank stability. Hence, we estimate the dynamic regression model in the equations below:

$$\begin{aligned} Stability_{it} = {} & \alpha_0 + \beta_1 Stability_{it-1} + \beta_2 GPR_{jt} + \beta_3 EPU_{jt} + \beta_4 LEV_{it} + \beta_5 ROA_{it} + \beta_6 CAPINV_{it} \\ & + \beta_7 INT_{it} + \beta_8 SIZE_{it} + \beta_9 INFL_{jt} + \beta_{10} GDP_{jt} + + \beta_{11} POL_{jt} + \beta_{12} RQ_{jt} + \theta_j + \mu_i + \delta_t + \varepsilon_{it} \end{aligned} \tag{5}$$

$$\begin{aligned} Stability_{it} = {} & \alpha_0 + \beta_1 Stability_{it-1} + \beta_2 GPR_{jt} + \beta_3 EPU_{jt} + \beta_4 LEV_{it} + \beta_5 ROA_{it} + \beta_6 CAPINV_{it} \\ & + \beta_7 INT_{it} + \beta_8 SIZE_{it} + \beta_9 INFL_{jt} + \beta_{10} GDP_{jt} + \beta_{11} POL_{jt} + \beta_{12} RQ_{jt} \\ & + \beta_{13} EPU * GPR_{jt} + \theta_j + \mu_i + \delta_t + \varepsilon_{it} \end{aligned} \tag{6}$$

where the *j, i*, and *t* denote country, bank, and year, respectively. θ_j stands for country effect, μ_i is a bank-specific effect, and δ_t is a set of year effects. The lagged dependent variable, $Stability_{it-1}$, is treated as endogenous as used in the literature. According to previous studies, we treat bank-specific control variables (leverage, return of assets, capital investment, interest rate, and bank size) as endogenous. In addition, we treat the institutional quality variables (political stability, and regulatory quality) and the macroeconomic controls (inflation and GDP growth rate) as predetermined (Delis, 2012). This means that banks assess the state of the economy and institutional quality in each year period and regulate their strategy accordingly.

5.3. Discussion of GMM results

The two-step System GMM results for the sample of banks are presented in Table 6. This study analyses the direct effect of GPR on bank stability and the interaction between EPU and GPR on bank stability conditions. The two-step System GMM estimator is utilized as a regression instrument using a robust standard error. The instruments' validity is tested using the Sargan test, indicating that over-identifying restrictions can be assumed to be valid and model specifications are accurate (Arellano & Bond, 1991). Furthermore, the AR(2) second-order serial correlation shows that all models have no serial autocorrelation. In addition, all lag(−1) variables are significant at the 1% level, demonstrating the model specification's dynamic nature. Finally, the selection of dynamic model specifications has been validated. So, further interpretation of the test results is possible.

Table 8 presents the impact of GPR on bank stability (for Panel A and Panel B). The results for Panel A indicate that GPR has a negative and significant effect on stability. This implies that a decline in GPR will considerably improve stability by 13.3%. The study shows that a greater GPR tends to decrease the stability of banks. This finding is consistent with Phan et al. (2022), Shabir et al. (2023), Chi and Li (2017), Phan, Iyke, et al. (2021), and Wu et al. (2020). Their findings reveal that an increase in GPR is associated with a decrease in bank stability. Studies suggest that GPR can lead to negative investor reactions, driving them to shift their investments from risky to safer assets, lowering liquidity, especially among banks. Caldara and Iacoviello (2018) and Caldara and Iacoviello (2022) suggest that the GPR events cause repression in the developed financial market and could potentially drive down capital flows, reducing bank stability. The geopolitical stakes in recent years are unpredictable and can cause a decline in lending, investment, and capital formation among banks. In addition, EPU negatively and significantly influences stability. This implies that a higher EPU tends to decrease bank stability.

Similarly, the result for Panel B shows a negative and a significant impact on the stability of banks. This suggests that a decrease in GPR will improve the stability of banks by 84.4%. This finding is consistent with Phan et al. (2022), Shabir et al. (2023), Chi and Li (2017), Phan, Iyke, et al. (2021), Wu et al. (2020), Zhang et al. (2021). The study shows that increasing EPU and GPR significantly constrains the bank risk and weakens stability. In addition to this, Caldara and Iacoviello (2018) posit that GPR offers some potential predictive content for stock returns and could alter the economic cycles' dynamics and investment decisions. EPU negatively and

Table 8. Result of bank stability sys-GMM model

Variables	Coef. Model 1	t-stat	Coef. Model 2	t-stat	Coef. Model 3	t-stat	Coef. Model 4	t-stat
	Panel A				**Panel B**			
$L.Stability_{t-1}$	.2777	14.23***	.3147	12.90***	.4230	42.55***	.6763	33.08***
GPR	−.1334	−2.28**	−.5502	−3.62***	−.8443	−2.81***	−.1856	−4.27***
LEV	.0241	2.92***	.5872	4.86***	10.838	33.13***	1.0902	4.13***
ROA	−.0673	−1.32	−.9250	−1.76*	.6471	19.87***	1.0790	7.10***
CAP INV	−.0040	−7.58***	−.0369	−1.50	−.0195	−10.95***	−.0094	−4.88***
INT	−.0107	−3.11***	−.0515	−1.35	−.5854	−12.64***	−.2311	−7.85***
SIZE	.4362	4.15***	−13.264	−4.26***	5.5670	16.78***	.2100	9.71***
GDP	−.0267	−8.90***	−.5444	−12.58***	−.4540	−8.24***	−.0139	−13.91***
INFL	.0020	3.77***	.0254	4.69***	−.0002	−0.01	−.0529	−5.11***
POL	.0199	23.77***	.6426	26.54***	.0542	6.71***	.0016	0.13
RQ	.0194	9.23***	.4907	7.16***	.0305	3.71***	.0413	4.00***
EPU	−.0460	−5.08***	−.5399	−3.82***	−.4130	−4.46***	−.2361	−2.11**
*EPU*GPR*			−6.5924	−3.49***			−2.2605	−2.77***
_cons	−.2296	−1.82*	9.8319	7.31***	1.1564	2.92***	.4779	1.97**
AR1	−1.2606 (0.0004)		−1.6883 (0.0000)		1.5354 (0.0015)		−1.0466 (0.0003)	
AR2	−2.6318 (0.2075)		−2.7486 (0.2260)		−1.3584 (0.7200)		−1. 0879 (0.9299)	
Sargan test	(0.2370)		(0.2514)		(0.8317)		(0.8253)	
Country FE	Yes		Yes		Yes		Yes	
Year FE	Yes		Yes		Yes		Yes	
F test	1912.31 (0.0000)		3093.35 (0.0000)		1549.99 (0.0000)		8.9306 (0.0000)	
No. of instruments	57		58		57		58	
Observations	819		819		546		546	

Note: *** significant at 1%, ** significant at 5%, * significant at 10%.

significantly influences stability. This implies that a higher EPU tends to decrease bank stability. The institutional quality variables (political stability and regulatory quality) are found to have a positive and significant impact on the stability of banks. Other control variables have a significant impact on the stability of banks.

Panel A of Table 8 results shows the interactive effect of EPU*GPR on bank stability. The result indicates that the interactive effect of EPU*GPR has a negative and significant impact on the stability of banks. This suggests that the interaction between EPU and GPR reduces bank stability. Studies argued that the exposure of banks to rising policy changes and adverse political events makes them vulnerable to GPR, which influences the stability of banks. GPR is shown to worsen the business and investment climate by raising capital destruction, stock return volatility, and the likelihood of economic recessions (Caldara & Iacoviello, 2022; Zhang et al., 2022). Bank stability can be influenced via several channels such as conflicts, unstable political climates, and tensions. These uncertainty shocks will likely reduce the demand for consumer loans and minimize capital inflows, which will have a negative effect on the availability of domestic credits (Zhou et al., 2020). Table 8.Result of bank stability sys-GMM model

The results of the interactive effect of EPU*GPR on bank stability for Panel B show a negative and significant impact. This implies that an increase in EPU will trigger the negative effect of GPR on the stability of banks. Caldara and Iacoviello (2022) found that greater GPRs predict lower investment, higher disaster likelihood, and more downside risks. The adverse consequences of the GPR index are driven by both the threat and the realization of adverse geopolitical events. Studies show that GPR and EPU increase the cost of debt, lower firm efficiency, and lower stock return, all of which contribute to significant cash flow volatility. In addition, it also impedes borrowers' ability to repay loans and increases default risks (Al-Thaqeb & Algharabali, 2019; Gholipour, 2019; Julio & Yook, 2012; Panousi & Papanikolaou, 2012). This could lead to NPLs and raise banks' risk. These findings corroborate our panel VAR results in our previous analysis.

5.5. Robustness check

The study employs a different indicator of bank stability to ascertain the validity of the empirical results and to identify any changes in the relationship. We use an alternative measure as the ratio of nonperforming loans to total loans to capture the bank's stability. Using the GMM model, the results show that GPR negatively and significantly affects bank stability. Our results are consistent. The result implies that GPR reduces stability. The interactive term (*EPU*GPR*) negatively and significantly affects bank stability at the 1% level. This suggests that an increase in EPU magnifies the adverse effect of GPR on bank stability. The empirical evidence supports the validity of our prior findings in Tables (8).

6. Conclusion

This study examines the effect of GPR on bank stability and the interaction between EPU and GPR on bank stability. We use a panel of 105 commercial banks in the BRICS countries from 2009 to 2021, totaling 1365 observations. We employ the panel VAR estimation techniques and the sys-GMM model to provide reliable estimations that control for potential endogeneity issues in the models. The sample was divided into two panels of countries: Panel A (China and India) and Panel B (the rest of the BRICS countries) to determine which group is more affected by geopolitical risk and policy uncertainty.

Our empirical findings are robust and contribute to the existing body of literature in several ways. First, we found that GPR has an adverse impact on the stability of banks. This implies that rising GPR tends to decrease bank stability. The study found that bank stability is more responsive to EPU and GPR. Second, we provide deeper insights and robust evidence that the interaction between GPR and EPU weakens bank stability. Our study found that the interaction between GPR and EPU reduces the stability of banks in BRICS countries. In addition, the institutional quality variables also affect bank stability. Therefore, this study provides important implications for stakeholders and policymakers.

First, in terms of GPR, the government should closely monitor the most vulnerable sectors of the economy to enhance lending conditions for banks, thereby promoting financial stability. Second, for banks, GPR introduces higher costs for external borrowing. The insights from this research can aid bank managers in strategically shifting their focus toward internal sources of financing during uncertain times. Third, regulators and policymakers can leverage the findings to evaluate the fragility of banks and implement effective measures to mitigate the adverse impacts of GPR on bank stability.

Our findings also offer valuable guidance to investors, particularly in terms of the timing of their investments. Understanding the influence of GPR on future returns allows investors to make informed decisions and potentially mitigate the impact of geopolitical uncertainties on their investment portfolios. From a broader policy perspective, enhancing stability in the banking sector is contingent upon addressing geopolitical risks, as these risks negatively affect capital flows. Risk-averse investors, seeking safer investments with lower exposure to GPR, can contribute to improved capital flow dynamics in the banking sector.

The GPR's impact extends across economies and politics, making financial markets and business environments experience tremendous turbulence, which affects resource allocation and creates friction in corporate policy. Therefore, managers must be aware of the changes in the economic climate to navigate the challenges posed by GPR effectively. In addition, government interventions play a crucial role in maintaining the stability of banks. Timely regulatory policies can enhance the share of mobilized capital, influence bank lending rates, and increase asset tangibility. The robustness of the study underscores the relevance of its findings for policymakers, especially in emerging economies. Future research could explore how economic uncertainty and GPRs affect bank credit growth, capital, and performance in different countries. Further study can also explore the effect of GPR and EPU in terms of bank size and listing status, whether small- and medium-sized banks or unlisted banks are more affected.

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