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GEOECONOMIC FRAGMENTATION AND FIRMS' FINANCIAL PERFORMANCE

by Alessandro D'Orazio*, Fabrizio Ferriani** and Andrea Gazzani**

Abstract

We introduce a novel firm-level revenue-weighted geopolitical risk index by integrating corporate revenue distribution with geopolitical risk across countries. Our findings reveal a significant real-financial feedback loop: firms with greater exposure to geopolitical risk have an increased probability of default, reduced market valuations and higher financing costs. Notably, the impact of this feedback loop has intensified since 2017, aligning with growing apprehension regarding economic fragmentation in firms' risk assessments.

JEL Classification: F36, F50, F65, G30.

Keywords: geopolitical risk, fragmentation, financial performance, revenue exposure.

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1 Introduction¹

How do economic and financial interdependencies among countries and firms respond when seismic geopolitical shifts disrupt the rule-based international system? This question has become salient in policy discussions as the advantages accrued over decades of economic integration face threats from escalating tensions that are leading to a reversal of international relations. This phenomenon has been labeled as geoeconomic fragmentation (Aiyar et al., 2023a). This trend, which has been accelerating in recent years, is exemplified by several events which have contributed to increased risks of fragmentation such as Brexit, trade disputes between the United States and China, trade flows restriction associated with the Covid-19 pandemic and, more dramatically, Russia’s invasion of Ukraine and the Israeli-Palestinian conflict.

As of now, the empirical analysis on the impacts of geoeconomic fragmentation has focused mainly on how a deterioration in international relations may lead to increased protectionist measures, including tariffs and trade restrictions motivated by national security concerns, ultimately harming the smooth functioning of highly interconnected global value chains (Aiyar et al., 2023c, Attinasi et al., 2023, Campos et al., 2023, and Hakobyan et al., 2023 among many others). Since Russia’s invasion of Ukraine, concerns of geoeconomic fragmentation in commodity markets have intensified and several studies examined how the war has affected global commodity flows, price differentials among blocs, and political attitudes toward the balance between energy security and energy transition (e.g. IMF, 2023a, Ferriani and Gazzani, 2023, Emiliozzi et al., 2023, Albrizio et al., 2023, and Alvarez et al., 2023). So far, evidence on the financial implications of geopolitical tensions has been more limited, with most studies have analyzing the impact on cross-border

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capital flows (especially foreign direct investments), asset prices and investors' risk aversion at the aggregate level (IMF, 2023b, Feng et al., 2023, Aiyar et al., 2023b, Salisu et al., 2022, Lee, 2023).

This paper offers a novel firm-level perspective to analyze the financial impacts of geoeconomic fragmentation. We combine detailed information on the geographic distribution of corporate revenues with country-specific geopolitical risk assessments to create a revenue-weighted geopolitical risk index at the firm level. To the best of our knowledge this study is the first to elaborate a micro-based measure of corporate exposure to geopolitical risk using the ultimate origin of firms' business risk, built on the specific location where the firm generates its revenues.² We employ this index to examine the impact of geopolitical risk on firms' probability of default and market-based proxies of their valuations for a large panel of non-financial firms in Europe and the US from 2010 to 2022. We find evidence of a real-financial feedback loop with revenue-driven exposure to geopolitical risk negatively influencing firms' default probability and depressing market valuation. Interestingly, the geopolitical risk of a firm's headquarters does not exhibit statistical significance, supporting the idea that geoeconomic fragmentation matters for firms only when considering the actual exposure of their revenues to geopolitical risks. Moreover, the magnitude of the effect spiked since 2017 when concerns over geoeconomic fragmentation became more pressing in firms' risk assessments.

The rest of the paper is organized as follows. Section 2 describes the dataset, Section 3 presents the empirical analysis. Section 4 concludes.

²In this sense, our approach complements other studies in the literature that rely on micro data to adequately address sample heterogeneity when measuring the interlink between geopolitical distress and export diversification or value added (Fisman et al., 2022, Borin et al., 2023).

2 Dataset

The construction of a unique dataset constitutes a key contribution of our work and it is achieved by collecting information from three main sources. Our sample spans the period between 2010 and 2022 and consists of non-financial firms included in the Eurostoxx 600 and the S&P 500, i.e. the two regional benchmarks encompassing the largest European and US firms. For these firms, we first rely on the *Orbis-Bureau van Dijk* database to obtain detailed information on the geographical breakdown of corporate revenues. This data, which is generally provided as complementary information in the explanatory notes to the official financial statements, exhibits an extremely high level of heterogeneity across firms in terms of reporting. Substantial differences across firms may emerge related to aspects such as the number of countries, the aggregation level of geographical macro-areas, and even the availability of the information itself. Figure A.1 in the Appendix presents an example of revenue breakdown retrieved from Orbis. The processing of this data requires an extensive exercise of geographical reclassification, which nevertheless proves to be quite successful in our work. Despite cases where data on revenue information is not available or not clearly assigned to a specific country or geographical area, we are able to map, on average, almost 83% of corporate revenues (median around 88%).³ For each firm, we simply compute the geographical revenue exposure as the share of yearly revenues obtained in a specific market.

As a second step, we measure country geopolitical risk using the yearly assessment of political risk obtained from the *International Country Risk Guide* (ICRG). The political risk rating ranges from 0 to 100, with higher scores associated with lower risk levels, and it

³The corporate revenues that are not mapped are associated to geographical aggregates in which countries are not clearly identifiable (e.g. "Asia and rest of the world", "Europe, CIS, Middle East and Africa"...). These observations are excluded from the sample as they cannot be matched with any country-specific measure of geopolitical risk.

VARIABLES	Mean	St. Dev.	p25	p50	p75
ICRG	64.75	12.34	56	63.5	74
Altman z-score	4.64	5.44	1.85	3.05	5.21
P/E	24.55	44.81	12.14	15.93	21.61
Tobin q	1.52	1.63	0.61	1.02	1.79

Table 1: The table provides descriptive statistics (mean, standard deviation, 25th, 50th, and 75th percentile). Values are computed on the whole sample (US and European firms) over the period 2010-2022.

covers the assessment of geopolitical risk across twelve dimensions: government stability, socioeconomic conditions, investment profile, internal conflict, external conflict, corruption, military in politics, religious tensions, law and order, ethnic tensions, democratic accountability, and bureaucracy quality. The ICRG political risk has already been adopted in several empirical studies (Bekaert et al., 2014, Lehkonen and Heimonen, 2015, Chen et al., 2016, King et al., 2021 among many others), and it offers two main advantages for the purpose of this analysis compared to other popular metrics in the literature (mainly the Geopolitical Risk - GPR - index developed by Caldara and Iacoviello, 2022). First, and most importantly, the ICRG index is available for more than 140 countries compared to around 45 countries of the GPR index. This is crucial for the purpose of this study, since it allows us to map firms' revenue exposure to political risk accurately. Second, the ICRG index is based on a set of questions to ensure a certain degree of consistency, both between countries and over time, whereas the country-specific GPR indices evaluate geopolitical risk based on three US newspapers and ultimately "*capture the US perspective on risks posed by, or involving, the country in question*".

As a third step, we retrieve from *Refinitiv* three dependent variables to measure firms' financial performance. The first is the *Altman Z-score* (Altman, 1968, Altman and Hotchkiss, 2010) which constitutes an inverse proxy of firms' default probability based on accounting variables, with higher values associated to stronger corporate soundness. The other

two dependent variables, namely the *price-earnings* (*P/E*) ratio and the *Tobin Q* ratio, reflect investors' assessment of firms' value and profitability.⁴ We also rely on *Refinitiv* to obtain other firm-specific control variables. Descriptive statistics for the main variables of interest are reported in Table 1.

3 Empirical analysis

As preliminary evidence, we present in Figure 1 the geographical breakdown of corporate revenues. Not surprisingly, the largest share of revenues originates from the geographical area where firms are listed: approximately 72% of revenues are generated in the United States and Canada for S&P500 firms, compared to an average of 64% of revenues generated in Europe for Eurostoxx companies. For US firms, the residual source of revenues is almost evenly divided between Europe and the rest of the world, while for European firms, the second most significant market is the US, whose share gradually increases to around one-quarter of total foreign revenues toward the end of the sample period. In both regions, revenue generated in China hovers around 3%.

⁴The Tobin Q ratio is defined according to Chung and Pruitt (1994) as market value of equity plus book value of preferred stock, long-term debt and short-term debt net of short-term assets, all divided by total assets. Altman Z-score is standardized, P/E ratio and Tobin Q ratio are yearly averages transformed in log-terms for the empirical analysis. All dependent variables are winsorized at 1% on both tails.

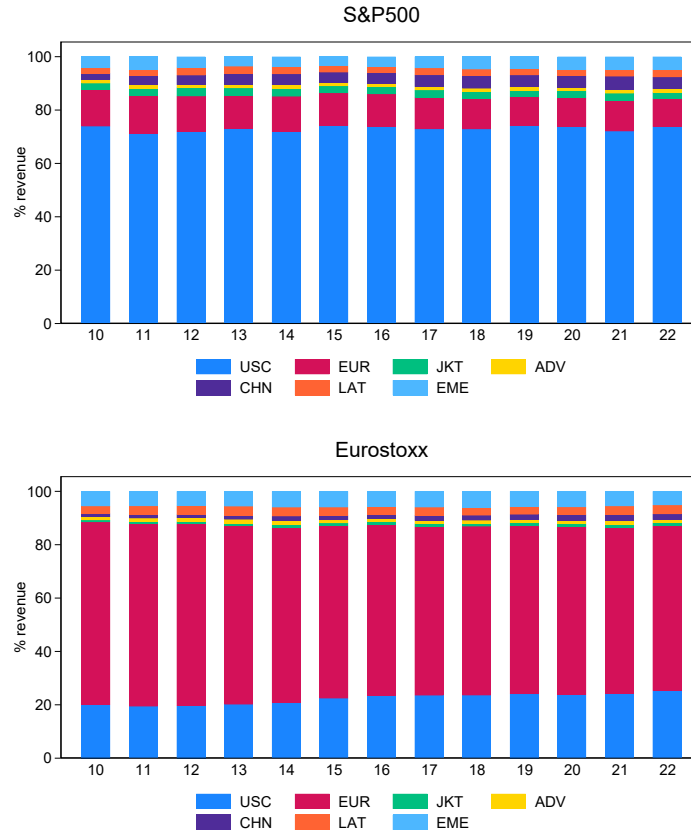


FIGURE 1: Geographical breakdown of corporate revenues: S&P500 (upper panel) vs Eurostoxx (lower panel). Acronyms are as follows: United States and Canada (USC), Europe (EUR), Japan, South Korea and Taiwan (JKT), other advanced economies (ADV), China (CHN), Latin America (LAT), other emerging markets (EME)

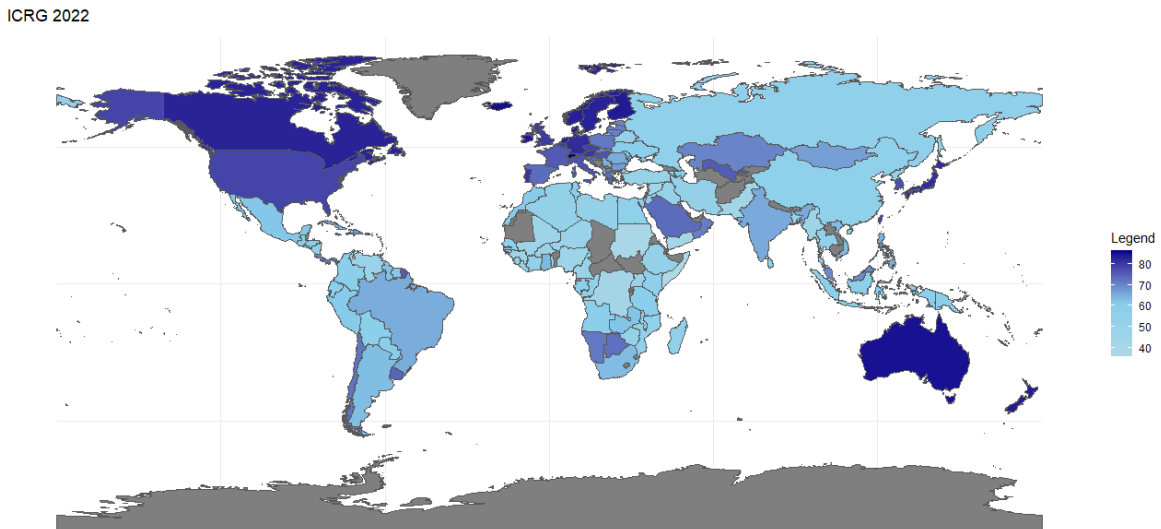


FIGURE 2: The plot displays countries' geopolitical risk in 2022. Data are from ICRG, higher values correspond to lower risk levels; gray countries have no available score.

Figure 2 provides information on the quantitative importance of geopolitical risk. The map illustrates risk rankings based on the ICRG 2022 assessment: lower geopolitical scores are generally associated with advanced economies (Western countries, Japan, Australia, South Korea), while most emerging economies exhibit higher geopolitical risk. Country-specific risk is relatively stable over time whereas at the aggregate level we observe a moderate deterioration of the average risk score from around 65 in 2010 to about 62 in 2022. Conversely, there is a fairly high variability across countries, with the political risk score ranging between approximately 30 and 90 points out of 100.

To assess analytically how the exposure to geopolitical instability may affect firms from a financial perspective, we employ the following regression model:

$$y_{i,t} = \alpha_s + \alpha_t + \alpha_c + \beta gprisk_{i,t} + \gamma X_{i,t} + \varepsilon_{i,t} \quad (1)$$

where $y_{i,t}$ represents either the Altman z-score, the P/E ratio, or the Tobin Q ratio, α_s are economic sector fixed-effects, α_t are yearly time fixed-effects, α_c are geographical fixed-effects based on firms' country of headquarters, $gprisk_{i,t}$ is the time-varying and firm specific measure of geopolitical risk, $X_{i,t}$ is a set of firm specific controls including return on assets (ROA), leverage, firm size (proxied by revenues), cash to total assets, working capital, share of fixed assets to total assets, the investment ratio (capital expenditure to total assets), and a dummy for firms paying dividends; finally, $\varepsilon_{i,t}$ is a standard error term.

We consider two alternative measures of firm-specific geopolitical exposure. The first one is constructed as the sum of the shares of firm revenues originating in each national market multiplied by the corresponding value of the country-specific ICRG index. This variable incorporates detailed information on the final location of corporate business revenues and provides a revenue-weighted measure of firms' exposure to geopolitical risk.

Alternatively, we consider a less refined measure that only reflects the geopolitical risk of corporate headquarters.⁵ The two $gprisk_{i,t}$ variables can imply distinct assessments of corporate exposure to geopolitical risk. For instance, consider two firms headquartered in the US – one generating all revenues from the local market and another with half revenues from the US and half from China. The geopolitical risk based on headquarters exposure is identical for both firms, amounting to 79 based on ICRG scores in 2022. In contrast, the assessment based on revenue exposure is 79 for the former firm with no foreign revenues but only 68 for the latter firm with more diversified revenue exposure. Our baseline results are reported in Table 2 where, to enhance comparability, we standardize each explanatory variable.

Our estimates show that firms' revenue exposure to markets characterized by high geopolitical risk impacts corporate soundness and it is also reflected in lower investor valuations. In contrast, this relationship is muted when examining geopolitical risk based on firms' headquarters.⁶ This last result squares with the graphical evidence reported in Figure 2: as S&P 500 and Eurostoxx firms are headquartered in countries with generally lower geopolitical risk. However, it is noteworthy that even relatively modest shares of revenue exposure to markets with higher geopolitical risks (roughly 12-15% on average across times and sectors) have substantial financial effects. This impact is not only statistically significant but also economically meaningful. A one standard deviation increase in our revenue-weighted geopolitical risk measure, i.e. an improvement in terms of risk exposure, results in a roughly 0.5 standard deviation increase in corporate soundness (Z-score), a 4.7% increase for the P/E ratio, and a 3.3% increase in the Tobin Q ratio. This

⁵When firms' revenues are linked to broader geographical areas with precisely identifiable member countries (e.g. NAFTA/USMCA, Eurozone...), the ICRG index associated to the area is the simple mean of the ICRG index of the countries included in the corresponding aggregate. The list of geographical aggregates with mapped ICRG values is available from the authors upon request.

⁶Results are qualitatively similar when geopolitical risk is measured with respect to the location of the ultimate parent country rather than firms' headquarters.

VARIABLES	Revenue - Weighted			HQ - estimates		
	(1) Altman	(2) P/E	(3) Tobin Q	(4) Altman	(5) P/E	(6) Tobin Q
Gprisk - rev. weight.	0.049** (0.010)	0.047*** (0.005)	0.033*** (0.005)			
Gprisk - HQ				-0.021 (0.265)	0.003 (0.857)	-0.043* (0.079)
ROA	0.364*** (0.000)	-0.068 (0.140)	0.264*** (0.000)	0.364*** (0.000)	-0.067 (0.150)	0.264*** (0.000)
Leverage	-0.259*** (0.000)	-0.039*** (0.006)	0.066*** (0.000)	-0.261*** (0.000)	-0.041*** (0.003)	0.065*** (0.000)
Cash	0.170*** (0.000)	0.115*** (0.000)	0.147*** (0.000)	0.168*** (0.000)	0.111*** (0.000)	0.146*** (0.000)
Working capital	0.237*** (0.000)	0.030** (0.028)	-0.034** (0.042)	0.235*** (0.000)	0.027* (0.062)	-0.035** (0.032)
Size	-0.049*** (0.000)	-0.101*** (0.001)	-0.091*** (0.004)	-0.049*** (0.000)	-0.100*** (0.001)	-0.091*** (0.005)
Fixed Assets/ Total Assets	-0.013 (0.571)	0.087*** (0.001)	-0.026 (0.315)	-0.016 (0.444)	0.084*** (0.001)	-0.029 (0.280)
Investment ratio	0.087*** (0.001)	-0.006 (0.698)	0.127*** (0.000)	0.085*** (0.001)	-0.008 (0.588)	0.126*** (0.000)
Dividend	-0.154 (0.115)	-0.262*** (0.000)	-0.031 (0.679)	-0.156 (0.126)	-0.265*** (0.000)	-0.033 (0.668)
Observations	11,458	11,301	10,861	11,458	11,301	10,861
R-squared	0.53	0.23	0.42	0.53	0.22	0.42
Time FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Geo FE	YES	YES	YES	YES	YES	YES

Table 2: **Fragmentation and firms' financial performance.** The table presents estimates of Equation 1, differentiating between measures of geopolitical risk - revenue-weighted versus HQ-specific. Controls include return on assets (ROA), leverage, firm size (proxied by revenues), cash to total assets, working capital, share of fixed assets to total assets, investment ratio (capital expenditure to total assets), and a dummy for firms paying dividends. Dependent variables: Altman is standardized, P/E and Tobin Q are expressed in log-terms. Models include a constant and time, industry and geographical fixed effects. P-values based on standard errors clustered at the country level in parentheses. *, **, and *** denote significance at, respectively, the 10%, 5% and 1% level.

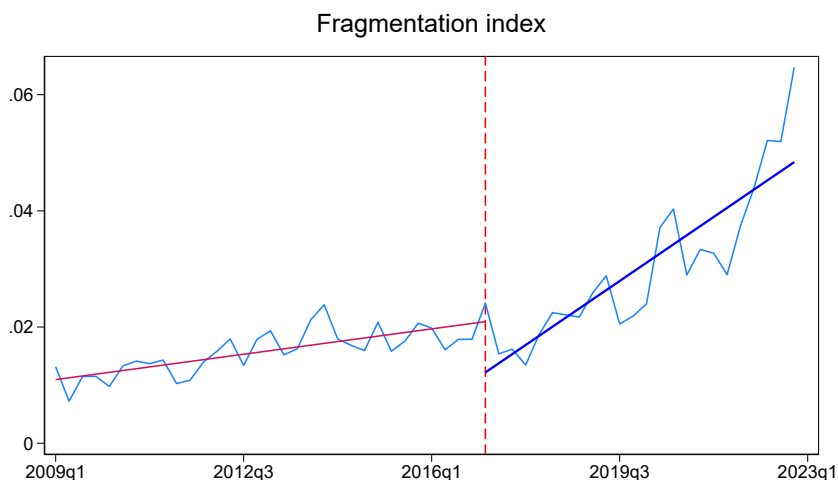


FIGURE 3: *Fragmentation index measures the average number of sentences, per thousand earnings calls, that mention at least one of the following keywords: deglobalization, reshoring, onshoring, nearshoring, friend-shoring, localization, regionalization. Data are obtained from NL analytics and are based on the methodology described in Hassan et al. (2019).*

evidence suggests that investors assessment of growth and profitability risks takes also into account exposure to geopolitical tensions. Two key findings emerge from our analysis. First, the availability of firm-level granular data is essential to capture the actual exposure of firms to risk factors, as opposed to relying on naive proxies based on the risk associated with firms' headquarters. Second, our results should be interpreted as conservative estimates of the actual effect, as our geographical breakdown of revenues pertains to revenues originating from the sale of final goods and services and does not account for other forms of cross-country linkages (e.g. intermediate output trades) arising from firms' exposure to sourcing from different countries.

We further extend the analysis of the impact of our revenue-weighted measure of geopolitical risk, by exploring whether the recent surge in geopolitical tensions has resulted in more substantial repercussions on firms' viability and valuations. As a preliminary stylized fact, Figure 3 presents a fragmentation index, derived through text mining analysis applied to corporate earnings calls, which illustrates firms' concerns about fragmentation.

VARIABLES	(1) Altman	(2) P/E	(3) Tobin Q
Gprisk - rev. weight.	0.062*** (0.001)	0.062*** (0.005)	0.033* (0.083)
Observations	5,413	5,336	5,410
R-squared	0.52	0.21	0.42
Controls	YES	YES	YES
Time, indus. and geo FE	YES	YES	YES

Table 3: Fragmentation and firms' financial performance - Post 2017. The table displays the estimates of Equation 1 for observations starting from fiscal year 2017 and revenue weighted GPR measure. See Table 2 for the list of controls. Dependent variables: Altman is standardized, P/E and Tobin Q are expressed in log-terms. Models include a constant and time, industry and geographical fixed effects. P-values based on standard errors clustered at the country level in parentheses. *, **, and *** denote significance at, respectively, the 10%, 5% and 1% level.

The index exhibits an evident upward trend, with its slope dramatically intensifying from 2017 onward, corresponding to the initial indications of US-China decoupling amid escalating trade tensions and heightened protectionist rhetoric. In light of this evidence, we then re-estimate the model in Equation 1 using the sub-sample of observations starting from fiscal year 2017; the results are displayed in Table 3. Coefficient estimates retain their statistical significance and their economic magnitude is amplified, at least for the Altman Z-Score and the P/E ratio. This suggests that in the second half of our sample, the heightened exposure of firms to geopolitical instability in final markets where revenues are originated has resulted in a more pronounced impact on corporate financial performance.

Finally, Table 4 shows various robustness exercises. First, in columns 1-3 we replicate the baseline estimates, but we consider a more stringent version of the ICRG political score which excludes economically-tilted sub-dimensions, specifically the country's socioeco-

VARIABLES	(1) Altman	(2) P/E	(3) Tobin Q	(4) Zmijewski	(5) WACC
Gprisk - rev. weight. - strict	0.053*** (0.002)	0.045*** (0.008)	0.031*** (0.005)		
Gprisk - rev. weight.				-0.029** (0.041)	-0.112* (0.079)
Observations	11,458	11,301	10,861	11,886	7,213
R-squared	0.53	0.23	0.42	0.68	0.34
Controls	YES	YES	YES	YES	YES
Time, indus. and geo FE	YES	YES	YES	YES	YES

Table 4: **Financial performance and geopolitical exposure - robustness exercises.** See Table 2 for the list of controls. The strict definition of the revenue-weighted geopolitical risk excludes countries' socioeconomic conditions and investment profile from the ICRG political score. See Table 2 for the list of controls. Dependent variables: Altman is standardized, P/E and Tobin Q are expressed in log-terms. Dependent variable is the Zmijewski (1984) score in column 4, and the WACC in column 5. Models include a constant and time, industry and geographical fixed effects. P-values based on standard errors clustered at the country level in parentheses. *, **, and *** denote significance at, respectively, the 10%, 5% and 1% level.

conomic conditions and its investment profile.⁷ Second, in column 4 we propose an alternative balance-sheet measure of corporate default risk, namely the Zmijewski (1984) score. In contrast to the Altman z-score, higher values of this variable are positively related to default risk.⁸ Then, in column 5 we estimate the impact of geoeconomic fragmentation on firms' *weighted average cost of capital* (WACC), which serves as a synthetic proxy for corporate cost of financing, with each capital category proportionally weighted, and represents the minimum return that a company must earn on its assets to satisfy all capital providers.⁹ Estimates in Table 4 align with our previous findings and confirm that corpo-

⁷These two sub-dimensions accounts for a substantial portion of the total ICRG political score, amounting to up to 24 points out of 100.

⁸The Zmijewski (1984) score is defines as $ZM = -4.336 - 4.513 * ROA + 5.679 * Total\ liabilities / Total\ assets - 0.004 * Current\ assets / Current\ liabilities$, see Acharya et al. (2013) for a valuable application of the Zmijevski score.

⁹Due to data limitations, the analysis of WACC is excluded from the baseline estimates, as this variable is only available from the fiscal year 2015.

rate exposure to geoeconomic fragmentation is reflected in firms' financial performance, also exerting an influence on the cost of financing for these firms.

4 Conclusions

This study sheds light on the financial impacts of geoeconomic fragmentation from a micro-level perspective. We introduce a novel revenue-weighted geopolitical risk index at the firm level and observe that geopolitical risk significantly affects firms' default probability and market valuations, with a notable escalation since 2017. The absence of statistical significance regarding geopolitical risks associated with firms' headquarters emphasizes the importance to access accurate microdata to precisely measure the real-financial interdependencies of geoeconomic fragmentation. As global tensions continue unabated, the financial consequences of fragmentation at the firm level may intensify, leading to more widespread macro-financial turbulence. This could manifest in cross-border effects, including capital shifts away from exposed firms, reduced asset valuations, and heightened market volatility.

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Online Appendix

	Sales
31/12/2022 (in th EUR)	
Austria	291,037
Germany	300,345
France	247,482
United States (Country)	864,903
Finland (Country)	103,134
Sweden (Country)	132,374
Norway (Country)	166,570
United Kingdom (Country)	600,194
Netherlands (Country)	397,970
Belgium (Country)	406,885
Russia (Country)	121,485
Poland (Country)	273,923
Czech Republic (Country)	230,043
Hungary	161,757

FIGURE A.1: Revenues geographical breakdown. The figure displays an example of revenues geographical breakdown for Wienerberger AG in 2022; data are obtained from Orbis-Bureau van Dijk.