GEOPOLITICAL RISK, FIRM EXPECTATIONS, AND SUPPLY-CHAIN PROPAGATION

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Abstract

We study how geopolitical risk affects firms' expectations and real activity through international trade exposure and domestic production networks, using administrative microdata. Higher geopolitical risk has stagflationary effects at the firm level: firms revise inflation, price, and unit-cost expectations upward while lowering expectations about sales, investment, employment, and the macroeconomic outlook. The effects are asymmetric across the source of exposure. Import-side geopolitical risk operates primarily through a cost-push and input-supply channel, generating stronger increases in price and cost expectations and larger declines in purchases and imports. Export-side geopolitical risk operates primarily through a foreign-demand channel, generating stronger declines in expected sales, investment, and exports. These expectation revisions are reflected in realized firm outcomes and propagate through domestic supply chains, with supplier-side exposure transmitting cost pressures and customer-side exposure transmitting demand weakness. Overall, geopolitical risk is not confined to directly exposed firms; it spreads through trade and production networks.

Keywords: Geopolitical risk, firm expectations, supply chains, production networks, international trade

JEL Classification: E31; E32; F14; F23; D22

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1 Introduction

Geopolitical risk has become a recurrent feature of the global economic environment. Wars, regional conflicts, terrorist attacks, sanctions, and disruptions to transportation routes can affect firms even when these events occur outside their home country. For firms integrated into international markets, geopolitical tensions may raise the cost or uncertainty of imported inputs, disrupt procurement, weaken foreign demand, or make access to destination markets more difficult. These forces are especially relevant for emerging markets, where firms are often exposed to imported inputs, exchange-rate fluctuations, external demand, and volatile financial conditions. Yet, despite the growing importance of geopolitical risk, we know relatively little about how firms incorporate these risks into their expectations and real decisions.

This paper studies how geopolitical risk affects firms' expectations and realized activity through international trade exposure and domestic production networks. Our main argument is that geopolitical risk matters not only because directly exposed firms trade with risky countries, but because these exposures reshape expectations and propagate through domestic production networks. The central idea is simple. A firm that imports inputs from countries experiencing elevated geopolitical risk may anticipate higher production costs, delivery disruptions, or more difficult input substitution. This should lead the firm to revise its cost and price expectations. By contrast, a firm that exports to countries experiencing elevated geopolitical risk may anticipate weaker foreign demand, lower sales, or disruptions in market access. This should lead the firm to revise down its expectations about sales, investment, and the overall macroeconomic outlook. Geopolitical risk can therefore have stagflationary effects at the firm level: it raises expected cost pressures while weakening expected real activity.

We examine these mechanisms using a rich firm-level dataset from Türkiye. Türkiye provides a useful setting because its firms are highly integrated into international trade networks and operate in an environment where external shocks, imported inputs, exchange-rate movements, and foreign demand are central to business decisions. We combine monthly firm-level expectations

from the Business Tendency Survey with administrative balance-sheet records, customs transactions, domestic buyer–supplier linkages, and country-specific geopolitical risk indices. The survey provides measures of firms' nominal and real expectations, while the administrative records link these expectations to realized outcomes. This matched structure allows us to observe, for the same firm and month, beliefs, realized activity, foreign trade exposure, domestic network position, and balance-sheet characteristics.

Our empirical strategy constructs firm-level exposure to geopolitical risk using predetermined trade shares. For each firm, we measure import-side exposure as the weighted average of geopolitical risk in the countries from which the firm imported inputs in the previous year. We measure export-side exposure analogously, using the countries to which the firm exported in the previous year.[1] Our baseline specification compares firms operating in the same sector, province, and month, but with different predetermined exposure to countries experiencing different levels of geopolitical risk. This design absorbs aggregate shocks, sector-specific shocks, and local shocks, and identifies the effect of geopolitical risk from differential exposure across firms.

The first set of results shows that geopolitical risk has stagflationary effects at the firm level. Firms exposed to higher geopolitical risk revise inflation, price, and unit-cost expectations upward, while revising sales, investment, employment, and macroeconomic outlook downward. The response is asymmetric across the source of exposure. Import-side geopolitical risk has stronger effects on nominal expectations: firms exposed through supplier countries expect larger increases in CPI inflation, PPI inflation, own prices, and unit costs. Export-side geopolitical risk has stronger effects on real activity expectations: firms exposed through destination markets become more pessimistic about sales, investment, employment, and the macroeconomic outlook. Risk in supplier countries primarily affects expected input costs and procurement conditions, whereas risk in destination markets primarily affects expected demand.

These expectation revisions are reflected in realized firm outcomes. Import-side exposure

[1]The use of lagged trade shares is important because it reduces concerns that contemporaneous trade adjustments mechanically respond to geopolitical risk.

leads to larger declines in purchases and imports, consistent with an input-supply and procurement channel. Export-side exposure leads to larger declines in sales and exports, consistent with a foreign-demand channel. Thus, firms' expectations are not merely survey responses disconnected from behavior. The same import–export asymmetry appears in both expectations and realized activity: supplier-country risk is associated with cost and input margins, while destination-market risk is associated with sales and demand margins.

A central contribution of the paper is to show that geopolitical risk is not confined to directly exposed firms. It also propagates through domestic production networks. A firm may not import directly from a country experiencing geopolitical tensions, but it may buy inputs from domestic suppliers that do. Similarly, a firm may not export directly to a risky destination, but it may sell to domestic customers whose foreign demand is exposed to geopolitical disruptions. We therefore construct upstream exposure using the import-side geopolitical risk exposure of a firm's domestic suppliers and downstream exposure using the export-side geopolitical risk exposure of a firm's domestic customers. The results show that upstream exposure is associated with larger declines in purchases and imports, while downstream exposure is associated with larger declines in sales and exports: domestic production networks spread foreign geopolitical disturbances beyond directly exposed importers and exporters.

The rest of the paper proceeds as follows. Section 2 reviews the related literature. Section 3 describes the data, firm-level expectation measures, administrative records, customs transactions, buyer–supplier linkages, and geopolitical risk indices. Section 4 explains the construction of direct and indirect geopolitical risk exposure and presents the empirical specifications. Section 5 reports the direct effects on expectations and realized outcomes, the heterogeneity results, and the supply-chain propagation evidence. Section 6 concludes.

2 Literature Review

This paper contributes to three strands of research: the macroeconomic and firm-level effects of geopolitical risk, the formation and consequences of firm expectations, and the propagation of shocks through production networks. First, the paper relates to the growing literature on geopolitical risk. Caldara and Iacoviello (2022) develop a news-based measure of geopolitical risk and show that geopolitical tensions are associated with adverse macroeconomic outcomes, lower investment, and weaker firm performance. Subsequent work has studied how geopolitical risk affects financial markets, corporate investment, capital structure, bank lending, trade, and supply-chain resilience (e.g., Alam et al., 2023; Campos et al., 2023; Nguyen and Thuy, 2023; Chowdhury et al., 2025; Wang et al., 2024; Chang et al., 2025). This literature establishes that geopolitical risk is economically important, but much less is known about the firm-level mechanisms through which such risk affects expectations and real decisions. Our paper contributes to this literature by using firms' predetermined trade exposure to construct direct measures of geopolitical risk faced through supplier countries and destination markets. This allows us to distinguish between import-side exposure, which is more closely related to input costs and procurement, and export-side exposure, which is more closely related to foreign demand and market access.

Second, the paper contributes to the literature on firms' expectations and their role in economic decisions. A growing body of work shows that firms' beliefs about inflation and macroeconomic conditions are dispersed, respond to information, and affect pricing, investment, employment, and other decisions (Coibion et al., 2018, 2020; Candia et al., 2024; Akarsu et al., 2025). This literature has largely focused on how firms form expectations about inflation, how information treatments shift these beliefs, and whether changes in expectations translate into firm behavior. We add to this literature by studying a distinct source of belief revision: geopolitical risk. Rather than focusing on information about inflation itself, we examine whether firms incorporate geopolitical tensions into their expectations about inflation, own prices, costs, sales, investment, employment, and the macroeconomic outlook. Our results show that geopolitical risk generates

a stagflationary expectation response: firms revise nominal expectations upward while revising real activity expectations downward.

Third, the paper is related to the literature on production networks and the propagation of shocks. Theoretical work shows that input-output linkages can transform microeconomic shocks into aggregate fluctuations (Acemoglu et al., 2012). Empirical work provides evidence that shocks propagate across firms through supplier and customer relationships. Barrot and Sauvagnat (2016) show that idiosyncratic shocks to suppliers caused by natural disasters reduce output among their customers, especially when inputs are specific. Boehm et al. (2019) document how foreign input disruptions transmit across countries through firm-level linkages. Carvalho et al. (2021) show that the Great East Japan Earthquake propagated both upstream and downstream through supply chains. Recent evidence using Turkish firm-level data also shows that disaster shocks, inflation-expectation shocks, and global financial shocks can propagate through domestic production networks (Akarsu et al., 2026a,b,c). We build on this literature by studying a different type of shock: geopolitical risk. Unlike natural disasters or localized production disruptions, geopolitical risk is partly anticipatory and can affect firms before realized trade flows collapse. This makes expectations a central margin of adjustment.

Our contribution is to connect these three literatures. We show that geopolitical risk affects firms not only through realized trade disruptions, but also through expectation formation. Moreover, we show that the transmission depends on where the exposure originates. Import-side geopolitical risk operates primarily through a cost-push and input-supply channel, raising inflation, price, and unit-cost expectations and reducing purchases and imports. Export-side geopolitical risk operates primarily through a foreign-demand channel, lowering sales, investment, and employment expectations as well as realized sales and exports. We then show that the same asymmetry propagates through domestic production networks: supplier-side exposure transmits cost and procurement pressures, while customer-side exposure transmits demand weakness. Finally, we show that balance-sheet fragility amplifies these effects: highly leveraged firms revise expectations more strongly and adjust realized activity more sharply in response to geopolitical risk.

The paper also speaks to work on firm heterogeneity and shock amplification. Firms differ in their ability to absorb adverse shocks because of differences in size, financial constraints, trade intensity, supplier diversification, and balance-sheet strength. Related research shows that small or financially constrained firms respond more strongly to macroeconomic and financial shocks (Ottonello and Winberry, 2020; Durante et al., 2022; Cloyne et al., 2023).[2] Consistent with this view, we find that the effects of geopolitical risk are stronger among trade-intensive firms, SMEs, and highly leveraged firms. This heterogeneity suggests that operational and financial fragility amplify the transmission of geopolitical risk from international markets to domestic expectations and real activity.

Overall, the literature has documented that geopolitical risk matters for macroeconomic and financial outcomes, that firm expectations affect real decisions, and that production networks propagate shocks. This paper brings these insights together by showing how geopolitical risk enters firms' expectations and realized activity through direct trade exposure and then spreads through domestic supplier–customer linkages.

3 Firm-Level Administrative Data and Geopolitical Risk Indices

Our analysis combines survey-based firm expectations with administrative firm-level records on balance sheets, trade, employment, and domestic buyer–supplier relationships. The objective is to study how geopolitical risk affects firms' expectations and realized outcomes, both through firms' own foreign trade exposure and through their domestic supply-chain linkages. The main data sources are: (i) the monthly Business Tendency Survey (BTS), which provides firm-level expectations about inflation, prices, costs, sales, employment, investment, and macroeconomic conditions; (ii) annual balance-sheet and income-statement records compiled by the Revenue Administration of Türkiye, which provide firm-level financial characteristics used to measure

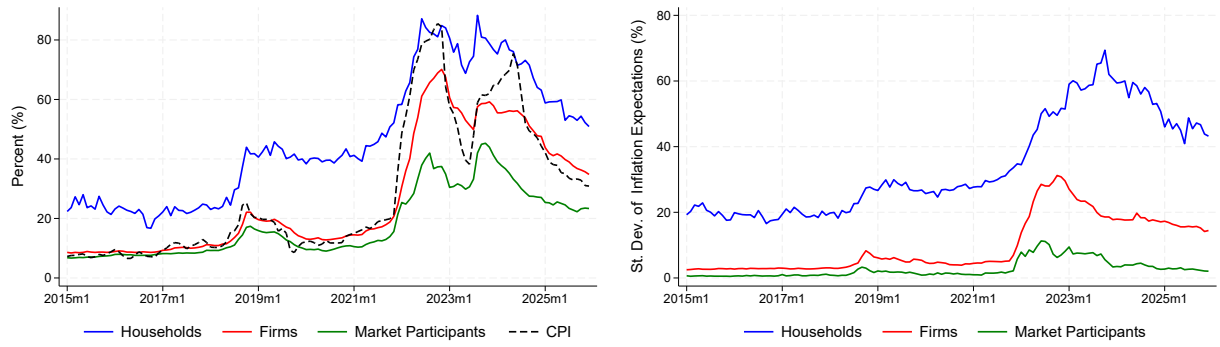
[2] This interpretation is related to the corporate finance literature on financing constraints, internal funds, collateral, and credit supply shocks (e.g., Fazzari et al., 1988; Hoshi et al., 1991; Blanchard et al., 1994; Kaplan and Zingales, 1997; Almeida and Campello, 2007; Duchin et al., 2010; Ivashina and Scharfstein, 2010; Hadlock and Pierce, 2010; Chaney et al., 2012; Hoberg and Maksimovic, 2015).

size, leverage, profitability, and other predetermined controls; (iii) domestic business-to-business transaction records based on VAT invoice declarations, which allow us to observe buyer–supplier linkages and construct upstream and downstream network exposure measures; (iv) customs records from the Ministry of Trade, which provide monthly firm-level imports and exports by partner country and product; and (v) country-specific geopolitical risk indices, which are used to construct firm-level import- and export-weighted exposure to geopolitical risk.[3]

3.1 Business Tendency Survey

The Business Tendency Survey (BTS) is a monthly firm survey conducted among manufacturing firms in Türkiye. The survey covers roughly 1,800–2,200 firms per month and collects information on firms' assessments of current business conditions, recent developments, and expectations about future economic activity. The BTS is particularly useful for our purposes because it provides high-frequency firm-level expectations, while also recording the exact month in which each firm reports its views. This allows us to link firms' expectations to monthly variation in geopolitical risk exposure. In addition, it contains both quantitative and qualitative expectation questions. The quantitative questions ask firms to report numerical forecasts. For example, firms report their 12-month-ahead expectations for consumer price inflation and producer price inflation (see Figure 1). These variables are our main quantitative measures of inflation expectations.

[3]These datasets are linked using anonymized firm identifiers and calendar time. The merged panel allows us to observe, for each firm and month, its expectations, realized activity, foreign trade composition, domestic supply-chain position, and predetermined balance-sheet characteristics.



(a) Inflation Expectations and Realized CPI **(b)** Disagreement in Inflation Expectations

Figure 1: Inflation Expectations, Realized Inflation, and Disagreement

Notes: Panel (a) plots inflation expectations of households, firms, and market participants together with realized CPI inflation. Panel (b) plots disagreement in inflation expectations, measured by the cross-sectional standard deviation of reported inflation expectations within each group. All series are reported in percent.

The survey also includes qualitative expectations about firms' own operating environment. These questions ask firms whether they expect a given variable to increase, remain unchanged, or decrease over the relevant horizon.[4] We code these responses as ordinal variables, where 1 denotes a decrease or deterioration, 2 denotes no change, and 3 denotes an increase or improvement. The main qualitative expectation outcomes include own-price expectations, unit-cost expectations, sales expectations, employment expectations, investment expectations, and macroeconomic outlook. For example, the own-price question asks whether the firm expects its selling prices to increase, remain unchanged, or decrease. Similarly, the unit-cost question captures whether the firm expects production costs to increase, remain unchanged, or decrease. The macroeconomic outlook question captures firms' assessment of the general economic environment and is coded so that higher values indicate a more favorable outlook.

3.2 Balance Sheets and Income Statements

We use annual balance-sheet and income-statement records compiled by the Revenue Administration of Türkiye to measure firms' predetermined financial characteristics. Firm balance-sheet and income-statement data cover the population of non-financial private-sector firms in

[4] See Appendix A for the questionnaire.

Türkiye.[5] Incorporated firms operating under the corporate income tax regime, such as limited liability and joint-stock companies, are required to submit full financial statements, whereas unincorporated firms subject to the personal income tax regime, such as sole proprietorships, report financial information only if they exceed legislated size thresholds.[6] These records provide detailed information from firms' balance sheets and income statements, including total assets, liabilities, sales, profitability, employment-related expenses, and other financial variables (see Table 1 for details).

3.3 Business-to-Business Transactions Data

Another key data source is the Business-to-Business (B2B) transactions dataset compiled by the Turkish Revenue Administration. The dataset records the value of domestic supplier–buyer transactions in Türkiye based on firms' VAT invoice declarations. For each supplier–buyer pair, annual sales are measured as the sum of all invoices issued by the supplier to the buyer during a given year. Under Turkish VAT law, taxable transactions must be declared. In the administrative extract available to the CBRT, all B2B invoices with a value of at least 5,000 TL are observed, providing near-universal coverage of formal inter-firm transactions above this reporting threshold.

The data report both the direction and the value of each transaction in local currency, which allows us to identify each firm's domestic suppliers and customers. We merge these network data with the BTS, customs records, and administrative firm-level datasets using anonymized firm identifiers. This merged structure allows us to study not only the direct effect of geopolitical risk exposure on firms' expectations and realized outcomes, but also whether these effects propagate through domestic production networks. In particular, we use supplier and customer linkages to examine whether firms are affected by geopolitical risk exposure transmitted through their trad-

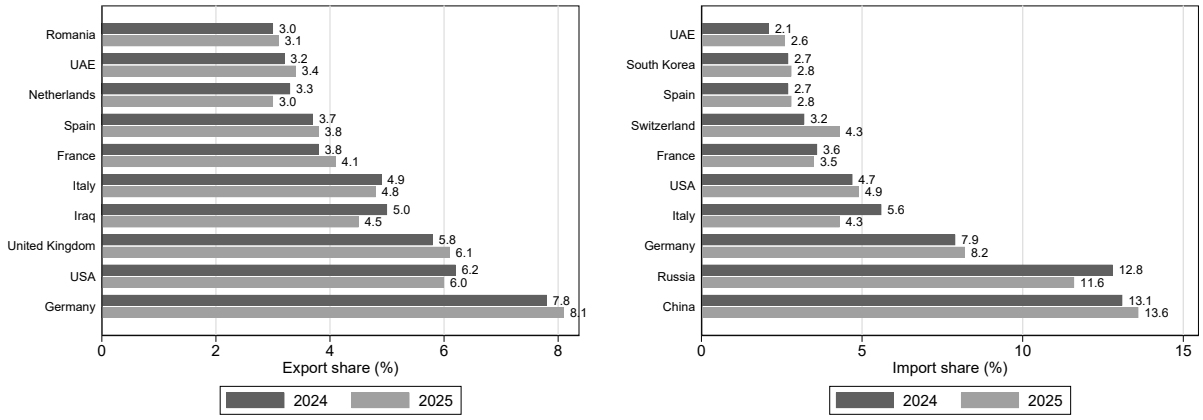
[5] They are compiled annually in accordance with the Tax Procedure Law under the balance-sheet accounting principle.

[6] As of 2023, firms in Türkiye are required to maintain accounting records under the balance-sheet method if they meet any of the following criteria: annual purchases exceeding 890,000 TL, annual sales exceeding 1,270,000 TL, annual gross business revenue exceeding 440,000 TL, or a combined total of five times business revenue and annual sales exceeding 890,000 TL.

ing partners.

3.4 Customs Records on Exports and Imports

We use monthly customs records from the Ministry of Trade to measure firms' foreign trade activity. The data report firm-level export and import transactions by month, partner country, and product (see Figure 2 for main partners). Product information is recorded at the HS6 level, while partner-country information identifies the destination country for exports and the origin country for imports. The customs records therefore allow us to observe not only the total value of firms' exports and imports, but also the geographic and product composition of their foreign trade. It serve two purposes in the analysis. First, they provide realized trade outcomes, including monthly firm-level exports and imports. Second, they allow us to characterize firms' exposure to foreign markets and foreign input sources.



(a) Top 10 Export Destinations **(b)** Top 10 Import Origins

Figure 2: Türkiye's Top Export and Import Partners

Notes: The figure reports Türkiye's top ten trading partners based on bilateral trade shares in 2024 and 2025. Panel (a) shows the share of each country in total exports, while Panel (b) shows the share of each country in total imports. Bars represent trade shares in percent. Countries are ordered according to their average trade share across 2024 and 2025. The figure highlights the concentration of Türkiye's exports toward European markets, especially Germany, the United States, and the United Kingdom, while imports are more concentrated in China, Russia, Germany, Italy, and the United States.

Table 1: Summary Statistics of Firm-Level Variables

	Mean	SD	P10	P90
Firm Characteristics				
Net Sales (Million TL)	1009.48	7124.77	25.55	1694.33
Employment	634.17	1397.78	86.92	1256.10
Total Assets (Million TL)	940.89	4783.68	24.43	1588.69
Capital (Million TL)	208.65	1312.86	3.63	334.72
Exports (Million TL)	309.23	2071.89	0.00	446.98
Age	28.07	15.82	9.54	47.70
Net Profit (Million TL)	81.01	772.03	-4.00	126.08
Leverage Ratio	0.60	0.33	0.23	0.92
Firm Expectations				
CPI Expectations (%)	20.27	18.98	6.80	52.50
PPI Expectations (%)	21.82	22.15	6.30	57.50
Capacity Utilization Ratio	64.90	20.10	39.00	88.00
Own Price Expectations	2.16	0.60	1	3
Unit Cost Expectations	2.31	0.57	1	3
Sales Expectations	1.80	0.64	1	3
Employment Expectations	1.75	0.54	1	3
Macroeconomic Outlook	2.02	0.56	1	3

Notes: Means, standard deviations (SD), and percentiles (P10, P90) are computed at the firm level. Monetary values are reported in million Turkish lira (TL). CPI and PPI expectations are numerical 12-month-ahead forecasts. All other expectation variables, except the capacity utilization ratio, are qualitative survey responses measured on a three-point scale, where 1 denotes a decrease or deterioration, 2 no change, and 3 an increase or improvement.

3.5 Country-Specific Geopolitical Risk Indices

We measure geopolitical risk using the country-specific geopolitical risk indices developed by Caldara and Iacoviello (2022). These indices are based on automated text searches of newspaper articles related to geopolitical tensions, threats, wars, and terrorist events. The benchmark global GPR index starts in 1985 and is constructed from newspaper coverage of adverse geopolitical events. The data also provide country-specific geopolitical risk indices for a set of advanced and emerging economies. These country-level indices allow us to capture the geopolitical risk conditions faced by firms through their foreign trading partners. The index is widely used to measure geopolitical risk because it provides a consistent monthly time-series measure that can be linked to macroeconomic and financial outcomes. The country-specific GPR indices are avail-

able from the authors' data page and the Economic Policy Uncertainty data repository. (Caldara and Iacoviello, 2022)

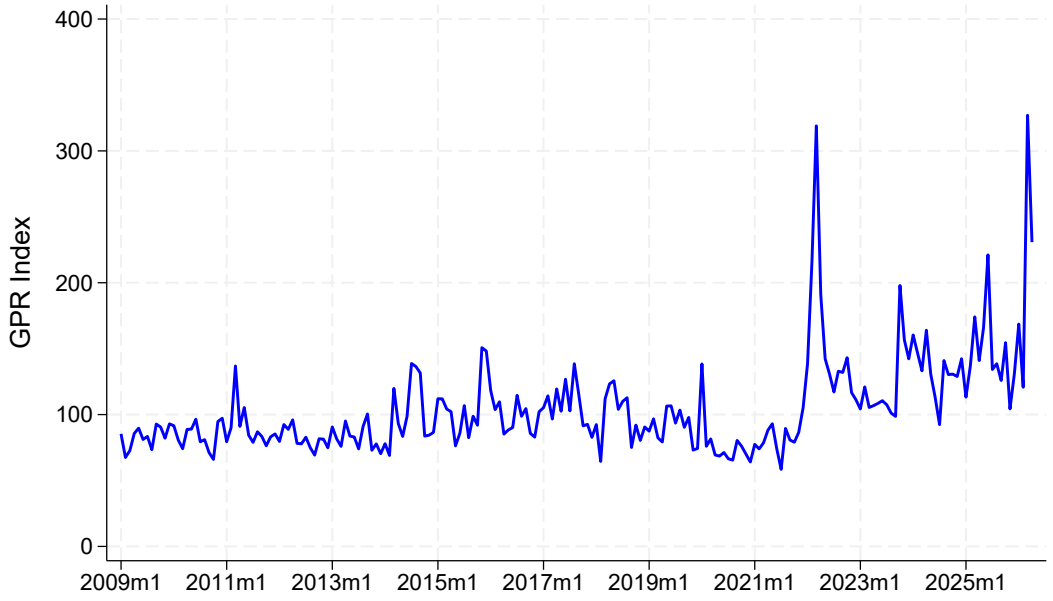


Figure 3: Geopolitical Risk Index

Notes: The figure plots the monthly global Geopolitical Risk (GPR) index of Caldara and Iacoviello (2022) over the sample period. The index is a news-based measure of adverse geopolitical events and associated risks, normalized to have an average value of 100 over 1985–2019.

3.6 Measuring Firm-Level Geopolitical Risk Exposure

We construct firm-level exposure to geopolitical risk by combining country-specific geopolitical risk indices with firms' predetermined trade exposure across partner countries. The objective is to capture the extent to which a firm is exposed to geopolitical developments in the foreign markets from which it sources inputs or to which it sells its products. This approach introduces cross-sectional heterogeneity in exposure to aggregate geopolitical shocks and allows us to compare firms that are differentially exposed to the same global risk environment.

Let $GPR_{c,t}$ denote the geopolitical risk index of country c in month t. For each firm i, we construct country-level trade shares using the firm's trade structure in the previous year. Specifically,

the import share of country c in firm i's total imports is defined as

$$s^{M}_{i,c,y-1} = \frac{M_{i,c,y-1}}{\sum_{c'} M_{i,c',y-1}}, \tag{1}$$

where $M_{i,c,y-1}$ denotes the value of imports of firm i from country c in year $y-1$. Similarly, the export share of country c in firm i's total exports is defined as

$$s^{X}_{i,c,y-1} = \frac{X_{i,c,y-1}}{\sum_{c'} X_{i,c',y-1}}, \tag{2}$$

where $X_{i,c,y-1}$ denotes the value of exports of firm i to country c in year $y-1$.

Using these predetermined shares, we define firm-level import-side geopolitical risk exposure as

$$GPR^{M}_{i,t} = \sum_{c} s^{M}_{i,c,y-1} GPR_{c,t}. \tag{3}$$

This measure captures the geopolitical risk faced by firm i through the countries from which it sources imported inputs. A firm that relies more heavily on imports from countries experiencing higher geopolitical risk receives a higher value of $GPR^{M}_{i,t}$.

Analogously, we define firm-level export-side geopolitical risk exposure as

$$GPR^{X}_{i,t} = \sum_{c} s^{X}_{i,c,y-1} GPR_{c,t}. \tag{4}$$

This measure captures the geopolitical risk faced by firm i through its destination markets. A firm that sells a larger share of its exports to countries experiencing elevated geopolitical risk is therefore more exposed to foreign demand and market-access disruptions.

A key feature of these measures is that the trade weights are predetermined. For all months in year y, we use the trade shares observed in year $y-1$. This timing convention reduces concerns that contemporaneous changes in firms' trade patterns mechanically respond to geopolitical risk realizations. The measures therefore vary at the firm-month level because geopolitical risk

changes over time across countries, while the intensity of exposure differs across firms according to their lagged trade structure.

For firms without positive imports or exports in the previous year, the corresponding exposure measure is set to zero, and the empirical specifications control for firms' trading status. In robustness exercises, we also restrict the sample to active importers or exporters to ensure that the results are not driven by extensive-margin differences between trading and non-trading firms.

Before entering the regressions, the country-specific geopolitical risk indices are standardized to have mean zero and standard deviation one. Accordingly, the firm-level exposure variables can be interpreted as weighted-average geopolitical risk exposure, where the weights reflect each firm's predetermined reliance on different partner countries.

4 Methodology

4.1 Direct Effect of Geopolitical Risk

We estimate the effect of firm-level geopolitical risk exposure on firms' expectations and realized outcomes using the following specification:

$$Y_{i,t} = \alpha_i + \delta_{s,t} + \phi_{p,t} + \beta_M GPR^M_{i,t-1} + \beta_X GPR^X_{i,t-1} + \Gamma' Z_{i,y-1} + \varepsilon_{i,t}, \tag{5}$$

where $Y_{i,t}$ denotes the outcome of firm i in month t. The main outcomes include firms' CPI inflation expectations, PPI inflation expectations, own-price expectations, unit-cost expectations, sales expectations, investment expectations, employment expectations, and macroeconomic outlook. We also examine realized firm outcomes, including sales, purchases, employment, and exports. The terms α_i, $\delta_{s,t}$, and $\phi_{p,t}$ denote firm fixed effects, sector-by-year-month fixed effects, and province-by-year-month fixed effects, respectively. Firm fixed effects absorb time-invariant differences across firms, including persistent differences in productivity, management quality, long-run trading orientation, and business models. Sector-by-year-month fixed effects

control for time-varying shocks common to firms operating in the same sector, such as sector-specific demand conditions, input-cost pressures, and global price movements. Province-by-year-month fixed effects absorb local time-varying shocks, including regional demand conditions, labor-market developments, and province-specific economic disruptions.[7] The vector $Z_{i,y-1}$ includes predetermined firm characteristics measured in the previous year, such as firm size, age, leverage, profitability, exporter status, importer status, and foreign-currency exposure. These controls account for observable differences across firms that may be correlated with both their trade structure and their expectations or realized outcomes.

The coefficient β_M captures the effect of geopolitical risk operating through firms' import exposure. A positive estimate for inflation expectations, unit-cost expectations, or own-price expectations would be consistent with a cost-push channel, whereby geopolitical tensions in supplier countries increase expected production costs and price pressures. The coefficient β_X captures the effect of geopolitical risk operating through export-market exposure. A negative estimate for sales, investment, or employment expectations would be consistent with a foreign-demand channel, whereby geopolitical tensions in destination markets weaken expected demand and reduce firms' real outlook.

4.2 Supply-Chain Propagation of Geopolitical Risk

We next examine whether geopolitical risk is transmitted across firms through domestic production networks. The direct-exposure specification captures the effect of geopolitical risk operating through firm i's own foreign trade links. However, firms may also be indirectly exposed to geopolitical risk through their suppliers and customers. For example, a firm may face higher expected costs if its suppliers are exposed to geopolitical tensions in their own import markets. Similarly, a

[7] The inclusion of these high-dimensional fixed effects implies that identification comes from differences across firms within the same sector, province, and month, depending on their predetermined exposure to geopolitical risk through foreign trading partners. In other words, we compare firms operating in the same sector and province at the same point in time, but with different lagged import and export exposure to countries experiencing different levels of geopolitical risk. This specification absorbs aggregate shocks such as domestic inflation, monetary policy, exchange-rate movements, oil-price changes, and global financial conditions, as well as sector- and province-specific time-varying shocks.

firm may revise down its sales or investment expectations if its customers are exposed to geopolitical risks in their export destinations.

To measure these indirect exposures, we combine firm-level geopolitical risk exposure with lagged domestic buyer–supplier links. Let $\mathscr{S}_{i,y-1}$ denote the set of suppliers of firm i in year $y-1$, and let $\mathscr{C}_{i,y-1}$ denote the set of customers of firm i in year $y-1$. We define the upstream purchase share of supplier j in firm i's total domestic purchases as

$$\omega^{U}_{ij,y-1} = \frac{P_{ij,y-1}}{\sum_{j' \in \mathscr{S}_{i,y-1}} P_{ij',y-1}}, \tag{6}$$

where $P_{ij,y-1}$ denotes the value of purchases by firm i from supplier j in year $y-1$. Similarly, we define the downstream sales share of customer k in firm i's total domestic sales as

$$\omega^{D}_{ik,y-1} = \frac{S_{ik,y-1}}{\sum_{k' \in \mathscr{C}_{i,y-1}} S_{ik',y-1}}, \tag{7}$$

where $S_{ik,y-1}$ denotes the value of sales from firm i to customer k in year $y-1$.

Using these predetermined network shares, we construct upstream geopolitical risk exposure as the weighted average of the direct geopolitical risk exposure of firm i's suppliers:

$$GPR^{U}_{i,t-1} = \sum_{j \in \mathscr{S}_{i,y-1}} \omega^{U}_{ij,y-1} GPR^{M}_{j,t-1}. \tag{8}$$

This measure captures the extent to which firm i is exposed to geopolitical risk through the foreign input exposure of its suppliers. If a supplier sources inputs from countries experiencing elevated geopolitical risk, this may increase expected input costs, delivery uncertainty, or production disruptions for its downstream customers.

Analogously, we construct downstream geopolitical risk exposure as the weighted average of

the direct geopolitical risk exposure of firm i's customers:

$$GPR^{D}_{i,t-1} = \sum_{k \in \mathcal{C}_{i,y-1}} \omega^{D}_{ik,y-1} GPR^{X}_{k,t-1}. \tag{9}$$

This measure captures the extent to which firm i is exposed to geopolitical risk through the foreign demand exposure of its customers. If a customer sells to countries experiencing elevated geopolitical risk, this may weaken its demand for intermediate inputs and transmit the shock upstream to its suppliers.

We then estimate the following specification:

$$Y_{i,t} = \alpha_i + \delta_{s,t} + \phi_{p,t} + \beta_M GPR^{M}_{i,t-1} + \beta_X GPR^{X}_{i,t-1} + \theta_U GPR^{U}_{i,t-1} + \theta_D GPR^{D}_{i,t-1} + \Gamma' Z_{i,y-1} + \varepsilon_{i,t}. \tag{10}$$

The coefficients β_M and β_X continue to capture the direct effect of geopolitical risk through firm i's own import and export exposure. The coefficients θ_U and θ_D capture the indirect propagation of geopolitical risk through domestic production networks. In particular, θ_U measures the effect of geopolitical risk transmitted from suppliers to firm i, while θ_D measures the effect transmitted from customers to firm i.

A positive estimate of θ_U for unit-cost, PPI, or own-price expectations would be consistent with an upstream cost-push propagation channel. In this case, geopolitical risk affects firms not only through their own import exposure, but also through the import exposure of their suppliers. A negative estimate of θ_D for sales, investment, or employment expectations would be consistent with a downstream demand-propagation channel, whereby geopolitical risk faced by customers weakens expected demand for firm i's output.

As in the direct-exposure specification, the network weights are measured using lagged annual transaction shares from year $y-1$. This timing convention ensures that the supply-chain exposure measures are predetermined relative to the realization of geopolitical risk in month $t-1$ and the outcome observed in month t. Therefore, the estimated propagation effects are not mechan-

ically driven by contemporaneous adjustments in buyer–supplier relationships. The inclusion of firm fixed effects, sector-by-year-month fixed effects, and province-by-year-month fixed effects implies that identification comes from comparing firms operating in the same sector, province, and month, but with different predetermined exposure to geopolitical risk through their domestic suppliers and customers.

5 Main Results

We report the effects of geopolitical risk exposure on firms' expectations and realized outcomes, covering both direct trade exposure and indirect exposure through domestic production networks. Four empirical facts organize the section.

1. *Geopolitical risk is stagflationary at the firm level*: it raises nominal expectations while weakening firms' expected real activity.
2. *Exposure source determines the channel*: import risk maps to costs; export risk maps to demand.
3. *Firms' expectation revisions are reflected in realized outcomes*: the same exposure margins that move expectations also predict subsequent changes in sales, purchases, employment, exports, and imports.
4. *Geopolitical risk propagates through domestic production networks*: foreign risk affects not only directly exposed importers and exporters, but also firms connected to them through supplier and customer relationships.

5.1 Direct Effects

Fact 1: geopolitical risk is stagflationary at the firm level.

Table 2 reports the direct effects of firm-level geopolitical risk exposure on firms' expectations. Panel A shows that both import- and export-side geopolitical risk exposure lead firms to revise in-

flation, price, and unit-cost expectations upward. A one-standard-deviation increase in import-side exposure raises 12-month-ahead CPI and PPI inflation expectations by 0.092 and 0.108 percentage points, respectively. The corresponding effects of export-side exposure are 0.050 and 0.061 percentage points.[8] The real side of the response moves in the opposite direction. Sales, investment, employment, and macroeconomic outlook all decline following higher geopolitical risk exposure. Thus, the same shock raises expected nominal pressures while weakening expected real activity, which is the firm-level stagflationary pattern at the center of the paper.

Fact 2: ***The source of exposure determines the channel.***

The import–export asymmetry reveals the economic mechanism behind this stagflationary response. The response of aggregate inflation expectations to import-side exposure is roughly 80 percent larger than the response to export-side exposure. The same pattern appears for firms' own price and unit-cost expectations: import-side exposure raises own-price and unit-cost expectations by 0.017 and 0.021 points on the 1–3 response scale, compared with 0.010 and 0.012 points for export-side exposure. Firms that source inputs from countries experiencing elevated geopolitical tensions therefore appear to anticipate higher production costs and incorporate these pressures into their own price-setting plans.

The pattern is reversed for real activity expectations. A one-standard-deviation increase in export-side exposure reduces sales and investment expectations by 0.025 and 0.030 points, respectively, compared with 0.011 and 0.014 points for import-side exposure. The export-side effects are therefore more than twice as large for these real activity expectations. The same pattern holds for employment expectations and macroeconomic outlook. This evidence points to a foreign-demand channel: when geopolitical risk rises in destination markets, firms expect weaker

[8] Because the two exposure measures enter the same specification, the estimates can also be used to quantify the effect of simultaneous exposure along both margins. A firm experiencing a one-standard-deviation increase in both import- and export-side geopolitical risk exposure revises its CPI and PPI inflation expectations upward by 0.14 and 0.17 percentage points, respectively. This combined response is economically meaningful, but it should be interpreted as the effect of joint exposure through the firm's own import and export links rather than as the effect of a one-standard-deviation increase in an aggregate geopolitical risk index.

demand for their output and revise down sales, investment, and employment plans. Export-side exposure also raises nominal expectations, but the effect is smaller, suggesting that geopolitical tensions in destination markets may increase perceived macroeconomic risk, exchange-rate risk, or broader uncertainty even though the primary channel operates through demand rather than imported inputs.

Panels B and C provide further support for this interpretation by exploiting heterogeneity in firms' trade intensity. In Panel B, the interaction between export intensity and export-side geopolitical risk is positive and significant for inflation, price, and unit-cost expectations, and negative and significant for sales, investment, employment, and macroeconomic outlook. This indicates that firms for which exports represent a larger share of sales respond more strongly to geopolitical risk in destination markets. The effects are particularly pronounced for real activity expectations, consistent with the idea that foreign-market disruptions matter more for firms whose revenues depend more heavily on exports.

Panel C shows the analogous pattern for import-intensive firms. The interaction between import intensity and import-side geopolitical risk is positive and significant for CPI, PPI, own-price, and unit-cost expectations, and negative for real activity expectations. These estimates suggest that firms that rely more heavily on imported inputs are especially sensitive to geopolitical risk in supplier countries. For these firms, geopolitical risk is more likely to be interpreted as a disruption to input availability, procurement costs, delivery conditions, or replacement costs.

Overall, the trade-intensity results sharpen the interpretation of the baseline estimates. Import exposure primarily affects firms through expected cost and price pressures, while export exposure primarily affects firms through expected demand and activity. This distinction is central for the rest of the analysis because the same logic later appears in the supply-chain results: supplier-side exposure transmits cost pressures, whereas customer-side exposure transmits demand weakness.

Table 3 examines whether these expectation responses differ across firms with different size and balance-sheet characteristics. Panel A shows that the effects of geopolitical risk exposure

are stronger for SMEs. For example, the total effect of import-side exposure on SMEs' CPI and PPI inflation expectations is 0.101 and 0.119 percentage points, compared with 0.074 and 0.087 percentage points for larger firms. Similarly, the total effect of export-side exposure on SMEs' sales and investment expectations is -0.035 and -0.044 points, compared with -0.021 and -0.026 points for larger firms. Thus, SMEs not only revise nominal expectations upward more strongly, but also become substantially more pessimistic about real activity.

This amplification is consistent with the idea that smaller firms have weaker buffers against disruptions in procurement, demand, and financing conditions. Since SMEs are less likely to have diversified supplier bases, extensive hedging capacity, or easy access to external finance, geopolitical risk exposure translates more strongly into both nominal and real expectation revisions.

Panel B shows a similar amplification among highly leveraged firms. The total effect of import-side exposure on high-leverage firms' CPI and PPI inflation expectations is 0.099 and 0.117 percentage points, compared with 0.069 and 0.081 percentage points for low-leverage firms. On the real side, the total effect of export-side exposure on high-leverage firms' sales and investment expectations is -0.036 and -0.045 points, compared with -0.019 and -0.024 points for low-leverage firms. These results suggest that balance-sheet fragility amplifies the expectation response to geopolitical risk. This finding is in line with evidence that financially constrained or highly leveraged firms respond more strongly to adverse macroeconomic and financial shocks (e.g., Durante et al., 2022; Cloyne et al., 2023; Akarsu et al., 2026d). In our setting, geopolitical risk appears to operate through a similar amplification mechanism: firms with weaker balance sheets expect larger cost and price pressures, while also becoming more pessimistic about sales, investment, employment, and the overall macroeconomic outlook.

Taken together, the expectation results show that geopolitical risk affects firms through two distinct but related channels. Import-side exposure generates stronger upward revisions in inflation, price, and cost expectations. Export-side exposure generates stronger downward revisions in sales, investment, employment, and macroeconomic outlook. These effects are amplified among trade-intensive firms, SMEs, and highly leveraged firms. The evidence therefore suggests that

geopolitical risk is not simply an uncertainty shock; firms interpret it as a shock that simultaneously raises expected costs and weakens expected activity.

Fact 3: ***Expectation revisions are reflected in realized outcomes.***

We next examine whether realized firm outcomes move in the same direction as firms' expectation revisions. Table 4 reports the effects of geopolitical risk exposure on realized sales, purchases, employment, exports, and imports. Since these outcomes are measured in logs, the coefficients can be interpreted approximately as percent changes.

Panel A shows that higher geopolitical risk exposure reduces realized activity. A one-standard-deviation increase in import-side exposure lowers sales by 1.8 percent, purchases by 2.6 percent, employment by 0.9 percent, exports by 1.2 percent, and imports by 3.1 percent. The largest effects of import-side exposure are therefore on purchases and imports, which is consistent with the input-side nature of this exposure. Firms exposed to geopolitical risk through supplier countries appear to reduce input purchases and imports more strongly than other margins of activity.

By contrast, export-side exposure has larger effects on sales and exports. A one-standard-deviation increase in export-side exposure reduces sales by 2.7 percent and exports by 3.4 percent. The effect on exports is almost three times as large as the corresponding effect of import-side exposure. This pattern mirrors the expectation evidence: import-side geopolitical risk is more closely associated with input and procurement margins, whereas export-side geopolitical risk is more closely associated with demand and sales margins.

Panels B and C again show that these effects are amplified among firms with greater trade intensity. In Panel B, export-intensive firms exhibit stronger declines in sales and exports following increases in export-side geopolitical risk exposure. This is consistent with the foreign-demand channel: firms whose revenues rely more heavily on foreign markets are more exposed to geopolitical disruptions in those markets. In Panel C, import-intensive firms exhibit stronger declines in purchases and imports following increases in import-side geopolitical risk exposure, consistent with disruptions to input sourcing and procurement.

Finally, Table 5 shows that realized outcomes are more responsive among SMEs and highly leveraged firms. These firms experience larger declines in sales, purchases, employment, exports, and imports following increases in geopolitical risk exposure. This heterogeneity is consistent with the expectation results in Table 3: firms with fewer operational or financial buffers not only revise their expectations more strongly, but also experience larger contractions in realized activity.

Overall, the realized-outcome results are consistent with the interpretation from expectations. Import-side exposure operates primarily through an input-supply and cost channel: the same exposure margin is associated with higher expected costs and prices and larger declines in purchases and imports. Export-side exposure operates primarily through a foreign-demand channel: the same exposure margin is associated with weaker expected activity and larger declines in sales and exports. The direct-effect evidence therefore establishes the central asymmetry of the paper. Geopolitical risk is stagflationary for exposed firms, but the mechanism depends on where the exposure arises: supplier-country risk raises cost pressure, while destination-market risk weakens demand. The supply-chain analysis below asks whether the same asymmetry propagates beyond directly exposed firms through domestic supplier and customer linkages.

5.2 Indirect Effects: Supply-Chain Propagation

Fact 4: ***Geopolitical risk propagates through domestic production networks.***

The direct-effect results show that firms respond to geopolitical risk when they are directly exposed through their own import and export relationships. We now ask whether these risks also propagate across firms through domestic production networks. This is a conceptually distinct question. A firm may not directly import from a country experiencing geopolitical tensions, but it may buy inputs from domestic suppliers that do. Similarly, a firm may not directly export to a risky destination, but it may sell to domestic customers whose foreign demand is exposed to geopolitical disruptions. In this sense, geopolitical risk can travel through the domestic input-output network, affecting firms that are only indirectly connected to foreign markets.

Table 6 reports the results for firms' expectations. The estimates indicate that indirect exposure through suppliers and customers has economically meaningful effects even after controlling for firms' own direct import- and export-side geopolitical risk exposure. This is important because the propagation coefficients capture variation in the geopolitical risk exposure of a firm's domestic trading partners, rather than the firm's own foreign trade links.

Panel A shows that upstream geopolitical risk exposure raises firms' inflation and price expectations. A one-standard-deviation increase in upstream exposure increases CPI and PPI inflation expectations by 0.049 and 0.058 percentage points, respectively. It also raises own-price and unit-cost expectations by 0.009 and 0.012 points on the 1–3 qualitative response scale. These effects are smaller than the direct import-side effects in Table 2, but they are far from negligible: the upstream effects on CPI and PPI expectations are roughly one-half of the corresponding direct import-side effects. This finding is consistent with the production-network literature, which shows that shocks to suppliers can propagate to downstream customers through input-output linkages, especially when inputs are difficult to substitute (Acemoglu et al., 2012; Barrot and Sauvagnat, 2016; Boehm et al., 2019). In our setting, geopolitical risk is not confined to direct importers. Instead, when suppliers are exposed to geopolitical tensions in their own foreign input markets, their downstream customers internalize these risks as higher expected costs and prices.

Downstream exposure generates a different pattern. It also raises nominal expectations, but by less: CPI and PPI inflation expectations increase by 0.031 and 0.037 percentage points, respectively, while own-price and unit-cost expectations increase by 0.006 and 0.007 points. By contrast, the downstream effects are stronger for real activity expectations. Sales, investment, employment, and macroeconomic outlook decline by 0.018, 0.023, 0.016, and 0.024 points, respectively. These effects are larger than the corresponding upstream effects. This asymmetry is intuitive: supplier exposure primarily transmits cost and input-supply pressures, whereas customer exposure primarily transmits demand-side disruptions. If a firm's customers are exposed to geopolitical risk in their export markets, the firm anticipates weaker demand for its own output, even if it is not directly exporting to those markets.

The comparison between upstream and downstream exposure therefore mirrors the direct-effect evidence. Import-side risk matters more for nominal expectations; export-side risk matters more for real activity expectations. The new result is that this logic extends beyond direct trade relationships. Geopolitical risk faced by a firm's suppliers affects the firm's expected costs and prices, while geopolitical risk faced by its customers affects the firm's expected sales, investment, employment, and outlook. The domestic production network therefore acts as a transmission mechanism that converts foreign geopolitical disturbances into domestic expectation revisions.

Panels B and C sharpen this interpretation by showing that propagation effects are stronger when the receiving firm is itself more exposed to international trade. Panel B interacts the supply-chain exposure measures with firms' export intensity. The interaction between downstream exposure and export intensity is especially strong: export-intensive firms revise sales, investment, employment, and macroeconomic outlook downward more sharply when their customers are exposed to geopolitical risk. This result is consistent with complementarities between a firm's own foreign-market orientation and the foreign exposure of its customer base. Firms that rely more heavily on external demand appear more sensitive not only to their own export-market risk, but also to geopolitical risk transmitted through customers.

Panel C shows the analogous pattern for import-intensive firms. The interaction between upstream exposure and import intensity is positive and significant for CPI, PPI, own-price, and unit-cost expectations, and negative for real activity expectations. This suggests that firms with a greater reliance on imported inputs are especially sensitive to supplier-side geopolitical risk. For these firms, geopolitical tensions affecting suppliers' foreign input sources are more likely to be interpreted as disruptions to procurement, input availability, delivery times, or replacement costs. Hence, upstream exposure becomes more salient when the firm itself has an import-intensive production structure.

Table 7 shows that these propagation effects are also amplified among SMEs and highly leveraged firms. SMEs respond more strongly to both upstream and downstream geopolitical risk exposure: they revise nominal expectations upward by more and real activity expectations down-

ward by more. This pattern is consistent with smaller firms having fewer margins of adjustment in response to supplier disruptions or customer-demand shocks. They may have less diversified supplier networks, weaker bargaining power, and more limited ability to absorb temporary disruptions without revising prices or production plans.

Highly leveraged firms exhibit a similar amplification. The interaction terms between high leverage and upstream exposure are positive for inflation, price, and unit-cost expectations and negative for sales, investment, employment, and macroeconomic outlook. The interaction terms between high leverage and downstream exposure are also negative and significant for real activity expectations. These results suggest that financial fragility magnifies the transmission of geopolitical risk through production networks. When balance-sheet constraints are tighter, firms appear less able to buffer supplier- or customer-side disruptions, leading to stronger revisions in expectations.

We next examine whether the expectation responses are reflected in realized outcomes. Table 8 shows that they are. Panel A reports that a one-standard-deviation increase in upstream exposure reduces sales by 1.2 percent, purchases by 2.0 percent, employment by 0.6 percent, exports by 0.7 percent, and imports by 2.2 percent. The larger effects on purchases and imports are consistent with the upstream input-supply channel: when suppliers are exposed to geopolitical risk, downstream firms reduce input purchases and imports more strongly.

Downstream exposure has a different real-side footprint. A one-standard-deviation increase in downstream exposure reduces sales by 2.0 percent and exports by 2.6 percent, compared with smaller effects on purchases and imports. This pattern is consistent with the downstream demand channel. If a firm's customers face geopolitical risk in their own export markets, their demand for intermediate inputs weakens, and this contraction is transmitted upstream to their suppliers. The realized-outcome results are therefore consistent with the interpretation from expectations: upstream exposure mainly operates through input and procurement margins, while downstream exposure mainly operates through sales and demand margins.

The trade-intensity results in Panels B and C reinforce this mechanism. Export-intensive firms

experience stronger declines in sales and exports when exposed to downstream geopolitical risk. Import-intensive firms experience stronger declines in purchases and imports when exposed to upstream geopolitical risk. Thus, propagation is not uniform across the network. It is strongest when the type of indirect exposure matches the firm's own business model: supplier-side risk matters most for import-intensive firms, while customer-side risk matters most for export-intensive firms.

Finally, Table 9 shows that SMEs and highly leveraged firms also contract more following indirect geopolitical risk exposure. For SMEs, upstream exposure has stronger effects on purchases and imports, while downstream exposure has stronger effects on sales and exports. Highly leveraged firms display a similar pattern. These results suggest that the propagation of geopolitical risk is amplified by operational and financial fragility. Firms with weaker buffers not only revise expectations more strongly, but also adjust realized activity more sharply.

Taken together, the supply-chain results provide evidence of a domestic propagation mechanism for geopolitical risk. Foreign geopolitical tensions affect directly exposed importers and exporters, but they also spill over to other firms through supplier and customer linkages. Upstream exposure transmits cost-push and procurement pressures; downstream exposure transmits foreign-demand weakness. This network channel helps explain how geopolitical risk can have broad macroeconomic consequences even when direct foreign trade exposure is concentrated among a subset of firms. In this sense, domestic production networks amplify the stagflationary nature of geopolitical risk: they spread higher expected costs and weaker expected activity across firms that are only indirectly connected to the original source of risk.

The same cost-versus-demand asymmetry appears across expectations and realized outcomes, and remains visible when all four exposure margins are included jointly. Tables B1–B4 show the estimates when direct import-side exposure, direct export-side exposure, upstream supplier exposure, and downstream customer exposure enter the same regression. The relevant coefficients retain their expected signs and remain statistically significant across the main expectation and realized-outcome margins, indicating that the four measures capture distinct channels of geopo-

litical risk transmission. Direct exposure reflects the firm's own foreign trade links, while upstream and downstream exposure reflect foreign risk embedded in domestic supplier–customer relationships. Thus, the propagation results are not simply driven by directly exposed firms being connected to other directly exposed firms; rather, geopolitical risk affects firms through multiple layers of exposure (see Appendix D for the theoretical background).

Moreover, these findings have policy implications. In open emerging markets, geopolitical risk can weaken the anchoring of inflation expectations even when the original disturbance is external and non-economic. Since firms interpret supplier-country risk as cost pressure and destination-market risk as demand weakness, geopolitical events can create a difficult policy environment in which inflation expectations rise while real activity deteriorates. Moreover, because the effects propagate through production networks, the macroeconomic footprint of geopolitical risk can extend well beyond firms that trade directly with affected countries. Monitoring geopolitical exposure through trade and supply-chain linkages can therefore help policymakers assess where inflationary pressures and real-side vulnerabilities are likely to emerge.

6 Conclusion

The results show that geopolitical risk has stagflationary effects at the firm level. Firms exposed through their import markets revise inflation, price, and unit-cost expectations upward, consistent with a cost-push and input-supply channel. Firms exposed through their export markets become more pessimistic about sales, investment, employment, and the macroeconomic outlook, consistent with a foreign-demand channel. These expectation revisions are reflected in realized outcomes: import-side exposure is associated with larger declines in purchases and imports, while export-side exposure is associated with larger declines in sales and exports.

A central finding is that geopolitical risk is not confined to directly exposed firms. It also propagates through domestic production networks. Supplier-side exposure transmits cost and procurement pressures, while customer-side exposure transmits demand weakness. These effects

are stronger among trade-intensive firms, SMEs, and highly leveraged firms, suggesting that operational and financial fragility amplify the transmission of geopolitical risk.

Overall, the evidence indicates that geopolitical risk is an important source of inflationary pressure and real-side weakness in emerging markets. By affecting both expectations and realized firm behavior, geopolitical risk can weaken the anchoring of inflation expectations and amplify macroeconomic fragility. These findings suggest that monetary and macro-financial policy frameworks should account not only for conventional demand and cost shocks, but also for geopolitical risks that enter through trade exposure and propagate through domestic production networks.

Table 2: Geopolitical Risk Exposure, Trade Intensity, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
				Panel A: Baseline Effects, All Firms				
$GPR^{M}_{i,t-1}$	0.092***	0.108***	0.017***	0.021***	-0.011**	-0.014***	-0.010**	-0.015***
	(0.025)	(0.030)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.050**	0.061**	0.010**	0.012**	-0.025***	-0.030***	-0.020***	-0.031***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.714	0.708	0.642	0.655	0.621	0.604	0.617	0.633
				Panel B: Heterogeneity by Export Intensity				
$GPR^{M}_{i,t-1}$	0.085***	0.099***	0.015***	0.019***	-0.010**	-0.012**	-0.009**	-0.013**
	(0.026)	(0.031)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.039*	0.048*	0.008*	0.009*	-0.019***	-0.023***	-0.015**	-0.024***
	(0.023)	(0.027)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.018*	0.022*	0.003	0.004	-0.005*	-0.006*	-0.004	-0.006*
	(0.010)	(0.012)	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
$GPR^{X}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.031**	0.038**	0.006**	0.007**	-0.021***	-0.026***	-0.018***	-0.027***
	(0.014)	(0.016)	(0.003)	(0.003)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.716	0.710	0.644	0.657	0.625	0.608	0.620	0.637
				Panel C: Heterogeneity by Import Intensity				
$GPR^{M}_{i,t-1}$	0.068***	0.079***	0.012**	0.015**	-0.008*	-0.010**	-0.007*	-0.011**
	(0.026)	(0.030)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.047**	0.057**	0.009**	0.011**	-0.023***	-0.028***	-0.019***	-0.030***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.058***	0.069***	0.010***	0.013***	-0.010**	-0.012**	-0.009**	-0.013**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.026**	0.031**	0.005*	0.006*	-0.011**	-0.013**	-0.010*	-0.014**
	(0.013)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
R-squared	0.717	0.711	0.645	0.659	0.624	0.607	0.620	0.636
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector × Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A reports baseline estimates for the full sample. Panel B interacts import- and export-side geopolitical risk exposure with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts import- and export-side geopolitical risk exposure with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 3: Geopolitical Risk Exposure, Firm Size, Financial Constraints, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Heterogeneity by Firm Size								
$GPR^{M}_{i,t-1}$	0.074***	0.087***	0.013**	0.016***	-0.009**	-0.011**	-0.008**	-0.012**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.041**	0.050**	0.008**	0.010**	-0.021***	-0.026***	-0.017***	-0.027***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times SME_{i,y-1}$	0.027**	0.032**	0.005*	0.007**	-0.009**	-0.011**	-0.008*	-0.012**
	(0.013)	(0.015)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times SME_{i,y-1}$	0.018*	0.022*	0.004*	0.005*	-0.014**	-0.018***	-0.012**	-0.019***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.006)	(0.006)	(0.005)	(0.006)
R-squared	0.716	0.711	0.645	0.658	0.626	0.610	0.622	0.638
Panel B: Heterogeneity by Financial Constraints								
$GPR^{M}_{i,t-1}$	0.069***	0.081***	0.012**	0.015**	-0.008*	-0.010**	-0.007*	-0.011**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.039*	0.048*	0.008*	0.009*	-0.019***	-0.024***	-0.016***	-0.025***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times HighLeverage_{i,y-1}$	0.030**	0.036**	0.006**	0.008**	-0.011**	-0.014***	-0.010**	-0.015***
	(0.014)	(0.016)	(0.003)	(0.004)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times HighLeverage_{i,y-1}$	0.021*	0.026*	0.004*	0.005*	-0.017***	-0.021***	-0.015**	-0.022***
	(0.012)	(0.014)	(0.002)	(0.003)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.717	0.712	0.646	0.659	0.628	0.612	0.624	0.640
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Sector × Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Province × Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions.Panel A allows the effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 4: Geopolitical Risk Exposure, Trade Intensity, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Baseline Effects, All Firms				
$GPR^{M}_{i,t-1}$	-0.018***	-0.026***	-0.009**	-0.012**	-0.031***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.027***	-0.016**	-0.013***	-0.034***	-0.014**
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
R-squared	0.781	0.764	0.842	0.736	0.728
	Panel B: Heterogeneity by Export Intensity				
$GPR^{M}_{i,t-1}$	-0.015**	-0.023***	-0.008**	-0.010*	-0.028***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.021***	-0.013*	-0.010**	-0.027***	-0.012*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{M}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.006*	-0.007*	-0.003	-0.006*	-0.007*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
$GPR^{X}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.018***	-0.009**	-0.008**	-0.024***	-0.007*
	(0.006)	(0.004)	(0.004)	(0.007)	(0.004)
R-squared	0.784	0.766	0.843	0.740	0.730
	Panel C: Heterogeneity by Import Intensity				
$GPR^{M}_{i,t-1}$	-0.013**	-0.019***	-0.006*	-0.009*	-0.023***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.025***	-0.015**	-0.012**	-0.032***	-0.013**
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{M}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.013**	-0.019***	-0.006*	-0.007*	-0.026***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{X}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.008*	-0.007*	-0.005*	-0.010**	-0.006*
	(0.004)	(0.004)	(0.003)	(0.005)	(0.003)
R-squared	0.783	0.767	0.843	0.738	0.732
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector × Year-Month FE	Yes	Yes	Yes	Yes	Yes
Province × Year-Month FE	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A reports baseline estimates for the full sample. Panel B interacts import- and export-side geopolitical risk exposure with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts import- and export-side geopolitical risk exposure with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 5: Geopolitical Risk Exposure, Firm Size, Financial Constraints, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Heterogeneity by Firm Size				
$GPR^{M}_{i,t-1}$	-0.014**	-0.021***	-0.007*	-0.009*	-0.025***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.022***	-0.013*	-0.010**	-0.028***	-0.011*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{M}_{i,t-1} \times SME_{i,y-1}$	-0.009**	-0.013**	-0.005*	-0.006*	-0.016**
	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{X}_{i,t-1} \times SME_{i,y-1}$	-0.012**	-0.007*	-0.006*	-0.016**	-0.006*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)
R-squared	0.784	0.767	0.844	0.739	0.733
	Panel B: Heterogeneity by Financial Constraints				
$GPR^{M}_{i,t-1}$	-0.012**	-0.018***	-0.006*	-0.008*	-0.022***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.020***	-0.012*	-0.009**	-0.026***	-0.010*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{M}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.012**	-0.017***	-0.006*	-0.007*	-0.021***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{X}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.015**	-0.008*	-0.007*	-0.019***	-0.007*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)
R-squared	0.786	0.769	0.845	0.742	0.735
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	Yes	Yes	Yes	Yes	Yes
Sector × Year-Month FE	Yes	Yes	Yes	Yes	Yes
Province × Year-Month FE	Yes	Yes	Yes	Yes	Yes
Firm Controls	Yes	Yes	Yes	Yes	Yes

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A allows the effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Supply-Chain Propagation

Table 6: Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Baseline Propagation Effects, All Firms								
$GPR^{U}_{i,t-1}$	0.049***	0.058***	0.009***	0.012***	-0.010**	-0.012**	-0.009**	-0.013**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.031**	0.037**	0.006**	0.007**	-0.018***	-0.023***	-0.016***	-0.024***
	(0.014)	(0.017)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
R-squared	0.722	0.717	0.651	0.664	0.632	0.616	0.628	0.645
Panel B: Heterogeneity by Export Intensity								
$GPR^{U}_{i,t-1}$	0.045***	0.053***	0.008***	0.011***	-0.009**	-0.010**	-0.008**	-0.011**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.023*	0.028*	0.005*	0.006*	-0.013**	-0.017***	-0.012**	-0.018***
	(0.013)	(0.016)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{U}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.012*	0.015*	0.002	0.003	-0.004*	-0.005*	-0.004	-0.006*
	(0.007)	(0.009)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
$GPR^{D}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.020**	0.024**	0.004*	0.005*	-0.014***	-0.017***	-0.013**	-0.018***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
R-squared	0.725	0.720	0.654	0.667	0.637	0.621	0.633	0.650
Panel C: Heterogeneity by Import Intensity								
$GPR^{U}_{i,t-1}$	0.033**	0.040**	0.006**	0.008**	-0.006*	-0.008*	-0.006*	-0.009*
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.029**	0.035**	0.006**	0.007**	-0.016***	-0.021***	-0.015***	-0.022***
	(0.014)	(0.017)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{U}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.038***	0.045***	0.007**	0.009**	-0.007*	-0.009**	-0.007*	-0.010**
	(0.014)	(0.017)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.014*	0.018*	0.003*	0.004*	-0.007*	-0.009*	-0.007*	-0.010*
	(0.008)	(0.010)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.005)
R-squared	0.726	0.721	0.655	0.669	0.636	0.620	0.632	0.649
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A reports baseline propagation estimates for the full sample. Panel B interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 7: Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Heterogeneity by Firm Size								
$GPR^{U}_{i,t-1}$	0.041***	0.049***	0.007**	0.010**	-0.007*	-0.009**	-0.007*	-0.010**
	(0.015)	(0.018)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.026**	0.031**	0.005*	0.006*	-0.015***	-0.019***	-0.014**	-0.020***
	(0.013)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
$GPR^{U}_{i,t-1} \times SME_{i,y-1}$	0.022**	0.027**	0.004*	0.006**	-0.007*	-0.009**	-0.006*	-0.010**
	(0.011)	(0.013)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times SME_{i,y-1}$	0.014*	0.018*	0.003*	0.004*	-0.012**	-0.015***	-0.011**	-0.016***
	(0.008)	(0.010)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.006)
R-squared	0.724	0.719	0.653	0.667	0.637	0.621	0.633	0.650
Panel B: Heterogeneity by Financial Constraints								
$GPR^{U}_{i,t-1}$	0.039***	0.047***	0.007**	0.009**	-0.007*	-0.008*	-0.006*	-0.009*
	(0.015)	(0.018)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.024*	0.030*	0.005*	0.006*	-0.014**	-0.018***	-0.013**	-0.019***
	(0.013)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
$GPR^{U}_{i,t-1} \times HighLeverage_{i,y-1}$	0.026**	0.031**	0.005**	0.007**	-0.009**	-0.011**	-0.008**	-0.012**
	(0.012)	(0.014)	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times HighLeverage_{i,y-1}$	0.017*	0.021*	0.004*	0.005*	-0.014**	-0.018***	-0.013**	-0.019***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.006)	(0.006)	(0.006)	(0.007)
R-squared	0.725	0.720	0.654	0.668	0.639	0.623	0.635	0.652
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A allows the propagation effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the propagation effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 8: Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Baseline Propagation Effects, All Firms				
$GPR^{U}_{i,t-1}$	-0.012**	-0.020***	-0.006*	-0.007*	-0.022***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.020***	-0.011**	-0.009**	-0.026***	-0.009*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
R-squared	0.789	0.772	0.847	0.746	0.738
	Panel B: Heterogeneity by Export Intensity				
$GPR^{U}_{i,t-1}$	-0.010**	-0.018***	-0.005*	-0.006*	-0.020***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.014**	-0.008*	-0.007*	-0.019***	-0.007*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.004)
$GPR^{U}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.004*	-0.006*	-0.003	-0.004	-0.006*
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
$GPR^{D}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.012**	-0.006*	-0.005*	-0.017***	-0.005*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)
R-squared	0.794	0.776	0.850	0.752	0.742
	Panel C: Heterogeneity by Import Intensity				
$GPR^{U}_{i,t-1}$	-0.007*	-0.013**	-0.004	-0.005	-0.015**
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.018***	-0.010**	-0.008**	-0.024***	-0.008*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{U}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.010**	-0.015**	-0.005*	-0.005*	-0.020***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{D}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.006*	-0.005*	-0.004	-0.008*	-0.005*
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
R-squared	0.793	0.777	0.850	0.750	0.743
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A reports baseline propagation estimates for the full sample. Panel B interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table 9: Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Heterogeneity by Firm Size				
$GPR^{U}_{i,t-1}$	-0.010**	-0.017***	-0.005*	-0.006*	-0.019***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.017***	-0.009*	-0.008**	-0.023***	-0.008*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{U}_{i,t-1} \times SME_{i,y-1}$	-0.007*	-0.011**	-0.004*	-0.004	-0.014**
	(0.004)	(0.005)	(0.002)	(0.003)	(0.006)
$GPR^{D}_{i,t-1} \times SME_{i,y-1}$	-0.010**	-0.005*	-0.005*	-0.014**	-0.005*
	(0.005)	(0.003)	(0.003)	(0.006)	(0.003)
R-squared	0.791	0.774	0.849	0.749	0.741
	Panel B: Heterogeneity by Financial Constraints				
$GPR^{U}_{i,t-1}$	-0.009*	-0.015**	-0.004	-0.005	-0.017**
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.015**	-0.008*	-0.007*	-0.021***	-0.007*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{U}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.009**	-0.014**	-0.005*	-0.005*	-0.018***
	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{D}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.012**	-0.006*	-0.006*	-0.017***	-0.006*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)
R-squared	0.793	0.776	0.850	0.752	0.743
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A allows the propagation effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the propagation effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

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Appendix A - Business Tendency Survey

Detailed Questionnaire

The BTS (Business Tendency Survey) collects data through monthly surveys of a representative sample of 1,800 to 2,200 manufacturing firms, since 2007. The questions from the BTS translated from Turkish are provided below:

Question 1: The production volume of your company over the last three month: Increased, Stayed the same, Decreased.

Question 2: The total amount of your currently registered orders: Above normal, Normal for the season, Below normal.

Question 3: The amount of your currently registered export orders: Above normal, Normal for the season, Below normal.

Question 4: The level of your current finished goods inventory: Above normal, Normal for the season, Below normal.

Question 5: Your production volume expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 6: Your sales price expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 7: Your total employment expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 8: The total amount of orders you received in the last three months: Increased, Stayed the same, Decreased.

Question 9: Your total order quantity expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 10: The amount of export orders you received in the last three months: Increased, Stayed the same, Decreased.

Question 11: Your export order quantity expectation for the next three months: It will increase,

It will remain the same, It will decrease.

Question 12: Your capacity utilization rate (Please indicate the actual capacity utilization as a percentage of physical capacity at present.)

Question 13: The amount of your currently registered domestic market orders: Above normal, Normal for the season, Below normal.

Question 14: The amount of domestic market orders you received in the last three months: Increased, Stayed the same, Decreased.

Question 15: Your domestic market order quantity expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 16: Your domestic market sales price expectation for the next three months: It will increase, It will remain the same, It will decrease.

Question 17: Compared to the past twelve months, your expectation for fixed capital investment expenditures in the next twelve months: It will increase, It will remain the same, It will decrease.

Question 18: Your average unit cost over the last three months: Increased, Stayed the same, Decreased.

Question 19: Your expectation for the average unit cost in the next three months: It will increase, It will remain the same, It will decrease.

Question 20: Your annual inflation expectation at the end of the next twelve-month period (Please specify as a percentage): (CPI:...) (PPI:...)

Question 21 :Your expectation for the short-term Turkish Lira interest rate in the upcoming three-month period: It will increase, It will remain the same, It will decrease.

Question 22: Your opinion on the general trend in your industry compared to a month ago: More optimistic, The same, More pessimistic.

Appendix B - Detailed Tables

Appendix Tables B1–B4 report the full version of the supply-chain specifications, where direct import-side exposure, direct export-side exposure, upstream supplier exposure, and downstream customer exposure enter the same regression. These tables are useful because they show that the four margins of geopolitical risk exposure contain distinct information. The direct-exposure coefficients remain significant after controlling for indirect exposure through suppliers and customers, while the upstream and downstream coefficients remain significant after controlling for firms' own import and export exposure. Thus, the propagation results are not simply driven by directly exposed firms being connected to other directly exposed firms. Instead, geopolitical risk affects firms through multiple layers of exposure: their own foreign trade links and the foreign exposure embedded in their domestic production network.

The joint estimates also preserve the economic asymmetry documented in the main text. Import-side and upstream exposure are more strongly associated with nominal expectations and input-related outcomes, consistent with cost-push and procurement channels. Export-side and downstream exposure are more strongly associated with real activity expectations and demand-related outcomes, consistent with foreign-demand transmission. In the realized-outcome specifications, all four exposure measures predict contractions in firm activity, but the largest effects line up with the relevant margin: direct import and upstream exposure matter more for purchases and imports, whereas direct export and downstream exposure matter more for sales and exports. Overall, the detailed tables show that geopolitical risk is transmitted through both direct and indirect exposure margins, and that each margin remains economically relevant even when the others are held fixed.

Table B1: Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Baseline Propagation Effects, All Firms								
$GPR^{M}_{i,t-1}$	0.074***	0.087***	0.013***	0.017***	-0.009**	-0.011**	-0.008**	-0.012**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.043**	0.052**	0.008**	0.010**	-0.021***	-0.026***	-0.017***	-0.027***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1}$	0.049***	0.058***	0.009***	0.012***	-0.010**	-0.012**	-0.009**	-0.013**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.031**	0.037**	0.006**	0.007**	-0.018***	-0.023***	-0.016***	-0.024***
	(0.014)	(0.017)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
R-squared	0.722	0.717	0.651	0.664	0.632	0.616	0.628	0.645
Panel B: Heterogeneity by Export Intensity								
$GPR^{M}_{i,t-1}$	0.070***	0.082***	0.012**	0.015**	-0.008*	-0.010**	-0.007*	-0.011**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.034*	0.042*	0.007*	0.008*	-0.016***	-0.020***	-0.013**	-0.021***
	(0.021)	(0.025)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1}$	0.045***	0.053***	0.008***	0.011***	-0.009**	-0.010**	-0.008**	-0.011**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.023*	0.028*	0.005*	0.006*	-0.013**	-0.017***	-0.012**	-0.018***
	(0.013)	(0.016)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{M}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.015*	0.018*	0.003	0.004	-0.004*	-0.005*	-0.004	-0.005*
	(0.009)	(0.011)	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)	(0.003)
$GPR^{X}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.026**	0.032**	0.005*	0.006*	-0.017***	-0.021***	-0.015**	-0.022***
	(0.012)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
$GPR^{U}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.012*	0.015*	0.002	0.003	-0.004*	-0.005*	-0.004	-0.006*
	(0.007)	(0.009)	(0.002)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)
$GPR^{D}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.020**	0.024**	0.004*	0.005*	-0.014***	-0.017***	-0.013**	-0.018***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
R-squared	0.725	0.720	0.654	0.667	0.637	0.621	0.633	0.650
Panel C: Heterogeneity by Import Intensity								
$GPR^{M}_{i,t-1}$	0.056**	0.067**	0.010**	0.013**	-0.007*	-0.009*	-0.006*	-0.010**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.040*	0.049*	0.008*	0.009*	-0.019***	-0.024***	-0.016***	-0.025***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1}$	0.033**	0.040**	0.006**	0.008**	-0.006*	-0.008*	-0.006*	-0.009*
	(0.016)	(0.019)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.029**	0.035**	0.006**	0.007**	-0.016***	-0.021***	-0.015***	-0.022***
	(0.014)	(0.017)	(0.003)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{M}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.044***	0.052***	0.008**	0.011***	-0.008**	-0.010**	-0.007*	-0.011**
	(0.015)	(0.018)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.017*	0.021*	0.003*	0.004*	-0.008*	-0.010**	-0.008*	-0.011**
	(0.010)	(0.012)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{U}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.038***	0.045***	0.007**	0.009**	-0.007*	-0.009**	-0.007*	-0.010**
	(0.014)	(0.017)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.014*	0.018*	0.003*	0.004*	-0.007*	-0.009*	-0.007*	-0.010*
	(0.008)	(0.010)	(0.002)	(0.002)	(0.004)	(0.005)	(0.004)	(0.005)
R-squared	0.726	0.721	0.655	0.669	0.636	0.620	0.632	0.649
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. ***p<0.01, **p<0.05, *p<0.1.

Table B2: Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Heterogeneity by Firm Size								
$GPR^{M}_{i,t-1}$	0.069***	0.081***	0.012**	0.015**	-0.008*	-0.010**	-0.007*	-0.011**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.039*	0.048*	0.008*	0.009*	-0.019***	-0.024***	-0.016***	-0.025***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1}$	0.041***	0.049***	0.007**	0.010**	-0.007*	-0.009**	-0.007*	-0.010**
	(0.015)	(0.018)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.026**	0.031**	0.005*	0.006*	-0.015***	-0.019***	-0.014**	-0.020***
	(0.013)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times SME_{i,y-1}$	0.025**	0.030**	0.005*	0.006*	-0.008**	-0.010**	-0.007*	-0.011**
	(0.012)	(0.014)	(0.003)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times SME_{i,y-1}$	0.017*	0.021*	0.004*	0.004*	-0.013**	-0.017***	-0.012**	-0.018***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.006)	(0.006)	(0.005)	(0.006)
$GPR^{U}_{i,t-1} \times SME_{i,y-1}$	0.022**	0.027**	0.004*	0.006**	-0.007*	-0.009**	-0.006*	-0.010**
	(0.011)	(0.013)	(0.002)	(0.003)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times SME_{i,y-1}$	0.014*	0.018*	0.003*	0.004*	-0.012**	-0.015***	-0.011**	-0.016***
	(0.008)	(0.010)	(0.002)	(0.002)	(0.005)	(0.005)	(0.005)	(0.006)
R-squared	0.724	0.719	0.653	0.667	0.637	0.621	0.633	0.650
Panel B: Heterogeneity by Financial Constraints								
$GPR^{M}_{i,t-1}$	0.066***	0.078***	0.011**	0.014**	-0.007*	-0.009*	-0.006*	-0.010**
	(0.025)	(0.030)	(0.005)	(0.006)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1}$	0.037*	0.046*	0.007*	0.009*	-0.018***	-0.023***	-0.015**	-0.024***
	(0.022)	(0.026)	(0.004)	(0.005)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1}$	0.039***	0.047***	0.007**	0.009**	-0.007*	-0.008*	-0.006*	-0.009*
	(0.015)	(0.018)	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.005)
$GPR^{D}_{i,t-1}$	0.024*	0.030*	0.005*	0.006*	-0.014**	-0.018***	-0.013**	-0.019***
	(0.013)	(0.015)	(0.003)	(0.003)	(0.005)	(0.006)	(0.006)	(0.007)
$GPR^{M}_{i,t-1} \times HighLeverage_{i,y-1}$	0.029**	0.035**	0.006**	0.007**	-0.010**	-0.013***	-0.009**	-0.014***
	(0.014)	(0.016)	(0.003)	(0.003)	(0.005)	(0.005)	(0.004)	(0.005)
$GPR^{X}_{i,t-1} \times HighLeverage_{i,y-1}$	0.020*	0.025*	0.004*	0.005*	-0.016***	-0.020***	-0.014**	-0.021***
	(0.011)	(0.013)	(0.002)	(0.003)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U}_{i,t-1} \times HighLeverage_{i,y-1}$	0.026**	0.031**	0.005**	0.007**	-0.009**	-0.011**	-0.008**	-0.012**
	(0.012)	(0.014)	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D}_{i,t-1} \times HighLeverage_{i,y-1}$	0.017*	0.021*	0.004*	0.005*	-0.014**	-0.018***	-0.013**	-0.019***
	(0.010)	(0.012)	(0.002)	(0.003)	(0.006)	(0.006)	(0.006)	(0.007)
R-squared	0.725	0.720	0.654	0.668	0.639	0.623	0.635	0.652
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. ***p<0.01, **p<0.05, *p<0.1.

Table B3: Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Baseline Propagation Effects, All Firms				
$GPR^{M}_{i,t-1}$	-0.014**	-0.021***	-0.007*	-0.009*	-0.025***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.023***	-0.014**	-0.011**	-0.029***	-0.012*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{U}_{i,t-1}$	-0.012**	-0.020***	-0.006*	-0.007*	-0.022***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.020***	-0.011**	-0.009**	-0.026***	-0.009*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
R-squared	0.789	0.772	0.847	0.746	0.738
	Panel B: Heterogeneity by Export Intensity				
$GPR^{M}_{i,t-1}$	-0.012**	-0.019***	-0.006*	-0.008*	-0.023***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.018***	-0.011*	-0.009*	-0.023***	-0.010*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{U}_{i,t-1}$	-0.010**	-0.018***	-0.005*	-0.006*	-0.020***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.014**	-0.008*	-0.007*	-0.019***	-0.007*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.004)
$GPR^{M}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.005*	-0.006*	-0.003	-0.005*	-0.006*
	(0.003)	(0.004)	(0.003)	(0.003)	(0.004)
$GPR^{X}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.014**	-0.007*	-0.006*	-0.018***	-0.006*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)
$GPR^{U}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.004*	-0.006*	-0.003	-0.004	-0.006*
	(0.002)	(0.003)	(0.002)	(0.003)	(0.003)
$GPR^{D}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.012**	-0.006*	-0.005*	-0.017***	-0.005*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)
R-squared	0.794	0.776	0.850	0.752	0.742
	Panel C: Heterogeneity by Import Intensity				
$GPR^{M}_{i,t-1}$	-0.009*	-0.015**	-0.005*	-0.006*	-0.018**
	(0.006)	(0.007)	(0.003)	(0.004)	(0.008)
$GPR^{X}_{i,t-1}$	-0.021***	-0.012*	-0.010**	-0.027***	-0.011*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{U}_{i,t-1}$	-0.007*	-0.013**	-0.004	-0.005	-0.015**
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.018***	-0.010**	-0.008**	-0.024***	-0.008*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{M}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.011**	-0.017***	-0.005*	-0.006*	-0.022***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{X}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.007*	-0.006*	-0.004*	-0.009*	-0.005*
	(0.004)	(0.004)	(0.002)	(0.005)	(0.003)
$GPR^{U}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.010**	-0.015**	-0.005*	-0.005*	-0.020***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{D}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.006*	-0.005*	-0.004	-0.008*	-0.005*
	(0.003)	(0.003)	(0.003)	(0.004)	(0.003)
R-squared	0.793	0.777	0.850	0.750	0.743
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. ***p<0.01, **p<0.05, *p<0.1.

Table B4: Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Heterogeneity by Firm Size				
$GPR^{M}_{i,t-1}$	-0.012**	-0.018***	-0.006*	-0.008*	-0.022***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.008)
$GPR^{X}_{i,t-1}$	-0.020***	-0.012*	-0.009**	-0.026***	-0.010*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{U}_{i,t-1}$	-0.010**	-0.017***	-0.005*	-0.006*	-0.019***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.017***	-0.009*	-0.008**	-0.023***	-0.008*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{M}_{i,t-1} \times SME_{i,y-1}$	-0.008*	-0.012**	-0.004*	-0.005*	-0.015**
	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{X}_{i,t-1} \times SME_{i,y-1}$	-0.011**	-0.006*	-0.005*	-0.015**	-0.005*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.003)
$GPR^{U}_{i,t-1} \times SME_{i,y-1}$	-0.007*	-0.011**	-0.004*	-0.004	-0.014**
	(0.004)	(0.005)	(0.002)	(0.003)	(0.006)
$GPR^{D}_{i,t-1} \times SME_{i,y-1}$	-0.010**	-0.005*	-0.005*	-0.014**	-0.005*
	(0.005)	(0.003)	(0.003)	(0.006)	(0.003)
R-squared	0.791	0.774	0.849	0.749	0.741
	Panel B: Heterogeneity by Financial Constraints				
$GPR^{M}_{i,t-1}$	-0.011*	-0.017**	-0.005*	-0.007*	-0.020**
	(0.006)	(0.007)	(0.004)	(0.004)	(0.008)
$GPR^{X}_{i,t-1}$	-0.019***	-0.011*	-0.009*	-0.025***	-0.010*
	(0.007)	(0.007)	(0.005)	(0.008)	(0.006)
$GPR^{U}_{i,t-1}$	-0.009*	-0.015**	-0.004	-0.005	-0.017**
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D}_{i,t-1}$	-0.015**	-0.008*	-0.007*	-0.021***	-0.007*
	(0.006)	(0.005)	(0.004)	(0.007)	(0.005)
$GPR^{M}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.010**	-0.015**	-0.005*	-0.006*	-0.019***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{X}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.014**	-0.007*	-0.006*	-0.018***	-0.006*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)
$GPR^{U}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.009**	-0.014**	-0.005*	-0.005*	-0.018***
	(0.004)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{D}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.012**	-0.006*	-0.006*	-0.017***	-0.006*
	(0.006)	(0.004)	(0.003)	(0.006)	(0.004)
R-squared	0.793	0.776	0.850	0.752	0.743
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. ***p<0.01, **p<0.05, *p<0.1.

Appendix C - Robustness: Exposure to the Top Trading Partner

As a robustness exercise, we replace the baseline weighted-average geopolitical risk exposure measures with exposure to each firm's top trading partner. In the baseline analysis, import-side and export-side exposure are constructed as weighted averages of country-specific geopolitical risk indices using firms' lagged trade shares across all partner countries. This approach captures the full geography of firms' foreign trade exposure. However, if firms are highly concentrated in a small number of markets, the weighted-average measure may smooth the geopolitical risk shock faced through the firm's most important trading partner.

To address this issue, we construct alternative exposure measures based on the firm's top import-origin and top export-destination country. Let $c_i^{M,Top}$ denote firm i's largest import-origin country and $c_i^{X,Top}$ denote its largest export-destination country. We define top import-side and top export-side geopolitical risk exposure as

$$GPR_{i,t}^{M,Top} = GPR_{c_i^{M,Top},t}, \qquad GPR_{i,t}^{X,Top} = GPR_{c_i^{X,Top},t}. \tag{C1}$$

These measures assign to each firm the geopolitical risk index of its dominant foreign trading partner. We then re-estimate the baseline specifications by replacing $GPR_{i,t-1}^{M}$ and $GPR_{i,t-1}^{X}$ with $GPR_{i,t-1}^{M,Top}$ and $GPR_{i,t-1}^{X,Top}$.

Table C1: Top-Country Geopolitical Risk Exposure, Trade Intensity, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Baseline Effects, All Firms								
$GPR^{M,Top}_{i,t-1}$	0.118***	0.137***	0.022***	0.027***	-0.015***	-0.019***	-0.014***	-0.020***
	(0.030)	(0.036)	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1}$	0.067***	0.078***	0.013***	0.016***	-0.034***	-0.041***	-0.027***	-0.043***
	(0.026)	(0.031)	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
R-squared	0.716	0.710	0.645	0.658	0.624	0.608	0.620	0.637
Panel B: Heterogeneity by Export Intensity								
$GPR^{M,Top}_{i,t-1}$	0.109***	0.126***	0.020***	0.024***	-0.013**	-0.016***	-0.012**	-0.017***
	(0.031)	(0.037)	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1}$	0.053**	0.064**	0.011**	0.012**	-0.026***	-0.031***	-0.021***	-0.033***
	(0.027)	(0.032)	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
$GPR^{M,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.024**	0.029**	0.004*	0.005*	-0.007**	-0.008**	-0.006*	-0.008**
	(0.012)	(0.014)	(0.002)	(0.003)	(0.003)	(0.004)	(0.003)	(0.004)
$GPR^{X,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.043***	0.051***	0.008**	0.009**	-0.029***	-0.035***	-0.025***	-0.037***
	(0.016)	(0.019)	(0.003)	(0.004)	(0.007)	(0.008)	(0.007)	(0.008)
R-squared	0.719	0.713	0.647	0.661	0.629	0.613	0.625	0.642
Panel C: Heterogeneity by Import Intensity								
$GPR^{M,Top}_{i,t-1}$	0.083***	0.098***	0.015***	0.019***	-0.011**	-0.013**	-0.010**	-0.014**
	(0.031)	(0.036)	(0.006)	(0.007)	(0.006)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1}$	0.061**	0.073**	0.012**	0.014**	-0.031***	-0.037***	-0.025***	-0.040***
	(0.026)	(0.031)	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
$GPR^{M,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.075***	0.087***	0.013***	0.017***	-0.014***	-0.016***	-0.012**	-0.017***
	(0.019)	(0.023)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.034**	0.041**	0.007**	0.008**	-0.015**	-0.018**	-0.014**	-0.019**
	(0.016)	(0.019)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.720	0.714	0.648	0.662	0.628	0.612	0.625	0.641
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A reports baseline estimates for the full sample. Panel B interacts import- and export-side geopolitical risk exposure with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts import- and export-side geopolitical risk exposure with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C2: Top-Country Geopolitical Risk Exposure, Firm Size, Financial Constraints, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Heterogeneity by Firm Size								
$GPR^{M,Top}_{i,t-1}$	0.096***	0.113***	0.018***	0.022***	-0.012**	-0.015***	-0.011**	-0.016***
	(0.030)	(0.036)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1}$	0.056**	0.068**	0.011**	0.013**	-0.028***	-0.034***	-0.023***	-0.036***
	(0.026)	(0.031)	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
$GPR^{M,Top}_{i,t-1} \times SME_{i,y-1}$	0.036***	0.043***	0.007**	0.009**	-0.012**	-0.015***	-0.011**	-0.016***
	(0.014)	(0.017)	(0.003)	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1} \times SME_{i,y-1}$	0.025**	0.030**	0.005**	0.006**	-0.019***	-0.024***	-0.017***	-0.026***
	(0.011)	(0.013)	(0.002)	(0.003)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.719	0.714	0.648	0.661	0.630	0.614	0.626	0.643
Panel B: Heterogeneity by Financial Constraints								
$GPR^{M,Top}_{i,t-1}$	0.090***	0.106***	0.016***	0.020***	-0.011**	-0.014**	-0.010**	-0.015**
	(0.030)	(0.036)	(0.006)	(0.007)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1}$	0.053**	0.064**	0.010**	0.012**	-0.026***	-0.032***	-0.021***	-0.034***
	(0.026)	(0.031)	(0.005)	(0.006)	(0.007)	(0.008)	(0.007)	(0.008)
$GPR^{M,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	0.040***	0.048***	0.008**	0.010**	-0.015***	-0.018***	-0.013**	-0.020***
	(0.015)	(0.018)	(0.003)	(0.004)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{X,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	0.030**	0.036**	0.006**	0.007**	-0.023***	-0.028***	-0.020***	-0.030***
	(0.013)	(0.015)	(0.003)	(0.003)	(0.007)	(0.008)	(0.007)	(0.008)
R-squared	0.720	0.715	0.649	0.662	0.632	0.616	0.628	0.645
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions.Panel A allows the effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C3: Top-Country Geopolitical Risk Exposure, Trade Intensity, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Baseline Effects, All Firms				
$GPR^{M,Top}_{i,t-1}$	-0.024***	-0.034***	-0.012***	-0.016***	-0.041***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.010)
$GPR^{X,Top}_{i,t-1}$	-0.036***	-0.021***	-0.017***	-0.046***	-0.019***
	(0.008)	(0.008)	(0.006)	(0.010)	(0.007)
R-squared	0.786	0.770	0.846	0.742	0.735
	Panel B: Heterogeneity by Export Intensity				
$GPR^{M,Top}_{i,t-1}$	-0.020***	-0.030***	-0.010**	-0.013**	-0.037***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.010)
$GPR^{X,Top}_{i,t-1}$	-0.028***	-0.017**	-0.014**	-0.036***	-0.016**
	(0.008)	(0.008)	(0.006)	(0.010)	(0.007)
$GPR^{M,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.009**	-0.010**	-0.004*	-0.008**	-0.010**
	(0.004)	(0.005)	(0.003)	(0.004)	(0.005)
$GPR^{X,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.025***	-0.013**	-0.011**	-0.033***	-0.010**
	(0.007)	(0.005)	(0.005)	(0.009)	(0.005)
R-squared	0.790	0.773	0.848	0.748	0.738
	Panel C: Heterogeneity by Import Intensity				
$GPR^{M,Top}_{i,t-1}$	-0.017**	-0.025***	-0.008**	-0.012**	-0.031***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.010)
$GPR^{X,Top}_{i,t-1}$	-0.033***	-0.020**	-0.016***	-0.043***	-0.017**
	(0.008)	(0.008)	(0.006)	(0.010)	(0.007)
$GPR^{M,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.018***	-0.026***	-0.008**	-0.010**	-0.034***
	(0.006)	(0.007)	(0.004)	(0.005)	(0.009)
$GPR^{X,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.011**	-0.010**	-0.007**	-0.014**	-0.009**
	(0.005)	(0.005)	(0.003)	(0.006)	(0.004)
R-squared	0.789	0.774	0.848	0.746	0.740
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A reports baseline estimates for the full sample. Panel B interacts import- and export-side geopolitical risk exposure with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts import- and export-side geopolitical risk exposure with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C4: Top-Country Geopolitical Risk Exposure, Firm Size, Financial Constraints, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Heterogeneity by Firm Size				
$GPR^{M,Top}_{i,t-1}$	-0.019***	-0.029***	-0.010**	-0.012**	-0.034***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.010)
$GPR^{X,Top}_{i,t-1}$	-0.030***	-0.018**	-0.014**	-0.038***	-0.015**
	(0.008)	(0.008)	(0.006)	(0.010)	(0.007)
$GPR^{M,Top}_{i,t-1} \times SME_{i,y-1}$	-0.012**	-0.018***	-0.007**	-0.008**	-0.022***
	(0.005)	(0.007)	(0.003)	(0.004)	(0.009)
$GPR^{X,Top}_{i,t-1} \times SME_{i,y-1}$	-0.017***	-0.010**	-0.008**	-0.022***	-0.009**
	(0.006)	(0.005)	(0.004)	(0.008)	(0.004)
R-squared	0.789	0.773	0.848	0.745	0.738
	Panel B: Heterogeneity by Financial Constraints				
$GPR^{M,Top}_{i,t-1}$	-0.017**	-0.025***	-0.008**	-0.011**	-0.031***
	(0.007)	(0.008)	(0.004)	(0.006)	(0.010)
$GPR^{X,Top}_{i,t-1}$	-0.027***	-0.016**	-0.013**	-0.035***	-0.014**
	(0.008)	(0.008)	(0.006)	(0.010)	(0.007)
$GPR^{M,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.017***	-0.024***	-0.008**	-0.010**	-0.029***
	(0.006)	(0.007)	(0.003)	(0.005)	(0.009)
$GPR^{X,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.021***	-0.012**	-0.010**	-0.027***	-0.010**
	(0.007)	(0.005)	(0.004)	(0.008)	(0.005)
R-squared	0.791	0.775	0.849	0.748	0.740
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (5) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A allows the effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ denotes firm-level import-side geopolitical risk exposure, and $GPR^{X}_{i,t-1}$ denotes firm-level export-side geopolitical risk exposure. Both exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05,

Table C5: Top-Country Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Baseline Propagation Effects, All Firms								
$GPR^{U,Top}_{i,t-1}$	0.064***	0.075***	0.012***	0.016***	-0.013***	-0.016***	-0.012***	-0.017***
	(0.019)	(0.022)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{D,Top}_{i,t-1}$	0.042***	0.050***	0.008**	0.010**	-0.024***	-0.030***	-0.021***	-0.032***
	(0.016)	(0.019)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
R-squared	0.725	0.720	0.655	0.668	0.637	0.621	0.633	0.650
Panel B: Heterogeneity by Export Intensity								
$GPR^{U,Top}_{i,t-1}$	0.058***	0.068***	0.011***	0.014***	-0.011**	-0.014**	-0.010**	-0.015***
	(0.019)	(0.022)	(0.004)	(0.005)	(0.005)	(0.006)	(0.005)	(0.006)
$GPR^{D,Top}_{i,t-1}$	0.032**	0.039**	0.006**	0.008**	-0.018***	-0.023***	-0.017***	-0.025***
	(0.015)	(0.018)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.017**	0.020**	0.003*	0.004*	-0.006**	-0.007**	-0.006*	-0.008**
	(0.008)	(0.010)	(0.002)	(0.002)	(0.003)	(0.003)	(0.003)	(0.004)
$GPR^{D,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	0.027***	0.032***	0.005**	0.007**	-0.020***	-0.024***	-0.019***	-0.026***
	(0.011)	(0.013)	(0.002)	(0.003)	(0.006)	(0.007)	(0.007)	(0.008)
R-squared	0.728	0.723	0.657	0.671	0.642	0.626	0.638	0.655
Panel C: Heterogeneity by Import Intensity								
$GPR^{U,Top}_{i,t-1}$	0.043***	0.052***	0.008**	0.011**	-0.009**	-0.011**	-0.009**	-0.012**
	(0.017)	(0.020)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D,Top}_{i,t-1}$	0.039**	0.047**	0.008**	0.009**	-0.022***	-0.028***	-0.020***	-0.029***
	(0.016)	(0.019)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.050***	0.059***	0.009***	0.012***	-0.010**	-0.012**	-0.010**	-0.014***
	(0.016)	(0.019)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
$GPR^{D,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	0.020**	0.025**	0.004*	0.005*	-0.010**	-0.013**	-0.010**	-0.014**
	(0.010)	(0.012)	(0.002)	(0.003)	(0.005)	(0.006)	(0.005)	(0.006)
R-squared	0.729	0.724	0.658	0.672	0.641	0.625	0.637	0.654
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A reports baseline propagation estimates for the full sample. Panel B interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C6: Top-Country Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Firm Expectations

	(1) CPI Expectations	(2) PPI Expectations	(3) Price Expectations	(4) Unit Cost Expectations	(5) Sales Expectations	(6) Investment Expectations	(7) Employment Expectations	(8) Macroeconomic Outlook
Panel A: Heterogeneity by Firm Size								
$GPR^{U,Top}_{i,t-1}$	0.053***	0.063***	0.010***	0.013***	-0.010**	-0.013**	-0.010**	-0.014**
	(0.018)	(0.021)	(0.003)	(0.004)	(0.005)	(0.005)	(0.005)	(0.005)
$GPR^{D,Top}_{i,t-1}$	0.035**	0.042**	0.007**	0.008**	-0.020***	-0.025***	-0.018***	-0.027***
	(0.015)	(0.018)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U,Top}_{i,t-1} \times SME_{i,y-1}$	0.030***	0.036***	0.006**	0.008**	-0.010**	-0.012**	-0.009**	-0.013**
	(0.012)	(0.014)	(0.002)	(0.003)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D,Top}_{i,t-1} \times SME_{i,y-1}$	0.020**	0.024**	0.004**	0.005**	-0.017***	-0.021***	-0.015***	-0.023***
	(0.009)	(0.011)	(0.002)	(0.002)	(0.006)	(0.006)	(0.006)	(0.007)
R-squared	0.728	0.723	0.657	0.671	0.642	0.626	0.638	0.655
Panel B: Heterogeneity by Financial Constraints								
$GPR^{U,Top}_{i,t-1}$	0.050***	0.060***	0.009***	0.012***	-0.009**	-0.012**	-0.009**	-0.013**
	(0.018)	(0.021)	(0.003)	(0.004)	(0.004)	(0.005)	(0.004)	(0.005)
$GPR^{D,Top}_{i,t-1}$	0.033**	0.040**	0.006**	0.008**	-0.019***	-0.024***	-0.017***	-0.026***
	(0.015)	(0.018)	(0.003)	(0.004)	(0.006)	(0.007)	(0.006)	(0.007)
$GPR^{U,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	0.035***	0.041***	0.007***	0.009***	-0.012**	-0.015***	-0.011**	-0.016***
	(0.013)	(0.015)	(0.002)	(0.003)	(0.005)	(0.005)	(0.005)	(0.006)
$GPR^{D,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	0.025**	0.030**	0.005**	0.006**	-0.020***	-0.025***	-0.018***	-0.027***
	(0.011)	(0.013)	(0.002)	(0.003)	(0.007)	(0.007)	(0.007)	(0.008)
R-squared	0.729	0.724	0.658	0.672	0.644	0.628	0.640	0.657
Observations	239,162	239,162	239,162	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1) and (2) examine firms' 12-month-ahead CPI and PPI inflation expectations, respectively. Columns (3) and (4) report own-price and unit-cost expectations measured on a 1–3 ordinal scale, where 1 denotes a decrease, 2 no change, and 3 an increase. Columns (5)–(8) report sales, investment, employment, and macroeconomic outlook expectations, also measured on a 1–3 ordinal scale, with higher values indicating more favorable expected conditions. Panel A allows the propagation effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the propagation effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C7: Top-Country Supply-Chain Propagation of Geopolitical Risk, Trade Intensity, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Baseline Propagation Effects, All Firms				
$GPR^{U,Top}_{i,t-1}$	-0.016***	-0.027***	-0.008**	-0.010**	-0.030***
	(0.006)	(0.007)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1}$	-0.027***	-0.015***	-0.012***	-0.035***	-0.012**
	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)
R-squared	0.795	0.779	0.851	0.754	0.745
	Panel B: Heterogeneity by Export Intensity				
$GPR^{U,Top}_{i,t-1}$	-0.014**	-0.024***	-0.007**	-0.009**	-0.027***
	(0.006)	(0.007)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1}$	-0.020***	-0.012**	-0.010**	-0.027***	-0.010**
	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)
$GPR^{U,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.006**	-0.009**	-0.004*	-0.006*	-0.009**
	(0.003)	(0.004)	(0.002)	(0.003)	(0.004)
$GPR^{D,Top}_{i,t-1} \times ExportIntensity_{i,y-1}$	-0.017***	-0.009**	-0.008**	-0.024***	-0.008**
	(0.006)	(0.004)	(0.004)	(0.007)	(0.004)
R-squared	0.800	0.782	0.853	0.760	0.748
	Panel C: Heterogeneity by Import Intensity				
$GPR^{U,Top}_{i,t-1}$	-0.010**	-0.018***	-0.005*	-0.007*	-0.021***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.007)
$GPR^{D,Top}_{i,t-1}$	-0.024***	-0.013**	-0.011***	-0.032***	-0.011**
	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)
$GPR^{U,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.014***	-0.021***	-0.007**	-0.008**	-0.028***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1} \times ImportIntensity_{i,y-1}$	-0.009**	-0.008**	-0.006*	-0.012**	-0.007**
	(0.004)	(0.004)	(0.003)	(0.005)	(0.003)
R-squared	0.799	0.783	0.853	0.758	0.749
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from Equation (10) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A reports baseline propagation estimates for the full sample. Panel B interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged export intensity, defined as the ratio of exports to gross sales in year $y-1$. Panel C interacts direct and supply-chain geopolitical risk exposure measures with firms' lagged import intensity, defined as the ratio of imports to cost of goods sold in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Table C8: Top-Country Supply-Chain Propagation of Geopolitical Risk, Firm Size, Financial Constraints, and Realized Firm Outcomes

	(1) Sales	(2) Purchases	(3) Employment	(4) Exports	(5) Imports
	Panel A: Heterogeneity by Firm Size				
$GPR^{U,Top}_{i,t-1}$	-0.013**	-0.022***	-0.007**	-0.008**	-0.025***
	(0.006)	(0.007)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1}$	-0.023***	-0.012**	-0.011***	-0.031***	-0.010**
	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)
$GPR^{U,Top}_{i,t-1} \times SME_{i,y-1}$	-0.010**	-0.016***	-0.006**	-0.006*	-0.020***
	(0.005)	(0.006)	(0.003)	(0.003)	(0.007)
$GPR^{D,Top}_{i,t-1} \times SME_{i,y-1}$	-0.014**	-0.008**	-0.007**	-0.020***	-0.007**
	(0.006)	(0.004)	(0.003)	(0.007)	(0.003)
R-squared	0.798	0.781	0.853	0.757	0.748
	Panel B: Heterogeneity by Financial Constraints				
$GPR^{U,Top}_{i,t-1}$	-0.012**	-0.020***	-0.006*	-0.007*	-0.023***
	(0.006)	(0.007)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1}$	-0.021***	-0.011**	-0.010**	-0.029***	-0.010**
	(0.007)	(0.006)	(0.004)	(0.008)	(0.005)
$GPR^{U,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.012**	-0.018***	-0.007**	-0.007**	-0.023***
	(0.005)	(0.006)	(0.003)	(0.004)	(0.008)
$GPR^{D,Top}_{i,t-1} \times HighLeverage_{i,y-1}$	-0.017***	-0.009**	-0.008**	-0.024***	-0.008**
	(0.006)	(0.004)	(0.003)	(0.007)	(0.004)
R-squared	0.800	0.783	0.854	0.760	0.750
Observations	239,162	239,162	239,162	239,162	239,162
Firm FE	✓	✓	✓	✓	✓
Sector × Year-Month FE	✓	✓	✓	✓	✓
Province × Year-Month FE	✓	✓	✓	✓	✓
Firm Controls	✓	✓	✓	✓	✓

Notes: This table reports estimation results from (10) using firm-year-month level data. Columns (1)–(5) report logarithm of realized firm outcomes: sales, purchases, employment, exports, and imports, respectively. Panel A allows the propagation effects to differ by firm size, where $SME_{i,y-1}$ is an indicator equal to one for firms with fewer than 250 employees in year $y-1$. Panel B allows the propagation effects to differ by financial constraints, where $HighLeverage_{i,y-1}$ is an indicator equal to one if firm i's leverage ratio, defined as total debt over total assets, is above the sector-year median in year $y-1$. $GPR^{M}_{i,t-1}$ and $GPR^{X}_{i,t-1}$ denote firm-level direct import-side and export-side geopolitical risk exposure, respectively. $GPR^{U}_{i,t-1}$ denotes upstream geopolitical risk exposure through suppliers, while $GPR^{D}_{i,t-1}$ denotes downstream geopolitical risk exposure through customers. All exposure measures are standardized. Standard errors are clustered at the firm level and reported in parentheses. The table reports the propagation coefficients; detailed coefficients are reported in Appendix B. The sample spans January 2009 to December 2025. ***p<0.01, **p<0.05, *p<0.1.

Appendix D - Production-Network Framework

This appendix presents a simple production-network framework that rationalizes the exposure measures used in the empirical analysis. The model is not intended to provide a full quantitative general-equilibrium environment. Instead, it shows that our direct and indirect geopolitical-risk exposure measures arise naturally as first-order terms in a standard production-network system. The framework builds on the logic of input-output propagation in Acemoglu et al. (2012) and related production-network models such as Baqaee and Farhi (2019) and Baqaee and Farhi (2020).

Consider an economy with N domestic firms indexed by i and foreign countries indexed by c. Firms produce differentiated goods using labor, domestic intermediate inputs, and imported inputs. Let $g_{c,t}$ denote geopolitical risk in foreign country c at time t. Geopolitical risk is an information variable that shifts firms' beliefs about future input costs, delivery conditions, foreign demand, and market access. This interpretation is important because the main empirical outcomes are expectations: variables with superscript e below should be read as firms' conditional expectations given the geopolitical information available at time t. Geopolitical risk affects domestic firms through two channels. First, geopolitical risk in supplier countries raises the expected cost or uncertainty of imported inputs. Second, geopolitical risk in destination markets weakens expected foreign demand or disrupts market access.

Direct import-side exposure and cost propagation

Let $s^M_{ic,y-1}$ denote the share of country c in firm i's imports in year $y-1$. The firm-level import-side exposure measure is

$$GPR^M_{i,t} = \sum_c s^M_{ic,y-1} g_{c,t}. \tag{C2}$$

This is the same direct import-side geopolitical-risk exposure used in the empirical analysis. In the model, this object captures the composition of the firm's foreign input exposure. If $m_{i,y-1}$

denotes the imported-input share in firm i's total variable cost, then the model-consistent cost shock is

$$\widetilde{GPR}_{i,t}^{M} = m_{i,y-1} GPR_{i,t}^{M}. \tag{C3}$$

The empirical baseline uses the normalized exposure measure in equation (C2) and separately examines heterogeneity by import intensity. Equation (C3) clarifies the theoretical scaling behind this heterogeneity test.

Let $\widehat{mc}_{i,t}^{e}$ denote firm i's expected marginal cost in log deviations from steady state, and let $\widehat{p}_{j,t}^{e}$ denote the expected price of domestic supplier j. Firm i's expected marginal cost is

$$\widehat{mc}_{i,t}^{e} = \alpha_i \widehat{w}_t^{e} + \sum_{j=1}^{N} a_{ij} \widehat{p}_{j,t}^{e} + \chi_M \widetilde{GPR}_{i,t}^{M}, \tag{C4}$$

where a_{ij} is the share of firm i's total variable cost spent on domestic input j, and $\chi_M > 0$ maps geopolitical risk in supplier countries into expected imported-input costs. We abstract from aggregate wage variation because the empirical specification absorbs aggregate, sector-by-month, and province-by-month shocks.

Suppose prices are set as a markup over expected marginal costs, allowing for incomplete pass-through:

$$\widehat{p}_{i,t}^{e} = \lambda_i \widehat{mc}_{i,t}^{e}, \qquad 0 \le \lambda_i \le 1. \tag{C5}$$

Substituting equation (C5) into equation (C4) gives

$$\widehat{mc}_{i,t}^{e} = \sum_{j=1}^{N} a_{ij} \lambda_j \widehat{mc}_{j,t}^{e} + \chi_M \widetilde{GPR}_{i,t}^{M}. \tag{C6}$$

In matrix form,

$$\widehat{mc}_{t}^{e} = A\Lambda \widehat{mc}_{t}^{e} + \chi_M \widetilde{GPR}_{t}^{M}, \tag{C7}$$

where A is the domestic input-cost share matrix and Λ is a diagonal matrix with elements λ_i. If the spectral radius of $A\Lambda$ is smaller than one, the solution is

$$\widehat{mc}_t^e = \chi_M (I - A\Lambda)^{-1} \widetilde{GPR}_t^M. \tag{C8}$$

Using the Neumann expansion,

$$(I - A\Lambda)^{-1} = I + A\Lambda + (A\Lambda)^2 + \cdots, \tag{C9}$$

so that firm i's expected marginal cost can be written as

$$\begin{aligned}\widehat{mc}_{i,t}^e =& \chi_M \widetilde{GPR}_{i,t}^M + \chi_M \sum_j a_{ij}\lambda_j \widetilde{GPR}_{j,t}^M \\ &+ \chi_M \sum_j \sum_k a_{ij}\lambda_j a_{jk}\lambda_k \widetilde{GPR}_{k,t}^M + \cdots.\end{aligned} \tag{C10}$$

The first term is firm i's own direct import-side exposure. The second term is first-order upstream exposure: geopolitical risk faced by firm i's domestic suppliers through their own import markets. If $a_{ij} = \nu_{i,y-1}\omega_{ij,y-1}^U$, where $\omega_{ij,y-1}^U$ is the share of supplier j in firm i's domestic purchases and $\nu_{i,y-1}$ is the domestic-intermediate input share in total cost, then

$$\sum_j a_{ij}\lambda_j \widetilde{GPR}_{j,t}^M = \nu_{i,y-1} \sum_j \omega_{ij,y-1}^U \lambda_j \widetilde{GPR}_{j,t}^M. \tag{C11}$$

If pass-through is common across suppliers, or if heterogeneity in λ_j is absorbed by the regression coefficient, this expression corresponds to the empirical upstream exposure measure

$$GPR_{i,t}^U = \sum_j \omega_{ij,y-1}^U GPR_{j,t}^M. \tag{C12}$$

Thus, the upstream exposure measure used in the empirical analysis is the first-order term in the Leontief expansion of a production-network cost system, up to input-intensity and pass-

through scaling. The higher-order terms in equation (C10) represent more distant supplier chains.

The model implies that import-side geopolitical risk raises expected marginal costs and expected prices:

$$\frac{\partial \widehat{mc}^{e}_{i,t}}{\partial GPR^{M}_{i,t}} > 0, \qquad \frac{\partial \widehat{p}^{e}_{i,t}}{\partial GPR^{M}_{i,t}} > 0, \tag{C13}$$

and that upstream geopolitical risk also raises expected marginal costs and expected prices:

$$\frac{\partial \widehat{mc}^{e}_{i,t}}{\partial GPR^{U}_{i,t}} > 0, \qquad \frac{\partial \widehat{p}^{e}_{i,t}}{\partial GPR^{U}_{i,t}} > 0. \tag{C14}$$

These predictions motivate the empirical tests using CPI inflation expectations, PPI inflation expectations, own-price expectations, and unit-cost expectations. If expected input costs and procurement disruptions lead firms to adjust activity, the same cost-side channel should also be visible in realized purchases and imports.

Direct export-side exposure and demand propagation

We next introduce export-market exposure and customer-side propagation. Let $s^{X}_{ic,y-1}$ denote the share of country c in firm i's exports in year $y-1$. The firm-level export-side exposure measure is

$$GPR^{X}_{i,t} = \sum_{c} s^{X}_{ic,y-1} g_{c,t}. \tag{C15}$$

This measure captures the geopolitical risk faced by firm i through its destination markets. If $x_{i,y-1}$ denotes the export share in firm i's total sales, the model-consistent direct foreign-demand shock is

$$\widetilde{GPR}^{X}_{i,t} = x_{i,y-1} GPR^{X}_{i,t}. \tag{C16}$$

As with the import-side measure, the empirical baseline uses the normalized exposure measure and separately tests whether the effects are stronger among export-intensive firms.

Let $\widehat{y}^{e}_{i,t}$ denote firm i's expected real activity, interpreted as expected sales or production. Geopolitical risk in destination markets lowers expected foreign demand. Domestic customer linkages transmit this demand shock upstream to suppliers. Let b_{ik} denote the share of firm i's sales going to domestic customer k. Then expected activity satisfies

$$\widehat{y}^{e}_{i,t} = -\chi_X \widetilde{GPR}^{X}_{i,t} + \sum_{k=1}^{N} b_{ik}\widehat{y}^{e}_{k,t} - \sigma_i \widehat{p}^{e}_{i,t}, \tag{C17}$$

where $\chi_X > 0$ maps geopolitical risk in destination markets into weaker foreign demand, and $\sigma_i > 0$ is the price elasticity of demand. In matrix form,

$$\widehat{y}^{e}_{t} = -\chi_X \widetilde{GPR}^{X}_{t} + B\widehat{y}^{e}_{t} - \Sigma\widehat{p}^{e}_{t}, \tag{C18}$$

where B is the customer-share matrix and Σ is a diagonal matrix of demand elasticities. If the spectral radius of B is smaller than one, the solution is

$$\widehat{y}^{e}_{t} = -\chi_X (I-B)^{-1}\widetilde{GPR}^{X}_{t} - (I-B)^{-1}\Sigma\widehat{p}^{e}_{t}. \tag{C19}$$

Using the Neumann expansion,

$$(I-B)^{-1} = I + B + B^2 + \cdots, \tag{C20}$$

so that

$$\begin{aligned}\widehat{y}^{e}_{i,t} = &-\chi_X \widetilde{GPR}^{X}_{i,t} - \chi_X \sum_{k} b_{ik}\widetilde{GPR}^{X}_{k,t} \\ &- \chi_X \sum_{k}\sum_{\ell} b_{ik}b_{k\ell}\widetilde{GPR}^{X}_{\ell,t} - \left[(I-B)^{-1}\Sigma\widehat{p}^{e}_{t}\right]_i .\end{aligned} \tag{C21}$$

The first term is firm i's own direct export-side exposure. The second term is first-order downstream customer exposure: geopolitical risk faced by firm i's domestic customers through their

export markets. The empirical downstream exposure measure is

$$GPR^D_{i,t} = \sum_k \omega^D_{ik,y-1} GPR^X_{k,t}, \tag{C22}$$

where $\omega^D_{ik,y-1}$ is the share of customer k in firm i's domestic sales. Therefore, $GPR^D_{i,t}$ is the first-order customer-side term in the demand-side network expansion, up to export-intensity and demand-sensitivity scaling.

The model predicts that export-side geopolitical risk lowers expected real activity:

$$\frac{\partial \widehat{y}^e_{i,t}}{\partial GPR^X_{i,t}} < 0, \tag{C23}$$

and that downstream customer exposure also lowers expected real activity:

$$\frac{\partial \widehat{y}^e_{i,t}}{\partial GPR^D_{i,t}} < 0. \tag{C24}$$

These predictions motivate the empirical tests using sales expectations, investment expectations, employment expectations, macroeconomic outlook, realized sales, and exports.

Mapping the model to the empirical specification

The model delivers four exposure margins. Direct import-side exposure is given by $GPR^M_{i,t}$, direct export-side exposure by $GPR^X_{i,t}$, upstream supplier exposure by $GPR^U_{i,t}$, and downstream customer exposure by $GPR^D_{i,t}$. The empirical specification can therefore be interpreted as a first-order approximation to the equilibrium network responses in equations (C10) and (C21):

$$Y_{i,t} = \alpha_i + \delta_{s,t} + \phi_{p,t} + \beta_M GPR^M_{i,t-1} + \beta_X GPR^X_{i,t-1} + \theta_U GPR^U_{i,t-1} + \theta_D GPR^D_{i,t-1} + \Gamma' Z_{i,y-1} + \varepsilon_{i,t}. \tag{C25}$$

The model implies the following sign restrictions. For nominal and cost expectations,

$$\beta_M > 0, \qquad \theta_U > 0, \tag{C26}$$

with import-side and upstream exposure expected to matter more strongly than export-side and downstream exposure. For real activity expectations and realized activity,

$$\beta_X < 0, \qquad \theta_D < 0, \tag{C27}$$

with export-side and downstream exposure expected to matter more strongly than import-side and upstream exposure. Import-side and upstream shocks may also reduce real activity through higher costs, while export-side and downstream shocks may also affect nominal expectations through broader uncertainty, exchange-rate risk, or general equilibrium effects. The central prediction, however, is an asymmetry across exposure margins: supplier-country risk is primarily a cost-push shock, whereas destination-market risk is primarily a demand shock.

The use of predetermined trade and network shares in the empirical analysis follows directly from the model. The relevant exposure of firm i depends on its pre-existing input suppliers, export destinations, domestic suppliers, and domestic customers. Measuring these shares before the realization of geopolitical risk avoids mechanically capturing contemporaneous adjustments in trade or buyer–supplier relationships. Therefore, the empirical exposure measures are designed to test the model's main implication: geopolitical risk affects firms not only through their own foreign trade links, but also through the foreign-risk exposure embedded in domestic production networks.