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Geopolitical risk and its impact on corporate cash holdings and investment decisions: evidence from Saudi Arabia

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Abstract:

This study aims to investigate the relationship between geopolitical risk (GPR) and corporate performance by examining how GPR influences two key corporate decisions—cash holdings and investment—within the Saudi Arabian context. The sample comprises publicly traded companies listed on the Saudi Stock Exchange from 2006 to 2019. Ordinary least squares (OLS) regression is employed to test the hypothesized relationships of the econometric models. Later, the study uses the two-step Generalized Method of Moments (GMM) system to address endogeneity issues. The analysis indicates that GPR significantly influences corporate decisions regarding optimal cash reserves and investment choices. Specifically, the findings show that firms hold lower levels of cash during periods of elevated GPR, a pattern consistent with agency motive theory. In addition, the evidence demonstrates that firms reduce their investment spending under heightened geopolitical uncertainty, aligning with the "wait-and-see" behavior predicted by real options theory. The results remain robust across various sensitivity analyses and after addressing endogeneity using the system GMM estimator. There is a scarcity of empirical evidence on the impact of geopolitical risks on firms, notably within the Saudi context. The findings offer important insights into how GPR affects firms' operations—particularly their cash-reserve management and investment decisions—in the Saudi context. First, the results provide managers with guidance on navigating periods of rising geopolitical uncertainty by adjusting liquidity strategies and investment planning. Second, financial analysts may incorporate geopolitical factors into their forecasts of corporate performance. Third, investors can use the evidence to better evaluate firms operating in environments exposed to elevated geopolitical risk. Overall, the findings offer important implications for policymakers and corporate managers by underscoring the need for more resilient cash-reserve strategies and flexible investment policies to strengthen risk management, enhance governance, and safeguard firm resources amid persistent geopolitical uncertainties.

Keywords: Geopolitical risk (GPR), cash holdings, corporate investment, Agency motive theory, Real options theory, System GMM, Saudi Arabia.

JEL Classification codes: G11, G32, E22, D81.

1. Introduction

Geopolitical risk (GPR) is defined as the threat, realization, and escalation of adverse events associated with wars and any tensions among states and political actors that affect the peaceful course of international relations (Caldara and Iacoviello, 2022). Existing literature has suggested that heightened GPR creates uncertainty, increases the likelihood of an economic downturn, and predicts reduced investment and employment levels, leading to a decline in national GDP and diminishing firm value (Abadie and Gardeazabal, 2003; Caldara and Iacoviello, 2022; Gupta *et al*., 2019; Pringpong *et al.*, 2023). Emerging countries, especially those in high-risk regions such as MENA, frequently face geopolitical tensions, making firms more vulnerable to economic challenges. Existing empirical evidence supports this proposition. For instance, Demir et al. (2019) show that geopolitical risks negatively affect firms' cash holdings in several emerging economies. Le and Tran (2021) document that geopolitical risks negatively affect firm investment activities. More recently, Pringpong et al. (2023) investigate how GPR affects firm value in emerging markets and find that higher levels of GPR are associated with lower firm value.

GPR has become an increasingly significant concern for corporations worldwide, as evidenced by numerous prolonged and disruptive events, including the Gulf War, the 9/11 attacks, the 2003 Iraq invasion, the Russian–Ukrainian conflict, the Iranian nuclear crisis, ongoing Palestinian–Israeli tensions, and, more recently, the COVID-19 pandemic. Consequently, a substantial body of research has emerged examining the effects of GPR on macroeconomic indicators and firm-level behavior, particularly within Western contexts. However, within the Middle East and North Africa (MENA) region the economic consequences of GPR remain comparatively underexplored. This paper fills this gap using the Saudi Arabian context.

The aim of this paper is to examine the effects of GPR on two critical corporate decisions: cash holdings and investment within the Saudi context. The Saudi context offers an ideal setting for several compelling reasons. First, Saudi Arabia is the world's largest oil exporter, consistently pumping over 10 million barrels per day. This makes Saudi firms increasingly vulnerable, especially during periods of geopolitical tensions and unrest. Furthermore, Saudi Arabia's geographic location within the MENA region warrants closer examination. Countries within the MENA region are more likely to experience substantial economic losses—estimated at $12.2 billion or 37% of the global total—and significant casualties, with over 35,000 attacks and more

than 90,000 deaths reported between 2002 and 2018, according to the Global Terrorism Index (GTI, 2019). Together, these factors warrant further investigation into the relationship between geopolitical risk and firm outcomes from an emerging market perspective.

Using a sample of 1,110 firm-year observations of Saudi-listed non-financial firms over the period from 2006 to 2019, the study documents strong and economically significant evidence that rising GPR during periods of significant geopolitical tensions leads Saudi firms to hold less cash. This finding seems to be driven by the need to cover ongoing operating activities and to mitigate the agency problems associated with free cash flow, a pattern consistent with *agency motive theory*. Further, the study finds that GPR also depresses corporate investments. This result aligns with real options theory, which suggests that during periods of heightened GPR, firms are more likely to delay investment activities until uncertainty is resolved. Finally, the results remain robust across a range of sensitivity analyses, including alternative measures of the dependent and explanatory variables and addressing endogeneity using a two-step GMM system.

The study contributes to the literature in several important ways. From a theoretical standpoint, this study advances the agency motive perspective by providing evidence that firms reduce their cash holdings in response to heightened GPR. This behavior is consistent with the notion that managers seek to mitigate agency problems associated with free cash flow, particularly when real economic activity declines and operational liquidity demands rise (Baker et al., 2016; Javadi et al., 2020; Demir et al., 2019). In addition, the study contributes to real options theory by documenting a negative association between GPR and corporate investment activities. This finding aligns with the core premise of real options theory: under elevated uncertainty, firms prefer to delay or scale back investment to avoid irreversible mistakes, effectively adopting a “wait-and-see” strategy until conditions become more favorable (Bernanke, 1983). This study advances the literature on geopolitical risk and corporate financial policy by establishing robust evidence of a significant negative association between GPR and corporate cash holdings in an emerging-market context (Demir et al., 2019; Ghoul et al., 2023; Phan et al., 2019). It further contributes to theory by demonstrating that geopolitical uncertainty meaningfully influences firms’ investment policies, thereby extending prior work on how external risk factors shape corporate decision-making processes (Le & Tran, 2021; Tan et al., 2022; Wang et al., 2023).

From a practical standpoint, the study provides valuable insights into how firms strategically adjust their resource allocation—particularly cash management and investment spending—in response to heightened geopolitical risk. These findings are especially relevant for firms operating in emerging economies, where exposure to global and regional geopolitical tensions may be more pronounced. The study also yields several policy implications, particularly for the Saudi economy in light of Vision 2030. By documenting how firms respond to fluctuations in geopolitical risk, the findings provide actionable guidance for corporate managers, boards of directors, and policymakers seeking to enhance risk-management and governance practices. In particular, the results highlight the importance of developing resilient cash-reserve strategies and flexible investment policies to safeguard firm resources and support economic stability amid persistent and evolving geopolitical uncertainties.

The rest of the paper is structured as follows: Section 2 outlines the theoretical framework. Section 3 provides a review of the relevant literature and develops the hypotheses. Section 4 details the sample selection and research methodology. Section 5 reports and interprets the findings, while Section 6 offers the conclusion.

2. Theoretical Framework

Previous literature has examined the effects of rising GPR on corporate outcomes through multiple theoretical perspectives. Regarding firms' cash holdings, two competing motives offer contrasting predictions. The *precautionary motive* suggests that geopolitical instability increases uncertainty, leading firms to hold larger cash reserves as a buffer against costly external financing and potential cash-flow disruptions (Opler et al., 1999; Bates et al., 2009). In contrast, the *agency motive* posits that higher geopolitical risk can reduce cash holdings. Excess free cash flow may exacerbate agency conflicts, as managers could divert resources for personal gain rather than shareholder benefit (Jensen, 1986). During periods of heightened geopolitical uncertainty, forcing managers to limit free cash flow can mitigate opportunistic behavior, thereby encouraging lower cash balances. Corporate investment decisions are similarly sensitive to geopolitical risk, as explained by *real options theory (ROT*). In the face of uncertainty, firms adopt a "wait-and-see" approach, delaying or reducing investments to avoid costly mistakes (Bernanke, 1983). Empirical evidence supports this effect: geopolitical uncertainty, particularly when downside risks are high, prompts firms to

postpone investment projects, as seen during national election periods when potential shifts in macroeconomic conditions, taxes, or regulations are anticipated (Julio & Yook, 2012).

Taken together, these frameworks suggest that heightened geopolitical risk influences corporate policies through multiple channels: it may increase cash holdings due to precautionary motives, reduce cash holdings due to agency considerations, and constrain investment spending through real options behavior. The net effect on corporate outcomes depends on which channel dominates in a given context, highlighting the complex interplay between uncertainty, managerial incentives, and investment strategy.

3. Literature review and hypotheses development

3.1. Related literature on geopolitical risk

The extant literature documents that GPR has significant detrimental effects at the firm and macroeconomic levels. For instance, Bloom (2009) documents that geopolitical tensions induce uncertainty shocks, which cause a dramatic decline in firms' output, productivity, and employment. Heightened GPR increases the likelihood of an economic downturn and predicts reduced investment and employment levels (Caldara and Iacoviello, 2022), disrupts international trade flows (Gupta *et al.*, 2019), leads to a decline in national GDP (Abadie and Gardeazabal, 2003), and diminishes firm value (Pringpong et al., 2023). Julio and Yook (2012) provide evidence that political event-related risks, such as elections, prompt firms to cut back on investment spending until the uncertainty surrounding the elections is resolved. In a similar vein, Jens (2017) finds that firms scale down their investments ahead of gubernatorial elections in the U.S.

Geopolitical tensions and uncertainty are more common in emerging countries, leaving firms in these environments particularly vulnerable to such risks. As such, firms in countries with high exposure to geopolitical risks (such as the MENA region) are more likely to face adverse economic consequences. According to the Global Terrorism Index (GTI, 2019), the MENA region experienced the highest economic impact of terrorism, totaling $12.2 billion, or 37% of the global total. The report reveals that the MENA region leads in absolute numbers of terrorist attacks and fatalities, with over 35,000 attacks and more than 90,000 deaths recorded between 2002 and 2018. The existing literature documents that firms in countries with high exposure to geopolitical risk are more likely to suffer economic and financial losses. For instance, Demir et al. (2019)

demonstrate that geopolitical risks negatively affect the cash holdings of hospitality firms, especially those based in emerging markets. Similarly, Al-Shboul et al. (2020) report that political risk is negatively linked to bank stability, with a more pronounced effect on conventional banks. Le and Tran (2021) contend that geopolitical uncertainty can shape corporate decision-making and pose risks to a firm's long-term viability. Their findings reveal a negative relationship between geopolitical risks and firm investment, with the effect being more pronounced in China and Russia and less evident in India and Turkey. Pringpong *et al*. (2023) investigate the effects of geopolitical risk (GPR) on firm value in emerging markets and provide evidence that elevated GPR is linked to a reduction in firm value.

3.2. The relationship between geopolitical risk and cash holdings

Patterns in firms' cash holdings can be explained by two competing views: the *precautionary motive* and the *agency motive*. The *precautionary motive* suggests that geopolitical unrest exacerbates uncertainty, which in turn causes firms to retain more cash as a buffer against excessively costly external finance (Opler *et al.*, 1999). Firms facing high levels of geopolitical risk are likely to boost their cash reserves as a safeguard against adverse cash flow shocks, particularly when external debt is costly (Bates *et al*., 2009). Thus, adverse consequences of GPR cause firms to cut back on investment projects and on spending cash reserves. Many studies have provided empirical evidence supporting the role of the precautionary motive in shaping corporate cash-holding policy. Phan *et al*. (2019) analyze the link between government economic policy uncertainty and corporate cash holdings. They find that increased uncertainty is positively correlated with cash holdings among U.S. firms. Le and Wang (2021) study the impact of geopolitical risk on the cash holdings of Chinese firms and find that, especially among financially constrained firms, there is a tendency to accumulate more cash as a precautionary response to such risks. More recently, Aksoy-Hazır and Tan (2023) examine the relationship between GPR and corporate cash policy of Turkish firms and find that GPR positively impacts cash holdings.

In contrast, the *agency motive* predicts that heightened geopolitical risk is associated with lower cash holdings. Jensen (1986) perceives free cash flow as being a major source of agency conflicts. The agency problem of free cash flow posits that directors of companies with excessive free cash flow are inclined to reap private benefits rather than distribute dividends to stockholders (Jensen, 1986). Forcing management to disgorge free cash flow, especially during periods of geopolitical

tensions, would preclude insiders from using the company's cash to benefit themselves. Periods of heightened geopolitical tensions or economic uncertainty are expected to exacerbate the agency problem associated with free cash flow. This is because significant instability can hinder firms' growth and earnings prospects. Baker *et al*. (2016) demonstrate that high uncertainty can restrict capital flows and slow the economy due to reduced spending, investment, and employment. Attig *et al*. (2021) posit that during periods of significant economic policy uncertainty (EPU), firms are more likely to pay higher dividends to mitigate the agency problem associated with free cash flows. Consistent with this posit, they find that increased payouts during periods of intensified EPU can encourage managers to exercise greater discipline in managing the firm's resources, notably cash flows. Their findings appear to align with the agency framework, which suggests that companies tend to increase dividend payouts during periods of geopolitical and economic unrest. Floyd et al. (2015) demonstrate that during periods of turmoil, firms are more likely to raise dividend payouts than to increase cash holdings to signal the firm's financial stability.

Bloom (2009) documents that geopolitical tensions induce uncertainty shocks, which cause a dramatic decline in firms' output, productivity, and employment. Moreover, index-based studies are increasingly used to explain how corporate decisions, notably cash holdings, are affected by political, regulatory, or environmental factors. For example, Javadi *et al*. (2021) argue that during periods of high EPU, firms tend to reduce cash holdings, presumably to mitigate the agency problem of free cash flow, which, in turn, should be valued by outside shareholders. Javadi et al. (2021) find evidence in support of this view. Ghoul *et al*. (2023) investigate the relationship between EPU and corporate cash holdings and find evidence that firms hold less cash when EPU is high. They suggest that this behavior aligns with the view that during periods of increased EPU, managers may be incentivized to accumulate cash to avoid regulatory scrutiny or for private benefits. Consequently, shareholders concerned about managerial self-dealing may pressure managers to increase cash distributions, such as dividends, to mitigate the risk of managerial entrenchment. Using the news-based index of geopolitical risks, Demir et al. (2019) investigate whether geopolitical tensions are associated with cash holdings and find a negative relationship between geopolitical risk and firms' cash holdings. They suggest that rising geopolitical tensions may force firms to use their available cash reserves to meet ongoing operational and investment demands, ultimately reducing their cash holdings.

Overall, the agency motive suggests that during periods of geopolitical and economic unrest, firms appear to hold less cash for at least three reasons: (1) to mitigate the agency problem of free cash flow, (2) to signal financial health, and (3) to meet the need for ongoing operational costs. Given Saudi firms' political and geographic exposure, they are particularly vulnerable to geopolitical risk, which is expected to increase uncertainty, reduce activity and earnings prospects, and lead to greater consumption of available cash. Based on the above discussion, our first hypothesis is as follows:

H1. There is a negative relationship between GPR and firms' cash holdings

3.3. The relationship between geopolitical risk and corporate investment

From the standpoint of corporate policy, *real options theory* (ROT) suggests that in times of heightened uncertainty, firms seek to avoid costly mistakes by delaying investment decisions or cutting back on investment spending, adopting a "*wait and see*" approach to determine if conditions improve later (Bernanke, 1983). Julio and Yook (2012) argue that an increase in geopolitical uncertainty reduces current investment, particularly when the probability of bad outcomes is high. In this regard, Julio and Yook (2012) also contend that firms tend to postpone investments during national election periods, anticipating potential adverse shifts in the country's macroeconomic conditions, tax systems, monetary policies, or overall regulatory framework. They find evidence consistent with their contention. Similarly, An *et al*. (2016) investigate the effect of political uncertainty on corporate investment and find that Chinese firms substantially cut back on investment after local government officials are replaced. Furthermore, Abadie and Gardeazabal (2003) demonstrate that the Basque Country's per capita GDP declined by around 10 percentage points after the onset of terrorist conflict. In a subsequent study using cross-country data, Abadie and Gardeazabal (2008) present empirical evidence linking terrorist attacks to heightened uncertainty and a decline in investment activity.

Recent literature has increasingly utilized uncertainty and risk indices to examine corporate investment decisions. Caldara and Iacoviello (2022) note that elevated geopolitical risk predicts reduced investment and employment levels and is linked to significant economic downturns. Caldara and Iacoviello (2022) use aggregate macroeconomic data to document that high GPR induces persistent declines in firm-level investment. Wang et al. (2023) explore the connection between geopolitical risk (GPR) and corporate investment, finding that higher GPR dampens

investment, aligning with real options theory. Specifically, their results show that a doubling of the GPR index leads to a 14% decrease in next-quarter investment relative to the sample mean. Similarly, Tan *et al*. (2022) examine the impact of geopolitical risk on corporate investment among Turkish manufacturing firms and find that higher GPR is associated with a decline in investment activity. Likewise, Le and Tran (2021) study the influence of geopolitical risk on corporate investment in emerging Asian economies, reporting a negative relationship between GPR and investment.

Therefore, based on the principles of real options theory and the studies discussed above, it is anticipated that geopolitical unrest generates uncertainty, prompting firms to delay investment decisions in anticipation of more favorable conditions and timing. Drawing from the preceding discussion, the second hypothesis is proposed as follows:

H2. There is a negative relationship between GPR and firms' investment levels.

4. Research design

4.1. Sample selection

The sample comprises all publicly traded non-financial firms listed on the Saudi Stock Exchange from 2006 to 2019. The starting year of 2006 was chosen because the Saudi Governance Code was introduced in that year. The end year of 2019 is chosen to ensure the analysis results are not affected by the COVID-19 pandemic and its aftermath. The initial sampling yielded 2,660 firm-year observations. I exclude financial firms (such as banks and insurance firms) and those with missing or incomplete data for any of the financial or governance variables to construct the final sample. The final sample consists of 1,110 firm-year observations. To reduce the influence of outliers in the regression analysis, extreme values in all continuous variables are winsorized at the 1st and 99th percentiles. Because listed firms have varying initial public offering (IPO) dates, the study uses an unbalanced panel dataset. The data is compiled from multiple sources: financial information is obtained from the S&P Capital I.Q. database, corporate governance data is manually collected from firms' annual reports, and geopolitical risk data is derived from the GPR index developed by Caldara and Iacoviello (2022).

4.2. Variable construction

4.2.1. Dependent variables – Cash holdings and Investment

The study has the following two dependent variables: (1) Cash holdings (*CASH*), which is computed as the ratio of cash and cash equivalents to net assets, where net assets are total assets minus cash and cash equivalents (Opler *et al.*, 1999); and (2) Investment (*CAP_EXP*), which is measured as the ratio of capital expenditures to total assets (Julio & Yook, 2012).

4.2.2. Independent variable – geopolitical risk (GPR)

The primary independent variable examined is the Geopolitical Risk (GPR) index, introduced by Caldara and Iacoviello (2022). This index is derived from newspaper articles and measures the monthly frequency of reports addressing increasing geopolitical risks, such as wars, terrorism, and inter-state tensions that disrupt international peace. A country-specific GPR index is created by tallying the number of times geopolitical terms appear alongside the name of the country, its capital, or its major cities in news publications. Since the GPR index is reported monthly, the 12-month average for each year is used to align with the annual data. The index is normalized to have a mean of 100, with higher values indicating greater geopolitical risk and vice versa.

For the robustness test, two alternative measures are used to proxy for geopolitical risk. First, the natural logarithm of GPR (*LnGPR*) is used to normalize the distribution of the GPR index, following Adra et al. (2023) and Le and Tran (2021). Second, political risk is measured by the International Country Risk Guide (*ICRG*), which is developed by the Political Risk Services (PRS) Group. ICRG provides monthly risk ratings for 141 countries across three main areas: political, financial, and economic. Reported values in this index range from 0 to 100, where a higher value denotes a lower risk. However, the ICRG scores are averaged into annual values to maintain consistency with the GPR index methodology. Further, this index is transformed by subtracting the score from 100, creating a new index in which higher values indicate greater risk, in line with prior studies (Le and Tran, 2021; Al-Shboul *et al.*, 2020).

4.2.3. Control variables

This study controls for a set of firm-level variables expected to influence firm cash holdings and investment, following prior literature (Demir et al., 2019; Ghoul et al., 2023; Le & Tran, 2021;

Opler et al., 1999). These include board size (*BSIZE*), board independence (*BIND*), firm size (*LnSIZE*), return on assets (*ROA*), the ratio of market to book (*MTB*), leverage (*LEV*), cash from operations (*CFO*), reporting a loss (*LOSS*), firm growth (*GROWTH*), and firm age (*Ln_AGE*). Finally, the study accounts for period effects using year dummy variables (YEAR) and controls for industry effects with industry dummy variables (INDUSTRY). Definitions for all other variables are in Appendix A.

4.3. Regression model

The following econometric model is used to investigate the impact of geopolitical risk on firm cash holdings:

$$CASH_{it} = \beta_0 + \beta_1 GPR + \beta_{2\text{-}10}\, Firm\ Specific\ Controls_{it} + YEAR_{it} + INDUSTRY_{it} + \varepsilon_{it} \quad (1)$$

Note that β1 in Equation (1) captures the impact of geopolitical risk (GPR) on firm cash holdings. A negative coefficient on β1 would indicate that as geopolitical risks heighten, the firm's cash holdings decline. A negative and significant coefficient on β1 indicates that hypothesis H1 is supported.

The following econometric model is used to investigate the impact of geopolitical risk on firm investment:

$$CAP\_EXP_{it} = \beta_0 + \beta_1 GPR + \beta_{2\text{-}10}\, Firm\ Specific\ Controls_{it} + YEAR_{it} + INDUSTRY_{it} + \varepsilon_{it} \quad (2)$$

Note that β1 in Equation (2) captures the impact of geopolitical risk (GPR) on firm investment. A negative coefficient on β1 would indicate that as geopolitical risks heighten, the firm's investment declines. A negative and significant coefficient on β1 indicates that hypothesis H2 is supported.

5. Results and discussion

5.1. Descriptive statistics

Figure 1 shows the volatility of the geopolitical risk (GPR) index for Saudi Arabia for the period from 1985 to 2019. Table 1 presents the descriptive statistics for the variables included in the econometrics models. The cash holdings ratio (*CASH*) has a mean of 8.2%, a median of 4.6 %, and ranges between 0.3% and 66.2%. Firms' investment to total assets ratio (*CAP_EXP*) has a

mean of 8.8% and a median of 5.7% with a minimum of zero and a maximum of 53.2%. As for the Geopolitical Risk Index (*GPR*) for Saudi Arabia, it has a mean of 24.6, a median of 23.0, and a standard deviation of 10.2. Regarding control variables, the mean board size (*BSIZE*) is 8.221 directors, while the proportion of independent directors to total directors (*BIND*) is 49.5%. The average natural logarithm of firm size (*LnSIZE*) is 14.530. On average, firms in the sample report a return on assets (*ROA*) of 6.3%, a market-to-book ratio (*MTB*) twice the book value, a leverage ratio (*LEV*) of 38.7%, cash flows from operations (*CFO*) of 9.3%, and sales growth (*GROWTH*) of 23.7%. Additionally, on average, 17.5% of firms reported a loss (*LOSS*) during the period. Finally, the average firm age (*AGE*) is approximately 26 years.

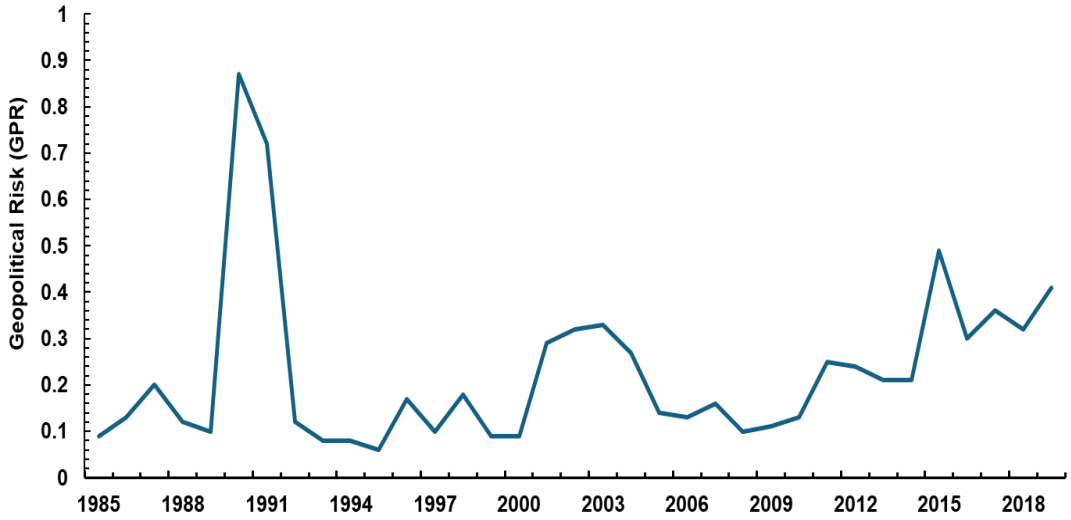

Figure 1. Geopolitical risk (GPR) index from 1985 to 2019

Table 1. Descriptive statistics of the sample variables

VARIABLE	Obs.	Mean	Median	Std. Dev.	Min	Max
CASH	1,110	0.082	0.046	0.104	0.003	0.662
CAP_EXP	1,110	0.088	0.057	0.100	0.000	0.532
GPR	1,110	0.246	0.230	0.102	0.100	0.400
BSIZE	1,110	8.221	8.000	1.479	3.000	12.000
BIND	1,110	0.495	0.444	0.180	0.000	1.000
LnSIZE	1,110	14.530	14.333	1.593	11.337	19.583

ROA	1,110	0.063	0.051	0.088	−0.172	0.335
MTB	1,110	2.006	1.508	1.792	0.000	10.014
LEV	1,110	0.387	0.384	0.210	0.030	0.866
CFO	1,110	0.093	0.079	0.095	−0.121	0.374
LOSS	1,110	0.175	0.000	0.380	0.000	1.000
GROWTH	1,110	0.237	0.039	1.532	−0.766	14.533
AGE	1,110	26.206	26.000	13.912	1.000	65.000
LnAGE	1,110	3.077	3.258	0.691	0.000	4.174

Note: Variables are defined in Appendix A.
Source: Created by the author.

5.2. Correlation analysis

Table 2 displays the Pearson correlation coefficients for the variables used in the regression analysis. The correlation between *GPR* and cash holdings (*CASH*) is negative and statistically significant at the 1% level. Further, the correlation between GPR and firms' investment (*CAP_EXP*) is negative and statistically significant at the 1% level. These results provide preliminary support for hypotheses H1 and H2, which posit that GPR negatively affects firm outcomes, notably cash holdings and investment. Further analysis of the table reveals that the correlation coefficients among independent variables are not high, indicating no severe multicollinearity.

Table 2. Pearson Correlation Matrix

VARIABLE	*CASH*	*CAP_EXP*	*GPR*	*BSIZE*	*BIND*	*LnSIZE*	*ROA*	*MTB*	*LEV*	*CFO*	*LOSS*	*GROWTH*	*LnAGE*
CASH	1.000												
CAP_EXP	0.005	1.000											
GPR	−0.094***	−0.173***	1.000										
BSIZE	0.053*	0.016	0.029	1.000									
BIND	−0.005	−0.022	−0.01	−0.145***	1.000								
LnSIZE	−0.072***	0.064**	0.062**	0.432***	−0.278***	1.000							
ROA	0.194***	0.115***	−0.202***	0.097***	−0.128***	−0.002	1.000						
MTB	0.062**	−0.015	0.055**	−0.137***	0.051*	−0.142***	0.043*	1.000					
LEV	−0.237***	−0.031	0.091***	0.102***	−0.152***	0.353***	−0.234***	0.035	1.000				
CFO	0.172***	0.159***	−0.092***	0.052*	−0.133***	0.045*	0.681***	0.039	−0.133***	1.000			
LOSS	−0.098***	−0.100***	0.138***	−0.095***	0.130***	−0.094***	−0.610***	0.099***	0.148***	−0.332***	1.000		
GROWTH	0.002	−0.018	−0.094***	−0.041	−0.011	0.013	−0.008	0.000	0.014	−0.108***	−0.017	1.000	
LnAGE	0.007	−0.092***	0.197***	−0.091***	0.057*	−0.144***	0.006	0.083***	−0.153***	0.092***	−0.108***	−0.182***	1.000

Note: ***, **, and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

5.3. Regression results

5.3.1. GPR and cash holdings

Table 3 presents the multivariate regression results analyzing the relationship between GPR and cash holdings, as specified in Equation (1). In model (1), a reduced model is estimated in which cash holdings are regressed on GPR, excluding other firm-level control variables, following prior studies (Boubakri *et al.*, 2013; Demir *et al.*, 2019). The coefficient on GPR is negative and statistically significant in this univariate regression at the 10% level (−0.097, $t = -1.823$, $p < 0.1$). In economic terms, this suggests that a one-unit increase in the GPR index is associated with an average decrease of about 0.097 percentage points in firms' cash holdings. In model (3), the model is expanded by including previously discussed control variables. The results continue to show a negative and highly significant coefficient for GPR at the 5% level (−0.154, $t = -2.317$, $p < 0.05$). In economic terms, this indicates that a one-unit increase in the GPR index is associated with a reduction of approximately 0.154 percentage points in firms' cash holdings, after controlling for firm-level characteristics. As expected, the adjusted R^2 increases from 14.4% to 24.1% in the expanded model. These results indicate that heightened GPR during periods of significant geopolitical tensions reduces firms' cash holdings, supporting hypothesis H1. The findings align with the *agency motive*, which predicts that heightened GPR is associated with lower cash holdings due to decreased real economic activities (Baker *et al.*, 2016), efforts to mitigate the agency problem of free cash flow in response to shareholder pressure (Javadi et al., 2021), and the need to meet ongoing operational costs (Demir *et al.*, 2019). Besides, these results are expected, given that during periods of increasing GPR, the Saudi economy faces heightened vulnerability, primarily due to oil price uncertainty, which ultimately leads to a decline in available cash.

5.3.2. GPR and investment

Models (2) and (4) of Table 3 report the relationship between GPR and corporate investment. First, a univariate regression is estimated in Model (2), where investment is regressed on GPR without considering other control variables. The results show that the coefficient on *GPR* is negative and highly significant at the 1% level. More specifically, the coefficient indicates that a one-unit increase in the GPR index is associated with a decrease of about 0.434 percentage points in capital expenditures for

Saudi firms. In model (4), the analysis is expanded by including previously discussed firm-level control variables. As expected, the results continue to estimate a negative and highly significant coefficient on GPR at the 1% level (−0.232, $t = -3.790$, $p < 0.01$). In economic terms, this indicates that a one-unit increase in the GPR index is associated with a reduction of approximately 0.232 percentage points in firms' capital expenditure, holding all other variables constant. The adjusted R^2 marginally increases from 13.5% to 13.9% after including firm-level controls. These findings align with real options theory, which suggests that during periods of heightened GPR, firms are more likely to delay investment activities until uncertainty is resolved, as highlighted by Bernanke (1983). Additionally, they support the view that increased geopolitical tensions elevate the likelihood of economic disasters and predict lower investment levels (Caldara and Iacoviello, 2022). Consistent with prior research documenting a negative relationship between GPR and investment (Le and Tran, 2021; Tan *et al.*, 2022; Wang *et al.*, 2023), these results reinforce hypothesis H2, indicating that significant geopolitical uncertainty or unrest tends to suppress investment activities by Saudi firms.

Table 3. Regression results of geopolitical risk

	(1)	(2)	(3)	(4)
VARIABLE	***CASH***	***CAP_EXP***	***CASH***	***CAP_EXP***
GPR	−0.097*	−0.434***	−0.154**	−0.232***
	(−1.823)	(−6.303)	(−2.317)	(−3.790)
BSIZE			0.005**	0.001
			(2.258)	(0.403)
BIND			−0.000	0.000
			(−0.997)	(0.870)
LnSIZE			−0.008**	0.004*
			(−2.458)	(1.873)
ROA			0.035	−0.007
			(0.504)	(−0.122)
MTB			0.006**	−0.001
			(2.526)	(−0.692)
LEV			−0.108***	0.002
			(−5.906)	(0.094)
CFO			0.054	0.162***
			(0.992)	(3.383)
LOSS			−0.002	−0.014
			(−0.202)	(−1.528)
GROWTH			0.001	−0.001
			(0.618)	(−0.393)
LnAGE			0.005	−0.012*
			(0.828)	(−1.838)
Constant	0.066***	0.231***	0.182***	0.100***

	(3.449)	(7.938)	(3.349)	(2.594)
Obs.	1,110	1,110	1,110	1,110
Industry & year FE	YES	YES	YES	YES
Adj. R^2	0.144	0.135	0.241	0.139

Note: t-statistics are shown in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

5.4. Sensitivity checks

The researcher assesses the robustness of our main results in two ways: (1) using logarithm transformation for the dependent as well as for the independent variables, and (2) using ICRG as an alternative proxy for geopolitical risk.

5.4.1. Alternative measures for the dependent and independent variables

In the main regression analysis, corporate cash holdings (*CASH*) is measured as the ratio of cash and cash equivalents to net assets, while corporate investment (*CAP_EXP*) is measured as the ratio of capital expenditures to total assets. To robustly assess the main results, the natural logarithm is used. The use of the natural logarithm reduces outliers and skewness in the model's data (Harford *et al.*, 2008; Le and Tran, 2021). Specifically, cash holdings (*CASH*) are replaced by their logarithmic transformation (LnCASH), capital expenditure (CAP_EXP) by its logarithmic transformation (LnCAP_EXP), and the geopolitical risk (GPR) index by its logarithmic transformation (*LnGPR*). The regression models specified in Equations (1) and (2) are then re-run for these alternatives. Table (4) presents the regression analysis results of these alternative specifications. Overall, the results remain unchanged and show that coefficients on *LnGPR* remain negative and highly significant in Model (1) for *LnCASH* and Model (2) for *LnCAP_EXP* at the 1% level. These results provide additional support for our main findings that high geopolitical risk has negative consequences on Saudi firms' outcomes, notably cash holdings and investments.

Table 4. Additional test – alternative measure for cash and investment

VARIABLE	(1) *LnCASH*	(2) *LnCAP_EXP*
LnGPR	−0.429***	−0.803***
	(−2.925)	(−4.673)
BSIZE	0.149***	0.026
	(5.015)	(0.811)
BIND	−0.004*	−0.001
	(−1.910)	(−0.367)
LnSIZE	−0.076*	1.111***
	(−1.870)	(34.628)
ROA	−0.012	0.945
	(−0.015)	(1.128)
MTB	0.067***	0.019
	(2.643)	(0.745)
LEV	−0.966***	0.874***
	(−4.393)	(2.915)
CFO	0.535	2.140***
	(0.975)	(3.407)
LOSS	−0.350***	−0.339**
	(−2.899)	(−2.134)
GROWTH	0.033*	−0.074
	(1.927)	(−1.591)
LnAGE	0.113	−0.143*
	(1.619)	(−1.688)
Constant	−4.192***	−7.273***
	(−6.766)	(−8.957)
Obs.	1,110	1,110
Industry & year FE	YES	YES
Adj. R^2	0.219	0.686

Note: t-statistics are shown in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

5.4.2. Alternative proxy for geopolitical risk using ICRG

To further support the analysis, the International Country Risk Guide (ICRG) risk index, published by the Political Risk Service Group, is employed. The ICRG has been used as an alternative proxy for geopolitical risk in many past studies (Adra *et al.*, 2023; Aksoy-Hazır and Tan, 2023; Al-Shboul *et al.*, 2020; Le and Tran, 2021). As reported in Table 5, the regression analysis is performed again, and the estimation results are presented in Model (1) for cash holdings and Model (2) for corporate investment. Importantly, in these two alternative specifications, geopolitical risk (proxied by ICRG) remains negatively and significantly associated with cash holdings at the 5% level and

with firm investment at the 1% level. To sum up, employing various econometric methods does not change the primary conclusion that geopolitical risk negatively affects both cash holdings and investment activities.

Table 5. Additional test – alternative measure for geopolitical risk using ICRG

	(1)	(2)
VARIABLE	***CASH***	***CAP_EXP***
ICRG	−0.015**	−0.023***
	(−2.317)	(−3.790)
BSIZE	0.005**	0.001
	(2.258)	(0.403)
BIND	−0.000	0.000
	(−0.997)	(0.870)
LnSIZE	−0.008**	0.004*
	(−2.458)	(1.873)
ROA	0.035	−0.007
	(0.504)	(−0.122)
MTB	0.006**	−0.001
	(2.526)	(−0.692)
LEV	−0.108***	0.002
	(−5.906)	(0.094)
CFO	0.054	0.162***
	(0.992)	(3.383)
LOSS	−0.002	−0.014
	(−0.202)	(−1.528)
GROWTH	0.001	−0.001
	(0.618)	(−0.393)
LnAGE	0.005	−0.012*
	(0.828)	(−1.838)
Constant	0.644***	0.797***
	(2.844)	(4.038)
Obs.	1,110	1,110
Industry & year FE	YES	YES
Adj. R^2	0.241	0.139

Note: t-statistics are shown in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

5.4.3. Endogeneity test: two-step system generalized method of moments (GMM)

The model of this study may suffer from endogeneity problems that may affect the econometric model examining the relationship between the independent variable (geopolitical risk) and the dependent variables (cash holdings and investment). To

address this concern, this study uses a two-step system generalized method of moments (GMM) estimator developed by Arellano and Bond (1991) and Blundell and Bond (1998). GMM is commonly used in studies with comparable research designs to address endogeneity caused by unobserved heterogeneity or simultaneity (e.g., Le and Tran, 2021; Al-Shboul *et al.*, 2020; Demir *et al.*, 2019). The study employs xtabond2 module in STATA to estimate the two-step system GMM approach (Roodman, 2009). Specifically, the study uses a two-step system GMM because a one-step system can produce biased estimation results (Roodman, 2009). To perform this test, the study uses lagged versions of the dependent variables (*Lag.LnCASH* and *Lag.LnCAP_EXP*) as internal instruments.

To avoid instrument proliferation—a key concern in GMM estimation (Roodman, 2009)—the study uses a restricted lag structure. The lagged dependent variables are used starting at lag 2, satisfying the requirement that instruments be predetermined and not correlated with the contemporaneous error term. Higher-order lags were deliberately avoided to keep the number of instruments at a reasonable level and reduce the risk of overfitting the endogenous variables. Several diagnostic tests were conducted to confirm the validity of the GMM estimation. The Hansen J-test for over-identifying restrictions shows insignificant p-values for both models (*LnCASH* = 0.209*; LnCAP_EXP* = 0.298), indicating that the null hypothesis of instrument validity cannot be rejected and confirming that the internal instruments used in the system GMM specification are appropriate. The Arellano–Bond autocorrelation tests reveal that AR(1) is significant, as expected in differenced models, while AR(2) is insignificant (*LnCASH* = 0.738; *LnCAP_EXP* = 0.260), suggesting the absence of second-order serial correlation and satisfying a key requirement for system GMM consistency. Instrument count was also carefully monitored following Roodman (2009), ensuring the number of instruments remained below the number of firms and avoiding instrument proliferation by applying instrument collapsing to maintain parsimony and reliability. Overall, the diagnostic results support the suitability of the system GMM estimator and indicate that the models are free from weak-instrument and over-identification problems. Table 6 presents the results of the two-step GMM system. The results show that the p-value of the Hansen J test is insignificant across the two specifications, suggesting that the instruments are valid and that there is no autocorrelation in the econometric models. Importantly, the results show that the coefficients on the variable

of interest, *LnGPR*, remain negative and statistically significant for *LnCASH* and *LnCAP_EXP*, indicating that the two-step GMM estimator supports the main results that geopolitical risk reduces the levels of cash holdings and investment activities of Saudi companies.

Table 6. GMM estimator regression results

VARIABLE	**(1)** ***LnCASH***	**(2)** ***LnCAP_EXP***
Lag.LnCASH	0.385***	
	(0.043)	
Lag.LnCAP_EXP		0.395***
		(0.109)
LnGPR	−0.184***	−0.200*
	(0.067)	(0.108)
BSIZE	0.089**	−0.015
	(0.043)	(0.035)
BIND	−0.001	0.001
	(0.002)	(0.003)
LnSIZE	−0.033	0.191***
	(0.038)	(0.060)
ROA	0.128	−1.412
	(0.813)	(1.167)
MTB	0.022	−0.001
	(0.026)	(0.032)
LEV	−0.587***	−1.447***
	(0.211)	(0.355)
CFO	1.253**	0.269
	(0.545)	(0.781)
LOSS	−0.284**	−0.033
	(0.117)	(0.212)
GROWTH	0.043**	−0.190**
	(0.018)	(0.073)
LnAGE	0.0130	−0.272**
	(0.090)	(0.106)
Constant	−2.308***	−2.844***
	(0.792)	(0.861)
Obs.	1,110	1,110
Industry & year FE	YES	YES
AR1 (p-value)	0.000	0.003
AR2 (p-value)	0.738	0.260
Hansen-J (p-value)	0.209	0.298

Note: t-statistics are shown in parentheses. ***, **, and * denote significance at the 0.01, 0.05, and 0.1 levels, respectively.

6. Conclusion

The paper examines how GPR affects firms' cash-holding behavior and investment policies in Saudi Arabia. Several factors make Saudi Arabia an ideal setting for this analysis. The country is the world's largest oil exporter and is situated in the MENA region, a geography marked by persistent geopolitical tensions and economic uncertainties. Exposure to these conditions increases firms' vulnerability and can lead to adverse economic outcomes. Drawing on agency-motive theory, the precautionary motive, and real options theory, and using a sample of 1,110 firm-year observations from Saudi non-financial listed firms, the study documents two important findings. First, it documents strong, economically significant evidence that increased GPR during periods of significant geopolitical tensions leads Saudi firms to hold less cash, aligning with *agency motive theory*. Second, the results show that increased GPR dampens corporate investment activity, in line with the "wait-and-see" behavior predicted by *real options theory*. These findings remain robust across multiple sensitivity analyses, including alternative measures of cash holdings, investment, and GPR, as well as controls for endogeneity using a two-step system GMM approach.

This study makes both theoretical and practical contributions. From a theoretical perspective, it advances the agency-motive framework and extends real options theory by demonstrating how geopolitical risk (GPR) shapes firms' cash-holding and investment decisions. Practically, the findings provide valuable insights into how firms strategically adjust resource allocation in response to heightened GPR, which is particularly relevant for companies operating in emerging economies. The results also carry important policy implications for Saudi Arabia in the context of Vision 2030, offering guidance for corporate managers, boards, and policymakers on enhancing risk management and governance. Specifically, the evidence underscores the need for resilient cash-reserve strategies and flexible investment policies to protect firm resources and support economic stability amid ongoing geopolitical uncertainties. However, this paper has some limitations: it focuses solely on Saudi firms, excludes the COVID-19 period, and examines only cash holdings and investments. Future research could extend this analysis by incorporating cross-country data, expanding the time horizon to capture the effects of the COVID-19 pandemic, and examining additional firm-level financial and operational variables beyond cash holdings and investment. Moreover, future studies may investigate interaction effects between

geopolitical risk and key corporate characteristics—such as ownership structure, board composition, and governance mechanisms—to provide a more nuanced understanding of how firm-specific attributes moderate the influence of geopolitical uncertainty on corporate policies.

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Appendix A. Variables definitions

Variable code	Variable name	Definition and measurement
Dependent variables:		
CASH	Cash holdings	The ratio of cash and cash equivalents to net assets
LnCASH	Log of *CASH*	The natural logarithm of *CASH*
CAP_EXP	Capital expenditures	The ratio of capital expenditures to total assets
LnCAP_EXP	Log of *CAP_EXP*	The natural logarithm of *CAP_EXP*
Independent variable:		
GPR	Geopolitical risk	The average monthly country-specific GPR index over a 12-month period is calculated at the end of each calendar year, as developed by Caldara and Iacoviello (2018). A higher value of GPR denotes higher geopolitical risk.
LnGPR	Log Geopolitical risk	
ICRG	International Country Risk Guide risk index	Political risk index from ICRG published by the Political Risk Service Group. ICRG, with a higher score, indicates higher political risk.
Control variables:		
BSIZE	Board size	The number of directors on the board
BIND	Board independence	The proportion of independent directors on the board
LnSIZE	Firm size	The natural log of book value of total assets
ROA	Return on assets	The ratio of net income to total assets
MTB	Market to book	The ratio of market value of equity to book value of equity
LEV	leverage	The ratio of total liabilities to total assets
CFO	Cash from operations	The ratio of cash flows from operation to total assets
LOSS	Negative earnings	an indicator variable equals to 1 if the firm reports a loss, and 0 otherwise;
GROWTH	Firm growth	Sales in current year minus the previous year's sales, divided by the previous year's sales
LnAGE	Firm age	the natural logarithm of the number of years since the firm was established;
YEAR	Year dummies	
INDUSTRY	Industry dummies	