Intermediaries in International Trade: Managing Sanctions and Reputational Risks*

Povilas Lastauskas Aurelija Proškutė Alminas Žaldokas

Abstract

We analyze the role of intermediaries in international trade, focusing on their impact on trade adjustments. Building on a theoretical model featuring heterogeneous firms, we document a feedback loop between intermediaries and direct exporters. We find that the increase in variable trade costs leads to a larger share of indirect trade. Intermediaries are more likely to serve more reputationally risky markets, especially when variable trade costs are low, as these markets are relatively more sensitive to fixed export costs. Conversely, political alignment between countries that reduces reputational risks makes direct trade more viable. Looking at the geopolitical episode that increased relative fixed exporting costs for producers versus the intermediation sector, we document empirically that exports via intermediaries increased particularly to countries that are likely more reputationally risky and that are closer geographically, while direct exports increased to distant but strategically aligned trade partners.

JEL classification: D22, F12, F14, L81

Keywords: trade sanctions, sectoral spillovers, market entry costs, reputational risks

*Lastauskas: International Monetary Fund and Pembroke College, University of Cambridge; Proškutė: Bank of Lithuania and Vilnius University; Žaldokas: National University of Singapore. Emails: p.lastauskas@trinity.cantab.net; aproskute@lb.lt; alminas@nus.edu.sg. Authors are grateful to Julian Hinz, Ginter Tamás, Lorenzo Trimarchi, Oleksiy Kryvtsov, participants at the CEBRA-BoL-NBP Fifth Biennial Conference "Macroeconomic Adjustments After Large Global Shocks", 21st CESEE Emerging Markets Workshop, 13th Annual Lithuanian Conference on Economic Research, ECB Working Group on Econometric Modeling (WGEM) Workshop, 9th NBB-NBP Annual Research Conference, CESifo Area Conference on Global Economy 2025, and 7th Baltic Economic Conference for helpful comments, Haoxuan Liu for the research assistantship, and Iceland, Liechtenstein and Norway for monetary support through EEA grants (project no. S-BMT-21-8 (LT08-2-LMT-K-01-073)) under a grant agreement with the Research Council of Lithuania.

1 Introduction

The Russian war on Ukraine and subsequent realignment of global trade networks have highlighted a critical but understudied margin of adjustment: the role of intermediaries in circumventing trade barriers. While a large literature examines how firms respond to trade shocks through entry and exit decisions, we know surprisingly little about how the *composition* of trade — direct versus intermediated — responds to geopolitical fragmentation. This paper fills this gap by developing and testing a model where intermediaries and producers engage in a feedback loop that fundamentally alters how economies adjust to sanctions.

Prior literature has documented that intermediaries play an important role in international trade by facilitating trade of manufacturing firms with medium-range productivity levels. Intermediaries are able to spread larger fixed country-specific or product-specific export costs over several manufacturers or products (Bernard et al. 2015) and exploit economies of scope (Akerman 2018). These export costs could be related to such frictions as non-enforceability of cross-country contracts (Felbermayr and Jung 2011), low quality of general contracting environment (Bernard et al. 2015), or regulatory barriers (Ahn et al. 2011). We consider another type of friction, related to geopolitical concerns, that also generates asymmetric fixed export costs across politically-aligned and misaligned countries and that induces a rationale for intermediation.

The rise of reputational costs associated with serving politically misaligned countries has become even more salient recently with the calls for international exporters to exit Russian market (Sonnenfeld et al. 2022). At the same time, the evidence is also appearing that firms exposed to such geopolitical risks tend to engage in their circumvention, e.g., by indirect exports via third countries (see, e.g, Haidar 2017, Chupilkin et al. 2023, or Bove et al. 2023). Moreover, when reputational costs of exporting to politically misaligned destinations increase, the geoeconomic fragmentation also indirectly reduces the relative cost of exporting to the aligned markets, not least because of export market-specific industry support measures.

In this paper, we combine these observations and introduce the sanctions and geoeconomic fragmentation into the intermediary's technology to document theoretically and empirically that intermediation plays a nuanced role of allowing manufacturing firms to avoid "reputational" costs of directly trading with politically misaligned markets and by doing so reducing their relative costs of direct exporting to the politically friendly destinations.

To illustrate our mechanism we build a model with heterogeneous firms either engaging in production, or in the intermediation services. We assume that producers have an option to serve domestic market and to export their products. Further, they can export directly or reach foreign market with the help of intermediation. The coexistence of heterogeneous producers and intermediaries creates a need for matching. Using random matching, we generate "double-marginalization", i.e., an intermediary's price includes producer's and intermediary's margins. A change in trade costs impacts direct exporters as per the "Melitz-type selection effect". In addition, intermediaries are affected by how producers perform.

At the center of our mechanism are the *relative* fixed costs of trade. Although generally fixed costs have no impact on the intensive margin of trade (Chaney 2008), here we focus on the *relative* fixed export costs between the two sectors (manufacturing vs. intermediation) and their interaction with the variable costs. As we shall see, changes in relative fixed costs lead to shifts in the composition of producers that trade directly and indirectly.

In providing the empirical support, we take the case of Lithuanian food producers that lost access to a major export market in 2014.[1] We use the rich firm-product-trading partner level dataset of the universe of Lithuanian firms and study how exports of banned products varied by direct exporters versus intermediaries following the introduction of these Russian sanctions. This Russian import ban in August, 2014 has mechanically increased the average

[1]The negative trade shock that we analyze is Russia's import ban of agricultural and food products as well as certain raw materials from the European Union (EU), the United States (US) and some other countries in August, 2014. The ban came as a result of the political tensions between Russia and the EU, in response to the Russia-Ukraine conflict in February, 2014. First, the EU, the US, and a few other Western countries introduced non-trade (primarily, financial) sanctions against certain Russian individuals and entities responsible for violating the sovereignty and territorial integrity of Ukraine. Then, Russia retaliated by issuing the import ban of agricultural and food products.

variable exporting cost to remaining destinations. We argue that at the same time it has also increased the reputational cost of direct exporting to politically-misaligned countries. As reputation is independent of the trade size, we consider it as a rise in fixed exporting cost for producers. Meanwhile, the fixed cost of indirect exports to the politically-misaligned countries might have changed less or even stayed constant. For example, serving politically-misaligned countries directly could generate potential negative externalities on domestic demand. That is, the domestic demand for firm's products might be lower if the domestic consumers suspect exports to a politically-unfriendly jurisdiction. Yet, an intermediary can mask the exporter's identity and provide the exporter with a plausible deniability of not being aware of the export destinations. Such intermediation does not have any externalities on the intermediary itself since it typically does not operate or is unknown in the domestic market. On the other hand, the fixed cost of direct exports to the politically-aligned countries might even have gone down — political alignment reduces search costs of entering friendly foreign markets, sometimes even amplified by sectoral trade policies subsidizing producers in their search for new markets.[2] Operating in these friendly foreign markets might also be less risky with respect to any future trade restrictions.

The change in the relative fixed costs of exporting to two types of countries across the two sectors is one of the key parameters in our theoretical model. To account for the reputational costs associated with international trade, we use the voting stance of countries in the UN General Assembly regarding the territorial integrity of Ukraine.[3] At the same time, the loss of a geographically close export market (Russia) also mechanically raises average variable export costs, generating a situation when two types of costs change at the same time and allow us to investigate their interactions.

In a difference-in-differences empirical analysis applied to Lithuanian food producers and

[2]One example is the European Commission (EC) support schemes, e.g. EC promotion programmes for agricultural products.

[3]Following the Russian annexation of Crimea in 2014, the voting for the "territorial integrity of Ukraine" in UN General Assembly Resolution 68/262 took place on March 27, 2014; countries that either voted against the resolution, abstained, or were absent during the vote are identified as potential sources of reputational risks to Lithuanian producers.

intermediaries over 2011-2017, we first find that the value of exports using intermediaries increased to the countries that were located closer to Lithuania. As for the directly exporting producers, we see a decrease (even if not statistically significant) to closer countries but an increase to further away countries. This suggests that the level of variable costs (proxied by distance) mattered in adjustments and stands in contrast with traditional trade theories on intermediation that find it particularly advantageous in reaching further (more costly) trade destinations. In our framework, this apparent paradox is addressed by simultaneously considering relative fixed costs and the level of (as well as a change in) variable trade costs.

We further look at the interaction between variable cost effects and the fixed reputational costs. We find that intermediaries were more likely to export to nearby countries if they posed higher potential reputational risk to the producers. Meanwhile, producers increased direct exports to the politically aligned countries, especially to those located further away.

Finally, consistent with the feedback loop interpretation, we document that the negative effect of the trade shock on firms' operating performance was mitigated for those firms that had products for which intermediaries increased exports to reputationally risky countries.

These findings are consistent with our theoretical framework in that the size of exports market and the intermediator's role in it is endogenous to variable and relative fixed costs of exporting across sectors: exporting to close export destinations carrying potential reputational cost explains the rise of intermediation in the distributional chains. On the other hand, reduced search and operating costs to the faraway export destinations that were largely politically friendly led to an increase in direct exports as compared to the intermediation.

Our paper contributes to a few strands of international trade literature. First, it adds to the research introducing an intermediation technology into Melitz (2003) international trade model and highlighting the role of intermediation in international trade. In this type of models, intermediators are able to facilitate exports of less productive firms by reducing their fixed cost of exporting. The fixed costs may be product-specific, such as homogeneity of the product, contracting intensity, product or brand quality (Bernard et al. 2015, Crozet

et al. 2013, Dasgupta and Mondria 2018), or – as in our case – country-specific, arising from either size or distance of the market, higher regulatory barriers (Ahn et al. 2011), low quality of general contracting environment (Bernard et al. 2015), or non-enforceability of contracts (Felbermayr and Jung 2011). Indirect trade is viable, as intermediaries exploit economies of scale and provide lower fixed costs of exporting for manufacturing firms without any implications on marginal costs (Ahn et al. 2011, Felbermayr and Jung 2011), ensure lower exporting fixed cost but with larger manufacturer's marginal costs (Crozet et al. 2013, Abel-Koch 2013), or due to convex fixed costs that are monotonically increasing in the range of goods that intermediary handles (Akerman 2018).

We differ from the above-mentioned research by introducing interaction between producers and intermediaries, where changes in one's marginal cost impact another's, giving rise to what we call a "feedback loop" among the intermediation and manufacturing sectors. For example, Akerman (2018) assumes a homogeneous intermediary and does not consider variable costs as a source of variation in the indirect trade share, Crozet et al. (2013) assumes zero intermediary's marginal costs, while Felbermayr and Jung (2011)'s intermediation share is independent of trade costs as these costs are offset for both direct and indirect exporters, thus in neither case generating a feedback loop. Closer to our paper, Ahn et al. (2011) assumes that heterogeneous firms self-select endogenously to direct and indirect trade. Yet, in their case indirect exporting is market-independent, i.e., any firm choosing to use intermediation would cover all markets not served directly, and the share depends solely on indifference conditions, i.e., indirect trade to all markets versus none. Since intermediaries are identical in each market and perfectly competitive, they hold no role in impacting producers. Instead, we assume that intermediaries are monopolistically competitive, ending up with a price that includes the average producer's and marginal intermediary's costs. This interaction produces an endogenous feedback loop from producers to the intermediaries, impacting not only the share of direct and indirect trade but also the overall openness, and so the marginal producer using indirect trade responds to changes in the intermediation sector.

In addition to the theory work on the intermediation in international trade, we also contribute to the empirical studies on this topic (Feenstra and Hanson 2004, Bernard et al. 2010, Blum et al. 2010, Bernard et al. 2012, 2015, Ganapati 2025), where we highlight the role of intermediaries in alleviating the reputational risk, which has been only recently recognized by the literature (see, e.g., Corsetti et al. 2024).

Second, by analyzing the episode of an international trade ban to one of the key export markets, we also contribute to the broad field of trade wars and trade sanctions literature, shedding light on trade adjustments and beneficiaries of a negative trade shock. Importantly, we differ from the empirical findings on trade restrictions (typically, analyzing the effects of tariff changes, e.g., Benguria and Saffie (2024) and Fajgelbaum et al. (2024)) by studying political sanctions as a clean identification of the trade shock. The episode we analyze stems from a political conflict, not associated with firm or industry characteristics and arising exogenously and independently of either country's economic conditions.

Other studies that have looked at the Russia's invasion and war in Ukraine in 2014 or 2022 and the sanctions that followed have focused on estimating the effects on aggregate trade flows and macroeconomy (e.g., Dong and Li 2018, Crozet and Hinz 2020, Bělín and Hanousek 2021, Itskhoki and Mukhin 2022, Chowdhry et al. 2024, Ghironi et al. 2024a,b) ordocumenting firm-level responses (e.g., Ahn and Ludema 2020, Crozet et al. 2021, Nigmatulina 2023, Lastauskas et al. 2023). Instead, in this paper we focus on the sectoral effects and illustrate that intermediation sector might benefit from a generally negative trade shock. With this, our findings provide another mechanism of trade diversion or trade shock circumvention that primarily focused of indirect exports via third countries (e.g., Fisman et al. 2008, Dong and Li 2018, Crozet et al. 2021) or smuggling (Tyazhelnikov and Romalis 2024).

Finally, we add some evidence to the friend-shoring literature (e.g., Felbermayr et al. 2023, Grossman et al. 2023, Alfaro and Chor 2023, Javorcik et al. 2024), that estimates substantial cost of re-shoring or friend-shoring. Our evidence is consistent with firms sometimes facing a trade-off between friend-shoring and near-shoring.

2 Theoretical Framework

2.1 Economic Intuition

Our model captures three key economic forces. First, sanctions increase both variable trade costs (through logistics disruption) and fixed costs (through compliance and reputational risks). Second, intermediaries can mitigate fixed cost increases by, for instance, pooling risks across multiple producers, but at the expense of double marginalization. Third, and most innovatively, a feedback loop emerges: when sanctions push marginal producers toward intermediation, the composition of the intermediation sector changes, affecting prices and further altering the direct-indirect trade margin. This feedback mechanism generates our key empirical predictions.

2.2 Main Ingredients

We defer a full model to Online Appendix A and cover only main elements necessary to illustrate the key insights and testable implications. For the sake of fixing ideas and mapping to the empirical analysis, let us consider the economy that has one type of goods, e.g., food. Consumers in country j have constant elasticity of substitution (CES) preferences, a standard assumption in the trade literature (see Krugman 1980):

$$U_{jt} = \left[\sum_i q_{ij}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}},$$

where q_{ij} denotes the quantity of product variety originating from country i consumed in country j, and $\sigma > 1$ is the elasticity of substitution between varieties.[4] The optimal demand for variety from country i in country j is:

[4]To simplify notation, we suppress the variety index and refer to variety ℓ having in mind ω_ℓ in $q_{ij}(\omega_\ell)$, where $\omega_\ell \in [0,1]$, thus implicitly assuming a unit mass of continuum varieties in each economy and a standard one-to-one mapping between producers and varieties. Preserving aggregation over origin countries while also capturing the continuum of varieties produced in each country i, the complete version is: $U_{jt} = \left[\sum_i \int_0^1 q_{ij}(\omega_\ell)^{\frac{\sigma-1}{\sigma}} \, d\omega_\ell \right]^{\frac{\sigma}{\sigma-1}}$.

$$q_{ij} = \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma},$$

where E_j is the total expenditure in country j, P_j is the price index, and p_{ij} is the price of the good from country i in country j. The revenue generated by exporting goods from country i to j is:

$$R_{ij} \equiv p_{ij} q_{ij} = \left(\frac{p_{ij}}{P_j}\right)^{1-\sigma} E_j.$$

We assume standard iceberg trade costs, where delivering one unit of a good from country i to j requires shipping $\tau_{ij} > 1$ units. The price paid by consumers in country j is $p_{ij} = \tau_{ij} p_i$, where p_i is the price of the good in the producer's home market. The total trade flow to country j is then $\sum_i p_{ij} q_{ij} = E_j$, and the price index is given by $P_j = \left(\sum_i p_{ij}^{1-\sigma}\right)^{\frac{1}{1-\sigma}}$.

Producers solve a profit maximization problem without adjustment costs:

$$\max_{p_{ij}} \sum_j \left(p_{ij} q_{ij} - \tau_{ij} \lambda_i q_{ij} - f_{ij}\right) \text{ s.t. } q_{ij} = \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma},$$

where λ_i is the marginal cost of production, and f_{ij} are the fixed costs of exporting from country i to country j. The optimal pricing strategy results in:

$$p_{ij} = \frac{\sigma}{\sigma - 1} \tau_{ij} \lambda_i,$$

with export revenues given by:

$$R_{ij} = \left(\frac{\sigma - 1}{\sigma} \frac{1}{\lambda_i} P_j\right)^{\sigma - 1} \tau_{ij}^{1-\sigma} E_j.$$

2.3 Manufacturer's Selection into Direct Exporting

As in Melitz (2003), firms are heterogeneous in their marginal costs (reciprocal of which are productivities) and will select into different modes of serving international markets. A food producer will engage in direct exporting if its exports cover the fixed costs:

$$\pi_{ij}(\lambda_i) \geq f_{ij},$$

yielding the zero-profit (threshold) marginal cost:

$$\lambda_i^\star = \frac{E_j^{\frac{1}{\sigma-1}} P_j}{\sigma^{\frac{1}{\sigma-1}} f_{ij}^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma-1}\tau_{ij}} = \Phi_j f_{ij}^{\frac{1}{1-\sigma}} \tau_{ij}^{-1}, \tag{1}$$

where $\Phi_j \equiv \left[\frac{\sigma\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}$ captures the elasticity of substitution, market size, and aggregate price level (the latter two can be reinterpreted as demand shifters). Hence, there is no qualitative difference if we consider variable trade costs growing or demand going down.

The elasticity of a change in variable trade costs is (negative) unitary, while the elasticity of fixed costs is $1/(1-\sigma) < 0$.[5]

2.4 Intermediaries' Problem

We now introduce an intermediation sector, allowing food producers to access foreign markets through intermediaries, which provide services at a reduced fixed costs of exporting for food producers. The operating profit function for an intermediary is:

$$\pi_{ij}^w = \left(p_{ij}^w - p_{ij}^{pw} - \tau_{ij}\lambda_i^w\right) q_{ij},$$

where p_{ij}^w is the price set by the intermediary, λ_i^w is the marginal cost of the intermediary, and p_{ij}^{pw} is the price the food producer charges the intermediary. The optimal pricing strategy for the intermediary is given by:

$$p_{ij}^w = \frac{\sigma}{\sigma-1}\left(p_{ij}^{pw} + \tau_{ij}\lambda_i^w\right).$$

[5]This implies a higher sensitivity of threshold marginal costs to changes in fixed costs than in variable costs (Boehm et al. 2023). The latter are fixed at -1, whereas the former depend on the elasticity of substitution, i.e., at $\sigma = 1.5$, $\frac{d\ln\lambda^\star}{d\ln f} = -2$ while $\frac{d\ln\lambda^\star}{d\ln\tau} = -1$.

Assuming random matching between intermediaries and producers,[6] we introduce an (inverse) *average* marginal productivity of a producer that uses intermediation services, $\tilde{\lambda}_i^{pw}$, and charges a price $p_{ij}^{pw}\left(\tilde{\lambda}_i^{pw}\right) = \frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}$. Then, the price set by the intermediary becomes:

$$p_{ij}^{w} = \frac{\sigma}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw} + \tau_{ij}\lambda_i^{w}\right).$$

This price includes a "double-marginalization" effect, as intermediaries add their own mark-up on top of the producer's price.

The intermediary's operating profit covers fixed costs, leading to the following condition:

$$\lambda_i^{w} \leq \left(\frac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}} \lambda_i^{\star} - \frac{\sigma}{\sigma-1}\frac{\tilde{\lambda}_i^{pw}}{\tau_{ij}}. \tag{2}$$

It ensures that the intermediary's marginal costs are below the direct exporting marginal costs after adjusting for the difference in fixed costs. Note that the equilibrium is characterized by four key cutoffs (Table 1): direct-export ($\lambda_i^{\star}$), intermediary participation ($\lambda_i^{w\star}$), indirect-export ($\lambda_i^{pw\star}$), and the direct/indirect indifference threshold ($\lambda_i^{\star\star}$). The complete equilibrium system and derivations appear in Online Appendix A.

[6]Given the empirical limitations to observe firm-level transactions, we do not explicitly model the formation of links between food producers and intermediaries. Instead, we adopt a "random matching" assumption, where each manufacturer has an equal probability of pairing with an existing intermediary. In other words, random matching imposes no structure on who matches with whom beyond equal probability. This approach can be justified by assuming informational structure that prevents assortative or other forms of strategic matching. For example, producers might only learn about an intermediary's productivity after engaging in business, leading them to randomize their initial choice of intermediary. This matching process can also be interpreted as a consequence of high learning costs about partner type, timing constraints or search frictions. Note also that in a frictionless market, the lowest price would dictate the choice of intermediary, while random matching process leads to an average intermediary, whose productivity adapts to sectoral dynamics, in line with the goal of this paper to understand the sector interactions between producers and intermediaries.

Table 1: Model Notation

Symbol	Definition
Cutoff marginal costs	
$\lambda_i^\star$	**Direct-export zero-profit cutoff**. Highest producer cost that still earns $\pi_{ij} = 0$ when exporting directly (Eq. (1)).
$\lambda_i^{w\star}$	**Intermediary participation cutoff**. Highest intermediary's cost that covers f_{ij}^w (Eq. (2)).
$\lambda_i^{pw\star}$	**Indirect-export zero-profit cutoff**. Highest producer cost that breaks even via an intermediary (Eq. (4)). Determines overall openness.
$\lambda_i^{\star\star}$	**Direct/indirect indifference cutoff**. Producer cost at which direct and intermediated exporting yield equal profits (Eqs. (A.6)-(A.9)). Splits the mass of exporters into direct and indirect.
CES cost aggregates	
$\tilde{\lambda}_i^w$	**Average cost of active intermediaries**. $(\tilde{\lambda}_i^w)^{1-\sigma} = \int_0^{\lambda_i^{w\star}} \lambda^{1-\sigma}\, dG(\lambda)$. Appears in the producer's variable-profit wedge $\left[\frac{\sigma}{\sigma-1} + \tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i}\right]^{-\sigma}$. Note that $\Lambda_i^w \equiv (\tilde{\lambda}_i^w)^{1-\sigma}$ stands for the *Cost-power aggregate* (analogous to the Melitz (2003) productivity index).
$\tilde{\lambda}_i^{pw}$	**Average cost of indirect exporters**. Defines the producer-to-intermediary price $p_{ij}^{pw} = \frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}$.
Parameters	
$\sigma > 1$	**Elasticity of substitution**.
$\alpha \in (0,1)$	**Relative fixed cost of intermediation**.
$\tau_{ij} > 1$	**Variable (iceberg-type) trade cost**.
$k_i > \sigma - 1$	**Pareto shape parameter**.

2.5 Selection into Intermediated Export Markets

2.5.1 Feedback Loop: Intermediation and Food Sectors

We now introduce a novel feature to the prior literature studying intermediation in trade (Akerman 2018, Crozet et al. 2013, Ahn et al. 2011, Blum et al. 2010, Felbermayr and Jung 2011) — the feedback loop between food producers and intermediaries.

The variable profit function of a food producer using intermediation is given by:

$$\tilde{\pi}_{ij} = \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1} + \frac{\tau_{ij}\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} \frac{R_{ij}}{\tau_{ij}^{1-\sigma}}.$$

This function accounts for the relative average marginal costs of intermediaries ($\tilde{\lambda}_i^w$) and marginal costs of producers (λ_i). The intermediation sector provides the "technology" to

access a foreign market at a portion of the direct exporting costs (αf_{ij}, where $\alpha < 1$). The parameter α plays an essential role in our analysis, as it encapsulates the fixed-cost savings of using an intermediary compared to exporting directly. There is a trade-off: intermediaries allow reaching a foreign market by saving on direct market access costs but lead to lower demand due to a higher final price arising from an intermediary's service of "processing" a good (e.g., relabeling, shipping, selling efforts).

For intermediation to be viable, the inequality must hold:

$$\lambda_i^\star \leq \lambda_i \leq \alpha^{-\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} \tau_{ij} \lambda_i^\star,$$

placing a restriction on the elasticity of substitution and the relative fixed costs α (see further discussion in Online Appendix A, Sections A.5 and A.8).

Remark: As mentioned, the parameter α encapsulates the differences in fixed costs that a producer encounters when deciding whether to export directly or via an intermediary. When α is small, the use of an intermediary imposes minimal fixed costs on the producer. Conversely, as α approaches one, the cost savings of using an intermediary diminish, resulting in fixed costs that are nearly equivalent to those of direct exporting. When nothing else changes, but sanctions and geopolitical fragmentation intensify, an additional source of market entry costs is related to reputational costs, which is a component of α. That is, even if fixed costs of exporting f_{ij} do not change, the relative costs of entering the market j would change due to reputational concerns that are pertinent to the producer but are not related to intermediary's fixed foreign market entry costs.[7]

[7]Similar reduced-form measures were used in the literature, capturing reputational risks. For instance, Corsetti et al. (2024) introduce a loss in revenue for firms engaging in trade with Russia when transactions are conducted in certain currencies, contingent upon the detection of such trade and the subsequent imposition of retaliatory measures.

2.5.2 Closed-Form Cutoffs for Intermediaries and Indirect Exporter

Making use of the zero-profit intermediary, we can solve a system of simultaneous system of equations. To gain more intuition, we will make parametric assumptions of marginal costs to be distributed as Pareto, in line with Chaney (2008) and Helpman et al. (2008), $G(\lambda_i) = \left(\frac{\lambda_i}{\lambda_{i0}}\right)^{k_i}$, $0 \leq \lambda_i \leq \lambda_{i0}$, where k_i is a shape parameter, governing heterogeneity (variance), and λ_{i0} is a scale parameter.

Using intermediary's zero-profit level, we can recover an average intermediary's marginal cost:

$$\left(\tilde{\lambda}_i^w\right)^{1-\sigma} = \frac{k_i \lambda_{i0}^{-k_i}}{k_i - \sigma + 1} \left(\lambda_i^{w\star}\right)^{k_i - \sigma + 1} = \frac{k_i \lambda_{i0}^{-k_i}}{k_i - \sigma + 1} \left(\left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \lambda_i^\star - \frac{\sigma}{\sigma - 1} \frac{\tilde{\lambda}_i^{pw}}{\tau_{ij}} \right)^{k_i - \sigma + 1}, \quad (3)$$

where a regularity condition requires $k_i > \sigma - 1$. Substituting it into the zero-profit marginal costs of producers that use intermediation services, we obtain:

$$\alpha^{-\frac{1}{\sigma}} \left(\tau_{ij} \lambda_i^\star\right)^{\frac{\sigma-1}{\sigma}} = \tfrac{\sigma}{\sigma-1} \left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \tau_{ij} \left(\tfrac{k_i}{k_i - \sigma + 1}\right)^{\frac{1}{1-\sigma}} \left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}} \left(\lambda_i^{w\star}\right)^{\frac{k_i - \sigma + 1}{1-\sigma}}, \quad (4)$$

where $\lambda_i^{w\star}$ is the cutoff marginal cost of intermediary's participation in trade, and where we applied the normalization $\lambda_{i0} = 1$ (see Online Appendix A, Section A.5). The zero-profit marginal costs $\lambda_i^{pw\star}$ refer to the producer that uses an intermediary and just breaks even. As we shall see, a producer will compare profits between two export modes, direct and via the intermediary, thus necessitating the definition of intermediary's marginal cost.

Before doing so, we concentrate on the new insight from the relationship in (4), the so-called *feedback mechanism*. Suppose the exporting environment deteriorates, i.e., it becomes costlier to export directly due to worsened demand or higher variable trade costs, τ_{ij}. That leads to a decrease in $\lambda_i^\star$, resulting in lower direct trade (equation (1)). This effect also impacts the intermediation sector. The equality of (2) pins down the marginal intermediary. A drop in direct traders' marginal costs, ceteris paribus, forces marginal costs for remaining intermediaries to go down. That means that intermediaries become more efficient and,

hence, share the "competitive pressure".[8] This feedback is incorporated into (4), leading to a bounce-back increase in $\lambda_i^{pw\star}$, relative to the baseline scenario when $\tilde{\lambda}_i^w$ (the level of cost-efficiency of intermediaries) and thus $\lambda_i^{w\star}$, remain unaffected. The full adjustment mechanism entails higher-order effects when the intermediaries responds to the average productivity of a producer using intermediaries to reach foreign markets and vice versa until equilibrium is reached.

In sum, when the trade environment deteriorates, the intermediation sector shares the competitive pressure with indirect exporters, making the economy more robust to trade shocks. A side product of this mechanism is that an increase in variable trade costs, τ_{ij}, e.g., in our empirical application due to the loss of Russia's market, leads to a rise in the proportion of indirect exporting.

2.6 Relative Fixed Costs of Indirect Exporting

As fixed costs have been covered extensively in the literature with and without intermediaries (e.g., Ahn et al. 2011, Akerman 2018, Chaney 2008, Crozet et al. 2013), we focus on α. When α changes – but not necessarily f_{ij} – direct exporter's zero-profit margin is unaffected. However, it impacts the *indifference marginal costs* $\lambda_i^{\star\star}$ (at which producers are indifferent between the two exporting modes – direct and via intermediation) *and* the average intermediaries' marginal costs $\tilde{\lambda}_i^w$. Hence, the change in $\lambda_i^{\star\star}$ will determine the export type structure (direct vs. indirect) for given $\lambda_i^{\star}$ and $\lambda_i^{pw\star}$. In equilibrium, these (zero-profit) values will also change, thus causing not only reallocation across market reach types but also the overall measure of exporting firms.

Remark: The direct exporter is *unaffected* by α but is impacted by τ_{ij}. Higher α reduces the zero-profit marginal cost for indirect exporters ($\lambda_i^{pw\star}$, equation (4)), as only more efficient producers can now afford intermediation (this also lowers the average marginal cost of active indirect exporters). However, reduced $\tilde{\lambda}_i^{pw}$ relaxes the viability constraint for intermediaries

[8] Please refer to the discussion on the properties of average cost indices to Online Appendix A.4.

(equation (2)), allowing less efficient intermediaries to operate. These intermediaries charge higher prices (p_{ij}^{w}), which further reduces demand for indirect exports, compounding the initial decline in $\lambda_i^{pw\star}$. Importantly, unlike variable trade costs, which attenuate shocks via adjustments to $\lambda_i^{\star}$, the positive α-shock operates *unidirectionally*: the intermediation sector's deteriorating efficiency ($\lambda_i^{w\star}$) reinforces the decline in indirect trade without countervailing adjustments from direct exporters.

We perform simulation to illustrate zero-profit and indifference marginal costs as functions of variable trade costs τ and relative indirect trade fixed costs α (see Online Appendix B for the assumed baseline values). We display it in Figure 1. The higher value of α implies that using intermediation services for a producer allows for lower savings in terms of fixed market entry costs. On the contrary, a lower α implies that an intermediary provides an easy access into the market without requiring a manufacturer to cover high fixed costs.

Figure 1 hints that an increase in variable trade costs leads to lower marginal direct exporting costs, τ_{ij}, but the drop is somewhat lower for higher indirect fixed exporting costs, α. This higher sensitivity to variable trade costs when it is cheap to access foreign markets indirectly stems from the feedback loop mechanism.[9] This is also implied by the zero-profit condition for the producer using intermediation services ($\lambda_i^{pw\star}$) as, for given variable trade costs, zero-profit marginal costs are higher when fixed indirect exporting costs are lower, as can be seen in the third panel of Figure 1.

Proposition 1. *Based on the assumptions of* $k_i > \sigma - 1$ *and* $\alpha \in \left(0, \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}\right)$*, it follows that:*

$$\frac{\partial \lambda_i^{pw\star}}{\partial \alpha} < 0.$$

That is, higher relative fixed costs of intermediation reduce the zero-profit cutoff for indirect exporting.

[9] An intriguing implication is that an intermediary might actually be less, not more, cost-effective when variable trade costs increase. Again, this results from the lower direct exporters' marginal costs, which are featured in the intermediary's threshold marginal costs.

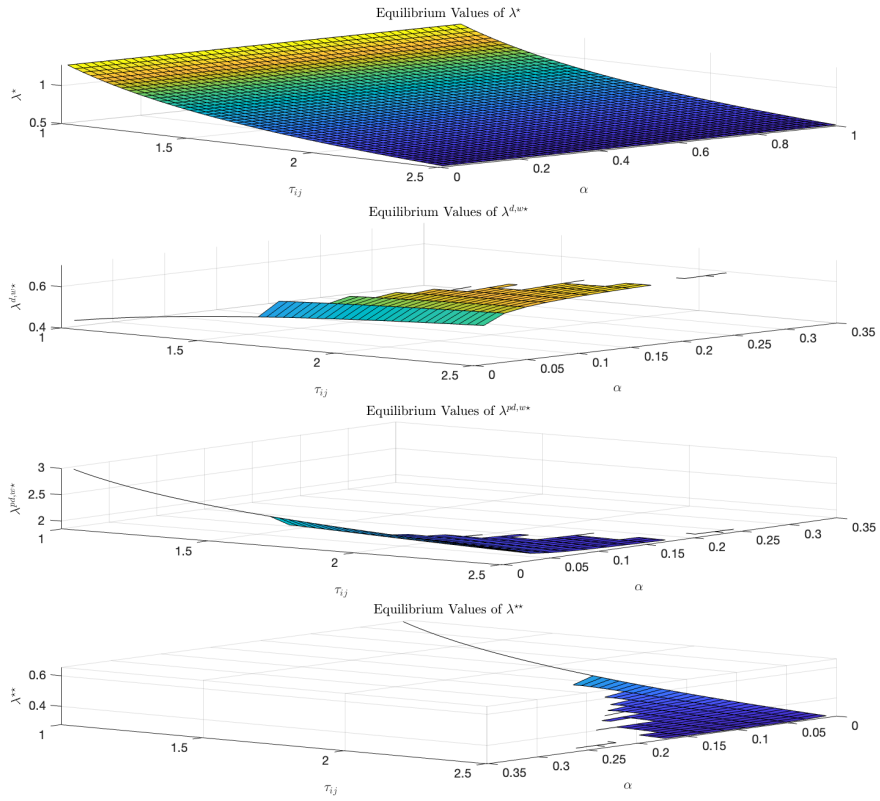


Figure 1: Stylized Illustration of Zero-profit and Indifference Marginal Costs as Functions of Variable Trade Costs τ and Relative Fixed Costs α

Proof. Follows from implicit differentiation of the producer's zero-profit condition. See derivations in Online Appendix. □

Conversely, as α decreases, reflecting lower fixed costs associated with using an intermediary *relative* to direct exporting, the threshold $\lambda_i^{pw\star}$ increases. This implies that producers can have higher marginal costs and still achieve zero profit when α is low, making indirect exporting more attractive. This relationship underscores how lower fixed export mode (direct vs. indirect trade) costs (lower α) allow a broader range of producers to benefit from using intermediaries.[10]

[10]Figure 1 also suggests that variable and fixed trade costs' impact on zero-profit and indifference conditions is not the same. Though low levels of α admit higher variable trade costs, the speed at which marginal costs need to get lowered varies considerably. For instance, a producer using an intermediary and making zero profit, i.e., $\lambda_i^{pw\star}$ reacts relatively little to higher variable trade costs, whereas for a marginal producer,

3 Mechanisms and Empirical Predictions

We provide the main implications of the full model in Online Appendix A, Section A.9. Instead of going through technicalities, we graphically summarize how our feedback-loop mechanism operates when there is a change in both variable trade costs τ and relative intermediation fixed costs α. We then lay out empirical implications.

3.1 Mapping Into Observables

To determine the overall openness and the relative shares of direct and indirect exporters, we need to identify the indifference marginal cost, $\lambda_i^{\star\star}$. This cost represents the point at which producers are indifferent between the two modes of exporting: direct exports and exports through intermediaries. In other words, at this $\lambda_i^{\star\star}$ threshold, the fixed-cost savings of intermediation balance out the higher marginal cost. Producers with marginal costs below the threshold prefer direct exporting, while those above it choose to export via intermediaries.

Under our parametric assumptions, the overall openness index and the share of intermediation can be expressed as follows:

$$\text{Openness Index} \equiv G(\lambda_i^{pw\star}) = (\frac{\lambda_i^{pw\star}}{\lambda_{i0}})^k, \tag{5}$$

$$\text{Intermediation Share} \equiv \frac{G(\lambda_i^{pw\star}) - G(\lambda_i^{\star\star})}{G(\lambda_i^{pw\star})} = 1 - (\frac{\lambda_i^{\star\star}}{\lambda_i^{pw\star}})^k. \tag{6}$$

Since we fix a measure of potential firms, the openness of the economy is fixed by the marginal exporter, in our case, the indirect exporter. The structure of the direct vs. indirect exporters is determined by the ratio of the two marginal cost values, both of them endogenous. This result differs from those in the literature that assumes exogenous cost structures (e.g., Ahn et al. 2011, Bernard et al. 2015, Blum et al. 2010, Felbermayr and Jung 2011).

indifferent between direct and indirect trade, its threshold value $\lambda_i^{\star\star}$ declines more steeply (particularly in low- and medium-τ markets). That implies that the reallocation happens more actively by switching direct and indirect exporting modes rather than by becoming a purely domestic business.

Lemma 1. *The Openness Index is a decreasing function in variable trade costs (τ) and relative indirect trade fixed costs (α).*

Proof. The result follows directly from the definition of $\lambda_i^{pw\star}$ (see equation (4)), when we simplify the intermediation sector by assuming zero marginal costs. Then $\lambda_i^{pw\star}$ becomes an affine function of $\lambda_i^{\star}$.[11] The visual illustration is provided in the upper panels of Figure 2. □

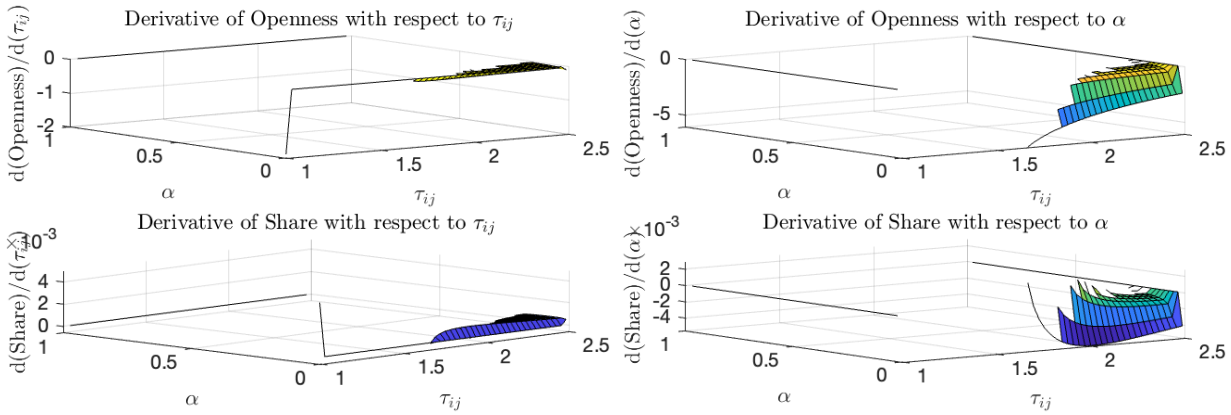


Figure 2: Stylized Illustration of Derivatives with Respect to Variable Trade Costs τ_{ij} and Relative Fixed Costs α

In other words, the overall trade, pinned down by the less productive producer using the intermediation services, is decreasing whenever trade costs — fixed and variable — increase. Larger variable costs (τ) raise the per-unit cost of trading, reducing trade profitability. Similarly, larger relative fixed costs (α) make it more difficult for less productive producers to engage in trade via intermediary, further reducing overall trade activity.

Proposition 2. *Define the Intermediation Share as $S \equiv G(\lambda_i^{pw\star}) - G(\lambda_i^{\star\star})$. Then:*

(i) $\partial S/\partial\alpha < 0$: higher relative fixed costs reduce intermediated trade.

(ii) $\partial^2 S/\partial\alpha\partial\tau_{ij} > 0$: the sensitivity of intermediated trade to α is stronger in low-τ (proximate) markets.

[11] Online Appendix A, in particular, Sections A.8-A.9, derives the general case.

Proof. Part (i) follows from Proposition 1 and the monotonicity of $\lambda_i^{\star\star}$ in α. We use $\lambda_i^{pw\star}$ as defined in equation (4)) and $\lambda_i^{\star\star}$ as fully derived in the Online Appendix A. See bottom panel of Figure 2 for illustration. Part (ii) is established in Online Appendix **??**. See Figure B.1 for numerical illustration. □

A change in α shifts the Intermediation Share in two steps. First, the direct effect operates through the profit function of firms exporting via intermediaries. Holding trade costs τ constant and abstracting from equilibrium adjustments in the intermediation sector, a decrease in α – i.e., a reduction in the fixed cost of indirect exporting – raises the profits of indirect exporters. This makes indirect exporting more attractive, lowering the indifference threshold $\lambda^{\star\star}$ and increasing the cutoff for indirect exporting, $\lambda^{pw\star}$ (see Figure 3 and equation (4)).

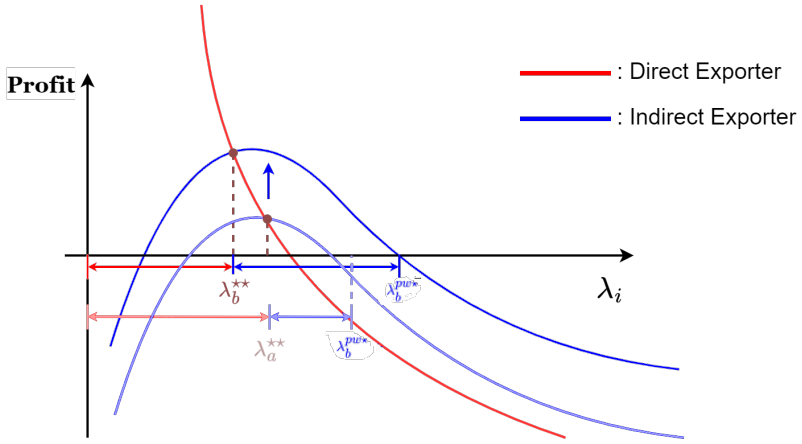


Figure 3: The Direct Channel: α Decreases

Second, the indirect channel acts through the effect of α on the intermediation sector. Due to new indirect exporters, which are relatively less cost-efficient, the intermediation sector sources goods at a higher cost ($\tilde{\lambda}^{pw\star}$), thereby discouraging new intermediaries from entering the market. Since that leads to lower intermediaries' marginal costs, λ^w (equation 2), a drop in $\lambda^{w\star}$ makes indirect exporting more competitive, which now shifts the profit function of intermediaries upward, resulting in a higher Intermediation Share.

Notice how our mechanism deviates from the existing literature by introducing an endogenous feedback loop between the intermediation sector and producers. Unlike models such as Crozet et al. (2013), where the intermediation sector operates at zero marginal costs, our model accounts for the impact of changes in producers' marginal costs on intermediaries' competitiveness. Specifically, when the cost of reaching a market through intermediaries decreases, the average marginal cost of the remaining producers operating through intermediaries increases. This increase in average marginal cost incentivizes only the most cost-effective intermediaries to stay in the market, thereby reinforcing the initial impact (intuitively, less competitive indirect exporters put pressure in the most productive intermediaries to stay the market, which contributes to more indirect exporting).

Conversely, in scenarios where it becomes relatively more costly (i.e., a higher α) for intermediaries to access foreign markets and fewer producers opt for intermediaries, a decrease in average producers' marginal costs prompts less cost-effective intermediaries to remain active (2). This reallocation process reinforces the negative feedback loop mechanism, ultimately encouraging even fewer producers to resort to indirect exporting.

The intuition behind the result on τ dependence lies in the relationship between variable trade costs and the share of exporters. Specifically, lower variable trade costs result in a higher threshold productivity level (inverse of $\lambda_i^\star$), which allows a larger number of firms to engage in exporting. Consequently, when the relative fixed costs of direct and indirect trade change, the reallocation of exporters is more pronounced for destinations with lower variable costs. Consider two markets: one with large variable costs and one with low variable costs. Large variable cost market, which initially had few direct exporters, and the low variable cost market, which had many, both experience a reduction in trade costs. This cost reduction induces a stronger reallocation towards indirect exporting in the low variable cost market, as more firms find it advantageous to switch from direct to indirect exporting.

3.2 Empirical Predictions

In the standard model proposed by Melitz (2003), the increase in both variable and fixed trade costs leads to less openness and a decrease in overall exporting. However, one of the implications of our model is the intermediation sector mitigating this negative impact of the trade shock. Moreover, this effect differs depending on variable trade costs. We will explore how different export modes (direct vs. indirect) interact before diving into the latter interaction effect.

Testable Prediction 1 (Variable Trade Costs)**.** *An increase in τ_{ij} decreases direct exports and increases the intermediation share: $\partial\lambda_i^\star/\partial\tau_{ij} < 0$ and $\partial S/\partial\tau_{ij} > 0$.*

When variable trade costs τ increase (e.g., because of lower demand due to sanctions), the threshold for direct exporting $\lambda_i^\star$ decreases (as per equation (1)), reducing the number of firms that can profitably export directly. The initial (direct) effect is depicted in Figure 4. However, due to the feedback loop mechanism in equation (4), intermediaries absorb part of the negative shock, allowing less productive firms to continue exporting indirectly. This results in an increase in the share of indirect exporters, even though the overall trade volume may decline.

Intuitively, when variable trade costs (τ) increase, the per-unit cost of exporting rises. As a result, fewer firms find direct exporting profitable, and the cutoff for direct exports falls (equation (1)). This leads to a decline in direct export activity. In response, the intermediation sector adjusts through a feedback mechanism: as relative demand for intermediation increases under the negative trade-cost shock, only the more efficient intermediaries remain active, lowering the marginal costs of intermediation (λ_i^w down; see equation (2)). This cost reduction makes indirect exporting more viable, raising the cutoff for indirect exports ($\lambda_i^{pw\star}$ up; see equation (4)). Consequently, the share of firms exporting via intermediaries rises, allowing trade to continue despite higher trade costs. Unlike a model without intermediation, this mechanism can lead to an expansion in trade following a negative trade shock.

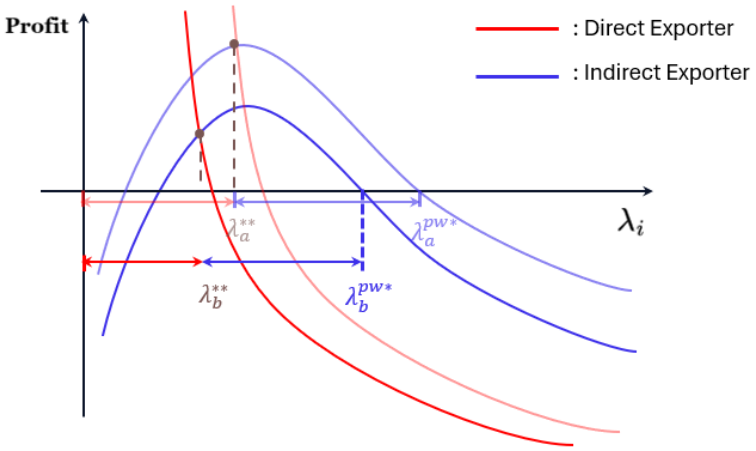


Figure 4: The Direct Channel: τ Increases

Testable Prediction 2 (Relative Fixed Costs and Distance Interaction)**.** *A decrease in* α *increases the intermediation share, with stronger effects in proximate markets:* $\partial S/\partial\alpha < 0$ *and* $\partial^2 S/\partial\alpha\partial\tau_{ij} > 0$.

A lower α reduces the fixed costs of exporting indirectly (αf_{ij}), making indirect exporting more attractive relative to direct exporting. Lower α shifts the indifference threshold $\lambda_i^{\star\star}$ down, leading to more firms choosing indirect exporting. The effect is stronger in nearby markets (low τ), where the initial share of direct exporters is higher, resulting in a larger reallocation from direct to indirect exporting.[12]

We provide the detailed description of direct and indirect effects of α reduction in Proposition 2. This shift from direct to indirect exporting is illustrated by the move in Figure 3 and the transition from the equilibrium in left panel to the right panel in Figure 5.

[12]These findings when intermediaries "compensate" for costly frictions echo those by Bernard et al. (2015) who show that intermediation increases with weaker governance quality, Felbermayr and Jung (2011) – with greater expropriation risk, and Chan (2019) – with greater financial frictions.

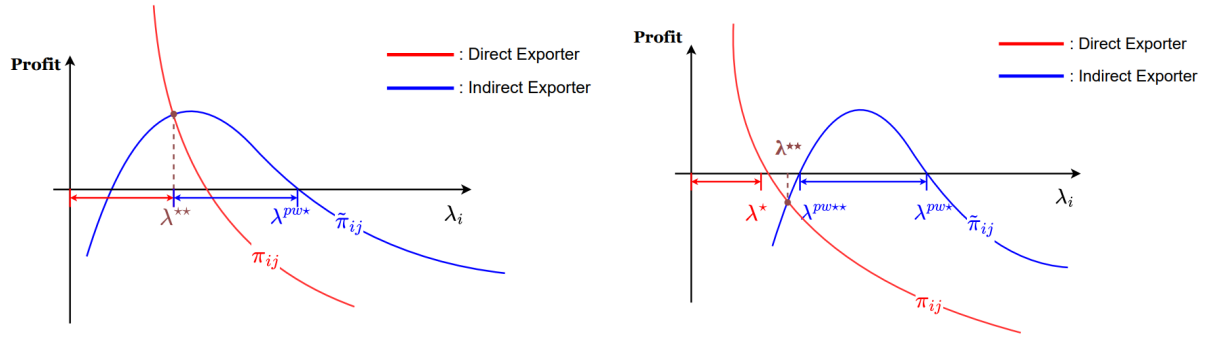


Figure 5: Direct and Indirect Exporting (left) and Advantageous Indirect Exporting (right)

Testable Prediction 3 (Combined Effect)**.** *An increase in the relative fixed costs of indirect exporting (α), combined with an increase in variable trade costs (τ), leads to a reallocation from indirect to direct exporting.*

The testable prediction we take to the data is that $\partial_\alpha \text{Share} < 0$ and $\partial_\tau \text{Share} > 0$, implying that a decrease in α increases intermediation share while increase in τ reduces it. In our calibration, the cross-derivative satisfies $\partial^2_{\alpha\tau} \text{Share} \leq 0$ on the interior (and is numerically zero at corners), so the combined effect is at most additive. The smallest proportional increases occur when τ rises from low levels and so we could see that α effect dominates despite the rise in τ.

These testable predictions articulate how changes in variable trade costs (τ) and the relative fixed costs of indirect exporting (α) influence firms' export mode choices and the overall composition of trade. The feedback loop mechanism is central to understanding these dynamics, as it captures the interdependent adjustments between producers and intermediaries in response to changing trade conditions.

Next, we use an episode of new trade sanctions to causally identify trade patterns, allowing us to compare direct and indirect trade in the face of geoeconomic fragmentation while proxying for relative fixed and trade costs. We will assume a change in geopolitical alignment of markets as a negative shock to the relative fixed cost of exporting, α, reflecting cross-sectoral differences for producers vs. intermediaries in terms of their geoeconomic risks

and reputational considerations associated, the value of strategic partnerships, and their potential associated costs (benefits). We will treat Russia's trade ban as an exogenous increase in variable trading cost, τ, as per our earlier observation that there is no qualitative difference if we consider variable trade costs growing or overall demand going down.

4 Data and Institutional Details

We study the universe of Lithuanian firms over 2011-2017. Our dataset contains detailed firm x partner country x product-level exports statistics. We consider firms with NACE2 codes 3, 10, 11 to be food producers (i.e., manufacturing sector in the theory model), and firms with NACE2 codes 46, 47, 49, 52, and 56 to be wholesalers, transportation companies, and firms providing related services such as warehousing (i.e., intermediation sector).

The negative trade shock that we analyze is Russia's import ban of agricultural and food products as well as certain raw materials from the EU, the US and some other countries in 2014.[13] The ban came as a result of the political tensions between Russia and the EU and was not related to economic reasons. In particular, in response to the Russia's annexation of a part of Ukraine in February-March 2014, the EU, the US, and a few other Western countries introduced non-trade (primarily, financial) sanctions against certain Russian individuals and entities responsible for violating the sovereignty and territorial integrity of Ukraine.[14] In August, 2014, Russia responded by imposing a complete import ban on a number of agricultural and food products from the above-mentioned countries. The range of products subject to Russian import restrictions mainly included meat, dairy products, fruits, and vegetables. These import restrictions were originally implemented for one year but have been extended annually since their introduction. As a result, they may have gradually come to be seen as

[13]The full list includes the countries of the EU, the US, Switzerland, Canada, Australia, Norway, Ukraine, Albania, Montenegro, Iceland, and Lichtenstein. More information about this decree is available at: `https://ec.europa.eu/food/horizontal-topics/international-affairs/eu-russia-sps-issues/russian-import-ban-eu-products_en`.

[14]Ahn and Ludema (2020) provide a detailed list of related EU Council and US White House decrees, including the sanctions against state-owned enterprises (Ahn and Ludema 2020, Nigmatulina 2023) and banks (Mamonov et al. (2023)).

nearly permanent.

This shock was particularly important to Lithuania, a small open economy, as Russia has been one of the most important trade partners for Lithuanian agricultural and food product exports. In 2013, 20% of Lithuanian exports were directed to Russia, around 18% of them contained banned product exports. Since Lithuania's exports make 80% of its GDP, a shock to the exports to Russia was a significant event, especially for industries exporting a considerable amount of banned products.[15]

We use two observable country characteristics that proxy for the parameters in our theory model. Inspired by the definition of the "friendly" countries in Kleinman et al. (2024)[16], the first characteristic that we take is whether the country voted in favor of the UN General Assembly Resolution 68/262 on the "territorial integrity of Ukraine".[17] 100 countries voted for the resolution, 11 countries voted against it, 58 abstained, and a further 24 states were absent when the vote took place. We consider the countries that voted against the resolution, abstained, or were absent as *against-vote* countries, creating reputational trade risk for Lithuanian producers. In 2013, the exports to these latter states, excluding Russia, constituted 9.12%, and in 2017, this export share was 8.5%.

The second characteristic we consider is the distance between the capitals of Lithuania and its trading partners. This is measured using geographical coordinates and is represented by the distance (*dist* variable) in the CEPII GeoDist database (Mayer and Zignago (2011)). We consider *close* countries to be those within 1000 kilometers of Lithuania.[18] We then

[15]Across Lithuanian firms, the ten most affected products (based on 8-digit HS codes) were: Cheese and curd; Milk and cream, not concentrated, not containing added sugar; Milk and cream, concentrated or containing added sugar; Meat of bovine animals, fresh or chilled; Prepared or preserved fish, caviar; Whey and products consisting of natural milk constituents; Apples, pears, and quinces; Citrus fruit; Fruit; Vegetables.

[16]Kleinman et al. (2024) also explore other proxies for political alignment such as strategic alliances and rivalries but this data on Lithuania in the recent time period is sparse.

[17]See: UN General Assembly Resolution 68/262. The resolution was adopted on March 27, 2014 during the sixty-eighth session of the UN General Assembly in response to the Russian annexation of Crimea, affirming the sovereignty and territorial integrity of Ukraine within its internationally recognized borders.

[18]That includes the other Baltic States, Finland, Denmark, Sweden, Central European countries such as Poland, Czechia, Slovakia, Austria, Germany, Hungary, and Eastern European countries such as Ukraine, Moldova, and Belarus.

consider countries of *medium* distance to be those further away than 1000 kilometers but closer than 3000 kilometers, which includes most of the rest of Europe but also the countries as far away as Egypt or Iran. We consider the other countries to be *far*. In 2013, 60% of exports were to close countries, 32% were to medium-distance destinations, and 8% were to far countries. In 2017, the share of exports to close countries dropped to 58%, medium-distance trade share declined to 26%, and the share of exports to far countries rose to 16%.

We document some initial data facts and observations. Figure 6 shows the overall dynamics of banned and non-banned products by the two sectors of our interest: (food) producers and intermediaries. Intermediation sector has been exporting more of non-banned products, compared to exports of non-banned products by the producers. For banned products, direct exports (by producers) was always more important than indirect exports (by intermediaries). After the trade ban to Russia in 2014, however, the intermediation sector's role in exporting banned producthas slightly increased.

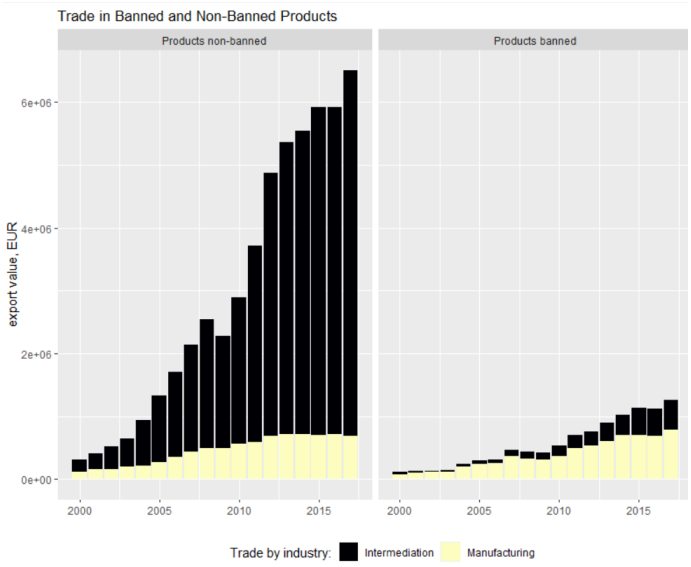


Figure 6: Trade in Banned and Non-banned Products by Sector

Figure 7 depicts the exports of banned products by Lithuanian firms, depending on their sector, distance and the UN vote. First, it shows that exports increased in both sectors after the trade ban, however the composition of those was quite different: the exports to

close markets seem to have increased relatively more for intermediation services sector, as compared to *far* markets. For producers, the growth of exports to *medium* and *far* markets seems to be the strongest. Second, while the most of the trade in banned products for both producer and intermediation sectors was concentrated in the countries without potential reputational cost (*in-favor* countries), in terms of the changes, intermediation sector increased the trade in banned products more and did so to countries with the potential reputational risk for producers (*against-vote* countries). In fact, close-distance against-vote destinations became served mostly by intermediation sector and direct producer exports were negligible after 2014. Meanwhile, producers started exporting banned products directly to further away destinations. One of the most salient rises for these direct exports is to friendly (*in-favour vote*) markets if they are located further away.

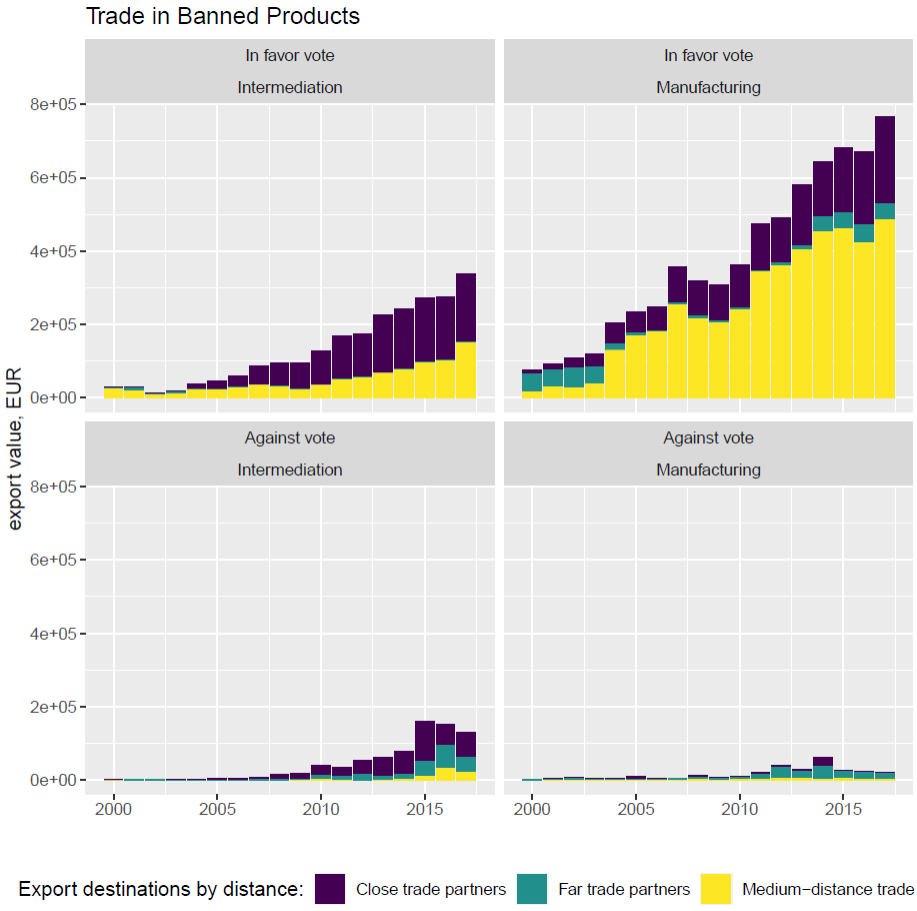


Figure 7: Trade in banned products by sector, distance and voting stance

In what follows, we construct the dataset at the product x sector x year x destination country level over 2011-2017 period. We define products at the eight digit HS-code level and assign all firms into two sectors: producers (NACE2 codes 3, 10, 11), and intermediaries (NACE2 codes 46, 47, 49, 52, and 56). We aggregate the firms at the sectoral level rather than perform firm-level analysis as we are primarily interested in sectoral shifts rather than within-firm dynamics.

5 Empirical Analysis

5.1 Main Findings

In our main analysis, we focus on the introduction of Russian sanctions for Lithuanian food and agriculture product exports in 2014. The closure of the Russian market acted as a shock to Lithuanian food producers and intermediaries in creating excess capacity. This excess capacity induced the distribution of exports to the other markets. Following our theoretical framework, trade ban changed the relative fixed costs of exports and should have had a different effect for countries that were politically aligned and thus created less reputational risk or even benefit as compared to the politically-misaligned countries.

In the model, τ represents variable trade costs between exporter i and market j, while α captures the relative fixed cost of indirect exporting (with $1-\alpha$ reflecting the fixed cost saved by using an intermediary). In the empirical analysis, we proxy high vs. low τ using geographic distance: *close* markets correspond to relatively low trade costs (and relatively low change in τ compared to the loss of proximate Russia's market), whereas *far* markets imply high τ (and relatively high change in τ compared to the loss of proximate Russia's market). Similarly, we proxy differences in reputational or political risk (which affect the relative fixed cost α of indirect exporting) using political alignment measures. In practice, countries that voted against or abstained on the 2014 UN resolution (Crimea) are considered *geopolitically-misaligned* – akin to destinations with higher reputational cost for our

exporters, whereas countries voting in favor are *geopolitically-aligned*.

Moving to the empirical setup, to control for the general economic trends, we study the effects on the exports of banned products as compared to non-banned products that act as the control group. We start with the separate analysis of intermediaries and producers. In Table 2, we report the estimates from the following specifications that we estimate separately for intermediaries (column (1)) and producers (column (2)):

$$Y_{k,c,t} = \beta Banned\ Product_k \times Post_t + \gamma_{c,t} + \delta_{k,c} + \epsilon_{k,c,t}, \tag{7}$$

where k, c, t index eight-digit HS code product, destination country, and year, respectively.[19] $Post_t$ indicates years after 2013. $\gamma_{c,t}$ captures the time varying demand from a particular destination country or time-varying export costs to that country, while $\delta_{k,c}$ captures the non-time varying match between particular destination countries and products (e.g., the general demand for particular products from particular countries). We use log exports to a particular destination country as our main $Y_{k,c,t}$ outcome variable. We exclude exports to Russia from our analysis.

Table 2: Intermediaries and Producers: Overall

	(1) Intermediaries	(2) Producers
Banned Product x Post 2013	0.253***	-0.049
	(0.057)	(0.098)
Constant	-1.205***	-1.097***
	(0.001)	(0.013)
R^2	0.532	0.510
N	1115630	174780

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian firms over 2011-2017. Column (1) reports the exports of the intermediaries and column (2) reports the exports of the producers. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

[19] The country index c here corresponds to destination j in the model.

Our theoretical model predicts an increase of exports via intermediaries in the face of sanctions. Indeed, Table 2 shows that intermediaries "gained" from the sanctions episode, as their trade increased in response to this negative shock. In contrast, the mean effect for direct producers is negative, albeit not statistically significant.[20] These findings support *Testable Prediction 1*, illustrating how a negative trade shock leads to an increased share of indirect trade through intermediaries.

We now move to our main analysis to explore the heterogeneity of the effects across the two sectors to different destination countries. We take into account both the geographic distance to an export destination and the reputational cost for Lithuanian producers when exporting. The reputational cost is based on a country's vote on the UN resolution, where against votes, abstentions or absences are considered as creating reputational risk. We estimate the following specification:

$$Y_{k,c,t} = \beta Banned\ Product_k \times Post_t \times Country\ Characteristic_c + \gamma_{c,t} + \delta_{k,c} + \theta_{k,t} + \epsilon_{k,c,t}, \quad (8)$$

where, as in a previous specification, k, c, t index eight-digit HS code product, destination country, and year, respectively. In addition to the other fixed effects included in specification (7), here we also include $\theta_{k,t}$ that captures product export trends, i.e., general changes in how much a particular product is exported in a particular year. We use log exports to a particular destination country as our main $Y_{k,c,t}$ outcome variable, and exclude exports to Russia, as before.

Given this well-saturated model, β captures the difference between intermediaries' exports of banned versus non-banned products after 2013 as compared to the period prior to 2013, to the export destinations with reputation risk (*against-vote* countries) compared to other export partners. We report the findings in Table 3, which we interpret as the supporting evidence for our *Testable Prediction 2*. In addition, we find evidence for *Testable Prediction*

[20] Later, in Table 7, we combine producers and intermediaries into one panel and confirm that intermediaries' trade increased, relative to producers.

3 of negative cross-derivative, implying that the effect is larger for the countries for which the variable costs increased least.

Table 3: Intermediaries: Against Vote

	(1) Close	(2) Medium	(3) Far
Against Vote x Close x Banned Product x Post 2013	0.326***		
	(0.111)		
Against Vote x Medium x Banned Product x Post 2013		-0.070	
		(0.269)	
Against Vote x Far x Banned Product x Post 2013			-0.022
			(0.092)
Constant	-1.189***	-1.189***	-1.189***
	(0.000)	(0.000)	(0.000)
R^2	0.680	0.680	0.680
N	1098960	1098960	1098960

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian intermediaries firms over 2011-2017. We separately perform interactions at different distance levels, where Close refers to the countries within 1000 kilometers of Lithuania, Medium refers the countries within 1000-3000 kilometers of Lithuania, Far refers to the countries over 3000 kilometers from Lithuania. Against Vote refers to the countries that voted against, abstained or were absent from the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

In particular, across columns (1)-(3), we see an increase of exports by intermediaries to closer countries if those created higher reputational risk to the manufacturers; this finding holds even controlling for the general trends of exporting that particular product. Column (1) of Table 3 shows a coefficient of 0.326 for the interaction Banned $\times$ Post $\times$ AgainstVote for intermediaries in close markets, implying that after the sanctions came into effect, intermediation sector increased exports of banned products to misaligned *against-vote* countries by about 33% more than to aligned ones, relative to the pre-sanction period. This is exactly the scenario of lower α (misalignment) combined with low τ (since many misaligned countries are geographically closer), in line the where *Testable Prediction 2-3* predict a shift toward intermediation.

Next, we perform similar tests for producers. Similarly to intermediaries, we add interactions betwee n voting behavior and distances but instead provide the findings for producers' direct export flows to countries that *voted in favor* of the resolution, across different distances. Across columns (1)-(3) in Table 4, we see the increase of exports by producers to further-away countries if those were politically aligned.

Table 4: Producers: In-favor Vote

	(1) Close	(2) Medium	(3) Far
In-favor Vote x Close x Banned Product x Post 2013	-0.099		
	(0.069)		
In-favor Vote x Medium x Banned Product x Post 2013		0.119*	
		(0.069)	
In-favor Vote x Far x Banned Product x Post 2013			0.353***
			(0.136)
Constant	-1.010***	-1.023***	-1.020***
	(0.004)	(0.004)	(0.001)
R^2	0.695	0.695	0.695
N	158460	158460	158460

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian food producer firms over 2011-2017. We separately perform interactions at different distance levels, where Close refers to the countries within 1000 kilometers of Lithuania, Medium refers the countries within 1000-3000 kilometers of Lithuania, Far refers to the countries over 3000 kilometers from Lithuania. In-Favor Vote refers to the countries that voted in favor of the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

To summarize Tables 2-4, in line with *Testable Predictions 1-3*, after the export ban to Russia, which is likely to have increased the variable trade cost of exporting for producers and intermediaries to all other export markets, the exports of banned products via intermediaries have increased, while they insignificantly decreased for producers. Moreover, exports of banned products by intermediaries increased to close politically misaligned export destinations – the effect that disappears with an increasing distance. On the contrary, direct exports of banned products by producers tend to increase after the shock, the effect mostly

coming from exports to *far* yet politically aligned countries, especially if variable trade costs decreased more.

5.2 Linking Intermediation and Producers: The Feedback Loop

Our model suggests the feedback loop, which implies that the intermediation sector allows producers to mitigate the consequences of a negative shock. We do not have access to the firm-level supplier-customer relationship data and are not able to provide the direct evidence on which producers started exporting via the intermediaries. Instead, we sort banned products at the eight-digit HS code level based on the same product's post-sanctions aggregate exports change, where we only look at the product's exports by intermediaries to countries that had voted against the resolution (thus, countries carrying reputation risk to Lithuanian producers).

In particular, we look at $\Delta Wholesaler\ Exports\ to\ Against\text{-}Vote\ Countries_{k(i)}$, the change of banned product exports by intermediation sector to against-vote countries between the 2011-2013 period to 2015-2017 period, and estimate it for each of the 279 food products in our sample. We anticipate that food producers that exported those banned products to Russia prior to 2014 and saw a larger increase of intermediaries' exports to reputationally-risky countries, would experience a lower negative drop in operating performance compared to food producers that exported certain banned products to Russia and saw a lower increase of such intermediaries' exports.

We look at the overall sales and employees of these food producers and estimate the following specification in a firm-year panel:

$$Y_{i,t} = \beta_1 Post_t \times \Delta Intermediaries\ Exports\ to\ Against\text{-}Vote\ Countries_{k(i)} + \gamma_i + \delta_t + \epsilon_{i,t}, \quad (9)$$

where i, t and $k(i)$ index firm, year and eight-digit HS code of product traded most by firm i, respectively. $Post_t$ indicates years after 2013. γ_i means firm and δ_t means year fixed effects.

For each firm i, we pick the largest value of $\Delta Intermediaries\ Exports\ to\ Against\text{-}Vote\ Countries_{k(i)}$ across its all banned products in 2013, although the estimates are consistent for the average measure weighted by export shares of each product k in firm's i portfolio in 2013. We look at two firm-level outcomes: natural logarithm of sales and natural logarithm of the number of employees.

While Lastauskas et al. (2023) report that following the Russia's sanctions, Lithuanian food producers experienced a negative effect on sales and employees, Table 5 shows that such negative effect on the sales and employees was mitigated for those firms that had products for which intermediaries increased exports to countries that had voted against the resolution, which is consistent with the feedback loop described in the theory model.

Table 5: Producers: Sales and Employees

	(1) Sales	(2) Employees
Δ Intermediaries Exports to Against Vote x Post 2013	0.005***	0.004**
	(0.002)	(0.002)
Constant	15.922***	4.662***
	(0.001)	(0.002)
R^2	0.938	0.955
N	692	692

Notes: This table shows the effect of the Russian ban on the operating performance of Lithuanian food producer firms over 2011-2017. The panel is constructed at firm and year level. The dependent variables are the sales (column (1)) and employees (column (2)) of the firm. $\Delta Intermediaries\ Exports\ to\ Against\text{-}Vote\ Countries_k$ refers to the change of banned product exports by intermediation sector to against-vote countries between the 2011-2013 period to 2015-2017 period for the firm's products, taking the largest value across firm's all banned products in 2013. All specifications include firm and year fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

5.3 Robustness

We further provide a number of robustness tests for findings reported in Section 5.1. First, in the Online Appendix C, we plot the event study analysis for Table 2, columns (1) and (2), by taking the last year prior to the sanctions as the basis and reporting separate coefficients for

each of the sample years prior and after the Russian sanctions came into effect. In Figure C.1 and Figure C.2, we do not see clear pre-trends and a strong increase in intermediaries' exports of banned products after 2014. Also, consistent with Table 2, column (2), we do not see the average effects for the manufacturers. We further zoom into the intermediaries exports to *close* distances as per column (1) of Table 3 and manufacturer exports into *far* distances as per column (3) of Table 4. As reported in Figure C.3 and Figure C.4, we see an increase in both cases after the sanctions came into effect in 2014. If anything, we observe a negative pre-trend for the intermediary exports of banned products to close destinations.

Second, we report the robustness tests where we choose different cut-offs for our *close*, *medium* and *far* markets, where instead of 1000 and 3000 km splits, we split the distances at 2000 and 4000 km thresholds, and we find similar trends (see Table C.1 and Table C.2).[21] Second, as reported in Table C.3 and Table C.4 of the Online Appendix C, instead of the OLS specification with log values of exports, we perform Poisson Pseudo-Maximum Likelihood estimations based on the absolute export volumes and again our findings are qualitatively similar and even more statistically significant.

Further, instead of sorting the trade partners by UN vote on Crimea resolution, we take an alternative way to capture the reputational costs for exporters by looking at the Pew Research Center survey's responses on the question "Overall opinion of Russia" across different countries. Pew Research Center reports data for 23 countries for both the period before and after 2014, and this reduces our sample, especially for the countries that are geographically close to Lithuania. We do not observe close countries with *Against* vote in this data and thus we are unable to replicate a statistically significant estimate reported in column (1) of Table 3. Yet, we are able to replicate the findings reported in column (3) of Table 4. Table C.5 in Online Appendix C presents results for four measures from Pew Research Center survey's "Overall opinion of Russia". First, in column (1) we use a time-varying measure of the difference between the number of respondents that have a favorable

[21]The power is too low to provide estimates for the medium markets.

opinion of Russia minus those that have unfavorable opinion of Russia. Second, in column (2) we focus on the difference between *very* favorable minus *very* unfavorable opinion. Third, in column (3) we look at the change in the favorable opinion between 2015 and 2013. Fourth, in column (4) we look at the change in the difference between favorable and unfavorable opinion between 2015 and 2013. A negative value for all these measures suggest a negative change in the opinion on Russia (in short, *Opinion*) and the negative coefficient here corresponds to the interpretation of a positive coefficient of *In-Favour* vote in Table 4. The findings in Table C.5 show qualitatively similar estimates as in Table 4.

Next, we control for the observed part of variable trade costs directly that could have also affected our observed sectoral shifts in trade. We use the time-varying trade costs (expressed as percentage margins) by destination country and four-digit HS code from OECD International transport and insurance costs of merchandise trade (ITIC) dataset.[22] The margins vary from 0% to 19.09% for the Lithuanian exporters over our sample period and we take them as an additional control variable to control for variable trade cost of Lithuanian exporters. In addition, we consider the priority export countries as described in the Lithuanian Government's Guidelines for the Development of Lithuanian Exports.[23] This list includes 40 countries, grouped into markets, in which Lithuanian export positions should be maintained and strengthened, the markets, aimed at diversifying production and reducing exporters risk, and the markets, aimed at exploring new export opportunities.

With these two control variables[24], we replicate our statistically significant findings from Table 3 and Table 4, and report them in Table 6. We see that controlling for the market being a priority export market for Lithuania and the trade costs, the exports by intermediaries particularly increased to the politically-misaligned countries in close destinations (column (1)).

[22]ITIC dataset provides information on the costs associated with transporting and insuring goods across borders. These costs are expressed as CIF/FOB margins, interpreted as the difference between the Cost, Insurance, and Freight (CIF) and the Free-On-Board (FOB) valuations for the same import flow. See OECD ITIC database.

[23]See The Guidelines for the Development of Lithuanian Exports, 2014-2020.

[24]As trade costs are already defined at the product and destination level and are time-varying, we do not interact them with the product and time dummies.

Controlling for the market being a priority export market for Lithuania and the trade costs, the direct exports of producers particularly increased to the politically-aligned countries in distant destinations (column (2)).

Table 6: Trade Costs and Priority Markets

	(1) Intermediaries	(2) Producers
Against Vote x Close x Banned Product x Post 2013	0.345***	
	(0.100)	
In-Favor Vote x Far x Banned Product x Post 2013		0.351**
		(0.143)
Priority Market x Banned Product x Post 2013	0.079	0.101
	(0.055)	(0.079)
Trade Cost	0.003	-0.011
	(0.003)	(0.012)
Constant	-1.055***	-0.857***
	(0.016)	(0.066)
R^2	0.714	0.725
N	816344	120352

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian firms over 2011-2017. In this table, we add additional controls to the specifications in column (1) of Table 3 and column (3) of Table 4, reported in column (1) and column (2) respectively. Close refers to the countries within 1000 kilometers of Lithuania and Far refers to the countries over 3000 kilometers from Lithuania. In-Favor Vote refers to the countries that voted in favor of the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014, and Against Vote refers to all other countries. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Next, we report a robustness test in which we consider the intermediaries and producers in a single panel and estimate the following specifications:

$$\begin{aligned} Y_{k,w,c,t} = & \\ & \beta_1 Post_t + \beta_2 Banned\ Product_k \times Post_t + \\ & \beta_3 Intermediary_w \times Post_t + \beta_4 Intermediary_w \times Banned\ Product_k + \\ & \beta_5 Intermediary_w \times Banned\ Product_k \times Post_t + \gamma_{k,w,c,t} + \epsilon_{k,w,c,t}, \end{aligned} \tag{10}$$

where k, w, c, t index eight-digit HS code product, firm type (intermediary or producer), destination country, and year, respectively. $Post_t$ indicates years after 2013. $\gamma_{k,w,c,t}$ covers an array of fixed effects. First, we control for $\gamma_{w,t}$, which captures sectoral trends for intermediaries versus producers, i.e., general changes in how much intermediaries are used for exports. $\gamma_{k,t}$ captures product export trends, i.e., general changes in how much a particular product is exported in a particular year. $\gamma_{k,w}$ is the non-time varying match between intermediaries and particular products, i.e., the non-secular differences in how much a particular product is exported via intermediaries versus producers. This would also capture the cases where some producers do not use intermediaries at all or at the other extreme only use intermediaries. $\gamma_{c,t}$ controls for the time varying demand from a particular destination country or time-varying export costs to that country. $\gamma_{w,c}$ captures the non-time varying match between intermediaries and particular destination countries (e.g., if the use of intermediaries is more prevalent in exporting to particular destinations). $\gamma_{k,c}$ captures the non-time varying match between particular destination countries and products (e.g., the general demand for particular products from particular countries).

We also add triple interactions between fixed effects: $\gamma_{w,c,t}$, $\gamma_{k,w,c}$, and $\gamma_{k,c,t}$ that allows us to control for even finer fixed effects structures. Based on this fixed effect structure, only $Intermediary_w \times Banned\ Product_k \times Post_t$ is identified and the other variables get absorbed in the regression equation ($\gamma_{k,w,c,t}$ collects three triple fixed effects listed in the previous sentence), and our specification becomes:

$$Y_{k,w,c,t} = \beta Intermediary_w \times Banned\ Product_k \times Post_t + \gamma_{k,w,c,t} + \epsilon_{k,w,c,t}. \tag{11}$$

Given this well-saturated model, β thus captures the triple difference of how much (i) intermediaries started exporting more compared to producers (ii) those products that were banned versus those that were not banned (iii) after 2013 (i.e., post-shock period) as compared to 2013 and before (i.e., pre-shock period).

We report the findings in Table 7. We find that intermediaries' exports increased for

banned products, as compared to non-banned products after 2013, and did so more than the increase for producers.

Table 7: Combined Panel

	(1)
Intermediary x Banned Product x Post 2013	0.190*
	(0.111)
R^2	0.856
N	177900

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian firms over 2011-2017. In this table, we pool intermediaries and producers into a single specification. The panels are constructed at sector, eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include sector-country-year, sector-product-year and sector-country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

5.4 Extension: FOB vs CIF

Finally, we explore robustness to one of our key assumptions. So far throughout the paper we assumed double-marginalization, i.e., that the producer ships the good to market j and the intermediary then adds destination-specific services that also scale with τ_{ij}. Alternatively, one could assume that only the intermediary incurs τ_{ij} when shipping. The distinction is reminiscent of FOB (Free on Board) and CIF (Cost, Insurance, and Freight) shipments.

We further show in Testable Prediction 4 that the two assumptions deliver opposing predictions in how the reaction varies with τ_{ij}: under FOB we should see larger intermediary effects for closer destinations, while under CIF we should see the opposite. Intuitively, under FOB, variable trade costs enter the producer's pricing and thus appear directly in the indifference condition between direct and indirect exporting; at close destinations, more firms operate near this margin, making the intermediation share more responsive to changes in relative fixed costs. Under CIF, the producer sells at the factory gate and the indifference condition is independent of τ_{ij}; the only channel through which distance affects the sensitivity to α is via the mass of potential direct exporters – which shrinks with higher τ_{ij}, concentrating

the reallocation effects at far destinations.

Testable Prediction 4 (CIF vs. FOB Intermediaries)**.** *The interaction between relative fixed costs* (α) *and variable trade costs* (τ_{ij}) *depends on the intermediation technology:*

(i) ***Wholesaler (FOB) channel****: A decrease in* α *increases the intermediation share more strongly in markets with* lower *variable trade costs (closer destinations):*

$$\frac{\partial^2 S^{FOB}}{\partial \alpha \, \partial \tau_{ij}} < 0.$$

(ii) ***Transportation/Distributor (CIF) channel****: A decrease in* α *increases the intermediation share more strongly in markets with* higher *variable trade costs (farther destinations):*

$$\frac{\partial^2 S^{CIF}}{\partial \alpha \, \partial \tau_{ij}} > 0.$$

Proof. See Online Appendix C. □

Intuitively, the difference arises from how the iceberg costs enter the pricing chain. Under FOB, the producer ships to the wholesaler and incurs τ_{ij}; double marginalization then amplifies the trade-cost distortion as both producer and wholesaler margins scale with τ_{ij}. The indifference condition between direct and indirect exporting contains $\tau_{ij}^{\sigma-1}$, creating a wedge that favors indirect trade most strongly when τ_{ij} is low. Hence, a reduction in α has the largest effect at close destinations. Under CIF, the producer sells at the factory gate and the distributor handles all shipping. Because the producer's indifference condition is independent of τ_{ij}, the only channel through which τ_{ij} affects the α-sensitivity is via $\lambda_i^\star \propto \tau_{ij}^{-1}$: higher τ_{ij} lowers $\lambda_i^\star$, shrinking the mass of potential direct exporters and amplifying the reallocation toward intermediated trade when α falls.

We do not have data to provide microfoundations for which assumption holds in our case empirically. However, rather than considering firms with all intermediary-like NACE codes together as in the main analysis, as a form of robustness, we separate pure transportation

services that are more likely to have CIF-type shipments without any additional services. We report our findings in Table 8, where we separately consider firms with NACE codes 46, 47, 56 as wholesalers (FOB shipments) and firms with NACE codes 49, 50, 51 as transport sector (CIF shipments). We indeed see the distinct patterns that are consistent with the opposing predictions: wholesalers show a positive and significant effect at close distances that turns negative at medium distances, while transporters exhibit a negative effect at close distances that turns positive at medium distances. That being said, in terms of the number of observations, our overall sample primarily consists of firms that could be considered wholesalers, so the FOB-type assumption is more consistent with our particular sample.

Table 8: Intermediaries: Wholesalers versus Transportation

	(1)	(2)	(3)	(4)	(5)	(6)
	Wholesalers			Transporters		
	Close	Medium	Far	Close	Medium	Far
Close x Banned Product x Post	0.294***			-1.305**		
	(0.065)			(0.586)		
Medium x Banned Product x Post		-0.281***			1.982***	
		(0.058)			(0.193)	
Far x Banned Product x Post			-0.071			0.764
			(0.093)			(0.956)
Constant	-1.194***	-1.187***	-1.189***	-1.582***	-1.589***	-1.589***
	(0.001)	(0.001)	(0.000)	(0.003)	(0.000)	(0.001)
R^2	0.682	0.682	0.682	0.624	0.624	0.624
N	1071800	1071800	1071800	39720	39720	39720

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian intermediaries firms over 2011-2017. We separately perform interactions at different distance levels, where Close refers to the countries within 1000 kilometers of Lithuania, Medium refers the countries within 1000-3000 kilometers of Lithuania, Far refers to the countries over 3000 kilometers from Lithuania. Columns (1)-(3) consider firms with NACE codes 46, 47, 56; while columns (4)-(6) consider firms with NACE codes 49, 50, 51. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

6 Conclusions

In the paper we analyze the intermediaries' role in international trade, focusing on their involvement in trade readjustments. We build a theoretical model featuring heterogeneous firms and document a non-linear relationship between distance, fixed costs, and the use of intermediation services. We show that increased variable trade costs due to trade sanctions lead to a drop in direct exports by producers. However, the same trade sanctions shock leads to a relative increase in indirect exports of the sanctioned products to other destination countries through intermediaries.

We use a universe of Lithuanian firms to showcase that after the export ban to an important export destination, the sectoral composition of export trade experienced a change by shifting from direct to intermediated trade. We delve deeper to understand the mechanism behind this result and find that distance alone, which is often taken as a proxy for trade costs, cannot explain the patterns of the trade in sanctioned products in the aftermath of the shock. We attribute the differences to the reputational costs and see that the shift to intermediation sector is particularly relevant for politically misaligned countries.

Our paper provides a more nuanced interpretation to the standard international trade theories, in which producers use intermediaries largely for the purpose of distributing trade costs of exporting to a new destination. A change in reputation costs is another important friction that, by interacting with variable trade costs via the endogenous feedback loop, helps rationalize the intermediary layer and its function as a sanctions shock absorber.

This newly documented channel opens new avenues for future research, namely, understanding the complexity and trade-offs between different intermediation functions and composition of trade costs, the role of intermediation in the process of global economic fragmentation and the industrial structure of modern economies.

References

Abel-Koch, J. (2013): "Who Uses Intermediaries in International Trade? Evidence from Firm-level Survey Data," *The World Economy*, 36, 1041–1064.

Ahn, D. P. and R. D. Ludema (2020): "The Sword and the Shield: The Economics of Targeted Sanctions," *European Economic Review*, 130.

Ahn, J., A. K. Khandelwal, and S.-J. Wei (2011): "The Role of Intermediaries in Facilitating Trade," *Journal of International Economics*, 84, 73–85.

Akerman, A. (2018): "A Theory on the Role of Wholesalers in International Trade Based on Economies of Scope," *Canadian Journal of Economics/Revue canadienne d' économique*, 51, 156–185.

Alfaro, L. and D. Chor (2023): "Global Supply Chains: The Looming "Great Reallocation"," NBER Working Paper 31661, National Bureau of Economic Research.

Benguria, F. and F. Saffie (2024): "Escaping the Trade War: Finance and Relational Supply Chains in the Adjustment to Trade Policy Shocks," *Journal of International Economics*, 152, 103987.

Bernard, A., M. Grazzi, and C. Tomasi (2012): "Intermediaries in International Trade: Direct Versus Indirect Modes of Export," CEPR Discussion Papers 8766, Centre for Economic Policy Research (CEPR).

Bernard, A. B., J. Eaton, J. B. Jensen, and S. Kortum (2003): "Plants and Productivity in International Trade," *American Economic Review*, 93, 1268–1290.

Bernard, A. B., M. Grazzi, and C. Tomasi (2015): "Intermediaries in International Trade: Products and Destinations," *The Review of Economics and Statistics*, 97, 916–920.

Bernard, A. B., J. B. Jensen, S. J. Redding, and P. K. Schott (2010): "Wholesalers and Retailers in US Trade," *American Economic Review*, 100, 408–413.

Blum, B. S., S. Claro, and I. Horstmann (2010): "Facts and Figures on Intermediated Trade," *American Economic Review*, 100, 419–423.

Boehm, C. E., A. A. Levchenko, and N. Pandalai-Nayar (2023): "The Long and Short (Run) of Trade Elasticities," *American Economic Review*, 113, 861–905.

Bove, V., J. D. Salvatore, and R. Nisticò (2023): "Economic Sanctions and Trade Flows in the Neighbourhood," *Journal of Law and Economics*, 66, 671–697.

Bělín, M. and J. Hanousek (2021): "Which Sanctions Matter? Analysis of the EU/Russian Sanctions of 2014," *Journal of Comparative Economics*, 49, 244–257.

Chan, J. M. (2019): "Financial Frictions and Trade Intermediation: Theory and Evidence," *European Economic Review*, 119, 567–593.

Chaney, T. (2008): "Distorted Gravity: The Intensive and Extensive Margins of International Trade," *American Economic Review*, 98, 1707–1721.

Chowdhry, S., J. Hinz, K. Kamin, and J. Wanner (2024): "Brothers in Arms: the Value of Coalitions in Sanctions Regimes," *Economic Policy*, 39, 471–512.

Chupilkin, M., B. Javorcik, and A. Plekhanov (2023): "The Eurasian Roundabout: Trade Flows into Russia Through the Caucasus and Central Asia," Working Paper 276, European Bank for Reconstruction and Development.

Corsetti, G., B. Demir, and B. Javorcik (2024): "Trading Around Geopolitics," Economics Series Working Papers 1052, University of Oxford, Department of Economics.

Crozet, M. and J. Hinz (2020): "Friendly Fire: The Trade Impact of the Russia Sanctions and Counter-Sanctions," *Economic Policy*, 35, 97–146.

Crozet, M., J. Hinz, A. Stammann, and J. Wanner (2021): "Worth the Pain? Firms' Exporting Behaviour to Countries Under Sanctions," *European Economic Review*, 134.

Crozet, M., G. Lalanne, and S. Poncet (2013): "Wholesalers in International Trade," *European Economic Review*, 58, 1–17.

Dasgupta, K. and J. Mondria (2018): "Quality Uncertainty and Intermediation in International Trade," *European Economic Review*, 104, 68–91.

Dong, Y. and C. Li (2018): "Economic Sanction Games Among the US, the EU and Russia: Payoffs and Potential Effects," *Economic Modelling*, 73, 117–128.

Fajgelbaum, P., P. Goldberg, P. Kennedy, A. Khandelwal, and D. Taglioni (2024): "The US-China Trade War and Global Reallocations," *American Economic Review: Insights*, 6, 295–312.

Feenstra, R. C. and G. H. Hanson (2004): "Intermediaries in Entrepôt Trade: Hong Kong

Re-Exports of Chinese Goods," *Journal of Economics & Management Strategy*, 13, 3–35.

Felbermayr, G. and B. Jung (2011): "Trade Intermediation and the Organization of Exporters," *Review of International Economics*, 19, 634–648.

Felbermayr, G., H. Mahlkow, and A. Sandkamp (2023): "Cutting Through the Value Chain: the Long-Run Effects of Decoupling the East from the West," *Empirica*, 50, 75–108.

Fisman, R., P. Moustakerski, and S.-J. Wei (2008): "Outsourcing Tariff Evasion: A New Explanation for EntrepÔt Trade," *The Review of Economics and Statistics*, 90, 587–592.

Ganapati, S. (2025): "The Modern Wholesaler: Global Sourcing, Domestic Distribution, and Scale Economies," *American Economic Journal: Microeconomics*, 17, 1–40.

Ghironi, F., D. Kim, and G. K. Ozhan (2024a): "International Economic Sanctions and Third-Country Effects," *IMF Economic Review*, 72, 611–652.

——— (2024b): "International Trade and Macroeconomic Dynamics with Sanctions," NBER Working Paper 32188, National Bureau of Economic Research.

Grossman, G. M., E. Helpman, and H. Lhuillier (2023): "Supply Chain Resilience: Should Policy Promote International Diversification or Reshoring?" *Journal of Political Economy*, 131, 3462–3496.

Haidar, J. I. (2017): "Sanctions and Export Deflection: Evidence from Iran," *Economic Policy*, 32, 319–355.

Head, K., T. Mayer, and M. Thoenig (2014): "Welfare and Trade Without Pareto," *American Economic Review*, 104, 310–316.

Helpman, E., M. Melitz, and Y. Rubinstein (2008): "Estimating Trade Flows: Trading Partners and Trading Volumes," *The Quarterly Journal of Economics*, 123, 441–487.

Itskhoki, O. and D. Mukhin (2022): "Sanctions and the Exchange Rate," NBER Working Paper 30009, National Bureau of Economic Research.

Javorcik, B., L. Kitzmüller, H. Schweiger, and M. A. Yildirim (2024): "Economic Costs of Friendshoring," *The World Economy*, 47, 2871–2908.

Kleinman, B., E. Liu, and S. J. Redding (2024): "International Friends and Enemies," *American Economic Journal: Macroeconomics*, 16, 350–85.

Krugman, P. (1980): "Scale Economies, Product Differentiation, and the Pattern of Trade," *Amer-*

ican Economic Review, 70, 950–959.

Lastauskas, P., A. Proškutė, and A. Žaldokas (2023): "How Do Firms Adjust When Trade Stops?" *Journal of Economic Behavior & Organization*, 216, 287–307.

Mamonov, M., A. Pestova, and S. Ongena (2023): ""Crime and Punishment"? How Banks Anticipate and Propagate Global Financial Sanctions," Working Paper 753, The Center for Economic Research and Graduate Education - Economics Institute, Prague.

Mayer, T. and S. Zignago (2011): "Notes on CEPII's Distances Measures: the GeoDist Database," Working Paper 2011-25, CEPII Research Center.

Melitz, M. J. (2003): "The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity," *Econometrica*, 71, 1695–1725.

Melitz, M. J. and S. J. Redding (2013): "Firm Heterogeneity and Aggregate Welfare," CEP Discussion Papers dp1200, Centre for Economic Performance, LSE.

Nigmatulina, D. (2023): "Sanctions and Misallocation. How Sanctioned Firms Won and Russia Lost," Working Paper 1886, Centre for Economic Performance.

Simonovska, I. and M. E. Waugh (2014): "The Elasticity of Trade: Estimates and Evidence," *Journal of International Economics*, 92, 34–50.

Sonnenfeld, J., S. Tian, S. Zaslavsky, Y. Bhansali, and R. Vakil (2022): "It Pays For Companies to Leave Russia," SSRN Working Paper 4112885.

Tyazhelnikov, V. and J. Romalis (2024): "Russian Counter-Sanctions and Smuggling: Forensics with Structural Gravity Estimation," *Journal of International Economics*, 152, 104014.

ONLINE APPENDIX

A Detailed Theoretical Framework

A.1 Demand Side

A consumer in country j has a CES utility function:

$$U_{jt} = \left[\sum_i q_{ij}^{\frac{\sigma-1}{\sigma}} \right]^{\frac{\sigma}{\sigma-1}}. \tag{A.1}$$

The optimal demand is then given by:

$$q_{ij} = \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma}, \tag{A.2}$$

so the revenue generated by trading food varieties between countries i and j is given by:

$$R_{ij} \equiv p_{ij} q_{ij} = \left(\frac{p_{ij}}{P_j} \right)^{1-\sigma} E_j.$$

Standard iceberg trade costs are assumed throughout: $p_{ij} = \tau_{ij} p_i$, i.e., to deliver one unit of a good i, one has to ship $\tau_{ij} > 1$ units. That difference is covered by a consumer in country j by paying $(\tau_{ij} - 1)\, p_i$ more than the price at home. The total trade flow is generated by summing revenues across all destinations: $\sum_i p_{ij} q_{ij} = \sum_i \left(\frac{p_{ij}}{P_j} \right)^{1-\sigma} E_j = \frac{E_j}{P_j^{1-\sigma}} \left(\sum_i p_{ij}^{1-\sigma} \right)^{\frac{1-\sigma}{1-\sigma}} = E_j$. It follows that the Dixit-Stiglitz price index is given by $P_j \equiv \left(\sum_i p_{ij}^{1-\sigma} \right)^{\frac{1}{1-\sigma}}$.

A.1.1 Optimal Pricing

Let the pricing not be subject to adjustment costs. Then, period-by-period, food producers solve the following profit maximization problem:

$$\max_{p_{ij}} \sum_j \left(p_{ij} q_{ij} - \tau_{ij} \lambda_i q_{ij} - f_{ij} \right) \text{ s.t. } q_{ij} = \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma}.$$

The first-order condition with respect to price delivers:

$$\begin{gathered}
\tfrac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} - \sigma p_{ij} \tfrac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma-1} + \sigma \tau_{ij} \lambda_i \tfrac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma-1} = 0 \\
\tfrac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} \left(1 - \sigma + \sigma \tau_{ij} \lambda_i p_{ij}^{-1}\right) = 0 \\
\sigma \tau_{ij} \lambda_i p_{ij}^{-1} = \sigma - 1 \\
p_{ij} = \tfrac{\sigma}{\sigma-1} \tau_{ij} \lambda_i.
\end{gathered}$$

The revenue from exporting is given by:

$$R_{ij} = \left(\frac{\sigma - 1}{\sigma} \frac{1}{\lambda_i} P_j\right)^{\sigma-1} \tau_{ij}^{1-\sigma} E_j.$$

Noticing, along the lines of Melitz (2003), that variable profits are proportional to revenues, we obtain:

$$\begin{gathered}
\pi_{ij}(\lambda_i) = p_{ij} q_{ij} - \tau_{ij} \lambda_i q_{ij} = (p_{ij} - \tau_{ij} \lambda_i) q_{ij} \\
= \left(\tfrac{\sigma}{\sigma-1} \tau_{ij} \lambda_i - \tau_{ij} \lambda_i\right) q_{ij} = \left(\tfrac{1}{\sigma-1}\right) \tau_{ij} \lambda_i q_{ij} = \left(\tfrac{1}{\sigma-1}\right) \tau_{ij} \lambda_i \tfrac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} \\
= \left(\tfrac{1}{\sigma-1}\right)^{1-\sigma} (\tau_{ij} \lambda_i)^{1-\sigma} \tfrac{E_j}{P_j^{1-\sigma}} \sigma^{-\sigma} = \sigma^{-1} \left(\tfrac{\sigma}{\sigma-1} \tau_{ij} \lambda_i\right)^{1-\sigma} \tfrac{E_j}{P_j^{1-\sigma}} = \tfrac{1}{\sigma} R_{ij}(\lambda_i).
\end{gathered} \tag{A.3}$$

A.2 Selection into Direct Exporting

As in Melitz (2003), firms are heterogeneous in terms of their marginal costs. They will select into different modes of serving international markets.

Food producers will engage in direct exporting if and only if:

$$\begin{gathered}
\pi_{ij}(\lambda_i) \geq f_{ij}, \\
\tfrac{1}{\sigma} \left(\tfrac{\sigma}{\sigma-1} \tau_{ij} \lambda_i\right)^{1-\sigma} \tfrac{E_j}{P_j^{1-\sigma}} \geq f_{ij}, \\
\left(\tfrac{1}{\lambda_i}\right)^{\sigma-1} \geq \tfrac{\sigma f_{ij} \left(\frac{\sigma}{\sigma-1} \tau_{ij}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}.
\end{gathered}$$

Recall that $\sigma > 1$, therefore:

$$\frac{1}{\lambda_i} \geq \frac{1}{\lambda_i^\star} = \left[\frac{\sigma f_{ij} \left(\frac{\sigma}{\sigma-1} \tau_{ij} \right)^{\sigma-1}}{E_j P_j^{\sigma-1}} \right]^{\frac{1}{\sigma-1}}.$$

$$\frac{1}{\lambda_i} \geq \frac{1}{\lambda_i^\star} = \frac{\sigma^{\frac{1}{\sigma-1}} f_{ij}^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1} \tau_{ij} \right)}{E_j^{\frac{1}{\sigma-1}} P_j}.$$

$$\frac{1}{\lambda_i^\star} = \frac{\sigma^{\frac{1}{\sigma-1}} f_{ij}^{\frac{1}{\sigma-1}} \left(\frac{\sigma}{\sigma-1} \tau_{ij} \right)}{E_j^{\frac{1}{\sigma-1}} P_j}.$$

$$\lambda_i^\star = \frac{E_j^{\frac{1}{\sigma-1}} P_j}{\sigma^{\frac{1}{\sigma-1}} f_{ij}^{\frac{1}{\sigma-1}} \frac{\sigma}{\sigma-1} \tau_{ij}}.$$

Marginal costs should be sufficiently small to overcome fixed exporting costs f_{ij}. An increase in f_{ij} leads to an increase in the inverse of threshold marginal costs $1/\lambda_i^\star$, or a decrease in the threshold marginal costs, $\lambda_i^\star$. The pass-through from the fixed exporting costs to the marginal costs depends on the elasticity of substitution, governed by $\sigma > 1$. The variable trade costs induce a unitary pass-through, conditional on all other determinants of the cut-off marginal costs.

A.3 Intermediaries' Problem

We deviate from Melitz (2003) in letting food firms have an alternative mode of serving the international market, namely through intermediation. Intermediation or indirect exporting via intermediaries requires us to sketch an intermediation sector. We proceed using a backward induction strategy: first, we solve for the optimal intermediary's price to determine the optimal quantities. The demand for goods in foreign markets remains the same as before (equation (A.2)). In other words, intermediaries do not produce goods for sale but provide a service to food producers by selling goods abroad on their behalf. Intermediaries service more

food producers, allowing them to spread fixed costs to ensure that there are food producers who gain from intermediation, even if they cannot afford direct exporting.

The operating profit function of an intermediary, π_{ij}^{w}, is given by:

$$\pi_{ij}^{w} = \left(p_{ij}^{w} - p_{ij}^{pw} - \tau_{ij}\lambda_{i}^{w}\right) q_{ij},$$

where the superscript w refers to the intermediary's optimal price (p_{ij}^{w}) and marginal costs (λ_{i}^{w}). Using the same logic as before:

$$\max_{p_{ij}^{w}} \sum_{j} \left(p_{ij}^{w} - p_{ij}^{pw} - \tau_{ij}\lambda_{i}^{w}\right) q_{ij} \text{ s.t. } q_{ij} = \frac{E_j}{P_j^{1-\sigma}} \left(p_{ij}^{w}\right)^{-\sigma},$$

we obtain:

$$\begin{gathered}
\tfrac{E_j}{P_j^{1-\sigma}} \left(p_{ij}^{w}\right)^{-\sigma} - \sigma \left(p_{ij}^{w} - p_{ij}^{pw} - \tau_{ij}\lambda_{i}^{w}\right) \tfrac{E_j}{P_j^{1-\sigma}} \left(p_{ij}^{w}\right)^{-\sigma-1} = 0 \\
\tfrac{E_j}{P_j^{1-\sigma}} \left(p_{ij}^{w}\right)^{-\sigma} \left(1 - \sigma \left(p_{ij}^{w} - p_{ij}^{pw} - \tau_{ij}\lambda_{i}^{w}\right) \left(p_{ij}^{w}\right)^{-1}\right) = 0 \\
p_{ij}^{w} = \tfrac{\sigma}{\sigma-1} \left(p_{ij}^{pw} + \tau_{ij}\lambda_{i}^{w}\right),
\end{gathered}$$

and, using an assumption of random matching, $p_{ij}^{pw}\left(\tilde{\lambda}_{i}^{pw}\right) = \frac{\sigma}{\sigma-1}\tilde{\lambda}_{i}^{pw}$, where $\tilde{\lambda}_{i}^{pw}$ refers to an average marginal cost among those food producers who reach a foreign market through the intermediary.

We therefore obtain:

$$p_{ij}^{w} = \frac{\sigma}{\sigma-1}\left(\frac{\sigma}{\sigma-1}\tilde{\lambda}_{i}^{pw} + \tau_{ij}\lambda_{i}^{w}\right).$$

The intermediary's price features a "double-marginalization" (Crozet et al. 2013, Akerman 2018) term on top of the intermediary's marginal costs. This is because intermediaries first cover food producer prices and then engage in monopolistic competition when selling a good abroad to cover their own costs.

The intermediary's operating profit function becomes:

$$\begin{aligned}
\pi_{ij}^{w} &= \left(\tfrac{\sigma}{\sigma-1}\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)-p_{ij}^{pw}-\tau_{ij}\lambda_i^{w}\right)q_{ij} \\
&= \left(\tfrac{\sigma}{\sigma-1}-1\right)\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)q_{ij} = \left(\tfrac{1}{\sigma-1}\right)\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)q_{ij} \\
&= \left(\tfrac{1}{\sigma-1}\right)\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)\tfrac{E_j}{P_j^{1-\sigma}}\left(\tfrac{\sigma}{\sigma-1}\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)\right)^{-\sigma} \\
&= \left(\tfrac{1}{\sigma-1}\right)\left(\tfrac{\sigma}{\sigma-1}\right)^{-\sigma}\tfrac{E_j}{P_j^{1-\sigma}}\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)^{1-\sigma} \\
&= \tfrac{1}{\sigma}\tfrac{E_j}{P_j^{1-\sigma}}\left(\tfrac{\sigma}{\sigma-1}\left(p_{ij}^{pw}+\tau_{ij}\lambda_i^{w}\right)\right)^{1-\sigma} = \tfrac{1}{\sigma}\tfrac{E_j}{P_j^{1-\sigma}}\left(p_{ij}^{w}\right)^{1-\sigma} = \tfrac{1}{\sigma}R_{ij}^{w}\left(\tilde{\lambda}_i^{pw},\lambda_i^{w}\right).
\end{aligned}$$

An intermediary will "select" to stay active in business as long as variable profit covers any fixed costs. Suppose that an intermediary requires $f_{ij}^{w} < f_{ij}$, fixed costs per period to sustain the intermediation/distribution network. Therefore, an operating profit $\frac{1}{\sigma}R_{ij}\left(\tilde{\lambda}_i^{pw},\lambda_i^{w}\right)$ should be such that:

$$\begin{aligned}
\tfrac{1}{\sigma}R_{ij}\left(\tilde{\lambda}_i^{pw},\lambda_i^{w}\right) &= \tfrac{1}{\sigma}\left(p_{ij}^{w}\right)^{1-\sigma}E_jP_j^{\sigma-1} \\
= \tfrac{1}{\sigma}\left(\tfrac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}+\tau_{ij}\lambda_i^{w}\right)^{1-\sigma}&\left(\tfrac{\sigma}{\sigma-1}\right)^{1-\sigma}E_jP_j^{\sigma-1} \geq f_{ij}^{w} \\
\left(\tfrac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}+\tau_{ij}\lambda_i^{w}\right)^{1-\sigma} &\geq \tfrac{\sigma f_{ij}^{w}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_jP_j^{\sigma-1}} \\
\left(\tfrac{1}{\frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}+\tau_{ij}\lambda_i^{w}}\right)^{\sigma-1} &\geq \tfrac{\sigma f_{ij}^{w}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_jP_j^{\sigma-1}},
\end{aligned}$$

or,

$$\begin{aligned}
\tfrac{1}{\frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}+\tau_{ij}\lambda_i^{w}} &\geq \left[\tfrac{\sigma f_{ij}^{w}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_jP_j^{\sigma-1}}\right]^{\frac{1}{\sigma-1}} \\
\tau_{ij}\lambda_i^{w} &\leq \left(f_{ij}^{w}\right)^{-\frac{1}{\sigma-1}}\left(f_{ij}\right)^{\frac{1}{\sigma-1}}\tau_{ij}\lambda_i^{\star}-\tfrac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw} \\
&= \left(\tfrac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}}\tau_{ij}\lambda_i^{\star}-\tfrac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}.
\end{aligned}$$

The condition is effectively a marginal cost (and marginal revenue in equilibrium) of an intermediary not exceeding direct exporting marginal costs, after having adjusted for fixed costs difference, i.e., $\tau_{ij}\lambda_i^{w}+\frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw} \leq \left(\frac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}}\tau_{ij}\lambda_i^{\star}$. In other words, the intermediary, in order to cover the fixed distribution network costs, will require such marginal costs that it at least breaks even, given a matched food producer with average marginal costs ($\tilde{\lambda}_i^{pw}$). Note that, from an intermediation sector perspective, a threshold value of direct exporting ($\lambda_i^{\star}$)

can be thought of as given. The intermediary who just breaks even is such that:

$$\lambda_i^{w\star} = \left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \lambda_i^\star - \frac{\sigma}{\sigma-1}\frac{\tilde{\lambda}_i^{pw}}{\tau_{ij}},$$

where we use the notation $\lambda_i^{w\star}$ to refer to the cutoff value of an operating intermediary, and $\tilde{\lambda}_i^{pw}$ as an average marginal cost value of an indirect food exporter.

A.4 Cost Indices and Their Comparative Statics

The random matching assumption introduces average costs into the pricing decisions. To elaborate on implications, let marginal costs λ be distributed i.i.d. Pareto on $[0, \lambda^\star]$ with c.d.f. $G(\lambda) = \big(\lambda/\lambda_0\big)^k$, shape $k > \sigma - 1$, and scale $\lambda_0 > 0$. We denote average as:

$$\big(\tilde{\lambda}\big)^{1-\sigma} \;=\; \int_0^{\lambda^\star} \lambda^{1-\sigma}\, \mathrm{d}G(\lambda) \qquad (\sigma > 1).$$

Proposition 3. *Cost and Productivity Indices & Their Comparative Statics.*

1. ***Productivity equivalence.*** *With $\varphi \equiv 1/\lambda$ and $\tilde{\varphi}$ defined by $(\tilde{\varphi})^{\sigma-1} = \int_{1/\lambda^\star}^{\infty} \varphi^{\sigma-1}\, \mathrm{d}G_\varphi(\varphi)$, we have*

$$(\tilde{\lambda})^{1-\sigma} = (\tilde{\varphi})^{\sigma-1},$$

hence $(\tilde{\lambda})^{1-\sigma}$ is just like the Melitz CES productivity aggregate.

2. ***Comparative statics with fixed mass.*** *If the support expands to $\lambda^\star + \Delta$ while the total mass of intermediaries remains 1 (the density rescales), then*

$$\frac{\partial(\tilde{\lambda})^{1-\sigma}}{\partial\lambda^\star} = \frac{k}{k-\sigma+1}\big(\lambda^\star\big)^{k-\sigma} > 0, \qquad \frac{\partial\tilde{\lambda}}{\partial\lambda^\star} < 0.$$

Hence with a fixed number of varieties *the CES* cost level $\tilde{\lambda}$ *increases, and so do consumer prices, when the threshold cost rises.*

3. ***Comparative statics with free entry.*** *If instead every additional intermediary*

is admitted without rescaling the density (mass of varieties grows), then $(\tilde{\lambda})^{1-\sigma} \propto (\lambda^{\star})^{k-\sigma+1}$ *and* $\frac{\partial \tilde{\lambda}}{\partial \lambda^{\star}} < 0$*; the variety effect dominates and consumer prices fall.*

Proof. (i) Substitute $\lambda = 1/\varphi$ and $\mathrm{d}G_{\varphi}(\varphi) = k\,\lambda_0^k \varphi^{-k-1}\,\mathrm{d}\varphi$ to obtain

$$(\tilde{\lambda})^{1-\sigma} = \int_0^{\lambda^{\star}} \lambda^{1-\sigma} k \lambda_0^{-k} \lambda^{k-1}\,\mathrm{d}\lambda = \int_{1/\lambda^{\star}}^{\infty} \varphi^{\sigma-1} k \lambda_0^k \varphi^{-k-1}\,\mathrm{d}\varphi = (\tilde{\varphi})^{\sigma-1}.$$

(ii) When the total mass is fixed at 1, the new density is $g_{\text{new}}(\lambda) = k\lambda^{k-1}/(\lambda^{\star}+\Delta)^k$. Evaluating the integral yields $(\tilde{\lambda})^{1-\sigma} = \frac{k}{k-\sigma+1}(\lambda^{\star}+\Delta)^{1-\sigma}$, whose derivative is positive because $1-\sigma < 0$. Since $\tilde{\lambda} = \left[(\tilde{\lambda})^{1-\sigma}\right]^{1/(1-\sigma)}$ and $1/(1-\sigma) < 0$, the sign is reversed for $\tilde{\lambda}$ itself.

(iii) With a rising mass the original density remains and the upper limit increases, giving $(\tilde{\lambda})^{1-\sigma} = \frac{k}{k-\sigma+1}\lambda^{\star 1-\sigma}$, again with $1-\sigma < 0$, hence $\partial\tilde{\lambda}/\partial\lambda^{\star} < 0$. □

Interpretation. $(\tilde{\lambda})^{1-\sigma}$ is an *average productivity* (as in Melitz 2003); while $\tilde{\lambda}$ is the average cost level. Whether $\tilde{\lambda}$ rises or falls with a looser cost threshold hinges on the modeling assumption about variety mass. Our focus is on the short-term adjustment, as covered empirically; we thus maintain a fixed mass assumption.

A.5 Selection into Intermediated Export Markets

We now return to a food producer that maximizes profits, taking the intermediary's pricing structure into account. A food producer "sells" goods to an intermediary's at a price p_i^{pw} and can expect to reach foreign markets, delivering $q_{ij} = E_j P_j^{\sigma-1} \left(p_{ij}^{w}\right)^{-\sigma}$ units of goods. The variable profit function is given by:

$$\tilde{\pi}_{ij} = \left(p_i^{pw} - \lambda_i\right) E_j P_j^{\sigma-1} \left(p_{ij}^{w}\right)^{-\sigma},$$

and using random matching with the intermediary along with the optimal prices, we obtain:

$$\begin{aligned}
\tilde{\pi}_{ij} &= \left(\tfrac{\sigma}{\sigma-1}\lambda_i - \lambda_i\right) E_j P_j^{\sigma-1} \left(\tfrac{\sigma}{\sigma-1}\left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)\right)^{-\sigma} \\
&= \left(\tfrac{1}{\sigma-1}\right) \lambda_i E_j P_j^{\sigma-1} \left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)^{-\sigma} \left(\tfrac{\sigma}{\sigma-1}\right)^{-\sigma} \\
&= \tfrac{1}{\sigma}\left(\tfrac{\sigma}{\sigma-1}\right) \lambda_i E_j P_j^{\sigma-1} \left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)^{-\sigma} \left(\tfrac{\sigma}{\sigma-1}\right)^{-\sigma} \\
&= \tfrac{1}{\sigma}\lambda_i E_j P_j^{\sigma-1} \left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)^{-\sigma} \left(\tfrac{\sigma}{\sigma-1}\right)^{1-\sigma} \\
&= \tfrac{1}{\sigma} E_j P_j^{\sigma-1} \lambda_i^{1-\sigma} \left(\tfrac{\sigma}{\sigma-1} + \tfrac{\tau_{ij}\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} \left(\tfrac{\sigma}{\sigma-1}\right)^{1-\sigma} \\
&= \tfrac{1}{\sigma}\left(\tfrac{\sigma}{\sigma-1} + \tfrac{\tau_{ij}\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} \left(\tfrac{\sigma-1}{\sigma}\tfrac{1}{\lambda_i}P_j\right)^{\sigma-1} E_j \\
&= \tfrac{1}{\sigma}\left(\tfrac{\sigma}{\sigma-1} + \tfrac{\tau_{ij}\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} \tfrac{R_{ij}}{\tau_{ij}^{1-\sigma}}.
\end{aligned} \tag{A.4}$$

Therefore, the profit function is no longer simply a revenue function adjusted for the elasticity of substitution, but also accounts for the relative magnitude of the marginal costs of an average intermediary and a food producer capable of exporting indirectly, though not sufficiently cost-efficient to do so directly. This extension builds on the seminal work by Melitz (2003) and the ensuing literature by incorporating intermediation services.

If a food producer has to cover αf_{ij}, with $\alpha < 1$, in fixed costs to enter a market through an intermediary, then:

$$\begin{aligned}
\tfrac{1}{\sigma}\lambda_i E_j P_j^{\sigma-1} \left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)^{-\sigma} \left(\tfrac{\sigma}{\sigma-1}\right)^{1-\sigma} &\geq \alpha f_{ij} \\
\left(\tfrac{\sigma}{\sigma-1}\lambda_i^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\tilde{\lambda}_i^w \lambda_i^{-\frac{1}{\sigma}}\right)^{-\sigma} &\geq \alpha \tfrac{\sigma f_{ij}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}} \\
\left(\alpha \tfrac{\sigma f_{ij}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right)^{-1} &\geq \left(\tfrac{\sigma}{\sigma-1}\lambda_i^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\tilde{\lambda}_i^w \lambda_i^{-\frac{1}{\sigma}}\right)^{\sigma} \\
\left(\alpha \tfrac{\sigma f_{ij}\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right)^{-\frac{1}{\sigma}} &\geq \tfrac{\sigma}{\sigma-1}\lambda_i^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\tilde{\lambda}_i^w \lambda_i^{-\frac{1}{\sigma}} \\
\alpha^{-\frac{1}{\sigma}} \left(\tau_{ij}\lambda_i^\star\right)^{\frac{\sigma-1}{\sigma}} \geq \tfrac{\sigma}{\sigma-1}\lambda_i^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\tilde{\lambda}_i^w \lambda_i^{-\frac{1}{\sigma}} &= \left(\tfrac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right) \lambda_i^{-\frac{1}{\sigma}}.
\end{aligned}$$

For the sake of argument, let an intermediary operate at zero marginal costs, then (recalling that $\sigma > 1$):

$$\lambda_i^\star \leq \lambda_i \leq \alpha^{-\frac{1}{\sigma-1}} \left(\tfrac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} \tau_{ij}\lambda_i^\star,$$

implying that variable and relative fixed entry costs are bounded by the elasticity param-

eter, $\left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} > \tau_{ij}^{-1}\alpha^{\frac{1}{\sigma-1}}$ or $\tau_{ij}^{1-\sigma}\alpha < \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}$. Generally, however, there is a fixed-point problem where the food producer's marginal costs enter the intermediary's decision and the intermediary's marginal costs are featured in the food producer's problem:

$$\left(\frac{\sigma}{\sigma-1}\lambda_i + \tau_{ij}\tilde{\lambda}_i^w\right)\lambda_i^{-\frac{1}{\sigma}} \leq \alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}}$$
$$\lambda_i^{-\frac{1}{\sigma}} \leq \frac{\alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}}}{\frac{\sigma-1}{\sigma}p_{ij}^w\left(\lambda_i,\tilde{\lambda}_i^w\right)} \text{or } \lambda_i \geq \left[\frac{\frac{\sigma-1}{\sigma}p_{ij}^w\left(\lambda_i,\tilde{\lambda}_i^w\right)}{\alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}}}\right]^{\sigma}.$$

Since the intermediary's price is a function of the food producer's marginal costs, we can exploit the marginal producer just breaking even:

$$\alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}} = \frac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\tilde{\lambda}_i^w\left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}},$$

leading to

$$\alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}}\left[\frac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right) + \tau_{ij}\tilde{\lambda}_i^w\right]^{-1} = \left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}},$$
$$\alpha\left(\tau_{ij}\lambda_i^{\star}\right)^{1-\sigma}\left[\frac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right) + \tau_{ij}\tilde{\lambda}_i^w\right]^{\sigma} = \lambda_i^{pw\star} = f\left(\lambda_i^{pw\star}\right).$$

Making use of the threshold intermediary, we can solve a system of simultaneous equations. To ease notation, we will make parametric assumptions of marginal costs to be distributed as Pareto:

$$G\left(\lambda_i\right) = \left(\frac{\lambda_i}{\lambda_{i0}}\right)^{k_i},\ 0 \leq \lambda_i \leq \lambda_{i0},$$
$$\frac{dG(\lambda_i)}{d\lambda_i} \equiv g\left(\lambda_i\right) = k_i\lambda_i^{k_i-1}\lambda_{i0}^{-k_i}.$$

Using the threshold level of an intermediary, we can recover the average intermediary marginal cost:

$$\left(\tilde{\lambda}_i^w\right)^{1-\sigma} \equiv \int_0^{\lambda_i^{w\star}}\lambda_i^{1-\sigma}dG\left(\lambda_i\right) = \int_0^{\lambda_i^{w\star}}\lambda_i^{1-\sigma}k_i\lambda_i^{k_i-1}\lambda_{i0}^{-k_i}d\lambda_i$$
$$= k_i\lambda_{i0}^{-k_i}\int_0^{\lambda_i^{w\star}}\lambda_i^{k_i-\sigma}d\lambda_i = k_i\lambda_{i0}^{-k_i}\frac{\left(\lambda_i^{w\star}\right)^{k_i-\sigma+1}}{k_i-\sigma+1}$$
$$= \frac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\left(\lambda_i^{w\star}\right)^{k_i-\sigma+1}.$$

A regularity condition requires $k_i > \sigma - 1$. Substituting the threshold level:

$$\left(\tilde{\lambda}_i^w\right)^{1-\sigma} = \frac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\left(\lambda_i^{w\star}\right)^{k_i-\sigma+1} = \frac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\left(\left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}}\lambda_i^{\star} - \frac{\sigma}{\sigma-1}\frac{\tilde{\lambda}_i^{pw}}{\tau_{ij}}\right)^{k_i-\sigma+1}.$$

It follows that:

$$\begin{aligned}\alpha^{-\frac{1}{\sigma}}\left(\tau_{ij}\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}} &= \tfrac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\left(\tfrac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\right)^{\frac{1}{1-\sigma}}\left(\left(\tfrac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}}\lambda_i^{\star} - \tfrac{\sigma}{\sigma-1}\tfrac{\tilde{\lambda}_i^{pw}}{\tau_{ij}}\right)^{\frac{k_i-\sigma+1}{1-\sigma}}\left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}} \\ &= \tfrac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \tau_{ij}\left(\tfrac{k_i}{k_i-\sigma+1}\right)^{\frac{1}{1-\sigma}}\left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}}\left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}},\end{aligned}$$

where the last line follows if normalization $\lambda_{i0} = 1$ is applied.

Technically, the profit function of indirect exporters crosses zero twice. Let us denote the two roots as $\lambda_i^{pw\star}$ and $\lambda_i^{pw\star\star}$ (we denote $\lambda_i^{pw\star\star} < \lambda_i^{pw\star}$ for convenience). Focusing on the economically more relevant case where $\lambda_i^{pw\star\star} < \lambda^{\star} < \lambda_i^{pw\star}$, the applicable value of the producer using an intermediation sector is $\lambda_i^{pw\star}$ and makes zero profit of exporting. This value fixes the total exporting volume (indirectly and directly combined) among the distribution of producers and thus the Openness Index.

A.6 The Indifference Condition

A.6.1 Basic Intuition

To determine the relative shares of direct and indirect exporters, we introduce the indifference marginal cost $\lambda_i^{\star\star}$, where producers are indifferent between the two exporting modes – direct and via intermediation. Using the direct trader's profit function from equation (A.3) and indirect trader's profit function (A.4), we obtain:

$$\frac{1}{\sigma}R_{ij}\left(\lambda_i^{\star\star}\right) - f_{ij} - \frac{1}{\sigma}\left(\frac{\sigma}{\sigma-1} + \frac{\tau_{ij}\tilde{\lambda}_i^{w}}{\lambda_i^{\star\star}}\right)^{-\sigma}\frac{R_{ij}\left(\lambda_i^{\star\star}\right)}{\tau_{ij}^{1-\sigma}} + \alpha f_{ij} = 0. \tag{A.5}$$

The direct trade is preferred if

$$\frac{\left(1-\tau_{ij}^{\sigma-1}\left(\frac{\sigma}{\sigma-1}+\frac{\tau_{ij}\tilde{\lambda}_i^{w}}{\lambda_i}\right)^{-\sigma}\right)\times\left(\frac{\sigma}{\sigma-1}\tau_{ij}\lambda_i\right)^{1-\sigma}\frac{E_j}{P_j^{1-\sigma}}}{\sigma(1-\alpha)f_{ij}} \geq 1. \tag{A.6}$$

The model admits various configurations, although the economically more relevant case is when $\lambda_i^\star$ is lower than the indifference condition, implying that two profit functions intersect in the positive zone. Therefore, the marginal cost range for indirect exporting is $(\lambda_i^{\star\star}, \lambda_i^{pw\star})$, meaning that firms whose marginal costs fall in the region $(\lambda_i^\star, \lambda_i^{\star\star})$ would instead opt for direct rather than indirect exporting.

A.6.2 Derivation

A firm is indifferent at the marginal cost $\lambda_i^{\star\star}$ when its net profits under the two export modes are equal:

$$\tilde{\Pi}_{ij}\big(\lambda_i^{\star\star}\big) \;=\; \Pi_{ij}\big(\lambda_i^{\star\star}\big).$$

Direct exporting The consumer price is $p_{ij}^{\text{dir}} = m\tau_{ij}\lambda_i$ with $m = \sigma/(\sigma-1)$. Hence

$$R_{ij}(\lambda_i) = E_j P_j^{\sigma-1}\big(m\tau_{ij}\lambda_i\big)^{1-\sigma}, \quad \Pi_{ij}(\lambda_i) = \frac{1}{\sigma}R_{ij}(\lambda_i) - f_{ij}.$$

Indirect exporting With $p_{ij}^{pw} = m\lambda_i$ and $p_{ij}^{w} = m\big(m\lambda_i + \tau_{ij}\lambda_i^w\big)$, variable profit is

$$\tilde{\Pi}_{ij}(\lambda_i) = \frac{1}{\sigma}\, R_{ij}(\lambda_i)\, \tau_{ij}^{\sigma-1} \left(m + \tau_{ij}\tfrac{\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} - \alpha f_{ij}.$$

Indifference equation Setting $\tilde{\Pi}_{ij} = \Pi_{ij}$ and cancelling $R_{ij}(\lambda_i^{\star\star})$ gives

$$1 - \tau_{ij}^{\sigma-1}\left(m + \tau_{ij}\tfrac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\right)^{-\sigma} = (1-\alpha)\,\sigma\left(\tfrac{\lambda_i^{\star\star}}{\lambda_i^\star}\right)^{\sigma-1}, \tag{A.7}$$

where $\lambda_i^\star$ is the direct-export zero-profit cut-off.

A.6.3 Detailed Interpretation

Rewrite (A.7) by defining the *markup wedge:*

$$\Theta(\lambda_i) \equiv m + \tau_{ij}\,\frac{\tilde{\lambda}_i^w}{\lambda_i}, \qquad m \equiv \tfrac{\sigma}{\sigma-1}.$$

Using the revenue homogeneity $R_{ij}(\lambda_i) = \sigma f_{ij}\big(\lambda_i/\lambda_i^\star\big)^{1-\sigma}$ (from the direct cut-off condition $R_{ij}(\lambda_i^\star) = \sigma f_{ij}$), the indifference condition can be written in two equivalent forms:

$$1 - \tau_{ij}^{\sigma-1}\Theta(\lambda_i^{\star\star})^{-\sigma} = (1-\alpha)\,\sigma\left(\tfrac{\lambda_i^{\star\star}}{\lambda_i^\star}\right)^{\sigma-1} \tag{A.7$'$}$$

$$(1-\alpha)\,f_{ij} = \frac{R_{ij}(\lambda_i)}{\sigma}\,\Big[1 - \tau_{ij}^{\sigma-1}\Theta(\lambda_i)^{-\sigma}\Big].$$

These representations help with the intuitive explanation of the main forces. If we divide both sides by the direct trader's revenue and recall the indirect trader's variable profit $\tilde{\pi}_{ij}$, we can express the equality as:

$$\frac{(1-\alpha)\,f_{ij}}{R_{ij}(\lambda_i^{\star\star})/\sigma} = 1 - \frac{\tilde{\pi}_{ij}}{R_{ij}(\lambda_i^{\star\star})/\sigma}, \tag{A.8}$$

or

$$\frac{(1-\alpha)\,f_{ij}}{\pi_{ij}(\lambda_i^{\star\star})} = 1 - \frac{\tilde{\pi}_{ij}(\lambda_i^{\star\star})}{\pi_{ij}(\lambda_i^{\star\star})}, \tag{A.9}$$

where fixed-cost saving $(1-\alpha)f_{ij}$ expressed as a share of the direct exporter's variable profit is equated to the fractional loss in variable profit when switching from direct to indirect exporting. In other words, the condition therefore balances the gain from a lower fixed cost against the loss in unit margin due to double mark-ups and the extra iceberg factor on the intermediation leg.

A.7 Equilibrium System

We now summarize the system of cutoffs that determine the behavior of direct and indirect exporters, intermediaries, and feed into openness measures.

Equation	Endogenous solved for
$\lambda_i^\star = \Big[\dfrac{\sigma f_{ij}\big(m\tau_{ij}\big)^{\sigma-1}}{E_j P_j^{\sigma-1}}\Big]^{1/(1-\sigma)}$	$\lambda_i^\star$
$\lambda_i^{w\star} = \Big(\frac{f_{ij}}{f_{ij}^w}\Big)^{1/(\sigma-1)}\lambda_i^\star - \dfrac{m}{\tau_{ij}}\,\tilde{\lambda}_i^{pw}$	$\lambda_i^{w\star}$
$\alpha^{-1/\sigma}\big(\tau_{ij}\lambda_i^\star\big)^{(\sigma-1)/\sigma} = m\big(\lambda_i^{pw\star}\big)^{(\sigma-1)/\sigma} + \tau_{ij}\tilde{\lambda}_i^w\big(\lambda_i^{pw\star}\big)^{-1/\sigma}$	
$1-\tau_{ij}^{\sigma-1}\left(m+\tau_{ij}\dfrac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\right)^{-\sigma} \;=\; (1-\alpha)\,\sigma\left(\dfrac{\lambda_i^{\star\star}}{\lambda_i^\star}\right)^{\sigma-1}$	$\lambda_i^{\star\star}$
$\big(\tilde{\lambda}_i^w\big)^{1-\sigma} = \dfrac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\big(\lambda_i^{w\star}\big)^{k_i-\sigma+1}$	$\tilde{\lambda}_i^w$
$\big(\tilde{\lambda}_i^{pw}\big)^{1-\sigma} = \dfrac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\Big[\big(\lambda_i^{pw\star}\big)^{k_i-\sigma+1} - \big(\lambda_i^{\star\star}\big)^{k_i-\sigma+1}\Big]$	$\tilde{\lambda}_i^{pw}$

All six unknowns $\{\lambda_i^\star, \lambda_i^{w\star}, \lambda_i^{pw\star}, \lambda_i^{\star\star}, \tilde{\lambda}_i^w, \tilde{\lambda}_i^{pw}\}$ are uniquely pinned down provided $\tau_{ij}^{\sigma-1}\alpha < \big(\frac{\sigma-1}{\sigma}\big)^\sigma,\ k_i > \sigma-1$. There are four main equations – the last two follow from the former four after we apply Pareto parametrization. As can be inferred from the threshold productivity of exporters to the market j from the home country i, $\lambda_i^\star$, it is fully driven by the bilateral fixed and variable trade costs, f_{ij} and τ_{ij}, respectively, and destination country's j aggregate measures, capturing a general price index P_j and the market size (recall that E_j is the spending on all considered varieties in country j). As is usual, the preference structure is assumed to hold across all countries, and the elasticity of substitution across varieties is captured by a constant $\sigma > 1$. The imperfect substitutability between varieties is what gives rise to trade.

We can simplify the system by substituting expressions for $\tilde{\lambda}_i^w$ into $\lambda_i^{pw\star}$ and $\tilde{\lambda}_i^{pw}$ into $\lambda_i^{w\star}$. Since the direct export threshold is determined by the exogenous factors (from the firm's perspective):

$$\lambda_i^\star = \Phi_j f_{ij}^{\frac{1}{1-\sigma}}\tau_{ij}^{-1},$$

where $\Phi_j \equiv \left[\frac{\sigma\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}$, we end up modeling intermediation as a function of variable trade costs τ_{ij} (and fixed costs yet our focus is on the *relative* fixed costs).

A.8 Different Cases

We determine the range of marginal costs for which firms prefer indirect exporting under the amended pricing $p_{ij}^{pw} = m\lambda_i$ ($m = \sigma/(\sigma-1)$).

A.8.1 Case: $\tilde{\lambda}_i^w = 0$

When the average intermediary has zero marginal cost ($\tilde{\lambda}_i^w = 0$), $\Theta(\lambda) = m$ and the indifference equation (A.7)′ becomes

$$1 - \tau_{ij}^{\sigma-1} m^{-\sigma} = (1-\alpha)\,\sigma\left(\frac{\lambda_i^{\star\star}}{\lambda_i^{\star}}\right)^{\sigma-1}.$$

Solving for the indifference cut-off gives

$$\frac{\lambda_i^{\star\star}}{\lambda_i^{\star}} = \Big[\frac{1 - \tau_{ij}^{\sigma-1} m^{-\sigma}}{(1-\alpha)\sigma}\Big]^{1/(\sigma-1)}. \tag{C-1}$$

Direct and indirect zero-profit cut-offs With $\tilde{\lambda}_i^w = 0$ the system reduces to

$$\lambda_i^{\star} = \frac{E_j^{1/(\sigma-1)} P_j}{\sigma^{1/(\sigma-1)} f_{ij}^{1/(\sigma-1)}\, m\, \tau_{ij}}, \qquad \lambda_i^{pw\star} = \alpha^{-1/(\sigma-1)} m^{-\sigma/(\sigma-1)}\, \lambda_i^{\star}. \tag{C-2}$$

When does the intermediation layer exist? The ordering of the two cut-offs is

$$\lambda_i^{pw\star} \begin{cases} < \lambda_i^{\star} & \text{if } \alpha^{-1/(\sigma-1)} m^{-\sigma/(\sigma-1)} < 1, \\ \geq \lambda_i^{\star} & \text{otherwise.} \end{cases}$$

Because $m^{\sigma/(\sigma-1)} = (\sigma/(\sigma-1))^{\sigma/(\sigma-1)}$, this condition is the familiar bound $\alpha^{-(\sigma-1)^{-1}}\left(\frac{\sigma-1}{\sigma}\right)^{\sigma/(\sigma-1)} < 1$.

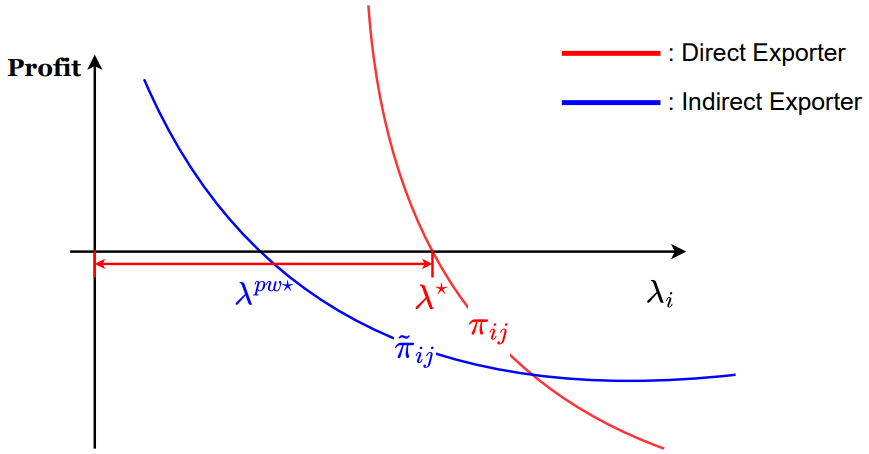


Figure A.1: Case: $\lambda^{pw\star} < \lambda^{\star}$

If $\lambda_i^{pw\star} < \lambda_i^{\star}$ the two profit curves meet below the zero line (Figure A.1); every surviving firm exports directly and the intermediation layer is empty. Otherwise they intersect in the positive-profit region and the range for indirect exporting is $[\lambda_i^{\star\star},\, \lambda_i^{pw\star}]$.

Share of indirect exporters From (C-1) and (C-2),

$$\frac{\lambda_i^{\star\star}}{\lambda_i^{pw\star}} = \Big[\frac{\alpha\, m^{\sigma}\left(1-\tau_{ij}^{\sigma-1}m^{-\sigma}\right)}{(1-\alpha)\sigma}\Big]^{1/(\sigma-1)}.$$

Hence

$$\text{Share} = 1 - X(\alpha)^{\,k/(\sigma-1)}, \qquad X(\alpha) \equiv \frac{\alpha\, m^{\sigma}\big(1-\tau_{ij}^{\sigma-1}m^{-\sigma}\big)}{(1-\alpha)\sigma}.$$

Differentiating,

$$\frac{d(\text{Share})}{d\alpha} = -\frac{k}{\sigma-1}\, X(\alpha)^{k/(\sigma-1)-1}\, \frac{1-\tau_{ij}^{\sigma-1}m^{-\sigma}+\alpha\big(\tau_{ij}^{\sigma-1}m^{-\sigma}-1\big)}{(1-\alpha)^2} \;<\; 0,$$

because $0<\alpha<1$ and $1-\tau_{ij}^{\sigma-1}m^{-\sigma}>0$ for all $\tau_{ij}>1$.

This mirrors the earlier monotonicity result but now the iceberg term $\tau_{ij}^{\sigma-1}$ enters explicitly.

A.8.2 Case: $\tilde{\lambda}_i^w \neq 0$

With positive intermediation sector costs the indirect zero-profit condition has two roots, so three mutually exclusive configurations remain:

1. $\lambda_i^\star > \lambda_i^{pw\star\star}$ – the intersection lies in the negative-profit region (Figure A.2); no firm chooses intermediation.

2. $\lambda_i^{pw\star} < \lambda_i^\star \leq \lambda_i^{pw\star\star}$ – indirect-export range $[\lambda_i^{\star\star}, \lambda_i^{pw\star\star}]$ (Figure A.4 left).

3. $\lambda_i^\star \leq \lambda_i^{pw\star}$ – indirect-export range $[\lambda_i^{pw\star}, \lambda_i^{pw\star\star}]$ (Figure A.4 right).

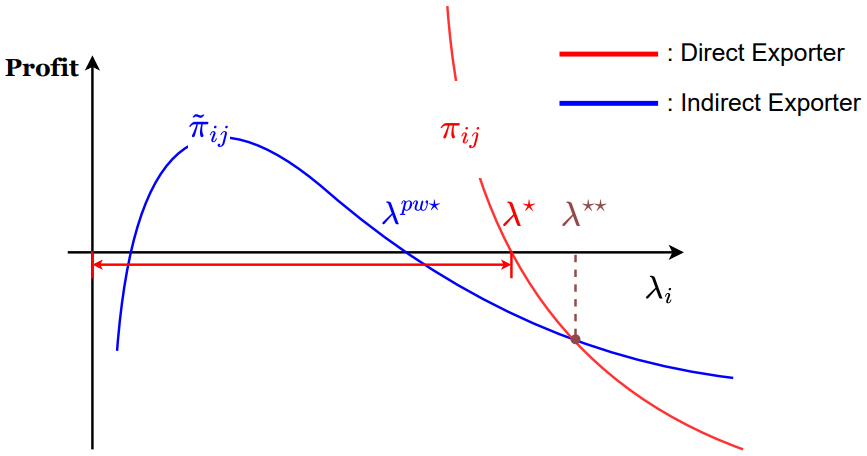


Figure A.2: Case 1: $\lambda_i^* > \lambda_i^{pw\star\star}$

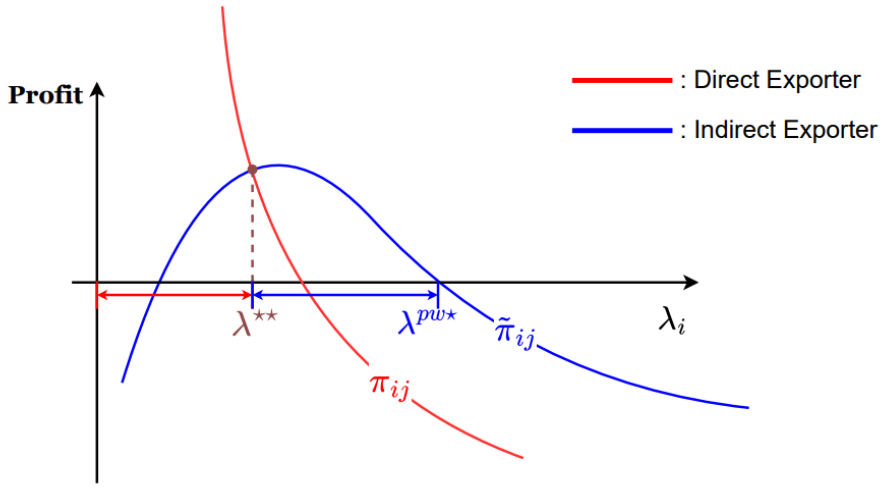


Figure A.3: Case 2: $\lambda_i^{pw*} < \lambda_i^* \leq \lambda_i^{pw**}$

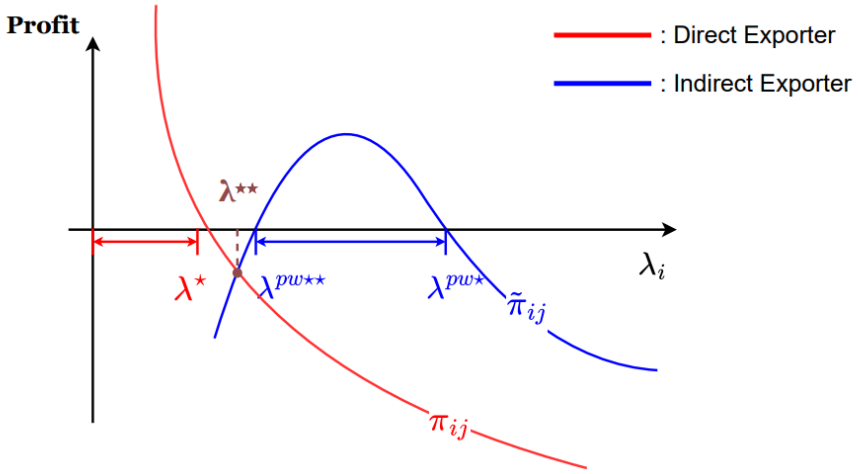


Figure A.4: Case 3: $\lambda_i^* \leq \lambda_i^{pw*}$

The boundary between $\lambda_i^{pw\star}$ and $\lambda_i^{\star}$ is determined by the transcendental condition

$$\alpha^{-1/\sigma}\left(\lambda_i^{\star}\right)^{(\sigma-1)/\sigma} = m\left(\lambda_i^{pw\star}\right)^{(\sigma-1)/\sigma} + \tilde{\lambda}_i^{w}\left(\lambda_i^{pw\star}\right)^{-1/\sigma},$$

for which closed-form roots generally do not exist but numerical evaluation is straightforward given parameter values.

Figures A.1–A.4 illustrate the three cases under the updated cost structure.

A.9 Elaboration on Equilibrium

The key relationships among manufacturing and wholesaling firms are described by the following system of equations:

Equation	Solves for
$\lambda_i^\star = \left[\frac{\sigma f_{ij}\left(\frac{\sigma}{\sigma-1}\tau_{ij}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}},$	$\lambda_i^\star$
$\lambda_i^{w\star} = \left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \lambda_i^\star - \frac{\sigma}{\sigma-1}\Psi_i^{\frac{1}{1-\sigma}}\left[(\lambda_i^{pw\star})^{k_i-\sigma+1} - (\lambda_i^{\star\star})^{k_i-\sigma+1}\right]^{\frac{1}{1-\sigma}},$	$\lambda_i^{w\star}$
$\alpha^{-\frac{1}{\sigma}}(\lambda_i^\star)^{\frac{\sigma-1}{\sigma}} = \frac{\sigma}{\sigma-1}(\lambda_i^{pw\star})^{\frac{\sigma-1}{\sigma}} + \Psi_i^{\frac{1}{1-\sigma}}(\lambda_i^{w\star})^{\frac{k_i-\sigma+1}{1-\sigma}}(\lambda_i^{pw\star})^{-\frac{1}{\sigma}},$	$\lambda_i^{pw\star}$
$1 - \left(\frac{\sigma}{\sigma-1} + \frac{\Psi_i^{\frac{1}{1-\sigma}}\left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}}}{\lambda_i^{\star\star}}\right)^{-\sigma} = (1-\alpha)\sigma\left(\frac{\lambda_i^{\star\star}}{\lambda_i^\star}\right)^{\sigma-1},$	$\lambda_i^{\star\star}$

There are four equations in four unknowns. As can be inferred from the threshold productivity of exporters to the market j from the home country i, $\lambda_i^\star$, it is fully driven by the bilateral fixed and variable trade costs, f_{ij} and τ_{ij}, respectively, and destination country's j aggregate measures, capturing a general price index P_j and the market size (recall that E_j is the spending on all considered varieties in country j). As is usual, the preference structure is assumed to hold across all countries, and the elasticity of substitution across varieties is captured by a constant $\sigma > 1$. The imperfect substitutability between varieties is what gives rise to trade.

We can simplify the system by substituting expressions for $\tilde{\lambda}_i^w$ into $\lambda_i^{pw\star}$ and $\tilde{\lambda}_i^{pw}$ into $\lambda_i^{w\star}$. Since the direct export threshold is determined by the exogenous factors (from the firm's perspective):

$$\lambda_i^\star = \Phi_j f_{ij}^{\frac{1}{1-\sigma}} \tau_{ij}^{-1},$$

where $\Phi_j \equiv \left[\frac{\sigma\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}$, we end up modeling intermediation as a function of exogenously

changing variable trade costs:

$$\lambda_i^{w\star} = \left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \Phi_j f_{ij}^{\frac{1}{1-\sigma}} \tau_{ij}^{-1} - \frac{\sigma}{\sigma-1} \Psi_i^{\frac{1}{1-\sigma}} \left[\left(\lambda_i^{pw\star\star}\right)^{k_i-\sigma+1} - \left(\lambda_i^{\star\star}\right)^{k_i-\sigma+1} \right]^{\frac{1}{1-\sigma}}, \quad \lambda_i^{w\star}$$

$$\alpha^{-\frac{1}{\sigma}} \left(\Phi_j f_{ij}^{\frac{1}{1-\sigma}} \tau_{ij}^{-1} \right)^{\frac{\sigma-1}{\sigma}} = \frac{\sigma}{\sigma-1} \left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \Psi_i^{\frac{1}{1-\sigma}} \left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}} \left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}}, \quad \lambda_i^{pw\star}$$

$$1 - \left(\frac{\sigma}{\sigma-1} + \frac{\Psi_i^{\frac{1}{1-\sigma}} \left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}}}{\lambda_i^{\star\star}} \right)^{-\sigma} = (1-\alpha)\sigma \left(\frac{\lambda_i^{\star\star}}{\Phi_j f_{ij}^{\frac{1}{1-\sigma}} \tau_{ij}^{-1}} \right)^{\sigma-1}, \quad \lambda_i^{\star\star}$$

This system of nonlinear equations has no closed-form solution, but we can invoke the implicit function theorem and also explore its behavior numerically (see Appendix for technical details).

A.9.1 Homogeneous Intermediation Sector

For the sake of transparency to see how relative fixed costs impact trade, let's assume that the intermediaries operate at zero marginal costs. We can express the system of equations as:

$$\lambda_i^{pw\star} = \left\{ \left(\frac{\left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \lambda_i^{\star} \cdot \frac{\sigma-1}{\sigma}}{\Psi_i^{\frac{1}{1-\sigma}}} \right)^{1-\sigma} + \left(\lambda_i^{\star\star}\right)^{k_i-\sigma+1} \right\}^{\frac{1}{k_i-\sigma+1}},$$

$$\lambda_i^{pw\star} = \left(\frac{\sigma-1}{\sigma} \alpha^{-\frac{1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \lambda_i^{\star},$$

$$\lambda_i^{\star\star} = \left[\frac{1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}}{(1-\alpha)\sigma} \right]^{\frac{1}{\sigma-1}} \lambda_i^{\star}.$$

In this case, the marginal costs for direct exporter is a function of parameters, equating the first and the second equation, while using the third equation in the first one. It is instructive to see that the indirect trader's marginal costs, the second equation, responds to the relative fixed costs as follows:

$$\frac{d\lambda_i^{pw\star}}{d\alpha} = -\frac{1}{\sigma-1} \left(\frac{\sigma-1}{\sigma} \right)^{\frac{\sigma}{\sigma-1}} \lambda_i^{\star} \alpha^{-\frac{\sigma}{\sigma-1}}$$

We used the fact that direct exporter's marginal costs are independent of α. Recall that

long-distance trade implies that $\lambda_i^\star$ is small (so that only a tiny portion of firms manage to trade directly). This implies that a change in relative fixed costs, *ceteris paribus*, is weaker the longer trade is. It also means that the larger the difference in relative fixed costs (a lower α), the stronger the effect.

A.9.2 Indifference Condition

A producer at $\lambda_i^{\star\star}$ is indifferent between modes when $\tilde{\Pi}_{ij}(\lambda_i^{\star\star}) = \Pi_{ij}(\lambda_i^{\star\star})$. Using $\Pi_{ij} = R_{ij}/\sigma - f_{ij}$ and $\tilde{\Pi}_{ij} = \left(\frac{\sigma}{\sigma-1} + \frac{\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} R_{ij}/\sigma - \alpha f_{ij}$, together with $R_{ij}(\lambda_i) = f_{ij}(\lambda_i/\lambda_i^\star)^{1-\sigma}$, yields (after simplification):

$$\left(1 - \left(\frac{\sigma}{\sigma-1} + \frac{\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma}\right) R_{ij} = (1-\alpha)\sigma f_{ij}.$$

To link this equation with λ_i^*, note that R_{ij} at λ_i^* by definition satisfies:

$$R_{ij}\left(\lambda_i^*\right) = f_{ij}.$$

Since

$$R_{ij} \propto \lambda_i^{1-\sigma},$$

it can be re-expressed as:

$$R_{ij} = f_{ij}\left(\frac{\lambda_i}{\lambda_i^*}\right)^{1-\sigma}.$$

Thus, the indifference condition becomes:

$$1 - \left(\frac{\sigma}{\sigma-1} + \frac{\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma} = (1-\alpha)\sigma\left(\frac{\lambda_i}{\lambda_i^*}\right)^{\sigma-1}.$$

To see the relationship in a more interpretable form for a generic firm, we can use the average and threshold marginal costs.

Direct-export revenue and profit

$$R_{ij}^{\text{dir}}(\lambda_i) = E_j P_j^{\sigma-1}\big(m\tau_{ij}\lambda_i\big)^{1-\sigma}, \qquad \Pi_{ij}(\lambda_i) = \frac{1}{\sigma}R_{ij}^{\text{dir}}(\lambda_i) - f_{ij},$$

where $m \equiv \sigma/(\sigma-1)$.

Indirect-export variable profit With $p_{ij}^{pw} = m\lambda_i$ and $p_{ij}^{w} = m\big(m\lambda_i + \tau_{ij}\lambda_i^w\big)$, variable profit is

$$\tilde{\Pi}_{ij}(\lambda_i) = \frac{1}{\sigma}\, R_{ij}^{\text{dir}}(\lambda_i)\, \tau_{ij}^{\sigma-1}\Big(m + \tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i}\Big)^{-\sigma} \;-\; \alpha f_{ij}.$$

Indifference cut-off Plugging the two profits into the indifference condition and cancelling common factors gives

$$1 - \tau_{ij}^{\sigma-1}\left(m + \tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\right)^{-\sigma} \;=\; (1-\alpha)\,\sigma\left(\frac{\lambda_i^{\star\star}}{\lambda_i^{\star}}\right)^{\sigma-1}, \tag{A.10}$$

where $\lambda_i^{\star}$ is the direct-export zero-profit cut-off derived earlier.

Direct trade is preferred whenever the left–hand side of (A.10), evaluated at a generic λ_i, is larger or equal to zero, i.e.,

$$\frac{\Big[1 - \tau_{ij}^{\sigma-1}\big(m + \tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i}\big)^{-\sigma}\Big]\,(m\tau_{ij}\lambda_i)^{1-\sigma}\,\dfrac{E_j}{P_j^{1-\sigma}}}{\sigma(1-\alpha)f_{ij}} \;\geq\; 1.$$

The system of equations that defines the equilibrium is provided below (also recall discussion in Section A.7).

Equilibrium system

Equation	Endogenous solved for
$\lambda_i^\star = \Big[\frac{\sigma f_{ij}\big(m\tau_{ij}\big)^{\sigma-1}}{E_j P_j^{\sigma-1}}\Big]^{1/(1-\sigma)}$	$\lambda_i^\star$
$\lambda_i^{w\star} = \Big(\frac{f_{ij}}{f_{ij}^w}\Big)^{1/(\sigma-1)}\lambda_i^\star - \frac{m}{\tau_{ij}}\,\tilde{\lambda}_i^{pw}$	$\lambda_i^{w\star}$
$\alpha^{-1/\sigma}\big(\lambda_i^\star\big)^{(\sigma-1)/\sigma} = m\big(\lambda_i^{pw\star}\big)^{(\sigma-1)/\sigma} + \tau_{ij}\tilde{\lambda}_i^w\big(\lambda_i^{pw\star}\big)^{-1/\sigma}$	$\lambda_i^{pw\star}$
$1-\tau_{ij}^{\sigma-1}\left(m+\tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\right)^{-\sigma} = (1-\alpha)\,\sigma\left(\frac{\lambda_i^{\star\star}}{\lambda_i^\star}\right)^{\sigma-1}$	$\lambda_i^{\star\star}$
$\big(\tilde{\lambda}_i^w\big)^{1-\sigma} = \frac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\big(\lambda_i^{w\star}\big)^{k_i-\sigma+1}$	$\tilde{\lambda}_i^w$
$\big(\tilde{\lambda}_i^{pw}\big)^{1-\sigma} = \frac{k_i\lambda_{i0}^{-k_i}}{k_i-\sigma+1}\Big[\big(\lambda_i^{pw\star}\big)^{k_i-\sigma+1} - \big(\lambda_i^{\star\star}\big)^{k_i-\sigma+1}\Big]$	$\tilde{\lambda}_i^{pw}$

All six unknowns $\{\lambda_i^\star, \lambda_i^{w\star}, \lambda_i^{pw\star}, \lambda_i^{\star\star}, \tilde{\lambda}_i^w, \tilde{\lambda}_i^{pw}\}$ are uniquely pinned down provided $\tau_{ij}^{\sigma-1}\alpha < \big(\frac{\sigma-1}{\sigma}\big)^\sigma,\ k_i > \sigma-1$.

B Stylized Numerical Exercises

Table B.1: Baseline Values for Numerical Exercises

Symbol	Value	Source
f_{ij}^w	10	Helps Replicate Ahn et al. (2011) to make an intermediary trade higher volumes than a direct trader
f_{ij}	1	Normalization
λ_0	5	Upper bound of marginal costs
E_j	20	Market size, controls the share of direct exporters
P_j	1	Normalization
k	3.849	Head et al. (2014), Benchmark (Top 1%)
σ	4	Bernard et al. (2003), Head et al. (2014), Simonovska and Waugh (2014), Melitz and Redding (2013)
k_s	$k-\sigma+1$	Definition
θ	$\big(\frac{\sigma}{\sigma-1}\big)^{\sigma-1}$	Definition
θ_2	$\frac{\sigma}{\sigma-1}$	Definition
θ_1	$\frac{\sigma}{\sigma-1}$	Definition
ξ	$\frac{k\lambda_0^{-k}}{k_s}$	Definition
ϕ	$\Big(\frac{\sigma f_{ij}\theta}{E_j P_j^{\sigma-1}}\Big)^{\frac{1}{1-\sigma}}$	Definition
τ_{ij}	$[1.1, 2.5]$	Range of values for most experiments
α	$[0.1, 0.99]$	Range of values for most experiments

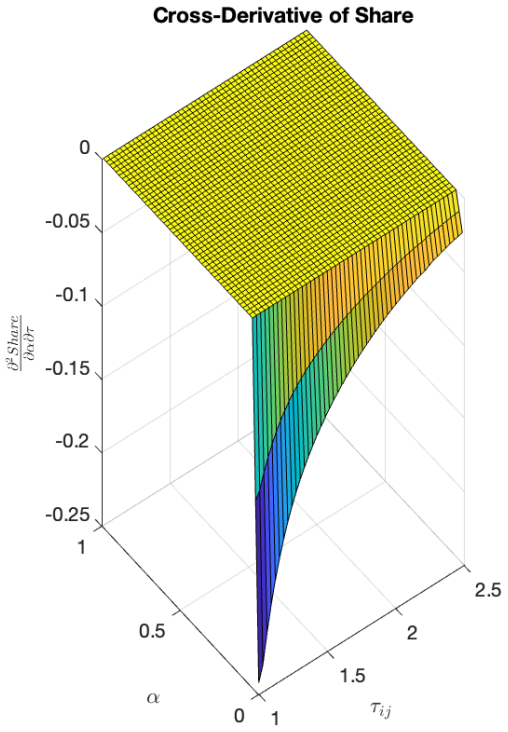


Figure B.1: The Stylized Function of the Share's Cross-Derivative

C Robustness: Theory Extension

This appendix derives the equilibrium conditions for the distributor (CIF) channel and establishes Testable Prediction 4.

C.1 Setup

Under the CIF assumption, the producer sells to the distributor at the factory gate at price $p_i^{pd} = m\lambda_i$, where $m \equiv \sigma/(\sigma-1)$. The distributor then incurs iceberg costs τ_{ij} to ship to market j and sets the final price:

$$p_{ij}^d = m\big(p_i^{pd} + \tau_{ij}\lambda_i^d\big) = m\big(m\lambda_i + \tau_{ij}\lambda_i^d\big).$$

Under random matching, we replace λ_i with the average $\tilde{\lambda}_i^{pd}$ among producers using distributors.

C.2 Distributor's Zero-Profit Condition

The distributor's operating profit from serving market j is:

$$\pi_{ij}^d = \frac{1}{\sigma} E_j P_j^{\sigma-1} \big(p_{ij}^d\big)^{1-\sigma} = \frac{1}{\sigma} E_j P_j^{\sigma-1} \big[m(m\tilde{\lambda}_i^{pd} + \tau_{ij}\lambda_i^d)\big]^{1-\sigma}.$$

The distributor breaks even when $\pi_{ij}^d = f_{ij}^d$, yielding:

$$\lambda_i^{d\star} = \Big(\frac{f_{ij}}{f_{ij}^d}\Big)^{1/(\sigma-1)} \lambda_i^\star - \frac{m}{\tau_{ij}} \tilde{\lambda}_i^{pd}. \tag{B.1}$$

C.3 Producer's Zero-Profit Condition (Indirect Exporting)

A producer using the distributor earns variable profit:

$$\tilde{\pi}_{ij} = \frac{1}{\sigma}\Big(m + \frac{\tilde{\lambda}_i^d}{\lambda_i}\Big)^{-\sigma} R_{ij},$$

where $R_{ij} = E_j P_j^{\sigma-1}(m\tau_{ij}\lambda_i)^{1-\sigma}$ is the hypothetical direct-export revenue. Setting $\tilde{\pi}_{ij} = \alpha f_{ij}$ and using $R_{ij}(\lambda_i^\star) = \sigma f_{ij}$, we obtain:

$$\alpha^{-1/\sigma}\big(\lambda_i^\star\big)^{(\sigma-1)/\sigma} = m\big(\lambda_i^{pd\star}\big)^{(\sigma-1)/\sigma} + \tilde{\lambda}_i^d\big(\lambda_i^{pd\star}\big)^{-1/\sigma}. \tag{B.2}$$

Key observation. Unlike the FOB/wholesaler case, τ_{ij} **does not appear on the left-hand side** of (B.2). The producer's zero-profit cutoff $\lambda_i^{pd\star}$ depends on τ_{ij} only indirectly through $\lambda_i^\star \propto \tau_{ij}^{-1}$.

C.4 Indifference Condition

Equating direct and indirect net profits at $\lambda_i^{\star\star}$:

$$\Pi_{ij}(\lambda_i^{\star\star}) = \tilde{\Pi}_{ij}(\lambda_i^{\star\star}).$$

Using $\Pi_{ij} = R_{ij}/\sigma - f_{ij}$ and $\tilde{\Pi}_{ij} = (m + \tilde{\lambda}_i^d/\lambda_i)^{-\sigma}R_{ij}/\sigma - \alpha f_{ij}$, with $R_{ij} = f_{ij}(\lambda_i/\lambda_i^\star)^{1-\sigma}$, we obtain:

$$1 - \Big(m + \frac{\tilde{\lambda}_i^d}{\lambda_i^{\star\star}}\Big)^{-\sigma} = (1-\alpha)\sigma\Big(\frac{\lambda_i^{\star\star}}{\lambda_i^\star}\Big)^{\sigma-1}. \tag{B.3}$$

Key observation. The term $\tau_{ij}^{\sigma-1}$ that multiplies the bracket in the FOB/wholesaler indifference condition is **absent** in (B.3).

C.5 Contrast: FOB vs. CIF Indifference Conditions

For reference, compare the two indifference conditions:

FOB (Wholesaler):

$$1 - \tau_{ij}^{\sigma-1}\Big(m + \tau_{ij}\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\Big)^{-\sigma} = (1-\alpha)\sigma\Big(\frac{\lambda_i^{\star\star}}{\lambda_i^\star}\Big)^{\sigma-1}.$$

CIF (Distributor):

$$1 - \Big(m + \frac{\tilde{\lambda}_i^d}{\lambda_i^{\star\star}}\Big)^{-\sigma} = (1-\alpha)\sigma\Big(\frac{\lambda_i^{\star\star}}{\lambda_i^{\star}}\Big)^{\sigma-1}.$$

The $\tau_{ij}^{\sigma-1}$ factor in the FOB case creates a wedge that is strongest at low τ_{ij}.

C.6 Equilibrium System

Combining with Pareto aggregation ($k_i > \sigma - 1$, $\lambda_{i0} = 1$):

$$\lambda_i^{d\star} = \big(\tfrac{f_{ij}}{f_{ij}^d}\big)^{1/(\sigma-1)}\lambda_i^{\star} - \tfrac{m}{\tau_{ij}}\tilde{\lambda}_i^{pd}$$

$$\alpha^{-1/\sigma}(\lambda_i^{\star})^{(\sigma-1)/\sigma} = m(\lambda_i^{pd\star})^{(\sigma-1)/\sigma} + \tilde{\lambda}_i^d(\lambda_i^{pd\star})^{-1/\sigma}$$

$$1 - (m + \tilde{\lambda}_i^d/\lambda_i^{\star\star})^{-\sigma} = (1-\alpha)\sigma(\lambda_i^{\star\star}/\lambda_i^{\star})^{\sigma-1}$$

$$(\tilde{\lambda}_i^d)^{1-\sigma} = \Psi_i(\lambda_i^{d\star})^{k_i-\sigma+1}, \quad \Psi_i \equiv k_i/(k_i-\sigma+1)$$

$$(\tilde{\lambda}_i^{pd})^{1-\sigma} = \Psi_i[(\lambda_i^{pd\star})^{k_i-\sigma+1} - (\lambda_i^{\star\star})^{k_i-\sigma+1}]$$

with feasibility condition $\alpha < \big(\frac{\sigma-1}{\sigma}\big)^{\sigma}$ (independent of τ_{ij}).

C.7 Proof of Testable Prediction 4

Define the intermediation share as:

$$S \equiv G(\lambda_i^{pd\star}) - G(\lambda_i^{\star\star}) = (\lambda_i^{pd\star})^{k_i} - (\lambda_i^{\star\star})^{k_i}.$$

Step 1: Recap of FOB result. From the main text, the FOB/wholesaler model yields:

$$\frac{\partial^2 S^{FOB}}{\partial\alpha\,\partial\tau_{ij}} < 0. \tag{B.4}$$

The $\tau_{ij}^{\sigma-1}$ factor in the indifference condition creates a wedge favoring indirect trade that is largest when τ_{ij} is low. A reduction in α therefore has the strongest effect at close destinations.

Step 2: CIF cross-partial. From (B.2) and (B.3), the only channel through which τ_{ij} affects $\partial S/\partial\alpha$ is via $\lambda_i^\star \propto \tau_{ij}^{-1}$. Differentiating (B.2):

$$\frac{\partial \lambda_i^{pd\star}}{\partial \alpha} \propto (\lambda_i^\star)^{(\sigma-1)/\sigma}.$$

Since $\lambda_i^\star$ is decreasing in τ_{ij}:

$$\frac{\partial}{\partial \tau_{ij}}\Big[(\lambda_i^\star)^{(\sigma-1)/\sigma}\Big] = \frac{\sigma-1}{\sigma}(\lambda_i^\star)^{-1/\sigma} \cdot \frac{\partial \lambda_i^\star}{\partial \tau_{ij}} < 0.$$

Higher τ_{ij} reduces $\lambda_i^\star$, which *reduces* the absolute magnitude of $\partial\lambda_i^{pd\star}/\partial\alpha$. However, higher τ_{ij} also shrinks the mass of potential direct exporters (since $\lambda_i^\star$ falls), making the reallocation margin more sensitive to changes in α.

The net effect is that higher τ_{ij} *amplifies* the effect of α on the intermediation share S because:

- The indifference cutoff $\lambda_i^{\star\star}$ moves closer to $\lambda_i^{pd\star}$ as τ_{ij} rises (fewer firms can profitably export directly).
- Changes in α therefore reallocate a larger fraction of the shrinking direct-exporter pool.

Hence:

$$\boxed{\frac{\partial^2 S^{CIF}}{\partial\alpha\,\partial\tau_{ij}} > 0.} \tag{B.5}$$

Summary. Equations (B.4) and (B.5) establish that the FOB/wholesaler and CIF/distributor channels deliver **opposite predictions** for how the effect of α varies with distance:

Channel	Cross-partial sign	Strongest effect at
FOB (Wholesaler)	$\partial^2 S/\partial\alpha\,\partial\tau < 0$	Close destinations
CIF (Distributor)	$\partial^2 S/\partial\alpha\,\partial\tau > 0$	Far destinations

This completes the proof of Testable Prediction 4. □

D Robustness Tests for Empirical Analysis



Figure C.1: Intermediation Sector Exports to All Destinations

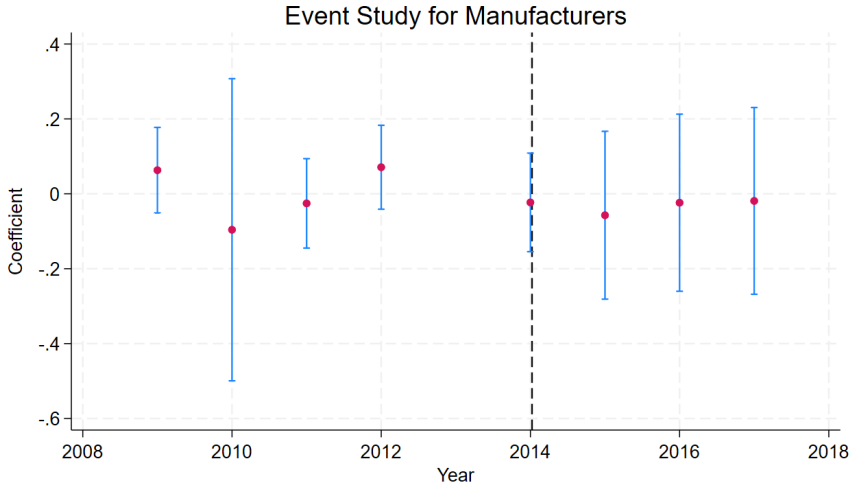


Figure C.2: Manufacturers Exports to All Destinations

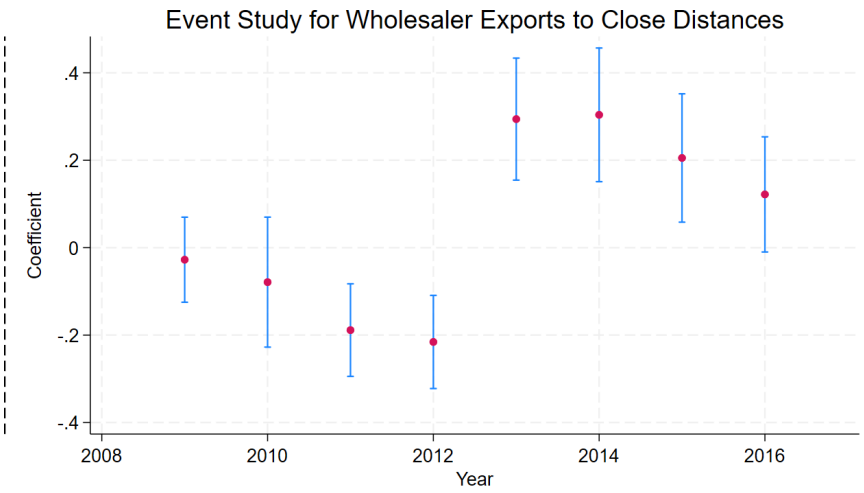


Figure C.3: Intermediation Sector Exports to Close Destinations

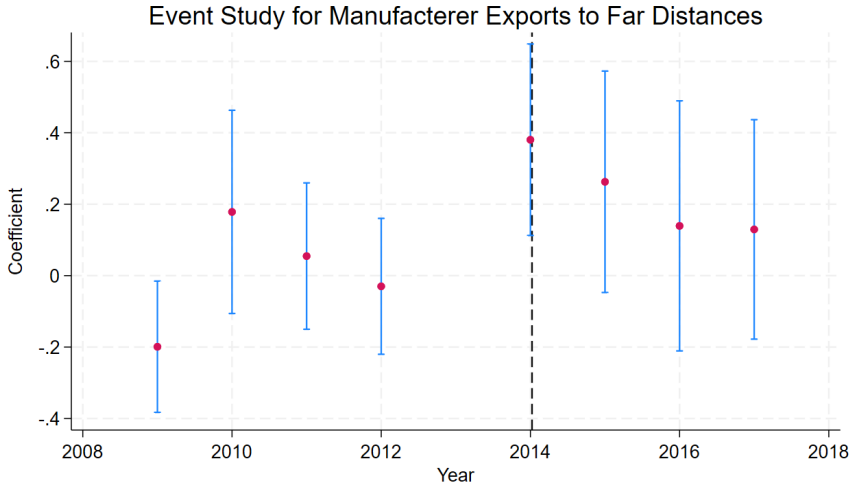


Figure C.4: Manufacturers Exports to Far Destinations

Table C.1: Intermediaries: Robustness to Distance Cut-Offs

	(1) Close	(2) Medium	(3) Far
Against Vote x Close x Banned Product x Post 2013	0.306***		
	(0.105)		
Against Vote x Medium x Banned Product x Post 2013			
Against Vote x Far x Banned Product x Post 2013			-0.102
			(0.206)
Constant	-1.189***	-1.101***	-1.101***
	(0.000)	(0.000)	(0.000)
R^2	0.701	0.701	0.701
N	890170	890170	890170

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian intermediaries firms over 2011-2017. We separately perform interactions at different distance levels, where Close refers to the countries within 2000 kilometers of Lithuania, Medium refers the countries within 2000-4000 kilometers of Lithuania, Far refers to the countries over 4000 kilometers from Lithuania. Against Vote refers to the countries that voted against, abstained or were absent from the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table C.2: Producers: Robustness to Distance Cut-Offs

	(1) Close	(2) Medium	(3) Far
In-favor Vote x Close x Banned Product x Post 2013	0.084		
	(0.084)		
In-favor Vote x Medium x Banned Product x Post 2013			
In-favor Vote x Far x Banned Product x Post 2013			0.363**
			(0.159)
Constant	-1.025***	-0.947***	-0.950***
	(0.008)	(0.000)	(0.001)
R^2	0.708	0.708	0.709
N	128340	128340	128340

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian food producer firms over 2011-2017. We separately perform interactions at different distance levels, where Close refers to the countries within 2000 kilometers of Lithuania, Medium refers the countries within 2000-4000 kilometers of Lithuania, Far refers to the countries over 4000 kilometers from Lithuania. In-Favor Vote refers to the countries that voted in favor of the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table C.3: Intermediaries: Poisson Pseudo-Maximum Likelihood Estimation

	(1) Close	(2) Medium	(3) Far
Against Vote x Close x Banned Product x Post 2013	0.704***		
	(0.193)		
Against Vote x Medium x Banned Product x Post 2013		1.648*	
		(0.969)	
Against Vote x Far x Banned Product x Post 2013			0.129
			(0.327)
Constant	7.913***	7.916***	7.918***
	(0.002)	(0.002)	(0.001)
R^2			
N	798273	798273	798273

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian intermediaries firms over 2011-2017. Instead of OLS, we perform Poisson Pseudo-Maximum Likelihood Estimation. We separately perform interactions at different distance levels, where Close refers to the countries within 1000 kilometers of Lithuania, Medium refers the countries within 1000-3000 kilometers of Lithuania, Far refers to the countries over 3000 kilometers from Lithuania. Against Vote refers to the countries that voted against, abstained or were absent from the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the dollar value of exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table C.4: Producers: Poisson Pseudo-Maximum Likelihood Estimation

	(1) Close	(2) Medium	(3) Far
In-favor Vote x Close x Banned Product x Post 2013	-0.265**		
	(0.131)		
In-favor Vote x Medium x Banned Product x Post 2013		0.169	
		(0.171)	
In-favor Vote x Far x Banned Product x Post 2013			1.281***
			(0.411)
Constant	8.005***	7.941***	7.942***
	(0.021)	(0.022)	(0.007)
R^2			
N	96007	96007	96007

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian food producer firms over 2011-2017. Instead of OLS, we perform Poisson Pseudo-Maximum Likelihood Estimation. We separately perform interactions at different distance levels, where Close refers to the countries within 1000 kilometers of Lithuania, Medium refers the countries within 1000-3000 kilometers of Lithuania, Far refers to the countries over 3000 kilometers from Lithuania. In-Favor Vote refers to the countries that voted in favor of the UN General Assembly Resolution on the "territorial integrity of Ukraine in 2014. The panels are constructed at eight-digit HS code product, destination country, and year level. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.

Table C.5: Producers: Pew Research Center Survey

	(1) Time-Varying	(2) Diff in Extremes	(3) Change in Positive	(4) Change
Opinion x Far x Banned Product x Post 2013	-0.009**	-0.016**	-0.026**	-0.011**
	(0.005)	(0.007)	(0.011)	(0.004)
Constant	-0.685***	-0.686***	-0.744***	-0.744***
	(0.002)	(0.003)	(0.003)	(0.003)
R^2	0.795	0.795	0.769	0.769
N	32243	32243	43020	43020

Notes: This table shows the effect of the Russian ban on the exports of Lithuanian food producer firms over 2011-2017. We separately perform specifications for different measures of Opinion extracted from Pew Research Center Survey's "Overall opinion of Russia" question. In column (1), we use a time-varying measure of the difference between the number of respondents that have a favorable opinion of Russia minus those that have unfavorable opinion of Russia. In column (2), we focus on the difference between *very* favorable minus *very* unfavorable opinion. In column (3), we look at the change in the favorable opinion between 2015 and 2013. In column (4), we look at the change in the difference between favorable and unfavorable opinion between 2015 and 2013. A negative value for all these measures suggest a negative change in the opinion on Russia and corresponds to a similar interpretation as the *In-Favour* vote in Table 4. Far refers to the countries over 3000 kilometers from Lithuania. The dependent variable is the log exports to a particular destination country of a particular product in a particular year. All specifications include country-year, product-year and country-product fixed effects. ***, **, and * refer to the statistical significance at 1%, 5%, and 10%, respectively.