Intermediaries in International Trade: Managing Sanctions and Geoeconomic Fragmentation*

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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 market 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

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1 Introduction

Intermediaries play an important role in international trade by facilitating trade of manufacturing firms with intermediate productivity levels. Wholesalers[1] 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 that differ between politically-aligned and misaligned countries and that induces a rationale of intermediation.

That exporting to politically misaligned countries gives rise to reputational costs has become even more salient with the recent calls for exporters to exit Russian market (Sonnenfeld et al. 2022). Meanwhile, firms exposed to geopolitical risks often engage in their circumvention by indirect exports via third countries (see, e.g., Haidar (2017), Chupilkin et al. (2023), or Bove et al. (2023)). At the same time, the geoeconomic fragmentation that increases the risk of exporting to politically misaligned countries also reduces the risk of exporting to the aligned markets, not least because of export market-specific industry support measures. In this paper, we introduce the sanctions and geoeconomic fragmentation into the wholesaler's technology and document theoretically and empirically that intermediation plays a nuanced role of balancing the reduced relative fixed costs of entering less friendly markets and the avoidance of "reputational" costs for manufacturing firms if they circumvent the sanctions.

To illustrate our mechanism we build a model with heterogeneous firms either engaging in production, or in the wholesale 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 wholesaler services. The coexistence of heterogeneous producers and wholesalers creates a need for matching. Random matching generates "double-

[1] We interchangeably refer to intermediaries as wholesalers.

marginalization", i.e., a wholesaler's price includes producer's and wholesaler's margins. A change in trade costs impacts direct exporters as per the "Melitz selection effect". In addition, intermediaries are affected by how producers perform. For instance, higher trade costs require direct exporters and wholesalers to be more productive. But due to double marginalization a lower average wholesaler's cost reduces the final price and increases the likelihood of exporting indirectly. This further facilitates indirect exports for lower-productivity producers.

At the center of our mechanism are the *relative* fixed costs of trade. Although fixed costs have no impact on the intensive margin of trade (Chaney 2008), here we focus on the *relative* fixed export costs between two sectors 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. Interestingly, this change in composition is influenced by the level of variable trade costs.

In providing the empirical support, we take the case of Lithuanian food producers that lost access to a major export market in 2014.[2] 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. We argue that this Russian export ban in August, 2014 drastically increased the "reputational cost" of direct exporting to politically-misaligned countries. We see this as a rise in fixed exporting cost for producers, since reputation is independent of the trade size. At the same time, fixed cost of exporting to the politically-aligned countries might have gone down or stayed constant. Thus, this event can be seen as a relative fixed trade cost shock for firms in both direct and intermediaries' sectors, affecting them in the opposite directions.

We consider that fixed costs differ between producers (direct exporters) and interme-

[2]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. Russia retaliated by issuing the import ban.

diaries (indirect exporters) when exporting to politically-misaligned countries. This could be the case for a few reasons. First, we consider reputational costs of serving politically-misaligned countries directly due to their potential 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. However, 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 wholesaler itself since it is typically unbranded to final consumers in the domestic market. Second, 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.[3] Operating in these friendly foreign markets might also be less risky with respect to any future trade restrictions.

These factors change the relative fixed costs of exporting to two types of countries across the two sectors – one of the key parameters in our theoretical model. To consider these fixed costs of exporting to politically-misaligned countries, we use the voting stance of countries in the UN General Assembly regarding the territorial integrity of Ukraine.[4] At the same time, the loss of a geographically close export market also raises average variable export costs, another key model parameter, that in line with the prior literature, we proxy by the distance from Lithuania.

In a difference-in-differences empirical analysis applied to Lithuanian food producers and intermediaries over 2008-2017, we find that the value of exports using intermediaries increased to the countries that were located closer to Lithuania, but decreased to the countries that were located further away from Lithuania. As for the directly exporting producers, we see a decrease to closer countries but an increase to further away countries. This stands in

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

[4] 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.

contrast with traditional trade theories on intermediation that find it particularly advantageous in reaching further (more costly) trade destinations.

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.

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 various variable and relative fixed costs 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 at least two major strands of literature in the field of international trade. 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 wholesalers, 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 wholesaler and does not consider variable costs as a source of variation in the indirect trade share, Crozet et al. (2013) assumes zero wholesaler'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. However, 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 wholesaler's costs. This interaction produces an endogenous feedback loop from producers to the intermediation sector, impacting not only the share of direct and indirect trade but the overall openness and thus the marginal producer using indirect trade responds to changes in the wholesaler's sector.

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

Second, by analysing 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, analysing the effects of tariff changes, e.g., Benguria and Saffie (2024) and Fajgelbaum et al. (2024)) by studying a clean identification of the trade shock. The episode we analyse 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)), or documenting firm-level responses (e.g., Ahn and Ludema (2020), Crozet et al. (2021), Nigmatulina (2022), 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)).

Finally, we add some evidence to the friend-shoring literature. Our findings stand in line with papers that estimate substantial cost of re-shoring or friend-shoring, such as Felbermayr et al. (2023), Grossman et al. (2023), Alfaro and Chor (2023), Javorcik et al. (2024). We add to the evidence of friend-shoring being rather costly to producers, while intermediators providing an alternative mechanism for the cost circumvention.

2 Theoretical Framework

2.1 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 food variety originating from country i consumed in country j, and $\sigma > 1$ is the elasticity of substitution between varieties.[5] The optimal demand for variety from country i in country j is:

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

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 from country i 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 to country j. The optimal pricing strategy results in:

[5] To simplify notation, we suppress the variety index and refer to variety i having in mind ω_i in $q_{ij}(\omega_i)$, where $\omega_i \in [0, 1]$, thus implicitly assuming a unit mass of continuum varieties in each economy and a standard one-to-one mapping between producers and varieties.

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

with export revenues given by:

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

2.2 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:

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

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 elasticity of a change in variable trade costs is (negative) unitary, while the elasticity of fixed costs is $1/\left(1-\sigma\right) < 0$. This means that a higher elasticity of substitution ($\sigma > 2$) leads to a lower pass-through from fixed costs to threshold marginal costs. According to Boehm et al. (2023), even the long-run elasticity can approach 2, implying a higher sensitivity of threshold marginal costs to changes in fixed costs than in variable costs.[6]

[6]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 $\frac{d \ln \lambda^{\star}}{d \ln \tau} = -1$.

2.3 Intermediaries' Problem

We now introduce an intermediation sector, allowing food producers to access foreign markets through wholesalers, which provide services that reduce the fixed costs of exporting for food producers. The operating profit function for a wholesaler 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 wholesaler, λ_{i}^{w} is the marginal cost of the wholesaler, and p_{ij}^{pw} is the price the food producer charges the wholesaler. The optimal pricing strategy for the wholesaler is given by:

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

Assuming random matching between intermediaries and producers,[7] we introduce an (inverse) average marginal productivity of a producer that uses intermediation services, $\tilde{\lambda}_{i}^{pw}$, and charges a price $p_{ij}^{pw}\left(\tilde{\lambda}_{i}^{pw}\right) = \frac{\sigma}{\sigma-1}\tau_{ij}\tilde{\lambda}_{i}^{pw}$. Then, the price set by the wholesaler becomes:

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

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

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

[7] Given the empirical limitation of observing firm-level transactions, we do not explicitly model the formation of links between food producers and wholesalers. Instead, we adopt a "random matching" assumption, where each manufacturer has an equal probability of pairing with an existing intermediary. This approach can be justified by assuming informational frictions that prevent assortative or other forms of strategic matching. For example, producers might only learn about a wholesaler'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 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 wholesaler, whose productivity adapts to sectoral dynamics, in line with the goal of this paper to understand the sector interactions between producers and intermediaries.

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

This ensures that the wholesaler's marginal costs are below the direct exporting marginal costs after adjusting for the difference in fixed costs.

2.4 Selection into Intermediated Export Markets

2.4.1 Feedback Loop: Intermediation and Food Sectors

We now introduce a novel feature of 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:

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

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: reaching a foreign market by saving on direct market access costs but facing lower demand due to a higher final price arising due to a wholesaler's service of "processing" a good (e.g., relabeling, shipping, selling efforts).

For intermediation to be viable, the inequality:

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

must hold, placing a restriction on the elasticity of substitution and the relative fixed costs

α (see further discussion in Online Appendix, Sections A.4 and A.6). We obtain a case where the intermediation sector reacts to changes in the production sector, leading to an equilibrium where marginal costs adjust based on the interaction between the two sectors.

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 could change due to reputational reasons that are pertinent to the producer and are not related to wholesaler's fixed foreign market entry costs.

2.4.2 Closed-Form Cutoffs for Wholesaler and Indirect Exporter

Making use of the zero-profit wholesaler, 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 wholesaler's zero-profit level, we can recover an average wholesale marginal cost:

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

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:

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

where $\lambda_i^{w\star}$ is the cutoff marginal cost of wholesaler's participation in trade, and where we applied the normalization $\lambda_{i0} = 1$ (see Online Appendix A, Section A.4). 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 another 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 higher fixed costs, f_{ij}, or a rise in variable trade costs, τ_{ij}. That leads to a decrease in $\lambda_i^{\star}$, resulting in lower direct trade. This effect also impacts the intermediation sector. The equality of (2) pins down the marginal wholesaler. A drop in direct traders' marginal costs, ceteris paribus, reduces wholesalers' marginal costs. That means that wholesalers become more efficient and, hence, share the "competitive pressure". 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 wholesalers) remains unaffected. The full adjustment mechanism entails higher-order effects when the wholesaler 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}, leads to a rise in the proportion of indirect exporting.

2.4.3 Relative Fixed Costs of Indirect Exporting

As fixed costs have been covered extensively in the literature with and without intermediaries (Ahn et al. 2011, Akerman 2018, Chaney 2008, Crozet et al. 2013, among others), we focus on

α. When α changes – but not f_{ij} – direct trader's zero-profit margin is unaffected. However, it impacts $\lambda_i^{\star\star}$ *and* $\tilde{\lambda}_i^w$. 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 trading firms.

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 Appendix B for the assumed baseline values). We display it in Figure 1.

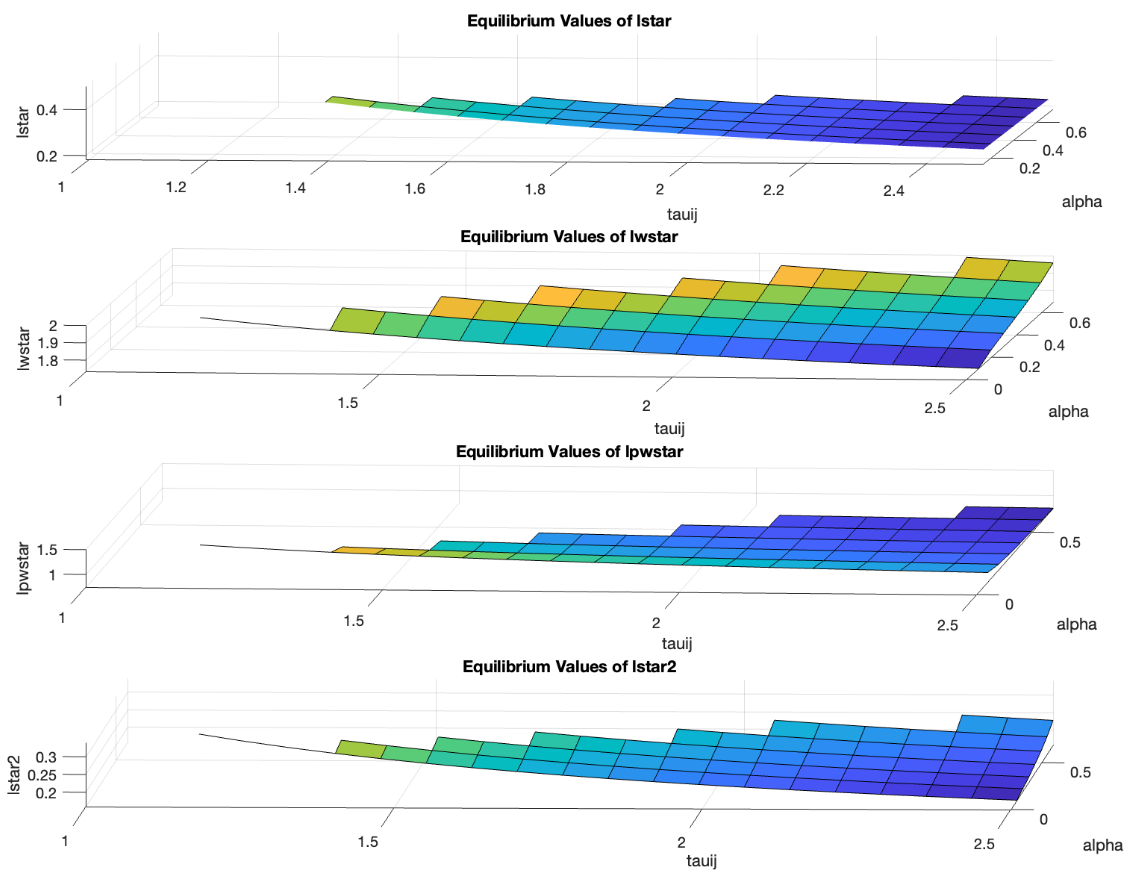

Figure 1: Zero-profit and indifference marginal costs as functions of variable trade costs τ and relative indirect trade fixed costs α

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 a wholesaler 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. This higher sensitivity to variable trade costs when it is cheap to access foreign markets indirectly stems from the feedback loop mechanism.[8] 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 Panel 3 of Figure 1.

Proposition 1. *The threshold marginal cost for zero-profit indirect exporting, denoted by* $\lambda_i^{pw\star}$*, exhibits a negative relationship with the relative (direct vs. indirect) fixed costs* α*.*

Specifically, 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. Conversely, when α is high, indicating that the intermediary offers little to no cost savings on fixed market entry, the threshold $\lambda_i^{pw\star}$ decreases, thus requiring producers to have lower marginal costs to achieve zero profit when using intermediation services. 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.[9]

[8]The intriguing result is that a wholesale 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.

[9]Furthermore, Figure 1 makes it clear 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 a wholesaler and making zero profit, i.e., $\lambda_i^{pw\star}$ reacts relatively little to higher variable trade costs, whereas a marginal direct-indirect trade producer, namely $\lambda_i^{\star\star}$, declines way more steeply. That implies that the reallocation happens more actively by switching direct and indirect exporting modes rather than by becoming a purely domestically oriented business.

3 Mechanisms and Empirical Takeaways

We provide the main implications of the full model in Online Appendix A, Section A.7. Instead of going through technicalities, we graphically analyze 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 Graphical Analysis

To determine the overall openness and the relative shares of direct and indirect exporters, we introduce the indifference marginal cost $\lambda_i^{\star\star}$, at which producers are indifferent between the two exporting modes – direct and via intermediation. At this $\lambda_i^{\star\star}$ threshold, the fixed-cost savings of intermediation balance out the higher marginal cost. Consequently, firms with marginal costs below $\lambda_i^{\star\star}$ choose direct exporting, while those above $\lambda_i^{\star\star}$ prefer wholesaler-based intermediation.

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

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

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

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).

Claim 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 $\lambda_i^{pw\star}$ (refer to the equation (4)), when we simplify the wholesale (intermediation) sector by assuming zero marginal costs. Then, $\lambda_i^{pw\star}$ becomes an affine function of $\lambda_i^{\star}$.[10] For the visual illustration, please refer to the upper panel of Figure 2. □

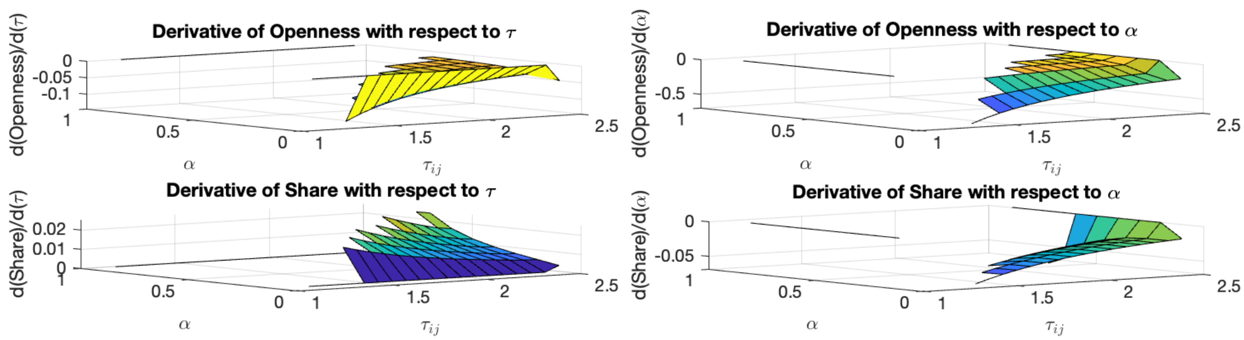

Figure 2: Derivatives with respect to variable trade costs τ_{ij} and relative fixed costs α

In other words, the overall trade, pinned down by the less productive producer using the wholesale 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 fixed costs make it more difficult for less productive producers to engage in or maintain trade via intermediary, further reducing overall trade activity.

Proposition 2. *The share of indirect exporters decreases when the relative fixed costs α increase, and increases when the relative fixed costs α decrease. This effect is more pronounced when the variable trade costs are smaller (due to, e.g., smaller distance) for each given α.*

Proof. We use $\lambda_i^{pw\star}$ as defined in equation (4)) and $\lambda_i^{\star\star}$ as fully derived in the Online Appendix A. For a visual illustration, see bottom panel of Figure 2 and upper panel of Figure 3. □

[10] Online Appendix A, in particular, Sections A.6-A.7, derives the general case.

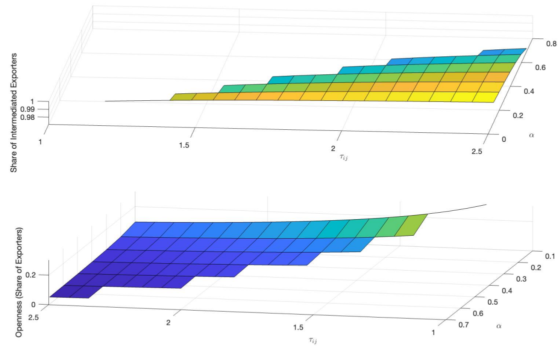

Figure 3: The Surfaces of Share of Intermediation (above) and Openness (below)

The intuition behind this result 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 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 via intermediaries. 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.

A change in α shifts the share index in two ways: the main effect comes from the shift of profit function of intermediated exporter: given trade costs τ, and ignoring the dynamics of the intermediation sector, an increase in α shifts the profit function of intermediated export downwards, making direct exporting more appealing ($\lambda^{\star\star}$ increases) and at the same time reducing overall openness ($\lambda^{pw\star}$). The indirect channel acts through the effect of α on the intermediation sector. As an indirect exporter becomes relatively more efficient, the wholesale intermediation sector can source goods at a lower cost ($\tilde{\lambda}^{pw\star}$) and become more profitable, thereby letting new intermediaries enter the market that previously found it prohibitively expensive to do so. Since that leads to higher intermediaries' marginal costs,

λ^w, a rise in $\lambda^{w\star}$ makes indirect exporting less competitive and further shifts the profit function of intermediaries downward, resulting in a lower share index. We summarize the mechanisms in the following claim.

Claim 2. *An increase in α affects the Share Index through two mechanisms:*

Direct Effect: an increase in relative fixed costs component α shifts the profit function of intermediated exporters downwards, making direct exporting more attractive (a higher $\lambda^{\star\star}$) and reducing overall openness (a lower $\lambda^{pw\star}$).

Indirect Effect: An increase in relative fixed costs α increases the cost efficiency of indirect exporters (fewer producers resort to indirect exporting), thus the intermediation sector can source goods at lower costs ($\tilde{\lambda}^{pw\star}$) and become more profitable. However, this allows for less productive intermediaries to survive, and by increasing $\lambda^{w\star}$, depresses average intermediation productivity and profitability, and leads to a lower indirect trade share index.

Proof. For a graphical representation refer to Figure 4. □

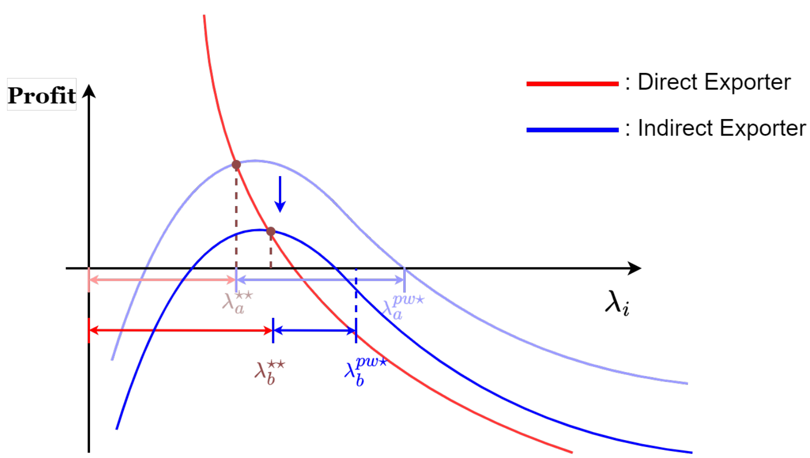

Figure 4: The Direct Channel: α Shifts

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 wholesalers' competitiveness. Specifically, when the cost of reaching a market through intermediaries increases, the average marginal cost of the remaining producers decreases. This decrease in average marginal cost incentivizes less cost-effective wholesalers to enter the market, thereby reinforcing the initial impact (intuitively, more competitive indirect exporters permit less productive wholesalers to enter the market, which contributes to less indirect exporting).

Conversely, in scenarios where it becomes relatively less costly (i.e., a lower α) for producers to access foreign markets and more producers opt for intermediaries, any increase in average producers' marginal costs prompts intermediaries to reallocate towards more cost-effective ones. This reallocation process reinforces the positive feedback loop mechanism, ultimately encouraging even more producers to resort 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 by making wholesalers' services more attractive. This effect is differs by variable costs of reaching the destination. Additionally, variable and fixed costs reinforce each other: when variable trade costs increase, more trade is routed through the intermediary, but this effect is further reinforced if relative fixed costs adjust. We will first explore how different export modes (direct vs. indirect) interact before diving into the latter interaction effect.

Testable Prediction 1. ***An increase in variable trade costs (τ) leads to a decrease in direct exporting and an increase in the share of indirect exporting via intermediaries.***

When variable trade costs τ increase (e.g., 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. 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.*

Hence, unlike the model with no intermediation, a negative trade shock impacting variable trade costs can actually translate into an increase in wholesaler trade. Intuitively, when the per-unit cost of exporting rises because of higher variable trade costs (τ), fewer firms can afford to export directly, leading to a decline in direct exports. Intermediaries help mitigate this effect by enabling less productive firms to export indirectly. The feedback loop means that as direct exporting becomes less viable, the intermediation sector adjusts by improving its cost efficiency (see equation (2)), which lowers the marginal costs of intermediaries and makes indirect exporting more efficient. Consequently, the share of indirect exports increases, as intermediaries facilitate continued trade despite higher costs.

Testable Prediction 2. ***A decrease in the relative fixed costs of indirect exporting (α) increases the share of indirect exporters, with the effect being more pronounced in markets with lower variable trade costs (τ).***

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 $\lambda_i^{\star\star}$ up, 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 significant reallocation from direct to indirect exporting.

When the relative fixed costs of indirect versus direct exporting α decrease, e.g., as when we will later assume reflecting differences in producer and intermediary reputation, strategic partnerships, and geoeconomic risks, the costs and risks for direct exporters relative to intermediaries increase, leading to a reduction in direct exporting. This additional effect operates through wholesale intermediaries: a more cost-effective producer allows for a larger share of intermediaries who previously did not make it profitable to operate, but this reduces the average cost-effectiveness of intermediaries. Consequently, prices in the foreign market rise, and the downward-sloping demand curve results in a lower quantity of goods sold abroad. This shift from direct to indirect exporting is illustrated by the transition from the equilibrium in Case 1 (Figure 5) to Case 2 (Figure 6).

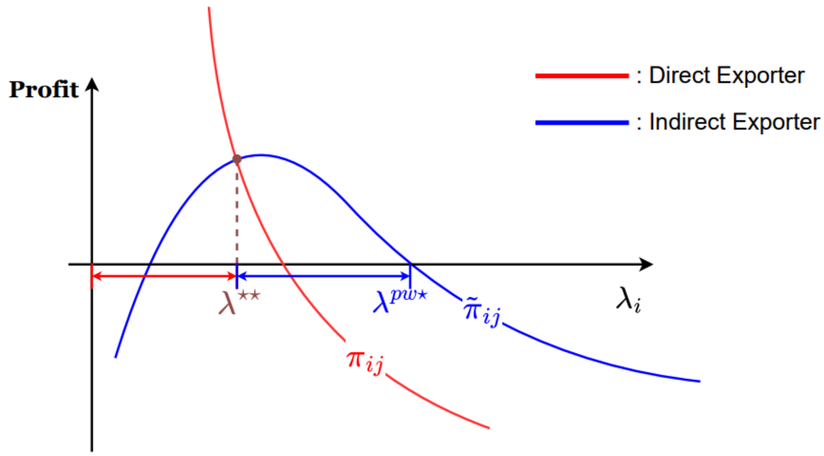

Figure 5: Case 1: Direct and Indirect Exporting

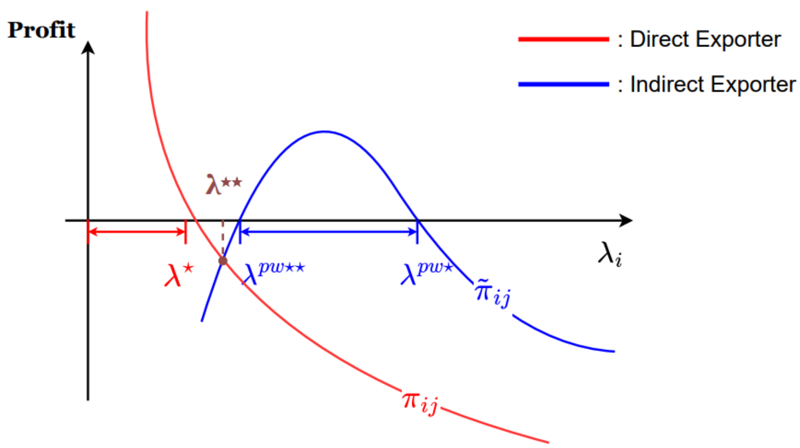

Figure 6: Case 2: Advantageous Indirect Exporting

Intuitively, when intermediaries become cheaper to use (lower α), firms find indirect exporting more cost-effective, and particularly so in closer markets with low variable trade costs (τ), where many firms previously exported directly due to lower costs. The reduction in relative fixed costs for indirect exporting encourages these firms to switch to using intermediaries. Therefore, intermediaries start covering markets that have become relatively riskier or more reputationally damaging for the producers to reach directly (a lower α case), as illustrated in Figures 5-6.[11]

Technically, this effect is more pronounced for low trade costs (closer) markets since sensitivity to changes in α is large for low τ cases. Through the feedback loop, as more firms use intermediaries, the average marginal cost of intermediaries adjusts (average is a transformation of equation (4)), reinforcing the attractiveness of indirect exporting (since the average producer becomes less productive, the surviving wholesaler becomes more productive). This leads to a noticeable shift from direct to indirect exporting in nearby markets.

Testable Prediction 3. ***An increase in the relative fixed costs of indirect exporting (α) decreases the share of indirect exporters, particularly in markets with higher variable trade costs (τ), leading to a reallocation toward direct exporting or market exit.***

As α increases, the fixed costs of indirect exporting (αf_{ij}) rise, making indirect exporting less attractive. This reduces the zero-profit threshold for indirect exporters $\lambda_i^{pw\star}$ (equation (4)), causing fewer firms to export indirectly. In high τ (distant) markets, where firms rely heavily on intermediaries, this leads to a decrease in indirect exports. Since a change reputation costs shifts the indifference condition, some firms shift towards direct trade, indirect exporting drops, and the share of direct trade increases.

Notice that this Prediction is not just an inverse of the Testable Prediction 2. This is because unlike a drop in relative fixed costs α, when potential indirect exporters (domestic producers close to the threshold to use a wholesaler) change their status into indirect exporters, an increase in α impacts current indirect exporters. Since high variable costs are associated with a higher share of intermediaries, the impact is stronger for a higher τ case.

[11] 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.

When α is larger, e.g., the savings on reputation, future geoeconomic fragmentation, and other risks are low using an intermediary, the profit of intermediated exporters decreases, making direct exporting more attractive and reducing overall trade openness. Additionally, a high α requires the efficiency of surviving indirect exporters to increase by lowering their average marginal costs thereby reducing the final price. However, as shown in Claim 1, this force attracts less productive intermediaries, resulting in higher wholesaler's marginal costs, thus, under a downward-sloping demand curve for producer's goods, depressing indirect trade share. In other words, increasing intermediation costs make indirect exporting less profitable (see Figure 4 and Figure 1).

In markets with high variable trade costs (τ), where indirect exporting was common, firms face a difficult choice. Some may attempt to switch to direct exporting despite higher per-unit costs, while others may stop exporting to those markets. The feedback loop means that as fewer firms use intermediaries, the average marginal cost in the intermediation sector may adjust unfavorably (equation (4)), further discouraging indirect exporting. This results in a decrease in the share of indirect exporters and a possible reallocation toward direct exporting or exit from the market, leading to a decline in trade in these markets.

Strictly speaking, when α increases, the threshold for direct exporters $\lambda_i^{\star}$ remains unaffected since it is independent of the fixed costs associated with using an intermediary (however, recall that what matters for the firm's choice is the indifference marginal costs $\lambda_i^{\star\star}$). Nevertheless, the increase in α makes indirect exporting less attractive, leading to a reallocation toward direct exporting. This shift is more pronounced when τ is low, as more firms are already inclined towards direct exporting; conversely, when τ is high, the shift is less noticeable because fewer firms are engaged in direct exporting from the start. The zero-profit marginal cost for producers using wholesalers, $\lambda_i^{pw\star}$, also decreases with higher α, but the reallocation effect is weaker in the context of higher τ, which constrains firms' ability to afford direct exporting.[12]

[12]Technically, the effect of α can be decomposed into a direct effect that shifts the profit function of the indirect exporting mode and an indirect effect that reinforces the former. A change in α is represented

If, however, variable trade costs τ decrease due to new strategic partnerships at the same time that α increases, direct exporting becomes significantly more attractive. The reduction in τ raises $\lambda_i^\star$, leading to a pronounced reallocation towards direct exporting. The combined effect of lower τ and higher α accelerates this shift as indirect exporting becomes increasingly less viable. Additionally, due to the feedback loop, the threshold $\lambda_i^{pw\star}$ for indirect exporters decreases with increasing α, reducing the number of firms that can survive via indirect exporting. Wholesalers face higher marginal costs, especially for high α, which makes them less competitive given the downward-sloping demand curve and resulting in higher final prices. Therefore, the decrease in τ intensifies this effect by further incentivizing direct exporting, and thus leading to a sharp decline in the share of indirect exporters and a substantial reallocation towards direct exporting.

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 the introduction of 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.

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by a vertical shift of the profit function in Figure 4. Assuming that the direct effect dominates, and the larger direct effect implies larger indirect effect, as well as that the impact on $\lambda^{\star\star}$ due to a change in α is of second-order and can be ignored, and, finally, that the curvature of the profit function of indirect exporting is (approximately) constant before and after the change, then we can take advantage of the local concavity of the profit function and conclude that the function is flatter around the peak value, and steeper the further away. This implies that a vertical shift in the profit function would have a more pronounced effect on the root $\lambda^{pw\star}$ the closer the peak profit is to zero. In other words, in a trade environment of little to no indirect exporting, the effect of α on intermediated trading is more pronounced. Finally, a low τ implies a lower pre-existing ratio of direct exporting and lays the ground for a more extreme "mean reversion" when a reduction in α makes the trade environment more favorable for intermediation.

4 Data and Institutional Details

We study the universe of Lithuanian firms over 2008-2017. 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-Ukraine conflict in February 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 these countries. The range of products subject to Russian import restrictions mainly included meats, 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 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

[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, that also list the sanctions against state-owned enterprises (Ahn and Ludema (2020), Nigmatulina (2022)) and banks (Mamonov et al. (2023)).

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, 11 countries voted against the resolution, 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 those creating reputational trade risk for Lithuanian producers; we call them *against-vote* countries. 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 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 rest of the countries to be *far*. In 2017, the share of exports to close countries dropped to 58% and the share of exports to far countries rose to 16%.

We document some initial data facts and observations. Figure 7 shows the overall dynam-

[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.

ics of banned and non-banned products by the two sectors of our interest: food production and intermediation. 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) have been more important than indirect exports (by intermediators). After the trade ban to Russia in 2014, however, the intermediation sector's role in exporting banned products has slightly increased.

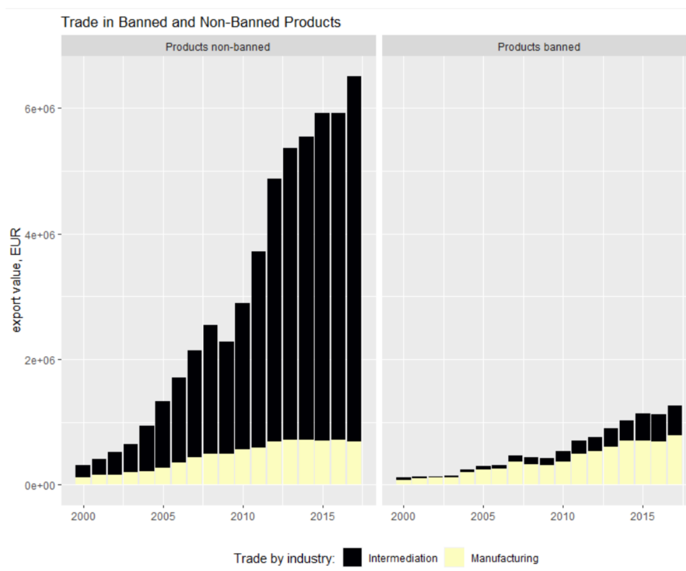

Figure 7: Trade in banned and non-banned products by sector

Figure 8 depicts the exports of banned products by distance to the destination and the two sectors of our interest: food production and intermediation. It shows that exports have 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 *far* markets seems to be the strongest.

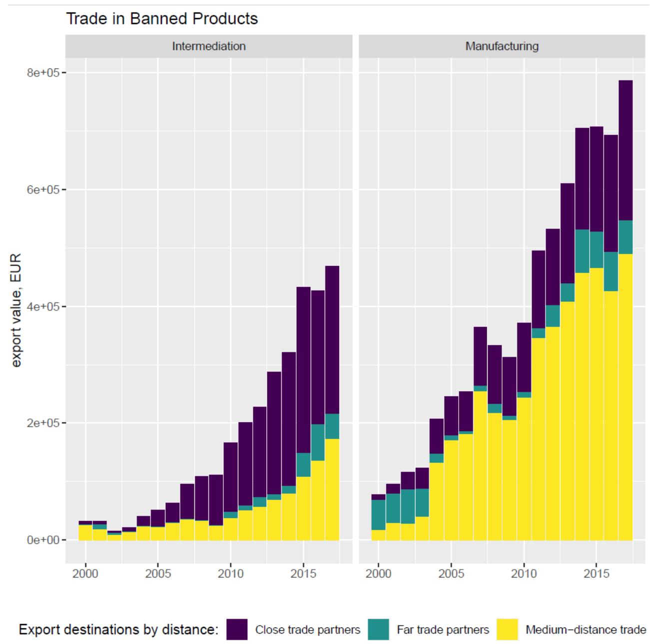

Figure 8: Trade in banned products by sector and distance to destination

Finally, Figure 9 depicts the exports of banned products by Lithuanian firms, depending on their sector, distance and the UN vote. The data reveal that the majority of trade in banned products for manufacturing and intermediation sectors is concentrated in the countries not carrying potential reputational cost. Intermediation sector appears to increase the trade in banned products to countries that carry potential reputational risk for producers (*against-vote* countries); besides, close-distance against-vote destinations are being served mostly by intermediation sector with direct exports by producers being absolutely negligible after 2014. Manufacturers start exporting banned products more directly to further away destinations after the Russian market closed in 2014. One of the most salient rises for these direct exports is to friendly (*in-favour vote*) markets if they are located further away.

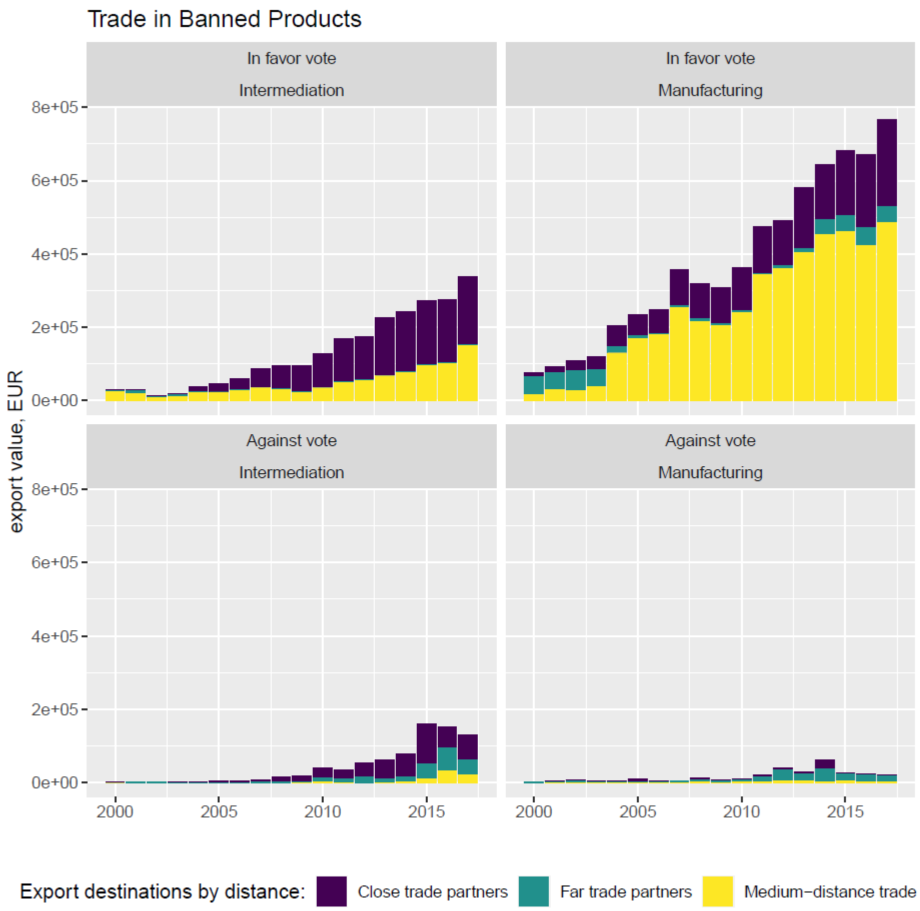

Figure 9: Trade in banned products by sector, distance and voting stance

In what follows, we construct the dataset at the product x sector x year x destination country level over 2008-2017 period. We define products at the eight digit HS-code level and assign all firms into two sectors: producers and intermediaries. 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.[19]

[19]This would also allow us to treat extensive and intensive margins effects consistently, as immediate changes on the extensive margin could be absorbed by firm fixed effects.

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 wholesalers 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.

To control for the general economic trends, we separately 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 1, we report the estimates from the following specifications that we estimate separately for intermediaries (column (1)) and producers (column (2)):

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

where k, c, t index eight-digit HS code product, destination country, and year, respectively. $Post_t$ indicates years after 2013. Parameter $\gamma_{k,c,t}$ represents various fixed effects: $\gamma_{c,t}$ that captures the time varying demand from a particular destination country or time-varying export costs to that country, and $\gamma_{k,c}$ that 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.

Our theoretical model predicts a general increase of exports via intermediaries and their particular increase to closer countries and those countries that could create reputational risk for the direct exporters. Indeed, Table 1 shows that wholesalers "gained" from the sanctions episode, as their trade increased despite the overall 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, consistent with the model's predictions.

Table 1: 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

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, following the approach of Kleinman et al. (2024). We estimate the following specification:

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

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 $\gamma_{k,c,t}$ also includes $\gamma_{k,t}$ 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

[20] In later Table 6, we combine wholesalers and intermediaries into one panel and confirm that wholesaler trade increased, relative to producers.

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 2.

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.

Table 2: 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

Next, we perform similar tests for producers. Similarly to intermediaries, we perform interactions between 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 3, we see the increase of exports by producers to further-away countries if those were politically aligned.

To summarize Tables 1-3, in line with *Testable Predictions 1-2*, 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 des-

Table 3: 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

tinations – the effect that disappears with an increasing distance. On the contrary, direct exports of banned products by producers tend to increase with distance after the shock, the effect mostly coming from exports to *far* politically aligned countries, in line with our *Testable Prediction 3*.

5.2 Linking Wholesalers and Producers: The Feedback Loop

Our model suggests the feedback loop, which implies that the wholesale 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 wholesalers. 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 wholesalers to countries that had voted against the resolution (thus, countries carrying reputation risk to Lithuanian producers).

In particular, we look at the change of banned product exports by wholesale sector to against-vote countries between the 2011-2013 period to 2015-2017 period, and estimate exports change 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, which saw a larger increase of wholesaler 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 that saw a lower increase of such wholesaler exports.

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

$$Y_{i,t} = \beta_1 Post_t + \beta_2 \Delta Wholesaler\ Exports\ to\ Against\text{-}Vote\ Countries_{k(i)} + \gamma_{i,t} + \epsilon_{i,t}, \quad (9)$$

where $k(i)$, i, t index eight-digit HS code product, firm, and year, respectively. $Post_t$ indicates years after 2013. $\gamma_{i,t}$ mean firm and year fixed effects. For each firm i, we pick the largest value of $\Delta Wholesaler\ Exports\ to\ Against\text{-}Vote\ Countries_k$ 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 4 shows that such negative effect on the sales and employees was mitigated for those firms that had products for which wholesalers increased exports to countries that had voted against the resolution, which is consistent with the feedback loop described in the theory model.

Table 4: Producers: Sales and Employees

	(1) Sales	(2) Employees
Δ Wholesaler 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

5.3 Robustness

We further provide a number of robustness tests for findings reported in Table 2 and Table 3. First, in the Online Appendix C, 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 only observe Germany and Poland and thus we are unable to replicate a statistically significant estimate reported in column (1) of Table 2 due to the lack of data on countries with non-positive vote. Yet, we are able to replicate the findings reported in column (3) of Table 3. 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 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

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

corresponds to a similar interpretation as the *in-favour* vote in Table 3. The findings in Table C.5 show qualitatively similar estimates as in Table 3.

Next, we control for the observed part of variable trade costs (proxied by the transport and insurance costs margins from OECD) 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 controls[24], we replicate our statistically significant findings from Table 2 and Table 3, and report them in Table 5. 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)). 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)).

Finally, we study the robustness tests in which we consider the intermediaries and producers in a single panel and estimate the following specifications:

[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.

Table 5: 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

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

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 $Wholesaler_w \times Banned\ Product_k \times Post_t$ is identified and the other variables get absorbed in the regression equation, and our specification becomes:

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

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 6. 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 6: Combined Panel

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

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 utilization 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 explanation for the deviation from the conventional international trade theory, in which producers use wholesalers solely for the purpose of distributing trade costs of exporting to a new destination. Indirect trade costs, such as potential negative impact on the reputation of a firm, break the linear relationship between the distance and fixed cost of exporting.

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 as well as relative market power of firms in manufacturing versus intermediation sectors.

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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:

$$\frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} - \sigma p_{ij} \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma-1} + \sigma \tau_{ij} \lambda_i \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma-1} = 0$$

$$\frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} \left(1 - \sigma + \sigma \tau_{ij} \lambda_i p_{ij}^{-1}\right) = 0$$

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

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

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:

$$\begin{aligned} \pi_{ij}(\lambda_i) &= p_{ij} q_{ij} - \tau_{ij} \lambda_i q_{ij} = (p_{ij} - \tau_{ij} \lambda_i) q_{ij} \\ &= \left(\frac{\sigma}{\sigma-1} \tau_{ij} \lambda_i - \tau_{ij} \lambda_i\right) q_{ij} = \left(\frac{1}{\sigma-1}\right) \tau_{ij} \lambda_i q_{ij} = \left(\frac{1}{\sigma-1}\right) \tau_{ij} \lambda_i \frac{E_j}{P_j^{1-\sigma}} p_{ij}^{-\sigma} \\ &= \left(\frac{1}{\sigma-1}\right)^{1-\sigma} (\tau_{ij} \lambda_i)^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}} \sigma^{-\sigma} = \sigma^{-1} \left(\frac{\sigma}{\sigma-1} \tau_{ij} \lambda_i\right)^{1-\sigma} \frac{E_j}{P_j^{1-\sigma}} = \frac{1}{\sigma} R_{ij}(\lambda_i). \end{aligned}$$

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:

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

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

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

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 Wholesalers' 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 wholesalers requires us to sketch a wholesaler's sector. We proceed using a backward induction strategy: first, we solve for the optimal wholesaler'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, wholesalers do not produce goods for sale but provide a service to food producers by selling goods abroad on their behalf. Wholesalers 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 a wholesaler, 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 wholesaler'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:

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

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

We therefore obtain:

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

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

The wholesaler's operating profit function becomes:

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

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

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

or,

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

The condition is effectively a marginal cost (and marginal revenue in equilibrium) of a wholesaler not exceeding direct exporting marginal costs, after having adjusted for fixed costs difference, i.e., $\lambda_i^{w}+\frac{\sigma}{\sigma-1}\tilde{\lambda}_i^{pw}\leq\left(\frac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}}\lambda_i^{\star}$. In other words, the wholesaler, 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 a wholesaler's sector perspective, a threshold value of direct exporting ($\lambda_i^{\star}$) can be thought of as given. The wholesaler who just breaks even is such that:

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

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

A.4 Selection into Intermediated Export Markets

We now return to a food producer that maximizes profits, taking the wholesaler's pricing structure into account. A food producer "sells" goods to a wholesaler at a price p_i 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:

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

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

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

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 wholesaler 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 a wholesaler, then:

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

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

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

implying that fixed entry costs are bounded by the elasticity parameter, $\left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} > \alpha^{\frac{1}{\sigma-1}}$ or $\alpha < \left(\frac{\sigma-1}{\sigma}\right)^{\sigma}$. Generally, however, there is a fixed-point problem where the food producer's marginal costs enter the wholesaler's decision and the wholesaler's marginal costs are featured in the food producer's problem:

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

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

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

$$\begin{aligned}\alpha^{-\frac{1}{\sigma}}\left(\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}}\left[\frac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right)+\tilde{\lambda}_i^{w}\right]^{-1} &= \left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}} \\ \alpha\left(\lambda_i^{\star}\right)^{1-\sigma}\left[\frac{\sigma}{\sigma-1}\left(\lambda_i^{pw\star}\right)+\tilde{\lambda}_i^{w}\right]^{\sigma} &= \lambda_i^{pw\star}=f\left(\lambda_i^{pw\star}\right)\end{aligned}.$$

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

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

Using the threshold level of a wholesaler, we can recover the average wholesale marginal cost:

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

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

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

It follows that:

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

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 only applicable value of the producer using a wholesale 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 or the Openness Index.

A.5 The Indifference Condition

A.5.1 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. Namely:

$$\frac{\left(1-\left(\frac{\sigma}{\sigma-1}+\frac{\tilde{\lambda}_i^w}{\lambda_i}\right)^{-\sigma}\right)\times\left(\frac{\sigma}{\sigma-1}\tau_{ij}\lambda_i\right)^{1-\sigma}\frac{E_j}{P_j^{1-\sigma}}}{\sigma(1-\alpha)f_{ij}}\geq 1. \tag{A.3}$$

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.

To gain more intuition, we can express the indifference condition in terms of the marginal and average costs, fixed costs, and the revenue function (refer to Appendix A.5):

$$\lambda_i^{\star\star}=\frac{(1-\alpha)f_{ij}}{\left(\frac{\sigma}{\sigma-1}+\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}\right)^{\sigma}R_{ij}}=\left(\frac{(1-\alpha)\,f_{ij}}{R_{ij}}\right)\times\left(\frac{\sigma\,\tilde{\pi}_{ij}}{R_{ij}}\right). \tag{A.4}$$

Intuitively, the savings on using the wholesaler in terms of the fixed costs compared to direct trade ($(1-\alpha)f_{ij}$) are weighted by a function that takes the elasticity of substitution, the ratio of the average wholesaler and the indifferent trading producer's marginal costs, and the revenue function into account. Alternatively, using the variable profit function when the producer uses a wholesaler, the indifference condition takes two ratios into account: the adjusted fixed costs of direct exporting relative to revenue and elasticity-scaled variable profits of using an intermediary relative to revenue.

A.5.2 Technical Details: Zero Profit Conditions

First, we observe that π_{ij} is a downward-sloping function, while $\tilde{\pi}_{ij}$ is an inverted U-shaped curve, with its peak determined by $\tilde{\lambda}_i^w$. Specifically, by taking the derivative and setting it to zero, we conclude that the function reaches its global maximum:

$$\tilde{\pi}_{ij}\left(\frac{\lambda_i^w}{\sigma}\right) = E_j \tau_{ij}^{1-\sigma} \frac{(\sigma-1)^{2\sigma-1}}{\sigma^{2\sigma+1}} \left(\frac{P_j}{\lambda_i^w}\right)^{\sigma-1} \geq \alpha f_{ij}.$$

at the argument value:

$$\lambda_i = \frac{\lambda_i^w}{\sigma}.$$

For the visual representation, refer to Figure A.1.

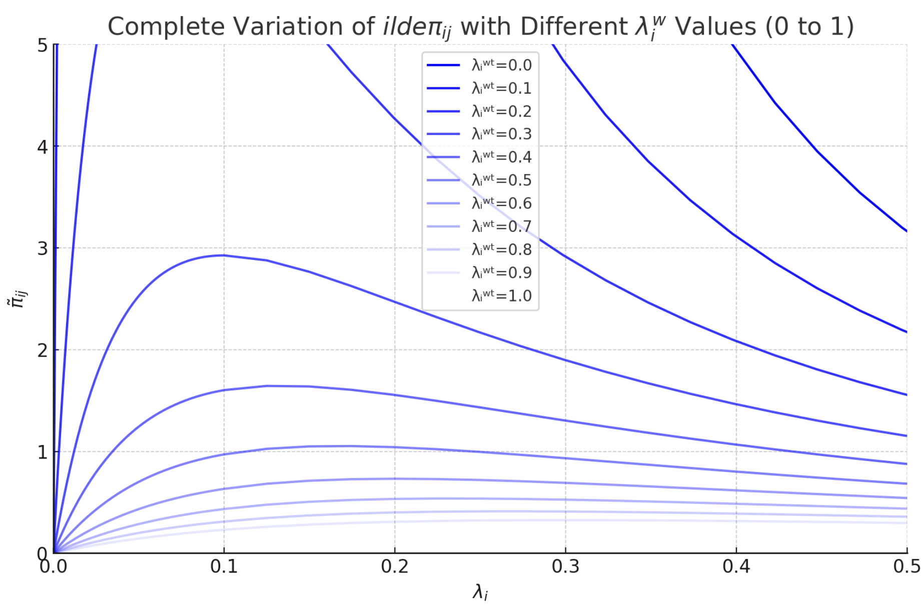

Figure A.1: Variation of $\tilde{\pi}_{ij}$ with Different Values of $\tilde{\lambda}_i^w$

The net profit, denoted as Π, is given by:

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

and

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

The zero profit threshold points are:

$$\Pi_{ij}\left(\lambda_i^*\right) = 0,$$

$$\tilde{\Pi}_{ij}\left(\lambda_i^{pw*}\right) = 0.$$

Since $\lim_{\lambda_i \to 0}\Pi_{ij}\left(\lambda_i\right) = \infty$ and $\lim_{\lambda_i \to \infty}\Pi_{ij}\left(\lambda_i\right) = -f_{ij}$, and the function monotonically decreases, the cutoff marginal cost λ^* is unique.

However, it is less obvious for λ^{pw*}, as the U-inverted shape means that either 1, 2, or no cutoff points exist depending on the relationship between the maximum and αf_{ij}.

A.5.3 Technical Details: Uniqueness

The exporter would opt for indirect exporting if

$$\tilde{\Pi}_{ij}\left(\lambda_i\right) \geq \Pi_{ij}\left(\lambda_i\right),$$

and substituting the expression of the profit function yields:

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

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

It is clear that at the break-even point, the function turns into a transcendental equation with no closed-form solution. To address this problem, we examine the LHS more closely. First, denote the LHS as $y\left(\lambda_i\right)$. We now show that $y\left(\lambda_i\right)$ is a monotonically increasing function that is guaranteed to cross $y=1$ once.

The derivative of $y\left(\lambda_i\right)$ is:

$$\frac{dy}{d\lambda_i}=\frac{E_jP_j^{\sigma-1}\left(\frac{\lambda_i\sigma+\lambda_i^w(\sigma-1)}{\lambda_i(\sigma-1)}\right)^{-\sigma}\left(\frac{\lambda_i\sigma\tau_{ij}}{\sigma-1}\right)^{1-\sigma}(\sigma-1)\left(\lambda_i^w\sigma+(\lambda_i\sigma+\lambda_i^w(\sigma-1))\left(\left(\frac{\lambda_i\sigma+\lambda_i^w(\sigma-1)}{\lambda_i(\sigma-1)}\right)^{\sigma}-1\right)\right)}{f_{ij}\lambda_i\sigma(\alpha-1)(\lambda_i\sigma+\lambda_i^w(\sigma-1))}.$$

Observe that given $\sigma>1$ and all other parameters are non-negative, $\frac{dy}{d\lambda_i}>0$ iff

$$\frac{\lambda_i\sigma+\lambda_i^w(\sigma-1)}{\lambda_i(\sigma-1)}=\frac{\sigma}{\sigma-1}+\frac{\lambda_i^w}{\lambda_i}>1,$$

which is always true. Also, notice that

$$\lim_{\lambda_i\to 0}=0 \text{ and } \lim_{\lambda_i\to\infty}=\infty.$$

So the function $y\left(\lambda_i\right)$ crosses $y=1$ only once. Equivalently, there exists a unique cutoff marginal cost λ_i^{**} such that when $\lambda\leq\lambda_i^{**}$, $y\geq 1$ and the exporter would opt for direct exporting, and vice versa when $\lambda\geq\lambda_i^{**}$.

A.5.4 Intuition

To gain more intuition, we will express $\lambda_i^{\star\star}$ using the definition of export revenues R_{ij}. The indifference marginal cost $\lambda_i^{\star\star}$, where firms are indifferent between direct exporting and exporting via intermediaries, relates to fixed costs (f_{ij}), the parameters α, and the revenues R_{ij}, while also incorporating cost structures through λ_i and $\tilde{\lambda}_i^w$.

The key relationship among manufacturing and wholesaling firms, provided in equation $(A.3)$, is given as:

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

This inequality expresses the indifference condition, which balances the profitability between direct exporting and intermediation.

Rewriting the inequality for equality, we obtain:

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

We now use the definition of revenues of the indifferent firm:

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

Thus, we can rewrite the left-hand side of the above equation using R_{ij}:

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

Finally, solving for $\lambda_i^{\star\star}$, we isolate the term for $\lambda_i^{\star\star}$ by rearranging the equation:

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

Taking the inverse of the remaining term:

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

Finally, we express $\lambda_i^{\star\star}$:

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

The implicit expression for $\lambda_i^{\star\star}$ follows directly from the system of equations and the definition of export revenues $R_{ij}(\lambda_i^{\star\star})$, which balances the indifference condition for firms choosing between direct and intermediated exporting. It states that the indifference is impacted by the relative intermediation costs α and the ratio of average wholesaler and the indifferent exporter $\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}}$, capturing the relationship between producers and intermediaries.

Notice that if the indifferent producer is just as productive as the average wholesaler, so that $\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}} = 1$, the indifference marginal costs simplify to a (scaled) ratio of fixed costs to revenue. Another scenario where the interaction between wholesalers and producers is shut off includes a standard assumption of zero marginal costs for wholesalers (no selection).

Consider Case 1 (when $\frac{\tilde{\lambda}_i^w}{\lambda_i^{\star\star}} = 1$):

$$\lambda_i^{\star\star} = \frac{(1-\alpha) f_{ij}}{\left(\frac{\sigma}{\sigma-1} + 1\right)^{\sigma} R_{ij}} = \frac{(1-\alpha) f_{ij}}{\left(\frac{2\sigma-1}{\sigma-1}\right)^{\sigma} R_{ij}}.$$

Let's turn to Scenario 2 (when $\tilde{\lambda}_i^w = 0$):

$$\lambda_i^{\star\star} = \frac{(1-\alpha) f_{ij} (\sigma-1)^{\sigma}}{\sigma^{\sigma} R_{ij}}.$$

The ratio of denominators:

$$\text{Ratio}_{\sigma>1} = \frac{\left(\frac{2\sigma-1}{\sigma-1}\right)^{\sigma}}{\frac{\sigma^{\sigma}}{(\sigma-1)^{\sigma}}} = \frac{(2\sigma-1)^{\sigma}}{\sigma^{\sigma}} > 1.$$

Therefore, it follows that for $\sigma > 1$, $\lambda_i^{\star\star}$ is smaller in Scenario 1 than in Scenario 2. Intuitively, the indifferent producer has to be more productive (has lower marginal costs) when the wholesaler's marginal costs are strictly positive compared to when they are zero.

A.6 Different Cases

In this section, we seek to determine the range of marginal costs where firms would opt for indirect exporting.

A.6.1 Case: $\tilde{\lambda}_i^w = 0$

For completeness, let us first consider the simple case when $\tilde{\lambda}_i^w = 0$. In this case, we can easily derive the algebraic form for the cutoff marginal costs $\lambda^\star$ and $\lambda^{pw\star\star}$:

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

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

This is also derived in the main text, where the coefficient is interpreted as a boundary imposed on the elasticity parameter: $\alpha^{-\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} < 1$. An alternative interpretation of this condition can be summarized by rewriting:

$$\begin{cases} \lambda^{pw\star} < \lambda^\star & \alpha^{-\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} < 1, \\ \lambda^{pw\star} \geq \lambda^\star & \alpha^{-\frac{1}{\sigma-1}} \left(\frac{\sigma-1}{\sigma}\right)^{\frac{\sigma}{\sigma-1}} \geq 1. \end{cases}$$

In the former case, since the net profit function of the indirect exporter is decreasing, the fact that $\lambda_i^\star$ has a higher value means that the two functions intersect in the negative profit zone, i.e., all firms that survived have chosen direct exporting (see Figure A.2). The intermediation layer does not exist. This provides a more nuanced perspective on the original interpretation: while there are no natural constraints on the set of parameters we can choose, our focus on the intermediation layer (and the existence of intermediation services in real life) clearly suggests that the parameters would be subject to such constraints in a fine-tuned model that includes the intermediaries.

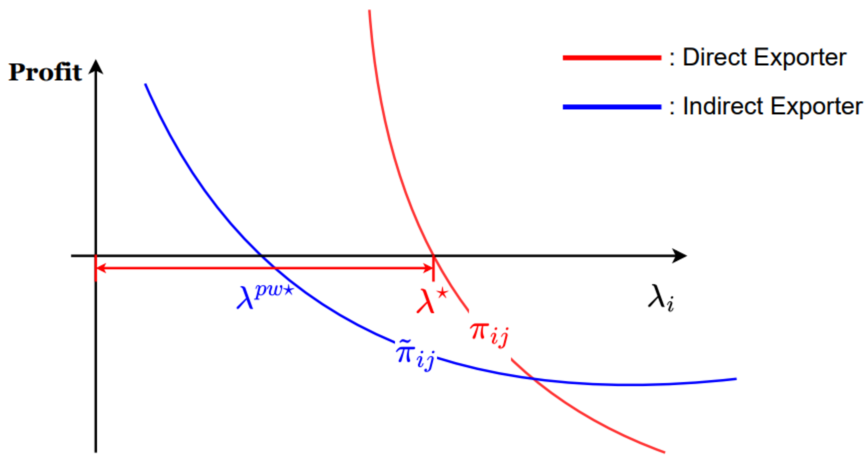

Figure A.2: Case: $\lambda^{pw\star} < \lambda^{\star}$

In the latter case, the fact that $\lambda_i^{\star}$ has a lower value implies that the two functions intersect in the positive profit zone. Therefore, the marginal cost range for indirect exporting is $[\lambda_i^{\star\star}$, $\lambda_i^{pw\star}]$.

Let's now explore how the share varies with the fixed costs component α. Before proceeding, let's denote the term inside the brackets as $X(\alpha)$:

$$\text{Share} = 1 - X(\alpha)^{\frac{k}{\sigma-1}},$$

where

$$X(\alpha) = \frac{\alpha \cdot \left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right)}{(1-\alpha)\sigma}.$$

Now, take the derivative of Share with respect to α:

$$\frac{d(\text{Share})}{d\alpha} = -\frac{k}{\sigma-1} X(\alpha)^{\frac{k}{\sigma-1}-1} \cdot \frac{dX(\alpha)}{d\alpha}.$$

Recall that

$$X(\alpha) = \frac{\alpha \cdot \left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right)}{(1-\alpha)\sigma}.$$

Taking the derivative of $X(\alpha)$ with respect to α:

$$\frac{dX(\alpha)}{d\alpha} = \frac{\left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) \cdot (1-\alpha)\sigma - \alpha \cdot (-\sigma)}{(1-\alpha)^2\sigma}.$$

Simplify the expression:

$$\frac{dX(\alpha)}{d\alpha} = \frac{\left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) \cdot \sigma - \left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) \cdot \alpha\sigma + \alpha\sigma}{(1-\alpha)^2\sigma},$$

$$\frac{dX(\alpha)}{d\alpha} = \frac{\sigma \cdot \left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) + \alpha\sigma \cdot \left(\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} - 1\right)}{(1-\alpha)^2\sigma}.$$

Factor out σ and simplify further:

$$\frac{dX(\alpha)}{d\alpha} = \frac{\left[\left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) + \alpha \cdot \left(\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} - 1\right)\right]}{(1-\alpha)^2}.$$

Finally, substitute $\frac{dX(\alpha)}{d\alpha}$ back into the derivative of Share:

$$\frac{d(\text{Share})}{d\alpha} = -\frac{k}{\sigma-1} \cdot X(\alpha)^{\frac{k}{\sigma-1}-1} \cdot \frac{\left[\left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right) + \alpha \cdot \left(\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} - 1\right)\right]}{(1-\alpha)^2} < 0.$$

To justify the sign of $\frac{d(\text{Share})}{d\alpha}$, consider the components of the expression:

1. $X(\alpha)^{\frac{k}{\sigma-1}-1}$ term is positive because $X(\alpha)$ is positive, and $\frac{k}{\sigma-1} - 1$ is positive (recall that variance must be positive).

2. The term $\frac{k}{\sigma-1}$ is positive because both k and $\sigma - 1$ are positive.

3. $\frac{\left[\left(1-\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right)+\alpha\cdot\left(\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}-1\right)\right]}{(1-\alpha)^2}$. The denominator $(1-\alpha)^2$ is positive for $0 < \alpha < 1$. The numerator involves the term $\left(1 - \left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}\right)$, which is positive because $\frac{\sigma}{\sigma-1} > 1$ implies

$\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma} < 1$. This implies that the whole numerator is positive because $0 < \alpha < 1$.

This simplified result relies on the assumption of zero wholesaler's marginal costs. We take the feedback mechanism into consideration in the simulation analysis and allow for the relationship between producers and the intermediation sector.

A.6.2 Case: $\tilde{\lambda}_i^w \neq 0$

Assuming that the zero-profit condition for indirect exporters has two solutions, we arrive at three different cases:

1. In the first case where $\lambda_i^\star > \lambda_i^{pw\star\star}$, the two profit functions intersect in the negative profit zone, and the range of marginal costs where firms would opt for indirect exporting is null.

2. In the second case where $\lambda_i^{pw\star} < \lambda_i^\star \leq \lambda_i^{pw\star\star}$, the range becomes $[\lambda_i^{\star\star}, \lambda_i^{pw\star\star}]$.

3. And in the third case where $\lambda_i^\star \leq \lambda_i^{pw\star}$ and an empty set of indifferent exporters, the range becomes $[\lambda_i^{pw\star}, \lambda_i^{pw\star\star}]$.

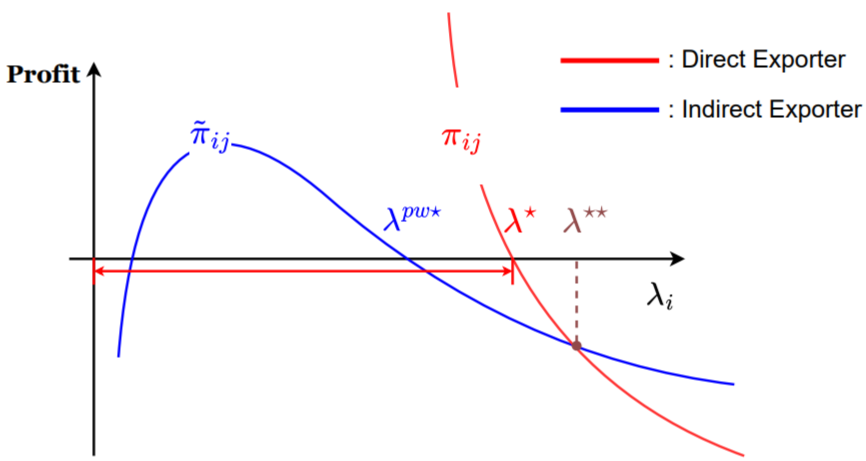

Figure A.3: Case 1: $\lambda_i^* > \lambda_i^{pw\star\star}$

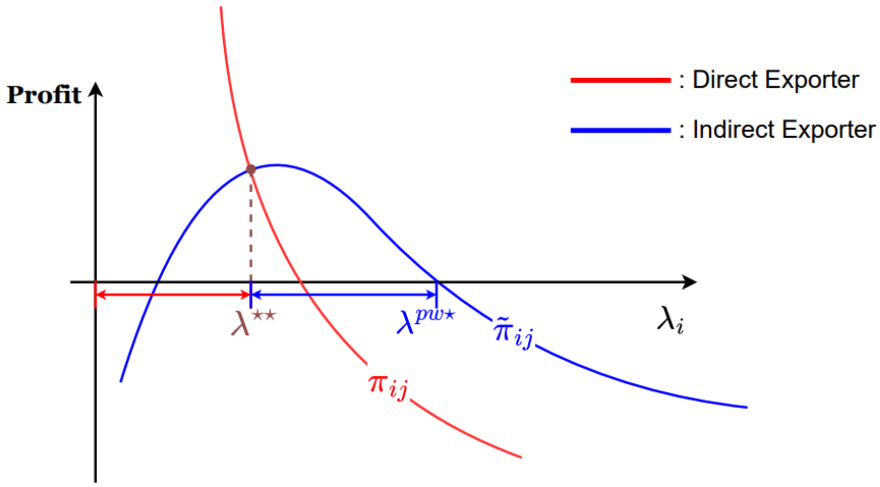

Figure A.4: Case 2: $\lambda_i^{pw*} < \lambda_i^* \leq \lambda_i^{pw**}$

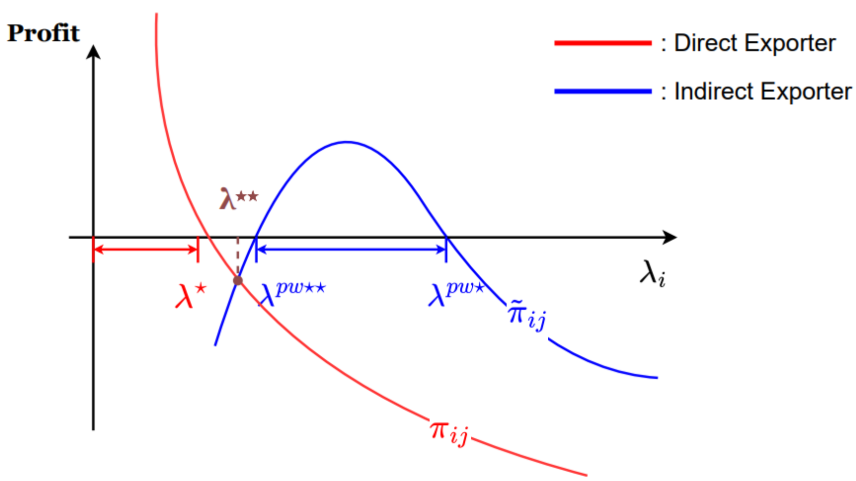

Figure A.5: Case 3: $\lambda_i^* \leq \lambda_i^{pw*}$

Following the relationship between λ_i^{pw*} and λ_i^*, as reported in the main text:

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

This is a transcendental equation, meaning that we cannot find a closed-form solution for the two roots. However, with given parameters, it would be easy to determine which of the three ranges applies.

A.7 Elaboration on Equilibrium

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

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

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:

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

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.7.1 Homogeneous Intermediation Sector

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

$$
\begin{aligned}
\lambda_i^{pw\star} &= \left\{ \left(\frac{\left(\frac{f_{ij}}{f_{ij}^w}\right)^{\frac{1}{\sigma-1}} \lambda_i^{\star} \cdot \frac{\sigma-1}{\sigma}}{\Psi_i^{\frac{1}{1-\sigma}}} \right)^{1-\sigma} + (\lambda_i^{\star\star})^{k_i-\sigma+1} \right\}^{\frac{1}{k_i-\sigma+1}}, \\
\lambda_i^{pw\star} &= \left(\frac{\sigma-1}{\sigma} \alpha^{-\frac{1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}} \lambda_i^{\star}, \\
\lambda_i^{\star\star} &= \left[\frac{1-\left(\frac{\sigma}{\sigma-1}\right)^{-\sigma}}{(1-\alpha)\sigma} \right]^{\frac{1}{\sigma-1}} \lambda_i^{\star}.
\end{aligned}
$$

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.7.2 Derivation

The indifference condition is:

$$\tilde{\Pi}_{ij}\left(\lambda_i^{**}\right) = \Pi_{ij}\left(\lambda_i^{**}\right).$$

Recall that the revenue function is given by:

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

Net profit functions can be rewritten as:

$$\Pi_{ij}\left(\lambda_i\right) = R_{ij} - f_{ij},$$

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

The indifference condition then becomes:

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

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:

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

The system of equations that defines the equilibrium is now:

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

A.7.3 Simplification

There are five equations in five unknowns. We can simplify the system by substituting expressions for $\tilde{\lambda}_i^w$ into $\lambda_i^{pw\star}$ and $\lambda_i^{\star\star}$, where $\Psi_i \equiv \frac{k_i \lambda_{i0}^{-k_i}}{k_i-\sigma+1}$:

$$\begin{aligned} \alpha^{-\frac{1}{\sigma}} \left(\lambda_i^\star \right)^{\frac{\sigma-1}{\sigma}} &= \frac{\sigma}{\sigma-1} \left(\lambda_i^{pw\star} \right)^{\frac{\sigma-1}{\sigma}} + \tilde{\lambda}_i^w \left(\lambda_i^{pw\star} \right)^{-\frac{1}{\sigma}} \\ &= \frac{\sigma}{\sigma-1} \left(\lambda_i^{pw\star} \right)^{\frac{\sigma-1}{\sigma}} + \Psi_i^{\frac{1}{1-\sigma}} \left(\lambda_i^{w\star} \right)^{\frac{k_i-\sigma+1}{1-\sigma}} \left(\lambda_i^{pw\star} \right)^{-\frac{1}{\sigma}}. \end{aligned}$$

For $\lambda_i^{\star\star}$:

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

Furthermore, we substitute $\tilde{\lambda}_i^{pw}$ into $\lambda_i^{w\star}$, ending up with:

$$
\begin{aligned}
\lambda_i^{\star} &= \left[\frac{\sigma f_{ij}\left(\frac{\sigma}{\sigma-1}\tau_{ij}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}, && \lambda_i^{\star} \\
\lambda_i^{w\star} &= \left(\frac{f_{ij}}{f_{ij}^{w}}\right)^{\frac{1}{\sigma-1}} \lambda_i^{\star} - \frac{\sigma}{\sigma-1}\Psi_i^{\frac{1}{1-\sigma}} \left[(\lambda_i^{pw\star\star})^{k_i-\sigma+1} - (\lambda_i^{\star\star})^{k_i-\sigma+1}\right]^{\frac{1}{1-\sigma}}, && \lambda_i^{w\star} \\
\alpha^{-\frac{1}{\sigma}} \left(\lambda_i^{\star}\right)^{\frac{\sigma-1}{\sigma}} &= \frac{\sigma}{\sigma-1} \left(\lambda_i^{pw\star}\right)^{\frac{\sigma-1}{\sigma}} + \Psi_i^{\frac{1}{1-\sigma}} \left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}} \left(\lambda_i^{pw\star}\right)^{-\frac{1}{\sigma}}, && \lambda_i^{pw\star} \\
1 - \left(\frac{\sigma}{\sigma-1} + \frac{\Psi_i^{\frac{1}{1-\sigma}}\left(\lambda_i^{w\star}\right)^{\frac{k_i-\sigma+1}{1-\sigma}}}{\lambda_i^{\star\star}}\right)^{-\sigma} &= (1-\alpha)\sigma \left(\frac{\lambda_i^{\star\star}}{\lambda_i^{\star}}\right)^{\sigma-1}, && \lambda_i^{\star\star}.
\end{aligned}
$$

Since the direct export threshold is pinned down by the exogenous factors from the firm's perspective, we will simplify further by expressing:

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

where

$$
\Phi_j \equiv \left[\frac{\sigma\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}}{E_j P_j^{\sigma-1}}\right]^{\frac{1}{1-\sigma}}.
$$

This approach allows us to explore the use of intermediation as a function of exogenously changing variable trade costs:

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

Equivalently, the system of equations requires:

$$
\begin{cases}
\lambda_i^{w\star} = f(\lambda_i^{pw\star\star}, \lambda_i^{\star\star}), \\
g(\lambda_i^{pw\star\star}, \lambda_i^{w\star}) = 0, \\
h(\lambda_i^{\star\star}, \lambda_i^{w\star}) = 0.
\end{cases}
$$

B Baseline Values for Numerical Exercises

Table B.1: Baseline Values for Numerical Exercises

Symbol	**Value**	**Source**
f_{ij}^w	5.89	Replicates Ahn et al. (2011) to make an intermediary trade higher volumes than a direct trader
f_{ij}	1	Normalization
λ_0	2	Upper bound of marginal costs
E_j	2.16	Market size, controls the share of direct exporters
P_j	1	Normalization
k	3.1	Head et al. (2014), Table A.2 (Top 5%)
σ	4	Bernard et al. (2003), Simonovska and Waugh (2014)
k_s	$k-\sigma+1$	Definition
θ	$\left(\frac{\sigma}{\sigma-1}\right)^{\sigma-1}$	Definition
θ_2	$\frac{\sigma}{\sigma-1}$	Definition
θ_1	$\frac{\sigma-1}{\sigma}$	Definition
ξ	$\frac{k\lambda_0^{-k}}{k_s}$	Definition
ϕ	$\left(\frac{\sigma f_{ij}\theta}{E_j P_j^{\sigma-1}}\right)^{\frac{1}{1-\sigma}}$	Definition
τ_{ij}	$[1.1, 2.5]$	Range of values for most experiments
α	$[0.1, 0.99]$	Range of values for most experiments

C Robustness Tests for Empirical Analysis

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	0.680	0.701	0.701
N	1098960	890170	890170

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 Medium 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	0.695	0.708	0.709
N	158460	128340	128340

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

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

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**			
	(0.005)			
Opinion x Far x Banned Product x Post 2013		-0.016**		
		(0.007)		
Opinion x Far x Banned Product x Post 2013			-0.026**	
			(0.011)	
Opinion x Far x Banned Product x Post 2013				-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