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The Role of Uncertainty

Geopolitical Risk's Effect on Target Debt Ratios Among Nordic Public Firms (2018-2024)

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Abstract

Inspired by the escalation in geopolitical risk following Russia's invasion of Ukraine, this thesis examines how geopolitical risk affects the target debt ratios of publicly listed Nordic firms, and whether this effect is stronger for firms with direct exposure to Russia. Using panel data on 1,387 publicly listed Nordic firms from 2018-2024 and the geopolitical risk index developed by Caldara and Iacoviello (2022), we estimate a dynamic partial-adjustment model with firm fixed effects to examine how geopolitical risk influences firms' target debt ratios.

Our results show a positive and significant relationship between geopolitical risk and target debt ratios in the Nordic context. This opposes our hypothesis that increased geopolitical risk would lead firms to adopt more conservative capital structures. We also find no meaningful difference between exposed and non-exposed firms, suggesting that the relationship between geopolitical risk and target debt ratios does not appear to be driven by firm-specific exposure to Russia.

Keywords: *Geopolitical Risk, Target Debt Ratio, Capital Structure, Partial Adjustment Model*
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1. Introduction

On the 24th of February 2022, Russian forces launched a full-scale offensive into Ukraine. More than 150,000 troops were deployed, supported by air power, missile strikes, drones, heavy artillery, and tanks (D'Anieri, 2023). It marks the outbreak of the largest armed conflict on European soil since the Second World War and signaled a fundamental shift in Europe's security landscape (Astrov et al., 2022). The consequences of the war were immediate and spread far beyond the regions directly involved (Aizenman et al., 2024). The global geopolitical risk (GPR) index, created by Caldara and Iacoviello's (2022), reached its third-highest level since 2000. Only the Iraq War and the 9/11 attacks registered higher peaks.

Since the release of the GPR index in 2022, academic literature has shown evidence that increased geopolitical risk influences firm-level behavior, such as a firms' leverage choices (Khoo and Cheung, 2021; Lee et al., 2021). While prior research looks at how geopolitical risk affects actual debt ratios, far less is understood about its influence on firms' long-run target leverage. One study that investigates this is *Impact of geopolitical risk on target debt ratio* by Shrestha et al. (2024). The authors find that U.S. firms tend to reduce their target debt ratios when geopolitical risk increases. Inspired by the escalation in geopolitical risk following Russia's invasion of Ukraine, this thesis aims to investigate how geopolitical uncertainty affects public Nordic firms' target debt ratios, and whether this effect is stronger for firms with direct exposure to Russia.

1.0.1 Geopolitical Risk Definition

Geopolitical risk concerns events and threats between political actors that affect the peaceful course of international relations (Caldara and Iacoviello, 2022). Since 2000, several events have drastically increased the global geopolitical risk. These include the 9/11 attacks in 2001, the Paris terrorist attacks in November 2015, and most recently Russia's invasion of Ukraine on 24 February 2022. Caldara and Iacoviello (2022) have developed an index that measures the level of geopolitical risk by counting the number of newspaper articles that report on adverse geopolitical events. The index reports on GPR at both the global and country level.

The index distinguishes between two components: Geopolitical Acts and Geopolitical Threats. The former refers to the realization, or the escalation, of conflicts, whereas the latter is defined as increase in tension and military buildups.

This paper focuses on the combined GPR index, as our time frame (2018-2024) captures both the pre-war period, characterized mainly by Geopolitical Threats, and the post-war period, dominated by Geopolitical Acts following the Russia-Ukraine conflict.

1.0.2 Target Debt Ratio Definition

The target debt ratio reflects the long-run optimal level of leverage a firm aims for. It is a theoretical construct and, unlike the market debt ratio, it cannot be directly observed. Instead, it is estimated from firm characteristics such as profitability, size, asset tangibility, and risk. Since firms gradually adjust toward this optimal level over several years, the target debt ratio aims to capture a firm's underlying financial strategy (Flannery and Rangan, 2006; Shrestha, Philip and Khaw, 2024).

1.1 Purpose and Contribution

Previous studies examining how geopolitical risk affects firms' leverage decisions focus on actual debt ratios (e.g., Khoo and Cheung, 2021). Just recently, Shrestha et al. (2024), showed that higher geopolitical risk lowers firms' target debt ratios. However, because their study focuses exclusively on the United States, it leaves questions about how geopolitical risk affects firms' target debt ratios in other regions. Our thesis seeks to fill that gap by investigating firms in the Nordic region, which offers a particularly relevant context.

While the U.S. country-specific GPR index has largely mirrored the movements of the global index, with the invasion marking the third-largest spike since 2000, the increase in the GPR index of the Nordic countries was even more striking. Although the Nordic region has historically exhibited low levels of GPR, the 2022 invasion raised geopolitical risk in Finland, Sweden, and Norway to their highest levels since 2000. Denmark also experienced one of its highest values during this period (Caldara and Iacoviello, 2022). The magnitude of the shock was reflected in a reconfiguration of the Nordic security landscape. For decades, Sweden and Finland judged that the costs of NATO membership outweighed its potential benefits (Alberque and Schreer, 2022). Yet, less than three months after Russia's invasion of

Ukraine, both countries reversed this position and applied for membership, bringing an end to their long-standing tradition of military neutrality (Pesu and Iso-Markku, 2024).

To examine how geopolitical risk influences Nordic firms' target debt ratios, we adopt a method similar to that of Shrestha et al. (2024) who build on the partial-adjustment model by Flannery and Rangan (2006). This thesis contributes to the literature in two primary ways. First, by comparing the nordic evidence with existing U.S. findings, we test whether prior conclusions also hold in a nordic context which offers a broader perspective on the firm-level consequences of heightened geopolitical risk. Second, by distinguishing between Nordic firms with and without direct exposure to Russia, we test how geopolitical uncertainty affects firms differently depending on their degree of exposure to heightened geopolitical risk.

In doing so, our analysis of publicly listed Nordic firms aims to answer the following research question:

"Do increases in geopolitical risk affect firms' target debt ratios among Nordic publicly listed firms, and is this relationship influenced by firms' exposure to Russia?"

1.2 Scope of Investigation

The scope of this thesis is limited to Nordic publicly listed companies, excluding firms from Iceland and Greenland. By focusing on Denmark, Finland, Norway, and Sweden, we ensure that our sample represents firms from countries with both comparable business environments and proximity to the conflict. Any reference made to the Nordics hereafter is done so with the previous definition, unless otherwise mentioned.

We acknowledge that firms across industries follow different accounting and financing norms. Financial-and real estate firms are therefore excluded, as their balance-sheet composition differs substantially from that of other industries. Furthermore, to enhance data reliability, we exclude firms with negative or zero book value of equity and those with fewer than three consecutive yearly observations.

This study analyses firms' target debt ratios over a seven-year period from January 2018 to December 2024, allowing a comparison of the period before and after Russia's invasion of

Ukraine on 22 February 2022. This time frame captures both the pre-war baseline of relatively low geopolitical risk and the post-invasion period of heightened risk, making it possible for us to identify any adjustments in firms' target debt ratios.

1.3 Results

The result for our first hypothesis shows that geopolitical risk is positively and statistically significantly associated with firms' target debt ratios. This finding stands in contrast to both our expectations and prior U.S. evidence (Shrestha et al., 2024). Furthermore, for our second hypothesis, we find no statistically meaningful difference in how firms with and without direct exposure to Russia adjust their target debt ratios. These results suggest that geopolitical risk may influence firms' target debt ratios differently across regions, and that firm-specific exposure appears to play a limited role in this relationship.

1.4 Disposition

The remainder of the thesis is structured as follows. Chapter 2 reviews the theoretical concepts and prior literature on geopolitical risk and capital structure that form the basis for our hypotheses. Chapter 3 then presents the hypotheses derived from the previous chapter. Chapter 4 describes the data and outlines the empirical methodology. Chapter 5 presents the main results together with additional robustness tests. Chapter 6 discusses the findings in relation to existing theory and prior research. Chapter 7 concludes by addressing limitations and proposing avenues for future research.

2. Literature and Theory

This chapter begins by outlining main capital structure theories, followed by a summary of existing studies on how geopolitical risk affects the macroeconomy, firm decisions, and leverage decisions. Together, they provide the foundation for understanding how Nordic firms might adjust their target debt ratios in response to geopolitical risk.

2.1 Theoretical Perspective

2.1.1 The Static Trade-Off Theory

In a world of perfect capital markets, the Modigliani-Miller theorem states that a firm's value is independent of its leverage decisions (Modigliani and Miller, 1958). However, once taxes are introduced, debt creates a tax advantage because interest payments reduce taxable income. These tax benefits increase the market value of the levered firm relative to the unlevered firm, which makes debt financially attractive. On the other hand, higher leverage increases the probability of bankruptcy, which introduces bankruptcy costs. These include the direct and indirect penalties a firm faces if it cannot meet its promised debt payments. Accordingly, the expected market value of the levered firm decreases as the risk of bankruptcy becomes more likely (Kraus and Litzenberger, 1973).

Firms select the level of debt that maximizes total firm value, defined as the unlevered value plus the present value of tax savings minus the present value of expected bankruptcy costs. The optimal capital structure therefore comes from the trade-off between the present value of tax savings from additional debt and the present value of expected bankruptcy costs (Kraus and Litzenberger, 1973).

2.1.2 The Dynamic Trade-Off Theory

The original formulation of the static trade-off theory does not account for the fact that adjusting capital structure is costly. In a frictionless market without such adjustment costs, a firm's actual debt ratio would always equal its target debt ratio. In practice, however, firms face numerous adjustment costs such as restructuring expenses, transaction costs, information costs and monitoring costs. This prevents them from instantaneously aligning actual debt ratio with the target. As a result, firms only partially adjust their capital structure over time.

2.1.3 The Pecking-Order Theory & Information Asymmetry

An alternative perspective is offered by the Pecking-Order Theory. It explains firms' financing behaviour by proposing a hierarchical preference order among financing sources. According to the theory, firms prefer to use internal funds (retained earnings) first, then debt, and turn to external equity only as a last resort (Myers and Majluf, 1984).

At the core of the Pecking-Order Theory lies asymmetric information between managers and external investors. Information asymmetry arises when one party possesses more knowledge about the value or quality of an asset than the other (Akerlof, 1970). Managers typically possess superior information about the firm's true value, performance, and risks. Outside investors cannot perfectly observe this information (Myers and Majluf, 1984).

The level of information asymmetry influences the relative cost of alternative financing sources. Retained earnings has the least information asymmetry and is therefore the cheapest source of financing. However, if internal funds are insufficient, firms will prefer debt over equity because the cost to current shareholders of issuing mispriced equity is larger than the cost of issuing debt. If the firm is undervalued, issuing equity will transfer wealth from existing to new shareholders. As managers act in the best interest of current shareholders, they will be reluctant to issue equity. That is one reason why equity issues are interpreted by investors as a signal of overvaluation or poor future prospects, which in turn tends to reduce stock prices (Myers and Majluf, 1984).

2.2 Literature Review

2.2.1 GPR's Effects on the Macroeconomy

Prior research shows that higher geopolitical risk depresses stock markets and investor sentiment. Yang and Yang (2021) show that shocks to geopolitical risk have a lasting negative effect on aggregate stock returns in the U.S. They also suggest that GPR provides predictive power in standard stock-return forecasting models across major markets. Complementing this evidence, He (2023) finds that GPR shocks Granger-cause declines in U.S. investor sentiment. The negative effects fluctuate over time and are more pronounced in the short-term. Yilmazkuday (2024) reports a similar stock market effect in the European area

where the author shows that increases in GPR reduce stock prices in countries such as Sweden and Denmark.

Moreover, GPR also appears to command a risk premium. Studying emerging markets, Zaremba et al. (2022) show that countries experiencing the largest increases in GPR subsequently earn the highest stock returns. These return differentials can be up to 1% per month between high-and low-GPR countries. Investors appear to initially overreact to negative geopolitical news, depressing prices, and then earn higher future returns as valuations revert.

GPR also influences the banking system and the cost of credit. Using a sample of U.S. loan facilities, Nguyen and Thuy (2023) show that higher geopolitical risk is associated with higher loan prices and tightened non-price terms. This finding aligns with the results of Phan et al (2022). They show that increases in GPR lower U.S. banks' Z-scores, a measure of bank stability, and raise the amount of non-performing loans. Similarly, Shabir et al. (2023), using data from 19 countries, show that geopolitical risk heightens banks' overall risk.

2.2.2 GPR's Effects on Firm Decisions

Geopolitical risk also shapes firm-level decisions. Wang et al. (2024) show that higher geopolitical risk is associated with lower next-quarter investment for firms in the U.S. The effect is strongest among firms with more irreversible capital and greater market power. Le and Tran (2021) find a similar negative relationship in emerging Asian countries. However, this reduction in investment does not necessarily extend to innovation. Instead, Jia et al. (2022) show that higher GPR is associated with greater innovation input and output for Chinese firms. The authors argue that periods of heightened GPR may offer firms an opportunity to secure future competitiveness, particularly when access to foreign technology becomes more uncertain.

A second strand of research highlights how firms manage liquidity under geopolitical uncertainty. Higher GPR brings greater cash-flow volatility and a higher risk of financial distress. In response to the increased risk, firms tend to adjust their payout policies: those exposed to higher GPR cut share repurchases while keeping cash dividends largely unchanged (Adra et al. 2023). Building on this idea, Lee and Wang (2021) show that firms

increase their cash reserves when GPR rises, with financially constrained firms reacting most strongly.

2.2.3 GPR's Effects on Leverage Decisions

Financing decisions are also shaped by geopolitical risk. Using data on Chinese listed firms, Lee et al. (2021) show that higher geopolitical risk reduces both debt and equity issuance. Kotcharin and Maneenop (2020) study shipping firms in Belt and Road Initiative (BRI) countries and find that rising geopolitical tensions along trade routes lead these firms to lower their leverage. Complementing this evidence, Khoo and Cheung (2021) show that geopolitical uncertainty reduces U.S. firms' total debt but raises their market leverage. This divergence arises from a mechanical effect: equity values fall more sharply in response to higher GPR than debt levels do. They also find that when geopolitical uncertainty rises, firms tend to shift away from public debt toward bank debt, reflecting a preference for less information-sensitive forms of financing.

While these studies test how firms adjust their actual debt ratios, more recent work has moved beyond observed leverage and estimated target debt ratios for U.S. firms. Shrestha et al. (2024) show that higher geopolitical risk lowers firms' target debt ratios as a result of increased probability of default. Similarly, Chowdhury et al. (2025) also find that geopolitical risk has a long-lasting negative impact on corporate leverage in the U.S.

A different part of the literature adds an important nuance. Khandokar Istiak and Serletis (2020) find that commercial banks' leverage in the United States tends to rise when geopolitical risk increases. They argue that it is partly because commercial banking is relationship-based: banks tend to continue supplying credit to their existing borrowers even when market conditions weaken. At the same time, they show that broker-dealers and shadow banks deleverage in response to uncertainty shocks.

Lastly, the role of managerial characteristics has started to receive attention. Yaghoubi (2024) finds that firms with a higher proportion of female executives react more strongly to geopolitical risk by adopting more conservative capital structures, whereas older executives tend to dampen the negative effect of GPR on leverage.

3. Hypothesis Development

This section draws on the capital structure theories, and the reviewed empirical literature, outlined in chapter 2 to understand how changes in geopolitical risk may affect the target debt ratios of Nordic publicly listed firms. First, we derive our main prediction for how the target debt ratios will respond to geopolitical risk, which leads to our first hypothesis. Second, we discuss whether exposure to heightened geopolitical risk through operations in Russia will amplify this relationship, and use this to formulate our second hypothesis.

3.1 Development of Hypothesis One

The static trade-off theory provides a natural starting point for understanding how firms might adjust their target debt ratio when geopolitical risk rises. The theory states that higher debt creates tax benefits, increasing the value of the levered firm in comparison to the unlevered firm (Kraus and Litzenberger, 1973). However, prior literature shows that elevated geopolitical risk makes corporate cash flows more volatile and increases the risk of financial distress (Adra et al., 2023). This could raise the likelihood of earnings falling short of debt obligations, thereby increasing expected bankruptcy costs. If geopolitical risk intensifies, these higher bankruptcy costs are then expected to outweigh the tax benefits of additional debt. Together, this suggests that firms should respond to higher geopolitical risk by lowering their target debt ratio.

The pecking-order theory, combined with empirical evidence, offers a different interpretation of how geopolitical risk affects a firms' target debt ratios. The pecking-order theory suggests that firms prefer to finance their activities according to a hierarchy: retained earnings first, then with debt, and as a last resort with equity (Myers and Majluf, 1984). Geopolitical risk has been shown to depress equity prices, making firms appear undervalued (Zaremba et al., 2022). In such situations, managers will avoid issuing equity as it will transfer value to new shareholders (Myers and Majluf, 1984). At the same time, geopolitical shocks tend to raise loan prices and create stricter lending terms, increasing the effective cost of debt (Nguyen and Thuy, 2023; Shabir et al., 2023). Together, these patterns suggest that periods of rising geopolitical risk should cause firms to rely less on external financing and instead prefer internal funds. Supporting this, prior studies show that firms cut back on risky investments

and increase cash holdings as a precaution when GPR increases (Le and Tran, 2021; Lee and Wang, 2021).

Taken together, these two lines of reasoning offer no single directional prediction of how GPR affects leverage. While the static trade-off theory, together with relevant literature, suggests that firms lower their target debt ratio, the pecking-order theory suggests that firms rely less on external financing and instead prefer to finance their investments with retained earnings. Nonetheless, neither line of reasoning directly predicts that the U.S. findings of Shrestha et al. (2024) would not hold in a Nordic context. This leads us to believe that an increase in geopolitical risk is associated with lower target leverage for Nordic publicly listed firms. If GPR has a negative effect on firms' target debt ratio, then higher geopolitical risk should be followed by firms aiming towards more conservative capital structures.

H_1**:** Higher geopolitical risk is associated with lower target debt ratios

3.2 Development of Hypothesis Two

In our sample period, the increase in geopolitical risk is largely driven by the Russia-Ukraine conflict. At the onset of the war, several Nordic firms operated in Russia. While many companies withdrew shortly thereafter, some decided to continue their activities (Yale School of Management, 2024). Regardless of whether they later exited or remained, firms with operations in Russia are presumed to be more directly exposed to the geopolitical risk.

Following the invasion in 2022, many countries responded by expressing their opposition and placing economic pressure on Russia through a wide range of sanctions. At the same time, large parts of the global agricultural supply chain experienced major disruptions (Aizenman et al., 2024). Firms operating in Russia during this period were directly exposed to these developments, thus facing heightened risks related to sanction and supply-chain breakdowns. Such disruptions are likely to increase cash-flow volatility, which from a trade-off perspective, increases the expected bankruptcy costs (Kraus and Litzenberger, 1973). Moreover, the increase in cash-flow volatility could make these firms appear riskier to creditors. This can result in tighter lending conditions and greater reluctance among lenders

to provide new financing. According to the pecking-order theory, exposed firms then have stronger incentives to use internal funds and avoid taking on additional debt, as geopolitical uncertainty effectively raises the cost of borrowing (Myers and Majluf, 1984).

Overall, if geopolitical risk leads firms to reduce their target debt ratios on average, we expect this response to be more pronounced for firms that are directly exposed to the Russian market. In other words, the decrease in leverage should be stronger for firms with operations in Russia than for non-exposed firms.

H_2: The negative association between geopolitical risk and leverage is stronger for firms that operated in Russia at the onset of the war than for firms without such exposure.

4. Methodology

This chapter outlines the empirical methodology we use to examine how geopolitical risk affects the target debt ratios of Nordic publicly listed firms. We first present the partial-adjustment framework that relates a firm's actual market debt ratio to its target debt ratio. We then present the model specifications used to test our two hypotheses. Next, we define our dependent, independent and control variables, with particular emphasis on how the GPR index is constructed and how we define exposure to the Russian market. The section ends with a description of our sample selection and data collection process.

4.1 Research Design

To test our hypotheses, we adopt a partial adjustment model following previous studies (Flannery and Rangan, 2006; Shrestha et al., 2024). The model assumes that firms gradually adjust their actual market debt ratio toward an unobserved target debt ratio:

$$DR_{i,t} - DR_{i,t-1} = \lambda\,(DR^*_{i,t} - DR_{i,t-1}) + e_{i,t} \quad (1)$$

where $DR_{i,t}$ is the actual market debt ratio of firm i in year t, $DR^*_{i,t}$ is the target debt ratio and $e_{i,t}$ is the error term. The parameter λ denotes the speed of adjustment (SOA), which measures how quickly firms move their actual market debt ratios toward the target debt ratio. A higher λ indicates faster adjustment, with the half-life being calculated as $ln(0.5) \,/\, ln(1 - \lambda)$.

4.1.1 Estimation for Hypothesis One

To test Hypothesis 1, we must first define how we estimate the unobserved target debt ratio. Following previous literature, we estimate it as a function of firm fundamentals and geopolitical risk:

$$DR^*_{i,t} = \alpha + \beta_1 GPR_{c(i),t} + \beta_2 Controls_{i,t} + \eta^*_i \quad (2)$$

where GPR_t represents the natural logarithm of the country-level geopolitical risk index, $Controls_{i,t}$ are firm-level control variables, and η^*_i captures firm fixed effects.

We then embed this relationship within the partial-adjustment model. By substituting (2) into (1), we get the following equation:

$$DR_{i,t} - DR_{i,t-1} = \lambda(\alpha + \beta_1 GPR_{c(i),t} + \beta_2 Controls_{i,t} + \eta^*_i - DR_{i,t-1}) + e_{i,t} \quad (3)$$

Or,

$$DR_{i,t} = b_0 + b_1 DR_{i,t-1} + b_2 GPR_{c(i),t} + b_3 Controls_{i,t} + \eta_i + e_{i,t} \quad (4)$$

where $b_0 = \lambda\alpha$, $b_1 = (1 - \lambda)$, $b_2 = \lambda\beta$ and $\eta_i = \lambda\eta^*_i$. The firm-fixed effects η_i capture unobserved heterogeneity across Swedish firms (e.g., governance quality, industry specialization). Since the debt ratio is bounded between 0 and 1, Shrestha et al. (2024) estimate equation (4) using a doubly-censored dynamic fractional panel model, which is designed for variables that can take any value between two limits. It is commonly used where variables are clustered exactly on the boundaries (0% or 100%).

We follow the same partial-adjustment specification in equations (1)-(4), but instead of using a double censored dynamic panel fractional model, we estimate it using a linear panel regression with firm-fixed effects and standard errors clustered at the firm level. This approach is widely used in the capital-structure literature and provides a transparent approximation to the target-adjustment dynamics (Flannery and Rangan, 2006). For our model, we expect $b_2 < 0$, indicating that firms reduce their target debt ratio in response to higher geopolitical risk.

4.1.2 Estimation for Hypothesis Two

Next, we explore whether firms with direct exposure to Russia adjust their target capital structures more strongly in response to the rise in geopolitical risk. To do so, we begin by

defining a Russia-exposure dummy. Firms are classified as exposed if they operated in Russia at the onset of the war:

$$GPRExposure_i = 1 \; if \; a \; firm \; has \; operations \; in \; Russia \; at \; the \; onset \; of \; the \; war, \; otherwise \; 0.$$

To test whether the effect of geopolitical risk differs between exposed and non-exposed firms, we build directly on the baseline specification in equation (4) and extend it by incorporating the Russia-exposure dummy:

$$DR_{i,t} = b_0 + b_1 DR_{i,t-1} + b_2 GPR_{c(i),t} + b_3 (GPR_{c(i),t} \; x \; GPRExposure_i) + \\ + b_4 Controls_{i,t} + \eta_i + e_{i,t} \quad (5)$$

Here, b_3 captures whether exposed firms adjust their target debt ratios more strongly when geopolitical risk increases. We expect $b_3 < 0$, i.e. that firms with direct exposure to Russia lower their target debt ratio more aggressively than firms without such exposure.

The model in (5) is estimated with the same linear panel regression with firm fixed effects and standard errors clustered at the firm level as for hypothesis 1.

4.2 Variables

Our set of control variables follows Shrestha et al. (2024). We include standard firm characteristics commonly used in target leverage models, such as asset volatility, profitability, market-to-book assets, firm size, tangibility, R&D intensity, an R&D dummy, non-debt tax shields, and the industry median market debt ratio. A summary of our control variables is provided in Table 1.

Table 1. Variable description

Variables	*Description*	*Source*
Variables used in formulas		
Market value of equity (MVE)	Market equity is computed as the matched fiscal-year share price [PRCC M] multiplied by shares outstanding [CSHPRIA]	Compustat
Dependent variables		
Market debt ratio (DR1)	Total debt [DLC+DLTT] over total debt [DLC+DLTT] plus market value of equity [MVE]	Compustat
Market debt ratio (DR2)	Total debt [DLC+DLTT] over total assets [AT] minus book equity [SEQ] plus market value of equity [MVE]	Compustat
Market debt ratio (DR3)	Total liabilities [LT] over total liabilities [LT] plus market value of equity [MVE]	Compustat
Market debt ratio (DR4)	Long-term debt [DLTT] over total assets [AT] minus short-term debt [DLC] minus book equity [SEQ] plus market equity [MVE]	Compustat
Book debt ratio (BDR)	Total debt [DLC + DLTT] over total assets [AT]	Compustat
Independent variable		
Geopolitical risk index	Monthly geopolitical risk (GPR) is measured using the frequency of articles in leading newspapers covering events such as terrorist activity, war threats, and military tensions. The GPR index is first averaged over 12 months for each Nordic country. These country-level averages are then merged to firms based on each firm's country of operation and fiscal year.	
Control variables		
Asset volatility	Standard deviation of monthly stock returns over the 12 months preceding the firm's fiscal year-end	Compustat
Profitability	Earnings before interest and taxes [EBIT] over total assets [AT]	Compustat
Market-to-book assets	Total debt [DLC + DLTT] plus market value of equity [MVE] over total assets [AT]	Compustat
Firm size	Natural logarithm of total assets [AT]	Compustat
Tangibility	Net property, plant, and equipment [PPENT] over total assets [AT]	Compustat
R&D expenses	Research and development expenditure [XRD] over total assets [AT]; [XRD] set to 0 if missing	Compustat
R&D expenses dummy	A dummy variable set to 1 if the firm reports positive R&D expenditure (XRD > 0), and 0 otherwise.	Compustat
Non-debt tax shield	Depreciation and amortisation expense [DP] over total assets [AT]	Compustat
industry median market debt ratio	The industry median market and book debt ratios are calculated using the Fama and French (1997) 48-industry classification.	Compustat

4.2.1 Dependent Variable

The dependent variable in all specifications is the market debt ratio (DR), which captures firms' leverage based on market values. Following Shrestha et al. (2024), we define market

debt ratio as total interest-bearing debt divided by the sum of total interest-bearing debt and the market value of equity.

We use market leverage instead of book leverage because book values reflect past accounting decisions and do not adjust to changing expectations about future performance. Since target debt ratio is inherently forward-looking, market-based measures are more appropriate as they, unlike book equity, incorporate these expectations.

4.2.2 Independent Variables

The next section is divided into two parts. We first explain how we measure geopolitical risk, and then how we define firms' exposure to the Russian market.

4.2.2.1 Geopolitical Risk Index

Our measure of geopolitical risk is the country-level GPR index developed by Caldara and Iacoviello (2022). We use the authors' country-level index for each Nordic country. Before estimating our regressions, we transform the GPR index using $ln(1 + GPR)$. Adding one, before taking the natural logarithm, ensures that we get non-negative values. This is in line with what the index's authors recommend.

4.2.2.2 Russian Market Exposure

To capture firms' exposure to Russia, we draw on the work by Yale School of Management. Since the invasion of Ukraine, they have tracked the responses of more than 1,500 multinational companies and graded firms on an A-F scale based on the completeness of their Russian withdrawal. Companies that continue business-as-usual receive an F, while those fully exiting or halting all Russian engagements are awarded an A (Yale School of Management, 2024). A firm is defined as exposed if it appears on the Yale list.

We use all firms on the Yale list (grades F-A) to identify companies that had any operations in Russia at the onset of the war. However, using this broad definition may overstate exposure. Grade A firms have fully exited Russia and no longer face Russia-specific geopolitical risks. To address this, we also rerun our regression using a narrower definition that only includes firms graded F-B, all of which still have some operational or strategic connection to Russia.

4.2.3 Control Variables

Our set of control variables follows Shrestha et al. (2024), and we adopt the same expected coefficient signs as in their baseline specification. We include standard firm characteristics commonly used in target leverage models, such as asset volatility, profitability, market-to-book assets, firm size, tangibility, R&D intensity, an R&D dummy, non-debt tax shields, and the industry median market debt ratio. A summary of our control variables is provided in Table 1.

4.3 Sample Selection and Data Collection

In this section, we outline our sample construction. For our two hypothesis, we work with two sample groups:

1. All Nordic publicly listed firms, including both exposed and non-exposed companies.
2. Nordic publicly listed firms with direct exposure.

The first group is used to test Hypothesis 1. The second group allows us to examine whether firms with direct exposure to Russia adjust their target debt ratios more strongly when geopolitical risk increases.

4.3.1 Full Nordic Sample

We use Compustat to collect company-specific data for Nordic publicly listed firms, excluding Iceland and Greenland, from Jan 1, 2018, to Dec 31 2024. We begin with 9,922 firm-year observations across 1,618 unique firms. We then apply a series of data-cleaning steps to ensure comparability and data quality. First, we only keep non-financial and non-real-estate firms by excluding SIC codes between 6000-6799 and 65xx. In this step, we also drop firms with unclassified or missing SIC codes (SIC $\geq$ 9990 or NA), yielding 9,714 observations (1,583 firms). Next, to ensure sufficient time-series information for dynamic specifications, we remove firms with fewer than three consecutive fiscal-year observations, resulting in 9,555 observations (1,490 firms).

We further exclude observations with missing values for the dependent variable (DR1), leaving 9,073 observations across 1,479 firms. To prevent distortion from incorrectly scaled financial statements, we drop observations with negative logged total assets (size_log_at < 0), resulting in a sample of 9,056 observations across 1,479 firms. Finally, we exclude firms

whose fiscal year does not end on December 31 to ensure their reporting periods align with the annual GPR index. After all steps have been completed, we end up with 8,412 firm-year observations, and 1,387 unique firms. Lastly, all continuous ratio variables, except the dependent variable, are winsorized at the 1st and 99th percentiles to mitigate the influence of outliers. We then merge the $ln(1 + GPR)$ of the country-year geopolitical risk index onto each firm-year observation.

This filtered dataset forms the basis for subsequent analyses. Table 2 is presented below and summarizes the sample build and data cleaning steps.

Table 2. Data cleaning process

Step in data cleaning process	*Remaining observations*	
	Firm-year observations	*Unique firms*
Download from Compustat all public firms in Sweden, Norway, Finland, and Denmark from 2018-2024	9922	1618
Drop financial, regulated, and real-estate SiC codes (6000-6799 and 65xx)	9897	1614
Drop firms with unclassified or missing SiC codes (>= 9990 or NaN).	9714	1583
Drop firms with fewer than three consecutive fiscal-year observations	9555	1490
Drop observations with missing dependent variable (DR1)	9073	1479
Drop observations with negative size screen: size_log_at < 0 (mis-scaled assets)	9056	1479
Drop firms with fiscal year ends not Dec 31	8412	1387
Winsorize continuous ratios. Applied 1.00%/99.00% winsorization bounds to ratio columns (dependent variables left untouched).	8412	1387
Merge the log of the country-year GPR index onto each firm-year observation.	8412	1387
Add subsidiary variables for each firm-year: a dummy (1 if the firm has any subsidiary, 0 otherwise) and a count of subsidiaries located in Russia or Ukraine.	8412	1387
Final Sum	**8412**	**1387**

This table documents the sample construction process for the study. Starting from all public firms in Sweden, Norway, Finland, and Denmark from 2018 to 2024, the final sample consists of 8,412 firm-year observations for 1,387 unique firms.

4.3.2 Exposed Subsample

We use the list compiled by the Yale School of Management to identify Nordic publicly listed firms with direct operations in Russia at the onset of the invasion. Panel A, in Table 3, starts from the 1,387 unique firms in our full Nordic sample and matches them to the Yale list, excluding any Yale-listed companies that are not part of our full Nordic sample. This procedure yields 81 exposed firms, corresponding to 497 firm-year observations.

Panel B, in Table 3, refines this exposed sample for the robustness test. From the 81 exposed firms in Panel A, we remove all companies with Yale grade A (classified as having fully withdrawn from Russia). After this step, the sample contains 39 exposed firms and 232 firm-year observations.

Table 3. Construction of Nordic exposed samples

Panel A. Exposed firms matched to the Nordic Compustat sample

Step in data cleaning process	*Remaining observations*	
	Firm-year observations	*Unique firms*
Our full Nordic Sample from previous step	8412	1387
All firm-year observations for companies on the Yale Russia list that can be matched to our Nordic Compustat sample.	497	81
Final Sum	**497**	**81**

Panel B. Exposed firms excluding fully withdrawn (Grade A) firms

Step in data cleaning process	*Remaining observations*	
	Firm-year observations	*Unique firms*
All firm-year observations for companies on the Yale Russia list that can be matched to our Nordic Compustat sample.	232	1387
From the exposed sample in step (1), remove all firms with Yale grade A (classified as having fully withdrawn from Russia).	232	39
Final Sum	**232**	**39**

This table summarises the construction of the exposed Nordic samples. Starting from all listed firms in Sweden, Norway, Finland, and Denmark (2018-2024), we match firms to the Yale Russia list and then, in Panel B, exclude companies with Yale grade A (fully withdrawn from Russia).

5. Empirical results

This chapter presents the empirical results of how geopolitical risk affects the target debt ratios of Nordic publicly listed firms. We begin by summarizing the descriptive statistics. We then estimate the partial-adjustment model to test whether higher geopolitical risk is associated with lower target debt ratios *(Hypothesis 1)*, followed by robustness checks for this hypothesis. Next, we compare the responses of firms with and without operations in Russia *(Hypothesis 2)* and present corresponding robustness tests.

5.1 Descriptive Statistics

Table 4 presents the descriptive statistics included in the empirical analysis, showing the distribution of firms' market debt ratio, geopolitical risk, and firm-level characteristics. The final dataset contains 8,412 firm-year observations across 1,387 publicly listed Nordic firms between 2018 and 2024.

Table 4. Descriptive statistics

Variable	*Obs*	*Mean*	*Std. Dev*	*Min*	*Max*	*P5*	*P25*	*P50*	*P75*	*P95*
Market debt ratio	8412	0.28	0.34	0.00	1.00	0.00	0.01	0.12	0.40	1.00
Log Geopolitical risk index	8412	0.09	0.05	0.02	0.21	0.03	0.05	0.07	0.10	0.21
Asset volatility	8412	0.75	2.42	0.00	11.48	0.00	0.21	0.37	0.60	1.34
Profitability	8412	-0.14	0.39	-1.99	0.33	-0.93	-0.23	0.00	0.08	0.19
Market-to-book assets	8412	2.68	4.18	0.00	13.78	0.00	0.66	1.28	2.96	9.88
Firm size	8412	5.86	2.38	1.56	12.01	2.44	4.01	5.57	7.43	10.25
Tangibility	8412	0.17	0.22	0.00	0.90	0.00	0.02	0.08	0.23	0.69
R&D expenses	8412	0.05	0.12	0.00	0.80	0.00	0.00	0.00	0.04	0.25
R&D expenses dummy	8412	0.45	0.50	0.00	1.00	0.00	0.00	0.00	1.00	1.00
Non-debt tax shield	8412	0.05	0.05	0.00	0.27	0.00	0.01	0.03	0.06	0.14
industry median market debt ratio	8412	0.17	0.20	0.00	1.00	0.00	0.05	0.11	0.24	0.59

This table summarizes the summary statistics of the sample. There are 8,412 firm-year observations with 1,387 firms over 7 years from 2018 to 2024. ***, **, * denote the significance levels for a two-tailed test at 1 %, 5 %, and 10 %, respectively.

As expected, several variables display skewness and dispersion. The market debt ratio, which serves as the dependent variable in our two hypotheses, has a mean of 0.28 and a median of 0.12. This indicates that the distribution is right-skewed, with many firms operating at low leverage levels and a smaller group exhibiting higher ratios. Despite having winsorized at the

1st and 99th percentiles to mitigate the influence of outliers, the maximum is 1 meaning that for some firms the market value of equity is close to zero relative to debt. Meanwhile, the minimum is 0, which reflects firms with no interest-bearing debt at all. However, most observations still fall within the interior of the distribution, with an interquartile range between 0.01 and 0.40. Although we do not adopt the doubly censored dynamic panel fractional model used by Shrestha et al. (2024), our linear panel fixed-effects estimator is unlikely to suffer from severe bias due to censoring at the boundaries.

The log geopolitical risk index exhibits relatively modest variation, with a mean of 0.09 and a median of 0.07. This reflects the overall stability of geopolitical conditions in the Nordics prior to the Russian invasion of Ukraine, followed by a notable rise in 2022 (Appendix 2). The maximum value of 0.21 corresponds to Finland's GPR level during the invasion year, while the minimum value of 0.02 was recorded for Denmark in 2020.

Profitability, measured as EBIT over total assets, is left-skewed with a mean of -0.14 and a median of 0.00. While many firms report modest earnings or break even in a given year, a smaller subset of observations exhibit substantial negative EBIT values, pulling the mean downward. This is illustrated by the minimum value of -1.99, which implies that one firm's EBIT losses were nearly twice the size of its total assets in that year.

The market-to-book ratio displays a mean of 2.68 with a wide right-skew, consistent with a sample that includes both highly valued growth firms and more mature, lower-valued incumbents. This highlights the importance of including market-to-book ratios to capture differences in growth opportunities that influence capital structure decisions. Firm size shows a similarly broad range, consistent with the coexistence of both smaller publicly listed firms to large multinational corporations. However, the mean and median are more closely aligned due to the log transformation of total assets.

Beyond these variables, the remaining firm characteristics also exhibit notable variation. Tangibility has a mean of 0.17 and a median of 0.08, indicating that many firms operate with limited physical assets while a smaller subset of asset-intensive firms raises the average. The non-debt tax shield is similarly right-skewed. R&D intensity and the R&D dummy indicate that nearly half of firms report on some level of R&D. Finally, the industry median market debt ratio highlights meaningful differences in leverage norms across sectors.

In summary, the descriptive statistics indicate relatively high heterogeneity across Nordic firms. The correlation matrix further shows that pairwise correlations among the explanatory variables are generally low, with most coefficients close to zero. The highest correlation is between firm size and market-to-book assets (0.50), and no pair exceeds 0.50 in absolute value (see Appendix 3). These patterns are consistent with the results of the VIF test. The mean VIF is 1.26 and all individual VIFs are close to 1 and well below conventional thresholds (e.g., 5), indicating that multicollinearity is unlikely to be a concern in our regression analysis (see Appendix 3).

5.2 Hypothesis One: Results

Hypothesis 1 states that firms should lower their target leverage when geopolitical risk increases. To examine this, we estimate the partial-adjustment model in equation (4) with the market debt ratio (DR1) as the dependent variable. Table 5 reports the baseline results. The lagged market debt ratio reflects how firms adjust their capital structure, and the log geopolitical risk index is the main explanatory variable. The specification also includes the full set of firm-level controls: asset volatility, profitability, market-to-book assets, firm size, tangibility, R&D expenditure, non-debt tax shields, and the industry median market debt ratio. All regressions are estimated with firm fixed effects and standard errors clustered at the firm level. Year fixed effects are excluded because they would absorb the time variation in GPR.

Table 5 shows that the coefficient on the lagged market debt ratio is positive (0.3152) and significant at the 1% level . This indicates that firms adjust their capital structures only gradually from one year to the next. Using the standard relationship $\lambda = 1 - b_1$, the implied speed of adjustment is 0.6848, meaning that firms close approximately 68.48% of the gap between their actual debt ratio and the target debt ratio within a year. The half-life $ln(0.5)/ln(1 - \lambda)$ is equal to approximately 0.6 years, meaning that it takes just over half a year for firms to close half of the gap between the actual debt ratio and the target debt ratio. This suggests relatively fast adjustment behavior compared to Shrestha et al. (2024)'s results of U.S. firms, where speed of adjustment was around 30%.

Table 5. Geopolitical risk and target debt ratio

Variable	*Expected sign*	*DR (1)*
Lag market debt ratio	+	0.3152***
		(20.2826)
Log Geopolitical risk index	-	0.1186**
		(3.0194)
Asset volatility	-	-0.0044***
		(-3.7006)
Profitability	-	-0.0198
		(-1.1025)
Market-to-book assets	-	-0.0210***
		(-12.2490)
Firm size	+	-0.0319***
		(-3.6685)
Tangibility	+	0.1974***
		(4.5792)
R&D expenses	-	-0.0088
		(-0.1811)
R&D expenses dummy	+	0.0423**
		(2.7263)
Non-debt tax shield	-	0.2179*
		(1.8966)
industry median market debt ratio	+	0.3308***
		(10.6705)
Firm fixed effects		Yes
Year fixed effects		No
No. of Observations		7025
R2		0.777
R2 (within)		0.303

This table reports the results from the partial adjustment model for firms' target market debt ratio (DR1). The dependent variable is the market debt ratio with firm fixed effects but no year fixed effects. t-statistics are reported in parentheses, and ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

Our main coefficient of interest is the log geopolitical risk, which is 0.1186 and statistically significant at the 5% level. This result suggests that higher geopolitical risk is associated with a higher target debt ratio for Nordic firms. This result stands in direct contrast to our prediction for the first hypothesis, as well as to the findings of Shrestha et al. (2024), who document a negative relationship between GPR and target debt ratios for U.S. firms.

The control variables behave largely in line with expectations. Asset volatility has a negative and significant coefficient (-0.0044), suggesting that firms with higher risk tend to have lower target leverage. Market-to-book assets are strongly and negatively related to the target debt

ratio. Tangibility is positively associated with target leverage, reflecting that firms holding more collateralizable assets can support a higher debt amount. The R&D dummy is positive and significant, while the continuous R&D measure is insignificant, suggesting that firms that report any R&D expenditure tend to aim for a higher leverage than non-R&D firms, but variation in R&D expenditure is not strongly related to target debt ratios. The non-debt tax shield has a positive coefficient that is significant at the 10% level. We anticipated that firms with larger non-debt tax shields would need to rely less on debt as they might not need as much interest tax shields. Instead, the positive association suggests that firms with higher non-debt tax shields may still choose to operate with higher leverage. Profitability is statistically insignificant, and firm size has the opposite sign to what we predicted, suggesting that larger firms tend to aim for lower target debt ratios. Finally, the industry median market debt ratio is positive and highly significant, indicating that firms' targets are closely aligned with typical leverage levels in their industry.

The overall fit of the model is high with $R^2 = 0.777$ and within-$R^2 = 0.303$. Since the estimated effect of geopolitical risk on the target debt ratio is positive and significant, we reject Hypothesis 1, which predicted a negative relationship. In the Nordic setting, higher geopolitical risk is associated with higher target debt ratios.

5.2.1 Hypothesis One: Robustness Test

To assess whether our main findings depend on the specific leverage measure, we conduct a set of robustness tests where we re-estimate the partial-adjustment model using four alternative market debt ratios (DR2-DR4) and a book debt ratio (BDR) as dependent variables. The detailed results are reported in Table 6.

Across the four market-based measures (DR1-DR4), the estimated coefficient on the log geopolitical risk index is always positive and statistically significant, and lies between about 0.07 and 0.35. The lagged debt ratio is also positive and highly significant in every specification, confirming that firms adjust their leverage gradually towards a target level. Most control variables have similar signs and significance as in the model in Table 5, suggesting that the relationships between firm characteristics and leverage are stable across different market leverage definitions. When leverage is measured using the book debt ratio, however, the GPR coefficient is no longer statistically significant. This indicates that the association between geopolitical risk and target debt ratio is weaker when leverage is based

on book rather than market values. The insignificant result for the book debt ratio is consistent with the way the two leverage measures react to geopolitical shocks. The market debt ratios adjust immediately when equity values move. By contrast, book leverage is based on historical accounting values that change mostly when firms actively raise or repay debt or issue new equity.

Table 6. Robustness tests

Variable	*DR (1)*	*DR (2)*	*DR (3)*	*DR (4)*	*BDR*
Lag market debt ratio	0.3152***	0.3258***	0.3717***	0.2343***	0.2140***
	(20.2826)	(12.4905)	(18.2586)	(7.3462)	(7.9762)
Log Geopolitical risk index	0.1186**	0.1208***	0.3502***	0.0734***	0.0251
	(3.0194)	(6.6632)	(11.2036)	(4.3408)	(0.9687)
Asset volatility	-0.0044***	-0.0010	-0.0005	-0.0005	-0.0014*
	(-3.7006)	(-1.4156)	(-0.5274)	(-0.7699)	(-2.4094)
Profitability	-0.0198	-0.0529***	-0.1148***	-0.0299***	-0.1009***
	(-1.1025)	(-5.9333)	(-6.7043)	(-4.5336)	(-6.2077)
Market-to-book assets	-0.0210***	-0.0036***	-0.0120***	-0.0023***	-0.0028**
	(-12.2485)	(-7.0762)	(-10.1170)	(-5.3262)	(-2.9319)
Firm size	-0.0319***	0.0221***	0.0416***	0.0202***	-0.0012
	(-3.6685)	(5.3931)	(56.1236)	(5.9972)	(-0.2149)
Tangibility	0.1974***	0.1534***	0.0674*	0.1875***	0.3488***
	(4.5792)	(5.1795)	(1.9951)	(6.1455)	(8.6931)
R&D expenses	-0.0088	0.0023	-0.0107	-0.0005	0.0553
	(-0.1811)	(0.1039)	(-0.2939)	(-0.0321)	(1.2638)
R&D expenses dummy	0.0423**	0.0049	0.0078	0.0051	0.0021
	(2.7263)	(0.7880)	(0.8996)	(0.8756)	(0.2722)
Non-debt tax shield	0.2179	0.0044	0.1659*	-0.0001	0.0847
	(1.8966)	(0.0863)	(2.1124)	(-0.0022)	(1.0004)
industry median market debt ratio	0.3308***	0.1203***	0.1785***	0.0878***	0.4886***
	(10.6705)	(8.3722)	(8.7888)	(5.6714)	(11.6655)
Firm fixed effects	Yes	Yes	Yes	Yes	Yes
Year fixed effects	No	No	No	No	No
No. of Observations	7025	5927	5927	5919	6973
R2	0.777	0.861	0.868	0.822	0.806
R2 (within)	0.303	0.245	0.347	0.173	0.196

This table reports the results from the partial adjustment model for firms' target market debt ratio (DR1). The dependent variable is the market debt ratio, and the specifications include the lagged market debt ratio, the log geopolitical risk index, and the same set of firm-level controls as in Table 4, with firm fixed effects but no year fixed effects. t-statistics are reported in parentheses, and ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.3 Hypothesis Two: Results

Hypothesis 2 states that firms with direct exposure to Russia adjust their target debt ratio more strongly to changes in geopolitical risk than non-exposed firms. To test this effect, we extend the partial-adjustment model in equation (4) by adding an interaction term between the log geopolitical risk index and a dummy variable for Russian exposure. Table 7 reports the results from this specification. The dependent variable is still the market debt ratio (DR1), and the set of firm-level controls is identical to the baseline model: asset volatility, profitability, market-to-book assets, firm size, tangibility, R&D expenditure, non-debt tax shields and the industry median market debt ratio. As before, all regressions include firm fixed effects, cluster standard errors at the firm level, and omit year fixed effects.

Table 7 shows that the coefficient on the lagged market debt ratio remains positive (0.3151) and significant at the 1% level. The coefficient on log geopolitical risk is 0.1140 and significant at the 5% level, which again implies that for the average firm, higher geopolitical risk is associated with a higher target debt ratio. This result is similar to that of hypothesis 1. Our main variable of interest in this specification is the interaction term, $GPR\ x\ GPR\ Exposure,$ which is statistically insignificant. Thus, for Hypothesis 2, we cannot reliably distinguish the response of exposed firms from that of non-exposed firms.

The pattern for the control variables is nearly unchanged compared with the baseline specification in Table 5. Asset volatility, market-to-book assets and tangibility keep the same signs and significance levels as before, and profitability, firm size, the two R&D variables and the non-debt tax shield also display almost identical coefficients. The industry median market debt ratio remains positive and highly significant. Overall, adding the interaction term does not materially affect the role of the control variables, which supports the robustness of the baseline relationships.

The overall explanatory power of the model is unchanged $R^2 = 0.777$ and within-$R^2 = 0.303$. Because the interaction term between geopolitical risk and exposure is statistically insignificant, we do not find evidence that direct exposure to Russia materially alters the way firms adjust their target debt ratios to changes in geopolitical risk. Consequently, Hypothesis 2 is not supported in our Nordic sample.

Table 7. Geopolitical risk, exposure, and target debt ratio

Variable	*Expected signs*	*DR (1)*
Lag market debt ratio	+	0.3151***
		(20.2751)
Log Geopolitical risk index	-	0.1140**
		(2.7344)
Asset volatility	-	-0.0044***
		(-3.7033)
Profitability	-	-0.0198
		(-1.1073)
Market-to-book assets	-	-0.0210***
		(-12.2469)
Firm size	+	-0.0318***
		(-3.6643)
Tangibility	+	0.1979***
		(4.5821)
R&D expenses	-	-0.0086
		(-0.1782)
R&D expenses dummy	+	0.0424**
		(2.7274)
Non-debt tax shield	-	0.2181*
		(1.8982)
industry median market debt ratio	+	0.3308***
		(10.6714)
GPR x GPR Exposure	-	-0.0645
		(-0.6790)
Firm fixed effects		Yes
Year fixed effects		No
No. of Observations		7025
R2		0.777
R2 (within)		0.303

This table reports the results from the partial adjustment model with an interaction between the log geopolitical risk index and a dummy for firms with operations in Russia. The dependent variable is the market debt ratio. The specification includes the lagged market debt ratio, the log geopolitical risk index, the interaction term, and the same firm-level controls as in Table 4, with firm fixed effects but no year fixed effects. t-statistics are reported in parentheses, and ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

5.3.1 Hypothesis Two: Robustness Test

As a further robustness test for Hypothesis 2, we examine whether the positive relation between geopolitical risk and target leverage differs across exposed firms and non-exposed firms, and whether our results depend on how we define firms as exposed. Table 8 re-estimates the partial-adjustment model in three ways. Column (1) restricts the sample to

firms that do not appear in the Yale list ("Non-exposed firms"), meaning that they have never had Russian operations during our sample period. Column (2) uses only firms that are classified as having had operations in Russia at any point from the onset of the war and onwards, grade F-A ("Exposed firms"). Column (3) redefines exposure by excluding firms that have fully exited Russia: all firms with an A rating on the Yale list are dropped, and the interaction term is now based on grades F-B only. In all three specifications, the dependent variable is the market debt ratio (DR1), and we keep the same set of controls as in Table 4, with firm fixed effects, no year fixed effects, and standard errors clustered at the firm level.

Column (1) shows that for non-exposed firms, the coefficient on log geopolitical risk is positive and significant at the 5% level, indicating that higher geopolitical risk is associated with higher target debt ratios among firms without identified Russian operations. Column (2) reports the regression only for the exposed subsample. Here, the GPR coefficient is also statistically significant, at the 10% level, and has a larger positive value than for non-exposed firms. However, the standard errors are wider because the exposed-firm sample is smaller (N = 424). Thus, while the estimate suggests a stronger increase for exposed firms, the precision is too low to conclude that their response differs systematically from that of non-exposed firms.

Column (3) re-estimates the interaction model used for Hypothesis 2 after dropping all A-graded firms from the Yale list, so that only firms graded F-B are treated as exposed. The coefficient on GPR remains positive and significant at the 5% level, while the interaction term between GPR and exposure remains statistically insignificant. This pattern mirrors the main Hypothesis 2 result: we do not detect a clear difference in how exposed and non-exposed firms adjust their target debt ratio when geopolitical risk changes.

Across all three specifications, the coefficients on the control variables are very similar to the results in hypothesis 1. Lagged leverage remains positive and highly significant, and firm characteristics retain their earlier signs and significance, indicating that the results are stable across subsamples. Taken together, these robustness tests suggest that our main conclusions about the relationship between geopolitical risk and target debt ratios are not very sensitive to whether we focus on non-exposed firms, exposed firms, or an exposure definition that excludes firms that have fully exited Russia. However, given the relatively small exposed

subsample and overlapping confidence intervals, these results should be interpreted as indicative rather than as strong evidence of heterogeneous effects.

Table 8. Geopolitical risk, exposure, and target debt ratio

Variable	*DR(1) (Non-Exposed)*	*DR(1) (Exposed)*	*DR(1) (Grade F-B)*
Lag market debt ratio	0.3122***	0.4755***	0.3158***
	(19.7750)	(7.6587)	(20.3113)
Log Geopolitical risk index	0.1137**	0.2141*	0.0109**
	(2.7270)	(2.4191)	(2.7435)
Asset volatility	-0.0044***	-0.0002	-0.0044***
	(-3.6817)	(-0.0664)	(-3.7385)
Profitability	-0.0185	-0.1081	-0.0198
	(-1.0279)	(-0.6443)	(0.0179)
Market-to-book assets	-0.0210***	-0.0236*	-0.0209***
	(-12.1288)	(-2.2438)	(-12.1741)
Firm size	-0.0322***	0.0349	-0.0319***
	(-3.6594)	(1.2290)	(-3.6751)
Tangibility	0.1871***	0.7210**	0.1967***
	(4.3657)	(2.7290)	(4.5613)
R&D expenses	-0.0070	-1.5818*	-0.0094
	(-0.1444)	(-1.9119)	(-0.1943)
R&D expenses dummy	0.0426**	0.0042	0.0424**
	(2.6815)	(0.1348)	(2.7282)
Non-debt tax shield	0.2209*	-1.4296	0.2141*
	(1.9175)	(-1.0483)	(1.8697)
industry median market debt ratio	0.3448***	0.1230*	0.3309***
	(10.4998)	(1.7050)	(10.6823)
GPR x GPR Exposure			-0.0025
			(-0.2331)
Firm fixed effects	Yes	Yes	Yes
Year fixed effects	No	No	No
No. of Observations	6601	424	7025
R2	0.772	0.903	0.777
R2 (within)	0.301	0.484	0.303

This table reports subsample regressions of the market debt ratio on the lagged market debt ratio, the log geopolitical risk index, and the same set of firm-level controls as in Table 4, estimated separately for firms without operations in Russia ("Non-exposed firms") and firms with operations in Russia ("Exposed firms"). All specifications include firm fixed effects but no year fixed effects, and standard errors are clustered at the firm level. t-statistics are reported in parentheses, and ***, **, * indicate statistical significance at the 1%, 5%, and 10% levels, respectively.

6. Discussion

In this section we interpret our empirical findings and connect them to the theoretical and empirical literature presented in Chapter 2. We discuss why Nordic firms' target debt ratios appear to increase, rather than decrease when geopolitical risk rises, and why we do not observe a stronger effect for firms with direct exposure to Russia. Moreover, we address the limitations of our methodology and suggest directions for future research.

Although we base our interpretation in established capital-structure theory and prior empirical work, the explanations we offer should not be viewed as the only possible readings of the results. Rather, they represent one way of making sense of the patterns we observe in the data, without claiming to provide a complete or final account of the underlying mechanisms.

6.1 Interpreting the Results for Hypothesis 1

As shown in Table 5, the coefficient on the geopolitical risk index is positive and statistically significant. This implies that when geopolitical risk rises, Nordic firms tend to move toward higher, rather than lower, target leverage. Interestingly, this finding contrasts with both our theoretical expectation and the results of Shrestha et al. (2024), who document a significant negative association between GPR and target leverage for U.S. firms.

According to standard capital-structure theory, leverage is expected to shift whenever the relative attractiveness of debt and equity changes (Kraus and Litzenberger, 1973; Myers and Majluf, 1984). Therefore, we divide our discussion of the results for Hypothesis 1 into two parts. First, we examine how increases in GPR may affect the equity component of leverage. We then consider how the debt component might be influenced by the same increase in GPR. By splitting our discussion into these two sections, it will make it easier to isolate what might motivate Nordic public firms to increase their target debt ratio when geopolitical risk increases.

6.1.1 Discussion on the Equity Component

A useful starting point for understanding how changes in equity can affect a firm's target debt ratio is to examine how the market debt ratio is calculated. Total debt appears in the

numerator, while the denominator is the sum of total debt and the market value of equity. This means that even with unchanged debt, a fall in equity values alone can cause a firm's market debt ratio to increase. This mechanism relates to the "mechanical effect" discussed by Khoo and Cheung (2021). Their study shows that periods of high geopolitical uncertainty in the U.S. are associated with higher market debt ratios because of the value of equity falling relatively more than the value of debt.

Shrestha et al. (2024) argue that this mechanical increase in leverage is mainly a short-term phenomenon that affects the actual market debt ratio, rather than the long-run target debt ratio: once GPR settles, equity values return to previous levels. Mechanical leverage changes therefore show up as temporary deviations of the actual ratio from the target, but they do not by themselves define where the target settles in the long run. However, during our sample period, the GPR index never returns to its pre-war levels. Instead, it remains elevated (Caldara and Iacoviello, 2022). Since periods of high GPR have been shown to depress equity values in a European context (Yilmazkuday, 2024), this could suggest that the Nordic firms' market equity values have not fully recovered but instead remain low. Under the pecking-order theory, managers are reluctant to issue new equity when the stock is undervalued, because doing so would dilute existing shareholders and transfer wealth to new investors (Myers and Majluf, 1984). In our Nordic context, this persistent combination of depressed equity valuations and reluctance to issue new shares means that an initially mechanical increase in leverage is more likely to become embedded in a higher long-run target debt ratio.

Further support for the mechanical-effect explanation comes from our robustness test in Table 6 where we test the partial adjustment model using alternative leverage definitions. We find that GPR is consistently positive and significant across all market-based leverage ratios, but insignificant when leverage is measured using book values. Since book leverage does not depend on equity valuations, this pattern indicates that the GPR's effect in the Nordics could be driven primarily by changes in market equity rather than by changes in firms' actual debt policies.

6.1.2 Discussion on the Debt Component

The mechanical effect relies on the idea that higher GPR depresses the market value of equity. However, we also need to consider whether debt, measured as total interest-bearing liabilities, shows a similar response.

The pecking-order theory predicts that the degree of information asymmetry shapes the relative costs of financing. Studies have found that higher geopolitical risk worsens information asymmetry between borrowers and creditors (Khoo and Cheung 2021). However, banks possess several tools that help mitigate this asymmetry. First, they have access to private information about borrowers, allowing them to more accurately assess firms' financial conditions (Ben-Nasr, 2019). Banks also retain flexibility that equity investors lack: they can renegotiate or restructure loan contracts when needed (Denis and Mihov, 2003). In addition, loan covenants give banks the right to intervene if a firm's risk profile worsens, enabling them to respond to firm-specific developments rather than broad external shocks. Finally, debt claims benefit from priority in payment, as interest obligations must be met before any returns are distributed to equity holders. As a result, banks can better manage information asymmetry under geopolitical uncertainty, which could reduce the effective cost of debt.

One could argue that our interpretation of debt being less sensitive to information asymmetry applies mainly to bank financing. Bond market financing, by contrast, is more information-sensitive and relies on publicly available information (Ben-Nasr, 2019). This suggests that issuing bonds could become more costly when uncertainty rises. Prior research partly confirms that. When geopolitical uncertainty increases, firms tend to shift away from public debt toward bank debt (Khoo and Cheung, 2021). Importantly, however, a shift toward bank debt does not affect our leverage measure, as total debt is defined as total interest-bearing liabilities. As a result, the overall debt level captured in our analysis remains the same even if the mix between bank loans and bond financing changes.

6.1.3 Integrating the Equity and Debt Discussions

Based on the reasoning above, we suggest two plausible explanations for why increases in GPR are associated with higher target debt ratios in our Nordic sample. Since the market debt ratio is calculated as total debt divided by the sum of total debt and the market value of

equity, a fall in equity values alone could cause a firm's market debt ratio to increase. If the equity values remain depressed because of an elevated GPR during our sample period, it is likely to cause an increase in Nordic firms' target debt ratios.

However, it is still plausible that firms simultaneously take on more debt. While we initially expected higher geopolitical risk to raise firms' cost of debt, banks' low reliance on public signals suggests that this need not be the case. Increases in GPR might not necessarily lead to higher interest rates, tighter credit conditions, or reduced credit supply. Consequently, firms' cost of debt may remain relatively unchanged despite rising geopolitical uncertainty. Meanwhile, issuing equity when the firm is undervalued transfers wealth from existing to new shareholders, which would make equity financing unattractive in high-GPR periods. Therefore, when internal funds are insufficient, firms in the Nordics might prefer to take on more debt rather than issuing equity. This would align with our finding that Nordic firms raise their target debt ratios when GPR increases.

6.2 Interpreting the Results for Hypothesis 2

Our second hypothesis predicted that if the general effect of GPR is to lower target leverage, the reduction should be more pronounced for firms directly exposed to Russia. However, our results do not support this prediction. The interaction term between GPR and the exposure dummy is statistically insignificant, meaning that exposed and non-exposed firms appear to respond in similar ways. However, the insignificance should not be interpreted as evidence that increased exposure to Russia has no effect. Instead, it may reflect that any moderating effect is simply too subtle to detect within our setting. A number of factors help explain why exposed and non-exposed firms appear to respond in similar ways.

First, all exposed Nordic firms in our sample are multinationals (Yale School of Management, 2024). As such, Russia was one market among many and the associated cash flows may have constituted only a limited share of group-level revenues and assets. Thus, even if a firm's Russian operations were affected by the war, they may represent too small a share of the firm's overall activities for this exposure to meaningfully influence its target debt ratio.

Second, Nordic firms that chose to operate in Russia may already have priced much of the geopolitical risk into their capital structure at the point of decisions before the 2022 invasion.

Russia has historically had high GPR levels compared to that of the nordic countries (Caldara and Iacoviello, 2022). For exposed firms, entering into a market with a history of political tension and regulatory uncertainty can motivate more conservative financing policies ex ante, for example lower target debt ratio. The subsequent rise in GPR after the invasion might therefore not require an additional adjustment in target leverage compared to non-exposed firms.

These explanations suggest that changes in target debt ratios might primarily be driven by the broader macroeconomic uncertainty affecting all Nordic firms, rather than by differences in firm-specific exposure levels. The Russia-Ukraine invasion generated a broad, region-wide increase in GPR-levels that affected all Nordic firms, not only those with operations in Russia. As a result, firms across the region may have focused on adapting to the overall business environment, rather than differentiating their target leverage policies based on whether they had direct operations in Russia or not.

7. Conclusions

This thesis examines how geopolitical risk affects firms' capital structure decisions, focusing on the target debt ratios of Nordic publicly listed firms from 2018 to 2024. Using a panel of 1,387 firms across Denmark, Finland, Norway, and Sweden, we estimate a dynamic partial-adjustment model with firm fixed effects and standard capital-structure controls, and link firm-year observations to the country-level geopolitical risk index developed by Caldara and Iacoviello (2022). In addition, we distinguish between firms with and without direct operations in Russia at the onset of the invasion, allowing us to study whether heightened exposure to the conflict amplifies the effect of geopolitical risk on firms' target debt ratios.

The study contributes to the existing literature by analysing how geopolitical risk relates to firms' target debt ratios in a Nordic setting, a context that to the best of our knowledge, has not been covered in prior work. In addition, by distinguishing between Nordic firms with and without direct exposure to Russia, this study highlights how geopolitical uncertainty may affect firms differently depending on their degree of exposure to heightened geopolitical risk.

The results show that increases in geopolitical risk are associated with higher, rather than lower, target debt ratios for Nordic firms. The coefficient on the geopolitical risk index is positive and statistically significant in our main specification. It remains robust across several alternative market-based leverage definitions, while becoming insignificant when leverage is measured using book values. This finding contradicts our first hypothesis and recent U.S. evidence that shows a negative association between geopolitical risk and target debt ratios, suggesting that the impact of geopolitical uncertainty on capital structure is not uniform across regions. For our second hypothesis, we find no statistically meaningful difference in how firms with and without direct Russian operations adjust their target debt ratios when geopolitical risk rises.

The relationship between geopolitical risk and firms' financing behaviour presents several avenues for further study. A natural extension would be to disaggregate the debt component and examine how geopolitical uncertainty influences the composition of debt rather than its total level. Such research could provide a more nuanced understanding of whether firms substitute between financing sources, such as reducing market-based debt while increasing bank borrowing, when geopolitical risk rises. Moreover, our study does not distinguish

between industries. Future research could examine how geopolitical risk affects firms within specific sectors, and whether industry characteristics, such as capital intensity and or supply-chain dependence, shape firms' financing responses. Finally, because the Russia-Ukraine invasion is a relatively recent event (Caldara and Iacoviello, 2022) an analysis over a longer period would allow researchers to observe whether the effects we identify persist once geopolitical conditions stabilize. A longer time horizon may also help separate valuation-driven mechanical effects from true long-run adjustments in firms' capital structure policies.

In conclusion, our results suggest that elevated geopolitical risk is associated with higher target debt ratios. Moreover, in our Nordic setting, geopolitical risk seems to be transmitted mainly through broad market-wide valuation and financing conditions rather than firm-specific exposure.

7.1 Limitations

While we have aimed for accuracy, we recognize that this study is subject to several limitations that should be kept in mind when interpreting the results.

7.1.1 No Control Sample

A limitation in our study is that there is no group of firms that is unaffected by geopolitical risk. Geopolitical risk is a pervasive, economy-wide source of uncertainty that influences financial markets and financing conditions broadly, rather than a phenomenon that hits some firms but leaves others untouched. All listed firms operate under some level of geopolitical risk, even if the intensity of their exposure differs across countries, industries, or business models. This means that we cannot construct a clean control group of unaffected firms as a benchmark.

7.1.2 Time-Period

Another limitation concerns the relatively short time horizon of our dataset. Our sample covers in total only seven years in total, whereas only three of those years are after the invasion. It is therefore possible that we have not observed enough time for geopolitical conditions or equity markets to stabilise. Our interpretation of the results relies partly on a long-term mechanical effect: since the 2022 invasion, GPR has remained persistently

elevated and equity valuations may not have recovered. If GPR eventually declines, the mechanical effects we document may weaken. By contrast, studies such as Shrestha et al. (2024), use 30 years of stock market data. Thus, they are less affected by valuation swings because their samples capture multiple cycles of rising and falling uncertainty. A longer post-invasion window may therefore yield different dynamics once geopolitical risk conditions settle.

7.1.3 Exposure definition

We classify exposure using a simple dummy variable that treats all exposed firms as identical. This means that firms with very limited Russian operations are grouped together with firms that are heavily exposed. If geopolitical risk primarily affects the highly exposed firms, combining them into one category introduces noise. This could have an effect on why our interaction term between GPR and exposure is statistically insignificant. Additionally, our sample of exposed firms to Russia might be understated. Although our exposure measure relies on the Yale School of Management's list of firms operating in Russia, which is created by experts, several companies have been shown to downplay or obscure the extent of their Russian operations. As a result, some firms we classify as non-exposed may in fact have had meaningful activities in Russia, effectively shrinking our exposed sample and weakening the contrast between the two groups.

8. References

8.1 Published Journals

Adra, S., Gao, Y., Huang, J., Yuan, J., 2023. Geopolitical risk and corporate payout policy. *International Review of Financial Analysis* 87, 102613.

Aizenman, J., Lindahl, R., Stenvall, D., Uddin, G.S., 2024. Geopolitical shocks and commodity market dynamics: New evidence from the Russia-Ukraine conflict. *European Journal of Political Economy* 85, 102574

Akerlof, G.A., 1970. The Market for "Lemons": Quality Uncertainty and the Market Mechanism. *The Quarterly Journal of Economics* 84, 488-500

Alberque, W., Schreer, B., 2022. Finland, Sweden and NATO Membership. *Survival* 64, 67-72.

Alin, J., Eichenberg, A., Kulikov, V., Simanovskyy, M., n.d. Public Pressure on Multinational Corporations in Russia Post-Invasion of Ukraine: a Comparative Perspective.

Astrov, V., Ghodsi, M., Grieveson, R., Holzner, M., Kochnev, A., Landesmann, M., Pindyuk, O., Stehrer, R., Tverdostup, M., Bykova, A., 2022. Russia's invasion of Ukraine: assessment of the humanitarian, economic, and financial impact in the short and medium term. *International Economics & Economic Policy* 19, 331-381

Baker, M., Wurgler, J., 2002. Market Timing and Capital Structure. *The Journal of Finance* 57, 1-32

Bats, J.V., Houben, A.C.F.J., 2020. Bank-based versus market-based financing: Implications for systemic risk. *Journal of Banking & Finance* 114, 105776

Ben-Nasr, H., 2019. Do unemployment benefits affect the choice of debt source? *Journal of Corporate Finance* 56, 88-107

Caldara, D., Iacoviello, M., 2022. Measuring Geopolitical Risk. *American Economic Review* 112, 1194-1225

Cheng, C.H.J., Chiu, C.-W. (Jeremy), 2018. How important are global geopolitical risks to emerging countries? *International Economics* 156, 305-325

Chowdhury, M.S.R., Aram, M., Javadi, S., Nejadmalayeri, A., 2025. Geopolitical risk and corporate capital structure. *Journal of Corporate Finance* 93, 102796

D'Anieri, P., 2023. Ukraine and Russia. *Cambridge University Press*.

Denis, D.J., Mihov, V.T., 2003. The choice among bank debt, non-bank private debt, and public debt: evidence from new corporate borrowings. *Journal of Financial Economics* 70, 3-28

Dierkens, N., 1991. Information Asymmetry and Equity Issues. *J. Financ. Quant. Anal*. 26, 181-199

Fama, E.F., French, K.R., 1997. Industry costs of equity. *Journal of Financial Economics* 43, 153-193.

Fama, E.F., French, K.R., 2002. Testing Trade-Off and Pecking Order Predictions about Dividends and Debt. *The Review of Financial Studies* 15, 1-33.

Flannery, M.J., Rangan, K.P., 2006. Partial adjustment toward target capital structures. *Journal of Financial Economics* 79, 469-506

He, Z., 2023. Geopolitical risks and investor sentiment: Causality and TVP-VAR analysis. *North Am. J. Econ. Financ*. 67

Istiak, K., Serletis, A., 2020. Risk, uncertainty, and leverage. *Economic Modelling* 91, 257-273.

Jensen, M.C., 1986. Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. *The American Economic Review* 76, 323-329.

Jensen, M.C., Meckling, W.H., 1976. Theory of the firm: Managerial behavior, agency costs and ownership structure. *Journal of Financial Economics* 3, 305-360

Jia, S., Yang, L., Zhou, F., 2022. Geopolitical risk and corporate innovation: Evidence from China. Journal of Multinational Financial Management 66, 100772

Khoo, J., Cheung, A. (Wai K., 2021. Does geopolitical uncertainty affect corporate financing? Evidence from MIDAS regression. *Global Finance Journal* 47, 100519

Kotcharin, S., Maneenop, S., 2020. Geopolitical risk and corporate cash holdings in the shipping industry. Transportation Research Part E: *Logistics and Transportation Review* 136, 101862

Kraus, A., Litzenberger, R.H., 1973a. A State-Preference Model of Optimal Financial Leverage. *The Journal of Finance* 28, 911-922

Kraus, A., Litzenberger, R.H., 1973b. A State-Preference Model of Optimal Financial Leverage. *The Journal of Finance* 28, 911-922

Le, A.-T., Tran, T.P., 2021. Does geopolitical risk matter for corporate investment? Evidence from emerging countries in Asia. *Journal of Multinational Financial Management* 62, 100703.

Lee, C.-C., Wang, C.-W., 2021. Firms' cash reserve, financial constraint, and geopolitical risk. *Pacific-Basin Finance Journal* 65, 101480

Liu, J., Lin, G., Liu, Z., Jiang, X., 2022. The Effect of Geopolitical Risk on Market Information Asymmetry, Management Disclosure and Investor Information Collection

Liu, J., Ma, F., Tang, Y., Zhang, Y., 2019. Geopolitical risk and oil volatility: A new insight. *Energy Economics* 84, 104548

Modigliani, F., Miller, M.H., 1958. The Cost of Capital, Corporation Finance and the Theory of Investment. *The American Economic Review* 48, 261-297.

Myers, S.C., Majluf, N.S., 1984. Corporate financing and investment decisions when firms have information that investors do not have. *Journal of Financial Economics* 13, 187-221

Nguyen, T.C., Thuy, T.H., 2023. Geopolitical risk and the cost of bank loans. *Finan. Res. Lett.* 54

Pástor, Ľ., Veronesi, P., 2013. Political uncertainty and risk premia. *Journal of Financial Economics* 110, 520-545

Pesu, M., Iso-Markku, T., 2024. Insufficiency of informal alignment: why did Finland choose formal NATO membership? *International Affairs* 100, 569-588

Phan, D.H.B., Tran, V.T., Iyke, B.N., 2022. Geopolitical risk and bank stability. *Finan. Res. Lett.* 46

Ra, Y., 2024. Why companies have low debt? An empirical evidence in Korea. Heliyon 10, e32956

Shabir, M., Jiang, P., Shahab, Y., Wang, P., 2023. Geopolitical, economic uncertainty and bank risk: Do CEO power and board strength matter? *Int. Rev. Financ. Anal.* 87

Shrestha, K., Philip, S.S.S., Khaw, K.L.-H., 2024. Impact of geopolitical risk on target debt ratio. *Finance Research Letters* 60, 104964

Sonnenfeld, J., Tian, S., Sokolowski, F., Wyrebkowski, M., Kasprowicz, M., 2022. Business Retreats and Sanctions Are Crippling the Russian Economy

Warr, R.S., Elliott, W.B., Koëter-Kant, J., Öztekin, Ö., 2012. Equity mispricing and leverage adjustment costs. *J. Financ. Quant. Anal*. 47, 589-616

Welch, I., 2004. Capital Structure and Stock Returns. *Journal of Political Economy* 112, 106-131

Wang, X., Wu, Y., Xu, W., 2024. Geopolitical Risk and Investment. Journal of Money, Credit and Banking 56, 2023-2059.

Yaghoubi, M., 2024. Executive characteristics as moderators: Exploring the impact of geopolitical risk on capital structure decisions. *International Review of Financial Analysis* 93, 103188.

Yang, J., Yang, C., 2021a. The impact of mixed-frequency geopolitical risk on stock market returns. *Economic Analysis and Policy* 72, 226-240

Yang, J., Yang, C., 2021b. The impact of mixed-frequency geopolitical risk on stock market returns. *Econ. Anal. Policy* 72, 226-240

Yilmazkuday, H., 2024. Geopolitical risk and stock prices. *European Journal of Political Economy* 83, 102553

Zaremba, A., Cakici, N., Demir, E., Long, H., 2022. When bad news is good news: Geopolitical risk and the cross-section of emerging market stock returns. *J. Financ. Stab.* 58

8.2 Electronic Sources

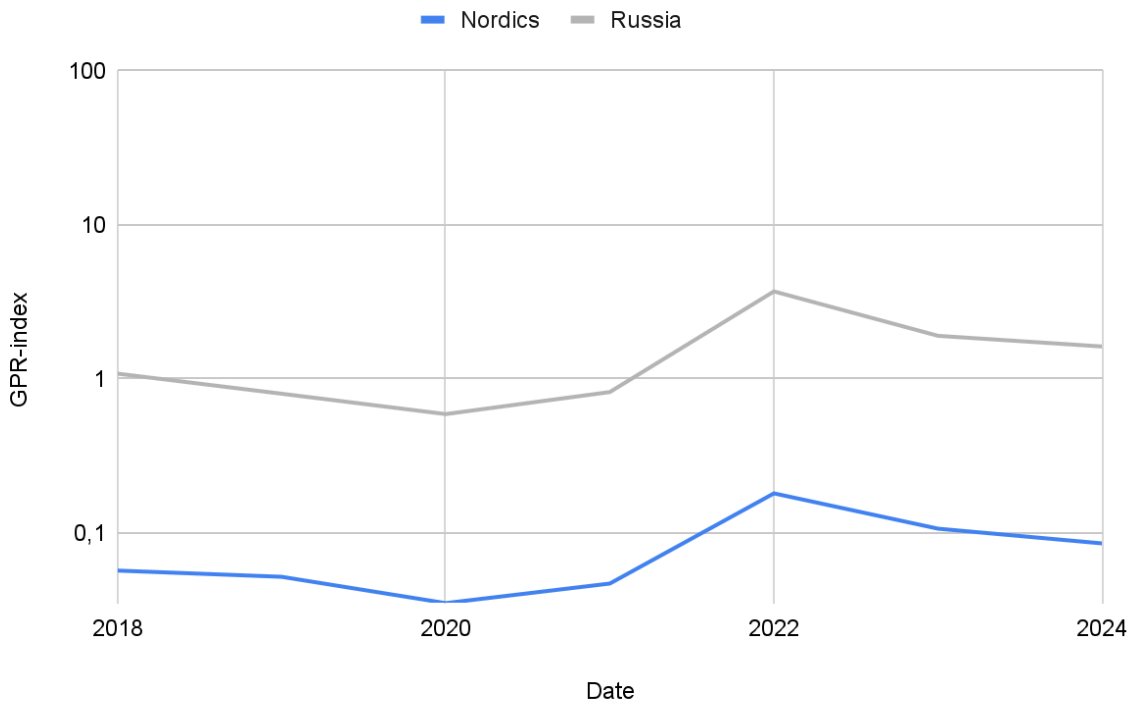
Over 1,000 Companies Have Curtailed Operations in Russia—But Some Remain | Yale School of Management [WWW Document], n.d. URL https://som.yale.edu/story/2022/over-1000-companies-have-curtailed-operations-russia-some-remain (accessed 10.12.25).

9. Appendix

Appendix 1. Sample distribution of firms across two-digit SIC industries

Sic Code	*Industries*	*Observations*	*%*
01 to 09	Agriculture, forestry and fishing	90	1.1
10 to 14	Mining	359	4.3
15 to 17	Construction	261	3.1
20 to 39	Manufacturing	4352	51.7
40 to 48	Transportation & public utilities	693	8.2
50 to 51	Wholesale trade	195	2.3
52 to 59	Retail trade	253	3.0
60 to 67	Finance, insurance, and real estate	0	0
70 to 89	Services	2209	26.3
91 to 99	Other	0	0
		8412	100

Appendix 2. Annual GPR index levels in the Nordic countries and Russia, 2018-2024



Appendix 3. Correlation Table

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
(1) Market debt ratio	1.00										
(2) Log Geopolitical risk index	-0.08	1.00									
(3) Asset volatility	-0.04	0.04	1.00								
(4) Profitability	0.09	-0.07	-0.12	1.00							
(5) Market-to-book assets	-0.39	-0.04	0.01	-0.13	1.00						
(6) Firm size	0.08	0.01	-0.09	0.50	-0.14	1.00					
(7) Tangibility	0.22	-0.05	-0.02	0.21	-0.06	0.30	1.00				
(8) R&D expenses	-0.14	0.04	0.04	-0.47	0.12	-0.20	-0.19	1.00			
(9) R&D expenses dummy	0.17	-0.02	0.00	0.07	-0.07	-0.01	0.23	-0.37	1.00		
(10) Non-debt tax shield	0.09	0.04	0.06	-0.11	-0.04	-0.10	0.14	-0.02	0.01	1.00	
(11) industry median market debt ratio	0.38	-0.12	-0.04	0.20	-0.16	0.19	0.32	-0.19	0.17	0.09	1.00
VIF (Mean = 1.26)		1.03	1.02	1.72	1.06	1.47	1.28	1.52	1.25	1.07	1.19

This table reports the pairwise correlations among the study variables.

Appendix 4. Use of Artificial Intelligence

We have made use of generative artificial intelligence in the form of ChatGPT (GPT-5.1 Thinking), developed by OpenAI. The tool is accessible through the following link: https://chatgpt.com. We used it primarily as support in our coding work (data handling, debugging, and understanding error messages) and to clarify certain methodological and theoretical concepts from the literature. We also used it for the written parts of the thesis. ChatGPT was used as a language assistant to propose alternative formulations, check grammar and spelling, and help us improve clarity and academic tone.

We are aware that AI tools can produce incorrect, biased, or outdated information. To reduce these risks, we treated all AI output as suggestions only. All code produced with AI was reviewed and when necessary, adjusted by us. The final choices regarding methods, analysis, and conclusions are our own.