Variable Import and Export Markups, and the Pro-Competitive Gains from Trade

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Abstract

This paper develops a multi-sector model of international trade and profit shifting in which both import and export markups are endogenously determined and depend on the competitiveness of each market. While it is well known that trade and trade barriers affect the global distribution of profits, little is known about how asymmetric markups are across countries and how this asymmetry shapes international profit shifting and the gains from trade. In this paper, we aim to fill this gap and develop a quantitative trade model in which the markup distributions for both imports and exports are allowed to vary across countries and sectors. Using a rich set of country- and industry-specific import demand elasticities for about 3,000 distinct sector-country pairs, we determine which countries are net exporters versus net importers of high markup goods and quantify how each country's specialization pattern affects the gains from trade and the nature of profit shifting in response to trade barriers. Our findings suggest that the gains from trade are significantly higher for net exporters of high markup goods, regardless of whether or not markups vary with competition. We do however also find that variable markups noticeably mitigate profit shifting, resulting in up to 1.3 percentage point smaller welfare losses from a global trade war. In contrast to the existing literature, we document that if demand elastiticies for a range of countries are sufficiently asymmetric, the pro-competitive gains are sizable, even for those countries in which import and export markups are aligned.

JEL Codes: F12, F14

Keywords: Profit shifting, imperfect competition, markups, trade war, gains from trade

1 Introduction

One of the classic arguments in favor of international trade is the fostering of competition. Especially in sectors that are dominated by few firms and in which market power is potentially important, proponents of free trade agreements often argue that trade provides great benefits to consumers through reductions in markups and forces companies to innovate. Further, given more and more evidence that market power across the world is becoming increasingly more relevant (De Loecker and Eeckhout, 2018; De Loecker, Eeckhout and Unger, 2020), such issues are likely to be of even greater importance today than they were in the past. Surprisingly however, even in the presence of sizable markups, recent work by Arkolakis et al. (2019) suggests that for a large class of models, such pro-competitive gains are likely to be small overall, especially if domestic and foreign markups respond similarly to a trade liberalization.

In this paper, we build on Arkolakis et al. (2019), but focus on the question to what extent markups and their responsiveness to tariffs might actually vary across markets and more importantly, how this variation affects the welfare implications of tariffs and the gains from trade. We introduce two forces through which markups vary across markets: First, we allow markups to be sector- and country-specific, which implies that export and import markups are potentially different within sectors due do differences in demand. As a consequence, some countries will be net exporters of high markups goods while others will be net importers. Second, the fixed cost of serving each market can vary which generates differences in firm entry even if the underlying demand is the same.

To study the consequences of markup heterogeneity, we first set up a multi-country, multi-sector model of international trade with three key features: First, the elasticity of substitution σ is allowed to be sector-country specific, i.e. firms face different demand schedules in each country and hence charge different markups. Second, demand for aggregate sectors is differently elastic than demand for goods within sectors, such that larger firms have incentives to charge higher markups than smaller ones. Lastly, each country is populated by a distribution of differently productive firms, which have to pay a market-specific fixed cost in order to sell in each country.

Intuitively, we expect the introduction of country-specific markups to be important for at least 2 reasons. On the one hand, welfare of net exporters of high-markup goods depends disproportionately on export profits, which makes a tariff potentially more costly than for exporters of low-markup goods (see Firooz and Heins, 2021). In addition, also the elasticity of aggregate markups with respect to tariffs will likely differ for net exporters versus importers of high markup goods, especially if markups across goods are more heterogeneous than markups across sectors.

To bring the model to the data, we estimate sector- and country-specific elasticities of substitution for 30 countries across HS2 industries using an approach developed by Soderbery (2015). Based on our estimates, we document considerable variation in terms of the extent to which countries both import and export high- versus low-markup goods. Specifically, we find that rich economies tend to import on average higher-markup goods than poorer economies. The average inverse demand elasticity of goods imported by the U.K., Germany, and Japan, for example, ranges between 0.45 and 0.49 compared to 0.36 in India and 0.38 in China. On the other hand, richer countries also tend to export higher-markup goods than poorer countries, and the average inverse demand elasticity of exports equals, for example, between 0.35 and 0.37 for China, Mexico and Vietnam, while it is around 0.42 for Belgium and Canada. Taken together, we find considerable variation in the difference in markups between imports and exports across countries and that this gap is moderately increasing in a country's income per capita. Exports of Canada, Belgium, and Vietnam for example are significantly higher-markup goods than their imports while the opposite is true for Norway, the U.K., and Germany.

On the supply side, we quantify both variable and fixed costs such that market shares and aggregate incomes predicted by the model closely match those observed in the data. The obtained cost and demand estimates then allow us to quantify to which extent variation in export versus import markups matters for the gains from trade and how they vary for net importers versus exporters of high-markup goods. To quantify the importance of pro-competitive gains, we compare our results to 2 alternative models: First, we compare our results to those obtained from a version in which markups are held fixed. This comparison allows us to infer whether or not asymmetric markups affect the "elusiveness" results found in Arkolakis et al. (2019) in a significant fashion. Second, we also compare our results to a setting in which demand elasticities are constant across countries, to ensure that our results are indeed driven by variation in demand schedules and not other departures from Arkolakis et al. (2019).

We find that variable markups noticeably mitigate profit shifting, especially in a setting with asymmetric markups. We find that the latter can result in up to 1.3 percentage point smaller welfare losses from a global trade war in the case of variable versus fixed markups, which is in contrast to the findings of Arkolakis et al. (2019) who document only small quantitative differences. We document that if demand elastiticies for a range of countries are sufficiently asymmetric, the pro-competitive gains appear to become more meaningful, in fact, even for those countries in which import and export markups are more comparable.

More specifically, we show first that welfare changes are largely heterogeneous across countries, ranging from -4% in Bangladesh to a moderate welfare gain of 0.3% in the UK and Germany. Countries which are net importers of higher-markup goods, such as Japan, the UK, or Germany, generally experience small welfare losses: As their tariff disproportionately taxes higher-markup varieties, these countries can now capture profits that were previously earned by foreign firms. Since this gain is larger than the amount of lost export profits, these countries experience only moderately welfare losses or even small gains. The exact opposite is true for net exporters of high-markup goods such as Belgium, Canada, and Vietnam, which suffer welfare losses that exceed 3%.

Second, domestic firms generally earn higher profits due to increased protection from foreign competition. The change in domestic profits is however, with one exception, dominated by a large decline in export profits, which ranges from 25% to 40%. Consequentially, profits overall decline, even when firms can raise prices due to greater market power. As expected, the decline in export profits is particularly strong in economies which specialize in exporting high-markup goods, e.g. Belgium, Canada, and Australia, which translates into high welfare losses overall.

Third, we find that welfare losses tend to be larger in the absence of variable markups. Belgium, Canada, and Vietnam for example experience up to 25% larger losses in the absence of variable markups. On the other hand, importers of high-markup goods, e.g. Germany, Japan, or the UK, tend to experience smaller gains or larger losses. Variable markups therefore appear to largely mitigate the negative consequences of trade disputes. Intuitively, especially wages see smaller declines under variable markups and firms on average lower prices compared to the fixed markup case. Consequentially, production on average expands which raises demand for labor and a smaller wage decline.

Our paper contributes to an extensive literature on variable markups and the pro-competitive gains from trade (see e.g. Atkeson and Burstein (2008), Edmond, Midrigan and Xu (2015), Arkolakis et al. (2019), and Feenstra and Weinstein (2017)). Our main contribution to this literature is to quantify how the (pro-competitive) gains from trade vary for net importers of high-markup goods versus net exporters by allowing for country-sector specific variation in demand and markups. Specifically, in contrast to Arkolakis et al. (2019) we employ a model based on CES preferences in which trade and markup elasticities are endogenous and heterogeneous across countries, and highlight the importance of this type of heterogeneity for the pro-competitive gains from trade.

Second, our paper relates to the literature on profit shifting (see e.g. Spencer and Brander, 1983; Brander and Spencer, 1985; Brander, 1986; Krugman, 1987; Bagwell and Staiger, 2012; Ossa, 2014; Lashkaripour and Lugovskyy, 2018; Firooz and Heins, 2021). We contribute to this literature by explicitly quantifying how each country's specialization pattern in goods with heterogeneous markups affects welfare and the gains from trade and we show that the net profits a country receives significantly shape its gains from trade. Our paper also differs from Ossa (2014) and Lashkaripour and Lugovskyy (2018), as we allow markups and profits to be variable as well as both sector- and market-specific which has important welfare implications of trade.

Third, we extend the framework developed in Atkeson and Burstein (2008) to one with a broad range of differently rich economies and allow for a detailed level of sectoral heterogeneity as well as country-pair-specific fixed costs. We develop a solution algorithm that allows us to evaluate the consequences of different trade regimes and solves for the complex counterfactual pattern of entry and exit across dozens of sectors. We document that consistently incorporating entry and exit in a setting with a finite, discrete number of firms is important in order to generate realistic welfare predictions.

Lastly, we use the model to evaluate the welfare consequences of the recent U.S.-China trade war and the gains from trade. We do so to understand how relevant competition and variable markups are for the consequences of bilateral trade conflicts and to explore to what extent asymmetry in profit shifting in combination with variable markups affects the gains from trade versus the impact of tariff wars.

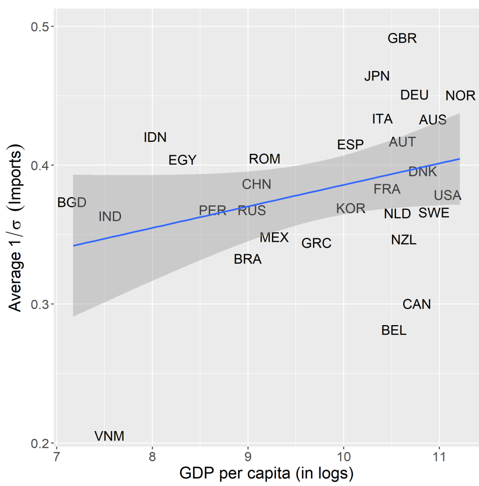
The paper is organized as follows. Section 2 documents the cross-country heterogeneity in import demand elasticities to motivate the paper. Section 3 develops a quantitative multi-sector trade model with imperfect product markets and sector- and country-specific markups. Section 4 describes the data and the procedure to estimate import demand elasticites and trade elasticities. To show the qualitative and quantitative relevance of profit shifting, Section 5 performs several counterfactual experiments. Section 6 concludes.

2 Motivation

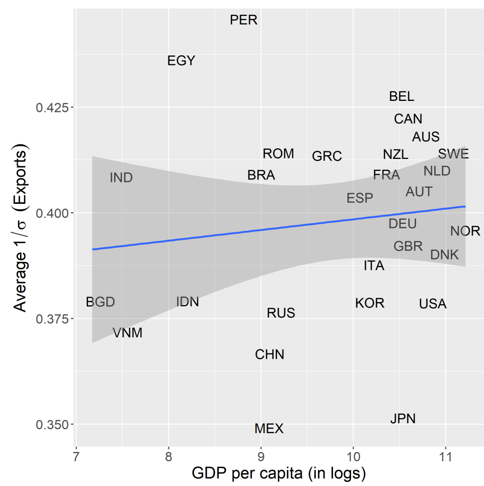
In this section, we first provide suggestive evidence that the goods which countries export and import vary systematically in terms of their demand elasticity and hence in their optimal markups. Specifically, we show that richer countries on average tend to export and import higher-markup goods while the opposite is true for poorer economies.

As described in more detail in Section 4, we begin by estimating the demand elasticity for each of several thousand categories of goods (sectors, hereafter), as defined by their 6-digit Harmonized System codes (HS6). To do so, we rely on the procedure originally developed by Feenstra (1994) and refined by Soderbery (2015) and use detailed information on imports for each country during the years between 1995 to 2015. This results in a set of demand elasticities which are allowed to be different for each country to allow for the possibility that traded varieties of each good as well as the demand for them may differ across countries. We then match the resulting sector- and country-specific elasticities to data on imports and exports of each country in 2015.

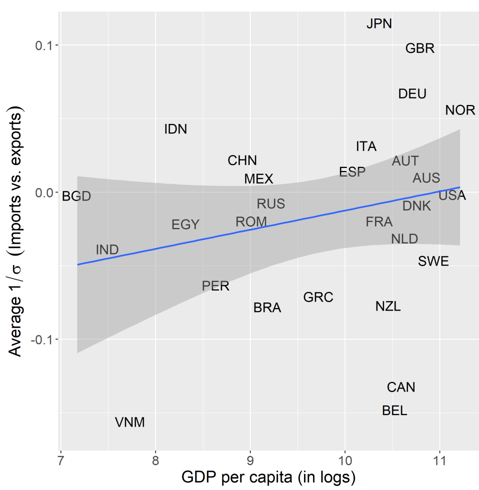
Figure 1: Average Inverse Demand Elasticity for Imports and Exports



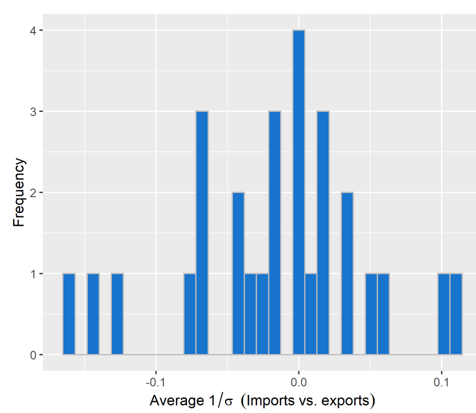
(a) Imports



(b) Exports



(c) Imports - Exports



(d) Imports - Exports (Histogram)

Notes: The top left figure plots the average inverse demand elasticity of each country's imports, weighted by trade volume, while the top right figure plots the corresponding averages for exports. The 2 bottom figures plot the difference between the two. The shaded areas reflect linear fitted lines along with their 95% confidence bands.

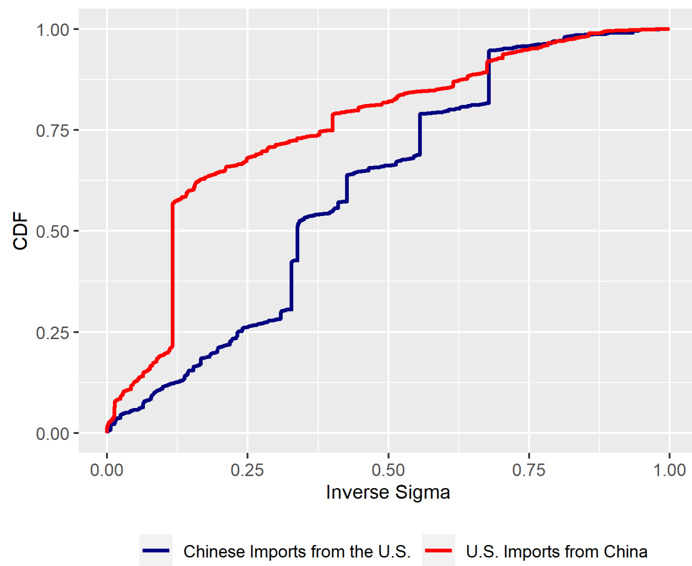
Figure 1 summarizes our estimates and plots the average inverse demand elasticities σ for each country's exports and imports, weighted by trade volumes. We report the inverse demand elasticity to ensure that the results are not driven by very large σ in some categories and also because the inverse demand elasticity is closely related to markups and profits per unit in our model. As shown in Figure 1a, we find that richer economies tend to import goods with, on average, lower demand elasticities σ. For the richest economies, the average $1/\sigma$ takes values in the range between 0.45 and 0.49, while the poorest economies we consider, Vietnam, Bangladesh, and India, import goods with an inverse elasticity between 0.2 and 0.37. On the other hand, richer countries also tend to export higher-markup goods than poorer countries do and the pattern we saw for imports is qualitatively similar but slightly less pronounced for exports. Also here for example, exports from Vietnam, Bangladesh and China tend to be on average lower-markup goods compared to those originating in Belgium, Australia, and Canada.

Taken together, we find considerable variation in the difference in markups between imports and exports across countries. Exports of Canada, Belgium, and Vietnam for example are significantly higher-markup goods than their imports while the opposite is true for Norway, the U.K., and China. As shown in Figure 1c, the exports of rich economies still tend to generate higher markups than their imports do, with the difference in the average inverse demand elasticity being 0.07 on average for the 5 richest economies. For poor economies, this number is negative and the 5 poorest economies export goods whose inverse elasticity is on average 0.05 units larger than that of their imports. Overall, we find that the extent to which exports and imports differ in terms of markups, varies greatly across countries.

Appendix Tables C.1 and C.2 describe in more detail why our estimates differ across countries. Specifically, these tables summarize each country's 3 most important import and export sectors along with the corresponding inverse elasticities in each industry. There are several main takeaways from this table. First, countries tend to import a similar composition of goods, with e.g. machinery and vehicles being the largest import sectors in most countries. Hence, the pattern seen in Figure 1a is mainly due to a considerable degree of country-product specific variation in demand elasticities, i.e., demand for goods in a given sector is differently elastic in one country compared to another, e.g. because of differences in income or product quality. The inverse elasticity of *Electrical Machinery and Equipment* is e.g. markedly higher in the UK than in Vietnam or Bangladesh.

The export mix on the other hand is significantly more dispersed across countries, and especially developing as well as resource-rich countries (e.g. Bangladesh, Norway, Brazil, or Australia) tend to export noticeably different goods than they import. Peru and India for example export on average relatively high-markup goods, which is partially due to a high export share of the low-σ sector *Precious Stones and Pearls*. The same is true for Belgium,

Figure 2: Cumulative Distribution Function - U.S. versus Chinese Exports



Notes: The figure plots the empirical CDF of inverse σ for goods imported by the U.S. from China as well as those which it exports to China. Each observation is weighted by trade volume $\times$ tariff.

the Netherlands, and Greece, who have a high export share in 'Pharmaceutical Products". On the other hand, a greater importance of clothing and footwear is the reason why the average export markup is comparably low in Bangladesh and Vietnam.

Importantly however, we also find a substantial degree of within-sector heterogeneity in markups, i.e. the estimated σ differs for a country's exports compared to its imports. The 3 most important import and export sectors in Austria and Germany are for example identical, but we find that the average import markup is higher than the average export one for all three. The opposite is true in Vietnam or Belgium, for which sectoral import markups are lower than the estimated export markups. The importance of within-sector heterogeneity can also be seen in more detail in Tables C.3 and C.4 as well as Tables C.5 and C.6. Specifically, the latter 2 tables report inverse demand elasticites for imports and exports if we use U.S.-based demand elasticities for all countries. Comparing Tables C.3 and C.5 shows that, for example, the main reason why Belgium's imports tend to be in low-markup goods is that our demand elasticity estimates are comparably large in Belgium's most important import sectors. On the other hand, China's export markups would be much smaller compared to import ones, if we used common elasticities for all countries.

Lastly, as implied by Figure 2, we also find a considerable degree of variation in the extent to which tariffs were imposed on higher versus lower markup goods in the 2018-19 U.S.-China trade war. Specifically, this figure shows the empirical CDF of the 2 countries' inverse demand elasticities across sectors, weighted by trade volume $\times$ tariff. As evident from the 2 curves, U.S. tariffs affected predominantly lower-markup goods compared to those affected by China's tariffs, which on average taxed higher-markup U.S. exports. It is therefore plausible, that these tariffs had an asymmetric impact on the distribution of profits across both countries and we study in detail below how this asymmetry matters for welfare.

In light of the cross-country variation documented in Figures 1 and 2, a natural question is how the observed specialization of economies into higher versus lower-markup goods translates into welfare and the gains from trade. In the next section we develop a structural model which allows for sectoral and cross-country heterogeneity in markups to answer this question and to understand how trade affects the distribution of profits and prices across countries.

3 The Quantitative Model

3.1 Environment

There are N countries in the world indexed by i and n. Country n is endowed with L_n identical workers/consumers who inelastically supply their labor in a perfectly competitive labor market. There are K sectors in each economy indexed by k. Each sector k consists of $J(k)$ sub-sectors indexed by j and l.

3.2 Preferences and Demand Curves

Preferences of the representative agent in country n are given by the following Cobb-Douglas function over all sectors:

$$U_n = \Pi_{k=1}^{K} Q_n^{k\ \alpha_n^k}, \qquad \sum_{k=1}^{K} \alpha_n^k = 1 \quad \forall n \in \{1, ..., N\} \tag{1}$$

where Q_n^k denotes a composite good in sector k and α_n^k its expenditure share in country n. The composite good Q_n^k is a Constant Elasticity of Substitution (CES) aggregate over its sub-sectors:

$$Q_n^k = [\sum_{j=1}^{J(k)} (d_n^{j(k)})^{1/\sigma_n^k} \cdot q_n^{j(k)\ \frac{\sigma_n^k - 1}{\sigma_n^k}}]^{\frac{\sigma_n^k}{\sigma_n^k - 1}} \tag{2}$$

where $q_n^{j(k)}$ is a composite good in sub-sector j belonging to sector k in country n and $d_n^{j(k)}$ a demand shifter. Parameter σ_n^k measures the elasticity of substitution between the sub-sectors of sector k in country n. Note that these elasticities are allowed to differ across sectors and countries. Equation (2) implies the following demand for the composite good $q_n^{j(k)}$:

$$q_n^{j(k)} = \left(\frac{P_n^{j(k)}}{\mathcal{P}_n^k}\right)^{-\sigma_n^k} d_n^{j(k)} Q_n^k \tag{3}$$

where $P_n^{j(k)}$ represents the ideal price index for sub-sector $j(k)$ in country n, and $\mathcal{P}_n^k$ denotes the CES price index for sector k in country n:

$$\mathcal{P}_n^k = [\sum_{j=1}^{J(k)} d_n^{j(k)} (P_n^{j(k)})^{1-\sigma_n^k}]^{\frac{1}{1-\sigma_n^k}} \tag{4}$$

Moreover, given the preference structure implied by (1), consumers in country n face the following price index:

$$\mathcal{P}_n = \Pi_{k=1}^K (\frac{\mathcal{P}_n^k}{\alpha_n^k})^{\alpha_n^k} \tag{5}$$

To introduce variable markups into the model we extend Atkeson and Burstein (2008), and assume the sub-sector $j(k)$ composite good $q_n^{j(k)}$ is CES aggregate over a finite (and endogenous) number of varieties from across the world:[1]

$$q_n^{j(k)} = [\sum_{i=1}^{N} \sum_{f=1}^{F_{in}^{j(k)}} q_{inf}^{j(k)\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}]^{\frac{\sigma_n^{j(k)}}{\sigma_n^{j(k)}-1}}, \tag{6}$$

where $q_{inf}^{j(k)}$ is the demand in country n from firm f in source country i in sub-sector $j(k)$. $F_{in}^{j(k)}$ is the number of firms in sub-sector $j(k)$ from country i selling to n, which is an endogenous object. $\sigma_n^{j(k)}$ is the elasticity of substitution between the goods, which are allowed to differ across sub-sectors and countries. Using Equation (6), we can solve for the demand $q_{inf}^{j(k)}$:

$$q_{inf}^{j(k)} = (\frac{p_{inf}^{j(k)}}{P_n^{j(k)}})^{-\sigma_n^{j(k)}} q_n^{j(k)} \tag{7}$$

where $p_{inf}^{j(k)}$ is the price charged in country n by firm f from country i, and the price index $P_n^{j(k)}$ is

$$P_n^{j(k)} = \left[\sum_{i=1}^{N} \sum_{f=1}^{F_{in}^{j(k)}} p_{inf}^{j(k)1-\sigma_n^{j(k)}}\right]^{\frac{1}{1-\sigma_n^{j(k)}}} \tag{8}$$

[1] Unlike Atkeson and Burstein (2008), we allow an *endogenous* number of firms from each country to serve each market.

3.3 Production

Firm f from country i in sub-sector $j(k)$ produces its unique variety according to the following Constant Returns to Scale (CRS) technology with labor as the sole input:

$$q_{nf}^{j(k)} = A_{nf}^{j(k)} l_{nf} \tag{9}$$

where $A_{nf}^{j(k)}$ is the firm-specific productivity in sector $j(k)$ in country n. To serve market n in sub-sector $j(k)$, all firms (domestic or foreign) have to pay a fixed cost $C_n^{j(k)}$. Moreover, to export a good in sub-sector $j(k)$ from country i to n, producers are subject to an ad valorem tariff $t_{in}^{j(k)}$ and an iceberg cost $d_{in}^{j(k)}$, i.e., to deliver a unit of good $j(k)$ from country i to country n, the producer has to ship $d_{in}^{j(k)} > 1$ units of the good since a fraction of the good melts on its way. Total trade frictions are defined as

$$\tau_{in}^{j(k)} = d_{in}^{j(k)}(1 + t_{in}^{j(k)})$$

with $\tau_{ii}^{j(k)} = 1$. We assume that the trade frictions satisfy the triangle inequality: $\tau_{ih}^{j(k)}\tau_{hn}^{j(k)} \geq \tau_{in}^{j(k)}$. The marginal cost for firm f in sub-sector $j(k)$ in country i exporting to country n is $\frac{w_i\tau_{in}^{j(k)}}{A_{if}^{j(k)}}$, where w_i is the wage in country i.

3.4 Market Structure

We assume firms in each sub-sector $j(k)$ in country n engage in a Cournot quantity competition.[2] Firm f in country i decides whether to serve country n and (if so) its quantity by solving the following profit maximization problem:

$$\max\left\{ \max_{p_{inf}^{j(k)}, q_{inf}^{j(k)}} p_{inf}^{j(k)} q_{inf}^{j(k)} - q_{inf}^{j(k)}[w_i\tau_{in}^{j(k)}/A_{if}^{j(k)}] - C_n^{j(k)}, 0 \right\} \tag{10}$$

subject to the demand equation (7). The first order condition of this profit maximization problem yields that the price charged by a firm is an endogenous markup over its marginal cost:

$$p_{inf}^{j(k)} = \frac{\varepsilon_{inf}^{j(k)}}{\varepsilon_{inf}^{j(k)} - 1}\left[\frac{w_i\tau_{in}^{j(k)}}{A_{if}^{j(k)}}\right] \tag{11}$$

[2]As a robustness check, we also report the results for Bertrand price competition.

where $\varepsilon_{inf}^{j(k)}$ is the demand elasticity that firm f from country i faces in sub-sector $j(k)$ in country n:

$$\varepsilon_{inf}^{j(k)} = \left[\frac{1}{\sigma_n^{j(k)}} (1 - s_{inf}^{j(k)}) + \frac{1}{\sigma_n^k} s_{inf}^{j(k)} \right]^{-1} \tag{12}$$

with $s_{inf}^{j(k)}$ being the market in country n of firm f from country i in sub-sector $j(k)$:

$$s_{inf}^{j(k)} = \left[\frac{p_{inf}^{j(k)}}{P_n^{j(k)}} \right]^{1-\sigma_n^{j(k)}} \tag{13}$$

Each firm faces an endogenously determined demand elasticity, depending on the weighted average of within and across sector elasticity of substitution, weighted by the firm's market share. Firms with small market share within a sector $j(k)$ mostly compete with other firms within their sector and so faces the demand elasticity closer to within-sector $\sigma_n^{j(k)}$. In contrast, firms with relatively high market shares in sector $j(k)$ face the upper-tier elasticity σ_n^k. When there is a change in the trade frictions $\tau_{in}^{j(k)}$, the changes in the market share of each firm affects the distribution of the markups. This is what we explore in our counterfactual experiments.

3.5 Total Expenditure and Total Income

Let I_n denote the total income in country$n$. Given Cobb Douglas preferences in (1), consumers in country n spend a fraction α_n^k of their income on sector k. Thus total expenditure in country n on sub-sector $j(k)$ is given by

$$X_n^{j(k)} = \alpha_n^k I_n \left(\frac{P_n^{j(k)}}{\mathcal{P}_n^k} \right)^{1-\sigma_n^k} \tag{14}$$

Income in country n consists of workers' wage, firms' profits Y_n, tariff revenue R_n, and trade deficits D_n:

$$I_n = w_n L_n + Y_n + R_n + D_n \tag{15}$$

where L_n is the labor force in country n.

Given the optimal price equation (11), we can write total profits as:

$$Y_n = \sum_{k=1}^{K} \sum_{j=1}^{J(k)} \sum_{i=1}^{N} \sum_{f=1}^{F_{ni}^{j(k)}} \frac{1}{\epsilon_{nif}^{j(k)}} \frac{s_{nif}^{j(k)} X_i^{j(k)}}{(1 + t_{ni}^{j(k)})} \tag{16}$$

Total tariff revenue earned by country n can be written as

$$R_n = \sum_{k=1}^{K} \sum_{j=1}^{J(k)} \sum_{i=1}^{N} \sum_{f=1}^{F_{in}^{j(k)}} \frac{t_{in}^{j(k)}}{1 + t_{in}^{j(k)}} s_{inf}^{j(k)} X_i^{j(k)} \tag{17}$$

Trade Deficits D_n are equal to total imports minus total exports:

$$D_n = \sum_{k=1}^{K} \sum_{j=1}^{J(k)} \sum_{i=1}^{N} \sum_{f=1}^{F_{in}^{j(k)}} \frac{s_{inf}^{j(k)} X_n^{j(k)}}{1 + t_{in}^{j(k)}} - \sum_{k=1}^{K} \sum_{j=1}^{J(k)} \sum_{i=1}^{N} \sum_{f=1}^{F_{ni}^{j(k)}} \frac{s_{nif}^{j(k)} X_i^{j(k)}}{1 + t_{ni}^{j(k)}} \tag{18}$$

3.6 Equilibrium

Equilibrium Definition. Given the productivities $A_{if}^{j(k)}$, elasticities of substitution $\sigma_n^{j(k)}$ and σ_n^k, Cobb-Douglas shares α_n^k, labor endowments L_n, iceberg trade costs $d_{in}^{j(k)}$, and ad valorem tariffs $t_{in}^{j(k)}$, an equilibrium is characterized by a vector of wages $\{w_n\}_{n=1}^{N}$ that satisfy the equilibrium conditions (11), (12), (13), (16), (17), (18), and (19).

Solving for Equilibrium To solve for the equilibrium, we follow these steps:

- Step 1: We start with a guess for a vector of wages $w_n^0 \equiv (w_1^0, w_2^0, ..., w_N^0)$.
- Step 2: We use Equation (11), Equation (12) and Equation (13) to solve for equilibrium prices for each firm. To do so, we follow these steps:
  - we start with a guess on prices for all firms with each market n and sub-sector $j(k)$.
  - We find the market shares in (13).
  - We find demand elasticities in (12).
  - Then we find prices in (11), and whether the firm serves this market using (10).
  - We iterate until we get the same prices as our initial guess.
- Step 3: Using prices and market shares that we computed above, we use Equations (15), (16), and (17) to solve for profits, tariff revenues, and total income, consistent with our guess for wages.
- Step 4: Check the trade balance Equation (18). If it is satisfied, we have solved the model. If it is not, we update our guess for wages and iterate till Equation (18) is satisfied.

4 Data and Estimation

4.1 Data

We combine several data sources to quantify the model. First, we use information on imports and exports during the year 2015 from UN Comtrade, disaggregated by 6-digit Harmonized System codes (HS6). We include a total of 30 countries in the analysis, which account for the vast majority of global trade and represent a mix of richer and poorer economies.[3] In order to capture spending on domestic goods we match the trade data to information on expenditure on domestic goods provided by the GTAP 8 database for each country.[4] Further, to keep the estimation manageable and to ensure that most countries produce most goods, we aggregate the data up to the 2-digit HS level.

To estimate the elasticity of substitution for each sector-country pair, we use trade data for the period between 1995 and 2015 in each country. In order to account for frequent changes in the HS classification over time, we construct a time-consistent sectoral classification using an updated version of Van Beveren, Bernard and Vandenbussche (2012) and crosswalk the data in each year accordingly.[5]

For the counterfactual experiments, we also use information on sector-specific tariffs imposed by countries on each other, which we collect from the WITS database. Specifically, we use applied ad valorem tariffs in each HS6 industry for the year 2015 and match it to the dataset. We obtain tariffs imposed by the U.S. and China during the 2018-19 Trade War from the Peterson Institute for International Economics. Specifically, we use information on tariffs which have been imposed in the first 3 waves, i.e., until September 2019. Finally, we infer each country's wage bill by using information on labor income shares as a percentage of GDP as provided by the ILO. Table 1 provides detailed summary statistics of the final dataset.

[3]Specifically, we include the following countries: Australia, Austria, Bangladesh, Belgium, Brazil, Canada, China, Denmark, Egypt, France, Germany, Greece, India, Indonesia, Italy, Japan, Mexico, Netherlands, New Zealand, Norway, Peru, Rep. of Korea, Romania, Russian Federation, Spain, Sweden, USA, United Kingdom, Vietnam, and a constructed Rest of the World.

[4]The GTAP database mainly uses national input-output tables to construct each country's expenditure on domestic and foreign goods across sectors and we use information on "sales of domestic product, at market prices" as well as "imports, at market prices" to infer a country's domestic expenditure share. Since the information on domestic good spending is provided within GTAP's sectoral classification, which is broader than the HS6 classification, we crosswalk it to the HS6 level and assume that the domestic share in each HS6 category is equal to that of the corresponding GTAP sector.

[5]More specifically, the issue is that HS categories can change over time and e.g. in some cases (1) split into multiple new HS codes or (2) several HS codes are merged into one. In those case, to make sure that categories do not cover different goods in one year versus the other, we keep track of these changes and create categories which contain all relevant HS codes. For example, category 722210 splits into 722211 and 722219 in year 1996, and we therefore create a synthetic category that contains all three categories and hence all goods that are part of 722210 in 1995 and before and of 722211 and 722219 afterwards.

Table 1: Summary Statistics

	Mean	Std. Deviation	N
Imports (in mn. $)	95.77	16208.68	1646356
Weight (in mn. kg)	28.02	24009.91	1523146
Exp. Share	0.07	0.20	1640866
Wage Bill (in bn. $)	2637.48	4212.64	1646356
Tariff (MFN, ad valorem)	6.58	21.80	1641733
Tariff (applied, ad valorem)	3.85	18.97	1644034
Tariff - Trade War (U.S., ad valorem)	18.26	9.39	4,111
Tariff - Trade War (China, ad valorem)	19.50	10.44	4,111

	Mean	Median	Std. Deviation	N
σ (HS6 level)	73.14	2.56	3520.43	1646356

4.2 Estimation of the Elasticities of Substitution

We estimate sector-specific elasticities of substitution separately for each country, using the hybrid estimator method (LIML) proposed in Soderbery (2015), which is based on the approach developed by Feenstra (1994), but addresses potential small sample biases as well as grid search inefficiencies present in previous applications.[6]

Specifically, we introduce a time subscript t as well as time-variety-specific taste shocks $b_{nt}^{j(k)}(\omega)$ into the CES aggregator in equation (6), such that

$$q_{nt}^{j(k)} = \left[\int b_{nt}^{j(k)}(\omega)^{\frac{1}{\sigma_n^{j(k)}}} q_{nt}^{j(k)}(\omega)^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}} d\omega \right]^{\frac{\sigma_n^{j(k)}}{\sigma_n^{j(k)}-1}} \tag{19}$$

We treat each HS6-country pair that we observe in data as one variety ω who is the winner of the competition in a subset of HS6 products. We also follow Soderbery (2015) and Broda and

[6] Elasticity estimates based on the Feenstra-method have been frequently used and referred to in other papers, such as Broda, Limão and Weinstein (2008), Hsieh and Klenow (2009), Khandelwal (2010), or Ossa (2014, 2015). Soderbery (2015)'s approach is also consistent with our theoretical framework as the demand side in both settings is derived from CES preferences. One difference is that Broda and Weinstein (2006) and Soderbery (2015) model the supply side in a reduced-form way compared to the more structural approach taken here and allow for an upward-sloping supply curve for varieties. Soderbery (2015)'s framework therefore nests ours, in which the supply curve is horizontal, and controls for any potential endogeneity bias in cases in which this assumption might be violated empirically. In practice, however, in line with recent findings by Fajgelbaum et al. (2020), our estimates of the inverse export supply elasticity tend to be very small in most sectors: For exporters to the U.S., for example, we estimate a median inverse elasticity of 0.043. Further, less than one third of export supply elasticities are statistically different from zero, which is consistent with supply being horizontal in the majority of sectors and which suggests that our estimates of $\sigma_n^{j(k)}$ would likely be similar if we imposed a horizontal export supply curve in the estimation as well.

Weinstein (2006) and allow for a potentially upward-sloping export supply curve, in which case this structure implies demand and supply curves of the form

$$\Delta^m ln(s_{nt}^{j(k)}(\omega)) = -(\sigma_n^{j(k)} - 1)\Delta^m ln(p_{nt}^{j(k)}(\omega)) - \xi_{nt}^{j(k)}(\omega) \tag{20}$$

$$\Delta^m ln(p_{nt}^{j(k)}(\omega)) = \Big[\frac{\kappa_n^{j(k)}}{1+\kappa_n^{j(k)}}\Big]\Delta^m ln(s_{nt}^{j(k)}(\omega)) + \delta_{nt}^{j(k)}(\omega) \tag{21}$$

where Δ^m denotes double differencing with respect to time and a reference variety m, $\kappa_n^{j(k)}$ denotes the inverse export supply elasticity for good $j(k)$, $s_{nt}^{j(k)}$ its expenditure share, and $\xi_{nt}^{j(k)}(\omega)$ and $\delta_{nt}^{j(k)}(\omega)$ reflect unobservable demand and supply shocks.

Following Feenstra (1994)'s identifying assumption that these demand and supply shocks are orthogonal, i.e., $E[\xi_{nt}^{j(k)}(\omega)\delta_{nt}^{j(k)}(\omega)] = 0$, one can then multiply the two shocks to convert the structural equations of demand and supply into one estimation equation

$$\Big(\Delta^m ln(p_{nt}^{j(k)}(\omega))\Big)^2 = \lambda_{1,j(k)}\Big(\Delta^m ln(s_{nt}^{j(k)}(\omega))\Big)^2 + \lambda_{2,j(k)}\Big(\Delta^m ln(p_{nt}^{j(k)}(\omega))\Big)\Big(\Delta^m ln(s_{nt}^{j(k)}(\omega))\Big) + u_{nt}^{j(k)} \tag{22}$$

where $\lambda_{1,j(k)} = \kappa_n^{j(k)}/[(\kappa_n^{j(k)}+1)\cdot(\sigma_n^{j(k)}-1)]$ and $\lambda_{2,j(k)} = [1-\kappa_n^{j(k)}(\sigma_n^{j(k)}-2)]/[(\kappa_n^{j(k)}+1)\cdot(\sigma_n^{j(k)}-1)]$, which can be consistently estimated using 2SLS estimation with variety indicators as instruments.[7]

As described above, we employ bilateral trade data on the HS6 level for the years between 1995 and 2015 and estimate $\sigma_n^{j(k)}$ separately for each HS2 sector and country to allow for the possibility that traded varieties of each good as well as the demand for them may differ across countries. Table 2 provides summary statistics and shows the distribution of the estimated import demand elasticities across countries. We estimate σ to be particularly low for Australia, the U.K., Italy, and Japan. On the other end, we estimate comparably large elasticities of substitution for Vietnam, India, Canada, Belgium, and China.[8]

Table 2 also shows that most elasticities are precisely estimated with for the majority of countries more than 80% being significantly different from 0. More importantly, in the majority of cases we can also reject that elasticities are the same as those estimated for the U.S., which supports our decision to allow for country-specific import demand elasticities. Specifically, we find that across all potential country-pair-sector combinations, about 70% of elasticities are significantly different.

[7]Following Soderbery (2015), we weight varieties by their respective estimated residuals to limit the impact of outliers.

[8]More generally, we also found the average elasticity to be noticeably larger than the median and to an even larger degree than e.g. Broda and Weinstein (2006), which is due to a small number of categories with very large estimates. In practice however, these large estimates have only a small impact on the results as the markup is effectively 0 for those products and hence contribute very little to profit shifting.

Table 2: Distribution of parameter estimates for θ and σ

σ	Median	1st Quartile	3rd Quartile	Share statistically significant	Share statistically different from U.S. σ
Australia	1.93	1.47	3.11	87.05	67.86
Austria	2.76	1.70	6.31	85.40	59.42
Bangladesh	2.99	2.06	5.06	84.17	71.43
Belgium	3.15	1.94	6.73	92.11	66.67
Brazil	2.58	1.74	4.28	85.92	73.47
Canada	4.41	2.09	11.13	92.48	73.97
China	3.05	1.85	6.52	83.22	60.00
Denmark	2.40	1.67	4.71	92.25	55.56
France	2.49	1.64	4.98	89.87	60.27
Germany	2.65	1.70	5.23	89.61	70.00
Greece	2.27	1.68	3.59	83.21	61.22
India	3.48	2.08	7.68	92.59	71.43
Indonesia	2.37	1.70	3.87	88.51	66.00
Italy	2.10	1.53	3.71	85.23	57.97
Japan	2.19	1.61	3.65	84.03	60.00
Rep. of Korea	2.63	1.70	4.65	84.89	51.56
Mexico	2.64	1.77	4.89	88.19	60.87
Netherlands	2.45	1.65	4.71	87.79	62.50
New Zealand	2.70	1.78	4.77	85.81	69.23
Norway	2.30	1.72	3.38	82.98	67.16
Peru	2.41	1.80	3.56	79.59	65.63
Romania	2.48	1.70	4.19	88.36	66.67
Russia	2.53	1.73	4.38	91.49	69.64
Vietnam	9.25	3.62	19.55	96.69	85.71
Spain	2.56	1.76	4.11	84.25	62.16
Sweden	3.04	1.79	6.73	90.76	68.09
Egypt	2.19	1.72	3.09	90.32	88.00
United Kingdom	1.96	1.50	3.34	84.93	63.38
USA	2.49	1.61	5.99	90.60	-
ROW	2.72	1.58	7.02	77.16	43.08

Notes: This table provides summary statistics for the parameter estimates of θ and σ. The former is estimated for 2-digit product categories and the latter for 6-digit sectors. The median and quartiles are taken over product categories. Standard errors for σ are computed via the delta method and we refer to an estimate as statistically significant (i.e. different from 0) whenever the corresponding t statistic exceeds 1.96. The reported fractions are similar when assessing if the estimates are significantly different from 1. Analogously, we assess whether or not the estimates for σ are statistically different from the U.S. via 2-sided t-tests.

Generally, we find that about 30% of the variation in the inverse σ can be explained by product and importer fixed effects, with about 2/3 of this variation being due to the elasticity of substitution varying across products. This is consistent with the idea in Feenstra (1994) that product categories are differently differentiated and certain categories are hence more or less substitutable in all countries. Variation across countries on the other hand suggests that demand for goods tends to be generally more elastic in some countries than in others, for example due to varying income levels, which might explain why the median σ is comparably high in the poorer economies Vietnam, India, and China.

Furthermore, a significant fraction of the variation in the elasticity of substitution is due to country-product-specific factors which suggests the presence of other, unobserved determinants of σ. This may for example be due to the set of varieties that one country imports being quite different compared to those that another country imports due to varying trade partners, product standards, or country-specific tastes. While understanding the exact nature of these factors is beyond the scope of the paper, our model is able to account for such country-product-specific factors in the analysis and can in principle provide insights on how important they are for the gains from trade, overall and across countries.

4.3 Estimation of Productivity and Iceberg Cost

We calibrate the firm specific productivity in each country using the data on the rank-size distribution and the number of firms in each sector and the model implied markups. The data on the number of firms is taken from UNIDO Industry Stat 4 Database. Specifically, for a firm f in a given sector, using (11)-(5), we can infer the ratio of its productivity to the productivity of the best firm as a product of ratio of their market shares and their markups. Here, $\mu = \epsilon(s)/(\epsilon(s) - 1)$. $\epsilon(s)$ is the demand elasticity, which is the weighted average of the within and across sector estimated elasticity, weighted by the market shares. We use the data on the rank-size distribution of each sector to calculate the ratio of the market shares.

$$\frac{A_n^f}{A_n^1} = \left(\frac{s_{nn}^{fk}}{s_{nn}^{1k}}\right)^{\frac{1}{\sigma_n^{j(k)}-1}} \frac{\mu_{nn}^{fk}}{\mu_{nn}^{1k}} \tag{23}$$

To estimate the iceberg cost (d_{in}), we use the CEPII data on the distance between the country-pairs ($dist_{in}$), dummy for common border ($border_{in}$), language ($lang_{in}$) and free trade agreement (fta_{in}). Specifically we use the below specification:

$$log(d_{in}^{j(k)}) = \beta_0^{j(k)} + \beta_1^{j(k)} \times dist_{in} + \beta_2^{j(k)} \times border_{in} + \beta_3^{j(k)} \times lang_{in} + \beta_4^{j(k)} \times fta_{in} \tag{24}$$

We estimate the iceberg cost parameters $(\beta_0, \beta_1, \beta_3, \beta_4)$ and the productivity of the best firm A_n^1 for each sector-country such that the model-implied market shares closely match the market shares in the data for the sector. Table 3 summarizes the productivity estimates and the number of firms in each country.

4.3.1 Taste Shifters

To infer the demand shifters $d_n^{j(k)}$ we first rewrite Equation (3) relative to an outside category $j'(k)$:

$$\frac{q_n^{j(k)}}{q_n^{j'(k)}} = \left(\frac{P_n^{j(k)}}{P_n^{j'(k)}}\right)^{-\sigma_n^k} \frac{d_n^{j(k)}}{d_n^{j'(k)}} \tag{25}$$

$$\Leftrightarrow \frac{q_n^{j(k)} P_n^{j(k)}}{q_n^{j'(k)} P_n^{j'(k)}} = \left(\frac{P_n^{j(k)}}{P_n^{j'(k)}}\right)^{1-\sigma_n^k} \frac{d_n^{j(k)}}{d_n^{j'(k)}} \tag{26}$$

$$\Leftrightarrow \frac{s_n^{j(k)}}{s_n^{j'(k)}} = \left(\frac{P_n^{j(k)}}{P_n^{j'(k)}}\right)^{1-\sigma_n^k} \frac{d_n^{j(k)}}{d_n^{j'(k)}} \tag{27}$$

$$\Rightarrow d_n^{j(k)} = \frac{s_n^{j(k)}}{s_n^{j'(k)}} \left(\frac{P_n^{j'(k)}}{P_n^{j(k)}}\right)^{1-\sigma_n^k} d_n^{j'(k)} \tag{28}$$

where $s_n^{j(k)}$ denotes the fraction of expenditure spent on subsector $j(k)$ within sector k. We normalize $d_n^{j'(k)}$ to 1 and evaluate the price indexes $P_n^{j(k)}$ using the estimates on productivity, trade costs, and data on wages by country.

Table 3: Summary Statistics: Productivity and Number of Firms

	Productivity		No of Firms	
	Mean	Median	Mean	Median
Australia	3.02	1.72	744.33	288.00
Austria	6.28	3.20	208.54	78.50
Bangladesh	1.13	0.97	290.14	127.50
Belgium	4.91	2.80	250.38	76.50
Brazil	3.63	1.60	1582.55	635.00
Canada	5.68	3.95	723.46	278.00
China	14.64	14.51	3475.00	1880.00
Denmark	4.79	2.03	109.47	41.50
France	4.58	2.63	1517.83	553.50
Germany	5.16	2.42	1620.72	540.50
Greece	3.11	1.42	483.98	192.00
India	1.33	0.98	2032.28	1175.00
Indonesia	10.63	8.23	255.75	121.50
Italy	4.04	2.01	3091.13	1097.50
Japan	3.09	1.45	2147.16	707.50
Korea, Rep.	4.05	2.58	1476.80	45.00
Mexico	5.32	3.79	479.72	136.50
Netherlands	5.33	2.68	102.10	31.00
New Zealand	3.99	2.43	127.54	47.00
Norway	3.24	1.68	42.53	27.50
Peru	7.19	3.88	550.67	191.00
Romania	7.30	6.54	414.41	153.00
Russia	9.48	6.53	1871.50	773.00
Vietnam	3.62	1.59	586.18	224.00
Spain	3.64	2.10	1400.67	442.00
Sweden	5.53	2.24	403.03	161.00
Egypt	1.85	0.97	49.11	23.00
United Kingdom	3.72	1.87	995.92	294.50
United States	4.16	1.91	2532.65	934.50
R^2	0.43	0.42		

5 Counterfactuals

We perform several counterfactuals to highlight the joint quantitative importance of variable markups and markup heterogeneity.[9] In our main counterfactual, we simulate the consequences of a global trade war in which all countries raise tariffs by 20 percentage points. We do so in two different ways, one in which firms adjust markups in response to changing competition, and one in which we hold markups at baseline levels. This approach allows us to assess how relevant the pro-competitive gains are in our setting and to understand in which way variable markups affect the model's outcomes.

Tables 4 summarizes the results, which have three main takeaways: First, welfare changes are largely heterogeneous across countries, ranging from -4% in Bangladesh to a moderate welfare gain of 0.3% in the UK and Germany. Intuitively, these findings are directly related to the evidence presented in Figure 1 and the difference between import and export markups. Countries which are net importers of higher-markup goods, such as Japan, the UK, or Germany, generally experience only small welfare losses (or they even gain): As their tariff disproportionately taxes higher-markup varieties, these countries can now capture profits that were previously earned by foreign firms. Since this gain is larger than the amount of lost export profits, these countries experience only moderately welfare losses or even small gains. The exact opposite is true for net exporters of high-markup goods such as Belgium, Canada, and Vietnam, which suffer welfare losses that exceed 3%.

Second, Table 4 also decomposes the change in profits into profits earned at home and from exporting, which go in opposite directions. Domestic firms generally earn higher profits due to increased protection from foreign competition. The change in domestic profits is however, with one exception, dominated by a large decline in export profits, which ranges from 25% to 40%. Consequentially, profits overall decline, even when firms can raise prices due to greater market power. As expected, the decline in export profits is particularly strong in economies which specialize in exporting high-markup goods, e.g. Belgium, Canada, and Australia, which translates into high welfare losses overall.

Third, Table 5 highlights to what degree variable markups affect the gains from profit shifting and hence the quantitative implications of a trade war. In general, we find that welfare losses tend to be larger in the absence of variable markups. Belgium, Canada, and Vietnam for example experience up to 25% larger losses in the absence of variable markups. On the other hand, importers of high-markup goods, e.g. Germany, Japan, or the UK, tend to experience smaller gains or larger losses. Variable markups therefore appear to largely mitigate the negative consequences of trade disputes. Intuitively, especially wages see smaller declines under variable

[9] The results presented in this section are based on a preliminary version without firm entry and exit.

markups and firms on average lower prices compared to the fixed markup case. Consequentially, production on average expands which raises demand for labor and a smaller wage decline.

As expected, the rise in domestic profits is larger in the variable-markup case for the majority of countries. Since tariffs allow domestic firms to capture higher market shares, these firms optimally charge higher prices, which translate into higher profits. Also the loss in export profits is mostly dampened: The loss in profits due to a decline in market shares is in most cases mitigated by price reductions. Taken together, profits hence decline less in a setting with variable markups.

Taken together, these findings suggest that variable markups noticeably mitigate profit shifting, especially in a setting with asymmetric markups. We find that the latter can result in up to 1.3 percentage point smaller welfare losses from a global trade war in the case of variable versus fixed markups, which is in contrast to the findings of Arkolakis et al. (2019) who document only small quantitative differences. Hence, if demand elastiticies for a range of countries are sufficiently asymmetric, the pro-competitive gains appear to become more meaningful, in fact, even for those countries in which import and export markups are more comparable.

Accounting for cross-country heterogeneity in import demand elasticities appears to be crucial in quantifying the pro-competitive effects of trade. To show this, Tables 6 and 7 run the same global trade war counterfactual experiment in the variable- and fixed-markup model, respectively, when we assume all countries share the same import demand elasticities as in the U.S. Comparing these two tables shows that there are almost no pro-competitive gains from trade for all countries in the world. We therefore conclude that accounting for cross-country heterogeneity in substitution elasticities is crucial for the "elusiveness" of pro-competitive gains from trade.

Table 4: Global Tariff War (all countries increase tariffs by 20pp), Variable Markups

	Welfare	Wages	Profits			Tariff Rev.	Prices
			Overall	Domestic	Export		
Australia	-0.0026	-0.0121	-0.0150	0.0166	-0.3350	8.3745	0.0399
Austria	-0.0269	-0.0624	-0.0927	0.0525	-0.2996	9.1785	0.0510
Bangladesh	-0.0395	-0.0877	-0.1037	0.0507	-0.2911	2.2466	0.0582
Belgium	-0.0313	-0.0811	-0.1135	0.0811	-0.3001	8.9848	0.0663
Brazil	-0.0019	-0.0112	-0.0093	0.0112	-0.2901	1.7313	0.0244
Canada	-0.0310	-0.0364	-0.1075	0.0222	-0.4004	5.5767	0.0740
China	-0.0046	-0.0143	-0.0094	0.0125	-0.3014	0.8872	0.0208
Denmark	-0.0188	-0.1019	-0.0712	0.0982	-0.2738	8.8188	0.0582
France	-0.0101	-0.0336	-0.0476	0.0316	-0.3050	5.5532	0.0423
Germany	0.0035	-0.0430	-0.0084	0.0510	-0.2737	8.6370	0.0173
Greece	-0.0091	-0.0300	-0.0389	0.0269	-0.2921	2.7853	0.0431
India	-0.0119	-0.0191	-0.0200	0.0091	-0.2662	0.2046	0.0175
Indonesia	-0.0070	-0.0235	-0.0292	0.0186	-0.2898	3.0387	0.0372
Italy	-0.0047	-0.0279	-0.0267	0.0241	-0.2818	3.6627	0.0314
Japan	-0.0030	-0.0163	-0.0056	0.0137	-0.2626	0.6722	-0.0044
Korea, Rep.	-0.0212	-0.0214	-0.0925	0.0361	-0.3425	0.8448	0.0708
Mexico	-0.0080	-0.0296	-0.0296	0.0313	-0.3217	4.7514	0.0197
Netherlands	-0.0261	-0.0727	-0.0939	0.0512	-0.3055	11.3660	0.0594
New Zealand	-0.0166	-0.0531	-0.0670	0.0664	-0.3094	8.7967	0.0551
Norway	-0.0061	-0.0573	-0.0291	0.0532	-0.2527	2.3853	0.0229
Peru	-0.0133	-0.0293	-0.0501	0.0261	-0.3176	10.6324	0.0507
Romania	-0.0134	-0.0343	-0.0518	0.0255	-0.3020	4.4098	0.0458
Russia	-0.0103	-0.0139	-0.0392	0.0111	-0.3356	2.2009	0.0655
Vietnam	-0.0350	-0.0595	-0.1190	0.0691	-0.3321	2.2326	0.0788
Spain	-0.0060	-0.0323	-0.0337	0.0309	-0.2929	10.9178	0.0347
Sweden	-0.0271	-0.0641	-0.0878	0.0653	-0.3016	2.0465	0.0506
Egypt	-0.0330	-0.1187	-0.0903	0.0864	-0.2655	1.6458	0.0715
United Kingdom	0.0030	-0.0443	-0.0069	0.0472	-0.2597	6.0035	0.0077
United States	0.0020	-0.0121	0.0012	0.0160	-0.3316	6.5099	0.0039
ROW	-0.0083	-0.0209	-0.0415	0.0222	-0.3452	0.4051	0.0451

Table 5: Global Tariff War (all countries increase tariffs by 20pp), Fixed Markups

	Welfare	Wages	Profits			Tariff Rev.	Prices
			Overall	Domestic	Export		
Australia	-0.0090	-0.0207	-0.0173	0.0155	-0.3392	8.0776	0.0453
Austria	-0.0320	-0.0652	-0.1005	0.0485	-0.3047	9.0843	0.0553
Bangladesh	-0.0400	-0.0885	-0.1037	0.0527	-0.2891	2.2361	0.0585
Belgium	-0.0343	-0.0822	-0.1185	0.0790	-0.3013	8.4215	0.0683
Brazil	-0.0045	-0.0156	-0.0098	0.0109	-0.2913	1.7276	0.0269
Canada	-0.0435	-0.0614	-0.1092	0.0299	-0.3797	6.0019	0.0697
China	-0.0040	-0.0146	-0.0076	0.0132	-0.2925	0.8838	0.0214
Denmark	-0.0330	-0.1190	-0.0773	0.0934	-0.2786	8.7121	0.0613
France	-0.0135	-0.0393	-0.0478	0.0313	-0.3047	5.5302	0.0433
Germany	-0.0042	-0.0546	-0.0096	0.0496	-0.2737	8.6926	0.0198
Greece	-0.0124	-0.0350	-0.0399	0.0262	-0.2939	2.8063	0.0453
India	-0.0152	-0.0254	-0.0204	0.0090	-0.2665	0.2074	0.0188
Indonesia	-0.0077	-0.0242	-0.0297	0.0183	-0.2905	3.0403	0.0387
Italy	-0.0079	-0.0340	-0.0266	0.0241	-0.2820	3.6755	0.0328
Japan	0.0013	-0.0088	-0.0052	0.0133	-0.2548	0.6802	-0.0034
Korea, Rep.	-0.0277	-0.0299	-0.0944	0.0365	-0.3426	0.8050	0.0725
Mexico	-0.0073	-0.0245	-0.035	0.0283	-0.3322	4.7243	0.0270
Netherlands	-0.0185	-0.0623	-0.0979	0.0503	-0.3158	9.1672	0.0669
New Zealand	-0.0242	-0.0639	-0.0703	0.0661	-0.3106	8.8698	0.0595
Norway	-0.0109	-0.0631	-0.0311	0.0512	-0.2540	2.3802	0.0258
Peru	-0.0126	-0.0264	-0.0530	0.0243	-0.3213	10.6481	0.0552
Romania	-0.0184	-0.0417	-0.0540	0.0246	-0.3041	4.2425	0.0488
Russia	-0.0141	-0.0201	-0.0398	0.0113	-0.3340	2.2379	0.0654
Vietnam	-0.0394	-0.0665	-0.1191	0.0704	-0.3267	1.8556	0.0783
Spain	-0.0087	-0.0371	-0.0337	0.0309	-0.2928	10.9800	0.0357
Sweden	-0.0281	-0.0611	-0.0952	0.0619	-0.3038	2.0713	0.0526
Egypt	-0.0382	-0.1237	-0.0942	0.0832	-0.2676	1.6382	0.0739
United Kingdom	0.0004	-0.0520	-0.0019	0.0498	-0.2463	6.0013	0.0037
United States	0.0253	0.0224	0.0088	0.0201	-0.3099	6.5991	0.0054
ROW	-0.0078	-0.0194	-0.0437	0.0193	-0.3459	0.4101	0.0504

Table 6: Global Tariff War (all countries increase tariffs by 20pp), Variable Markups, Homogeneous Sigma

	Welfare	Wages	Profits			Tariff Rev.	Prices
			Overall	Domestic	Export		
Australia	-0.0105	-0.0194	-0.028	0.0088	-0.3264	6.0572	0.0629
Austria	-0.0332	-0.1078	-0.1056	0.0910	-0.2766	5.0551	0.0796
Bangladesh	-0.0332	-0.0521	-0.0951	0.0377	-0.3180	1.3026	0.0763
Belgium	-0.0580	-0.1506	-0.1650	0.1275	-0.2794	11.4170	0.1156
Brazil	-0.0067	-0.0185	-0.0196	0.0125	-0.2785	1.0094	0.0341
Canada	-0.0117	-0.0455	-0.0400	0.0422	-0.3070	5.5358	0.0461
China	-0.0029	-0.0199	-0.0123	0.0177	-0.2686	1.2523	0.0232
Denmark	-0.0429	-0.1070	-0.1358	0.0730	-0.2816	8.4324	0.0847
France	-0.0162	-0.0556	-0.0648	0.0411	-0.2858	8.0822	0.0635
Germany	-0.0035	-0.0401	-0.0321	0.0415	-0.2787	7.8393	0.0412
Greece	-0.0088	-0.0335	-0.0393	0.0261	-0.2813	3.1370	0.0500
India	-0.0090	-0.0182	-0.0195	0.0109	-0.2731	0.3558	0.0273
Indonesia	-0.0088	-0.0215	-0.0257	0.0113	-0.2778	1.1363	0.0352
Italy	-0.0078	-0.0339	-0.0377	0.0263	-0.2813	4.3868	0.0520
Japan	-0.0053	-0.0140	-0.0102	0.0106	-0.2630	0.3662	0.0085
Korea, Rep.	-0.0148	-0.0387	-0.0426	0.0123	-0.2517	1.0033	0.0297
Mexico	-0.0075	-0.0386	-0.0320	0.0357	-0.2958	5.6707	0.0331
Netherlands	-0.0395	-0.1226	-0.1262	0.0866	-0.2681	9.8648	0.0867
New Zealand	-0.0222	-0.0615	-0.0821	0.0556	-0.2972	8.8245	0.0719
Norway	-0.0190	-0.0508	-0.0648	0.0331	-0.2665	0.8961	0.0492
Peru	-0.0165	-0.0484	-0.0634	0.0303	-0.2864	27.6280	0.0525
Romania	-0.0225	-0.0739	-0.0789	0.0553	-0.2772	3.1583	0.0623
Russia	-0.0068	-0.0153	-0.0243	0.0093	-0.3048	2.1411	0.0564
Vietnam	-0.0321	-0.0731	-0.0906	0.0517	-0.2997	1.9511	0.0721
Spain	-0.0048	-0.0332	-0.0334	0.0301	-0.2826	10.4160	0.0482
Sweden	-0.0207	-0.0920	-0.0777	0.0868	-0.2721	4.6000	0.0647
Egypt	-0.0437	-0.1144	-0.1245	0.0881	-0.2755	1.7421	0.0859
United Kingdom	-0.0108	-0.0425	-0.0482	0.0372	-0.2830	5.9744	0.0486
United States	-0.0011	-0.0096	-0.0068	0.0085	-0.3150	6.9601	0.0317
ROW	-0.0055	-0.0167	-0.0188	0.0096	-0.2972	0.2171	0.0495

Table 7: Global Tariff War (all countries increase tariffs by 20pp), Fixed Markups, Homogeneous Sigma

	Welfare	Wages	Profits			Tariff Rev.	Prices
			Overall	Domestic	Export		
Australia	-0.0106	-0.0193	-0.0291	0.0088	-0.3264	6.0549	0.0627
Austria	-0.0339	-0.1071	-0.1075	0.0893	-0.2779	5.0401	0.0798
Bangladesh	-0.0339	-0.0522	-0.0973	0.0379	-0.3179	1.3021	0.0758
Belgium	-0.0583	-0.1502	-0.1656	0.1267	-0.2799	11.3720	0.1156
Brazil	-0.0068	-0.0184	-0.0199	0.0124	-0.2788	1.0074	0.0341
Canada	-0.0110	-0.0459	-0.0377	0.0436	-0.3026	5.5140	0.0440
China	-0.0025	-0.0200	-0.0114	0.0183	-0.2668	1.2511	0.0221
Denmark	-0.0444	-0.1061	-0.1401	0.0708	-0.2831	8.3900	0.0851
France	-0.0165	-0.0554	-0.0654	0.0404	-0.2861	8.0594	0.0635
Germany	-0.0038	-0.0401	-0.0324	0.0413	-0.2788	7.8265	0.0410
Greece	-0.0092	-0.0335	-0.0401	0.0259	-0.2814	3.1251	0.0498
India	-0.0090	-0.0181	-0.0195	0.0108	-0.2733	0.3552	0.0270
Indonesia	-0.0091	-0.0215	-0.0265	0.0111	-0.2785	1.1342	0.0352
Italy	-0.0080	-0.0339	-0.0380	0.0262	-0.2816	4.3644	0.0520
Japan	-0.0056	-0.0139	-0.0109	0.0102	-0.2634	0.3647	0.0085
Korea, Rep.	-0.0150	-0.0386	-0.0429	0.0119	-0.2521	1.0006	0.0294
Mexico	-0.0079	-0.0385	-0.0329	0.0350	-0.2962	5.6648	0.0334
Netherlands	-0.0402	-0.1222	-0.1287	0.0865	-0.2698	9.8704	0.0875
New Zealand	-0.0230	-0.0611	-0.0843	0.0544	-0.2978	8.7932	0.0718
Norway	-0.0202	-0.0505	-0.0678	0.0317	-0.2672	0.8870	0.0492
Peru	-0.0174	-0.0480	-0.0655	0.0287	-0.2871	27.2390	0.0526
Romania	-0.0229	-0.0737	-0.0796	0.0546	-0.2776	3.1496	0.0622
Russia	-0.0070	-0.0154	-0.0246	0.0092	-0.3048	2.1119	0.0561
Vietnam	-0.0322	-0.0728	-0.0908	0.0514	-0.3000	1.9482	0.0718
Spain	-0.0048	-0.0332	-0.0334	0.0300	-0.2826	10.4060	0.0479
Sweden	-0.0210	-0.0917	-0.0781	0.086	-0.2722	4.5910	0.0644
Egypt	-0.0469	-0.1119	-0.1327	0.0817	-0.2775	1.7185	0.0854
United Kingdom	-0.0115	-0.0425	-0.0498	0.0373	-0.2833	5.9557	0.0488
United States	-0.0012	-0.0096	-0.0070	0.0084	-0.3174	6.8886	0.0332
ROW	-0.0054	-0.0167	-0.0187	0.0097	-0.2969	0.2169	0.0490

6 Conclusions

To be completed.

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Appendices

A Derivations

This section derives the optimal price-setting rule in our setting. First, given that the composite quantity in sector k equals

$$Q_n^k = \left[\sum_{j=1}^{J(k)} (d_n^{j(k)})^{1/\sigma_n^k} \cdot (q_n^{j(k)})^{\frac{\sigma_n^k - 1}{\sigma_n^k}} \right]^{\frac{\sigma_n^k}{\sigma_n^k - 1}} \tag{29}$$

households maximize

$$L = Q_n^k + \lambda_n^k \left(I_n^k - \sum_{j=1}^{J(k)} P_n^{j(k)} q_n^{j(k)} \right) \tag{30}$$

where I_n^k denotes expenditure on sector k in country n. The first-order condition of this problem implies that

$$\frac{\sigma_n^k}{\sigma_n^k - 1} \left[\sum_{j=1}^{J(k)} (d_n^{j(k)})^{1/\sigma_n^k} \cdot q_n^{j(k)\ \frac{\sigma_n^k - 1}{\sigma_n^k}} \right]^{\frac{\sigma_n^k}{\sigma_n^k - 1} - 1} (d_n^{j(k)})^{1/\sigma_n^k} \cdot q_n^{j(k)\ \frac{\sigma_n^k - 1}{\sigma_n^k} - 1} = \lambda_n^k P_n^{j(k)} \tag{31}$$

and hence

$$\left(\frac{d_n^{j(k)}}{d_n^{j'(k)}} \right)^{1/\sigma_n^k} \cdot \left(\frac{q_n^{j(k)}}{q_n^{j'(k)}} \right)^{-1/\sigma_n^k} = \frac{P_n^{j(k)}}{P_n^{j'(k)}} \tag{32}$$

$$\Leftrightarrow \left(\frac{d_n^{j(k)}}{d_n^{j'(k)}} \right)^{-1} \cdot \frac{q_n^{j(k)}}{q_n^{j'(k)}} = \frac{P_n^{j(k)}}{P_n^{j'(k)}}^{-\sigma_n^k} \tag{33}$$

$$\Leftrightarrow q_n^{j(k)} = \frac{d_n^{j(k)}}{d_n^{j'(k)}} \cdot \frac{P_n^{j(k)}}{P_n^{j'(k)}}^{-\sigma_n^k} q_n^{j'(k)} \tag{34}$$

$$\Leftrightarrow P_n^{j(k)} q_n^{j(k)} = \frac{d_n^{j(k)}}{d_n^{j'(k)}} \cdot \frac{P_n^{j(k) 1-\sigma_n^k}}{P_n^{j'(k) -\sigma_n^k}} q_n^{j'(k)} \tag{35}$$

$$\Leftrightarrow I_n^k = \frac{\sum_j d_n^{j(k)} P_n^{j(k) 1-\sigma_n^k}}{d_n^{j'(k)} P_n^{j'(k) -\sigma_n^k}} q_n^{j'(k)} \tag{36}$$

$$\Rightarrow q_n^{j'(k)} = \frac{d_n^{j'(k)} P_n^{j'(k) -\sigma_n^k}}{\sum_j d_n^{j(k)} P_n^{j(k) 1-\sigma_n^k}} I_n^k \tag{37}$$

Defining

$$\mathcal{P}_n^k = \left(\sum_j d_n^{j(k)} (P_n^{j(k)})^{1-\sigma_n^k} \right)^{\frac{1}{1-\sigma_n^k}} \tag{38}$$

we can write this as

$$q_n^{j'(k)} = \frac{d_n^{j'(k)} (P_n^{j'(k)})^{-\sigma_n^k}}{(\mathcal{P}_n^k)^{(1-\sigma_n^k)}} I_n^k \tag{39}$$

$$\Leftrightarrow q_n^{j'(k)} = \frac{d_n^{j'(k)} (P_n^{j'(k)})^{-\sigma_n^k}}{(\mathcal{P}_n^k)^{(1-\sigma_n^k)}} Q_n^k \mathcal{P}_n^k \tag{40}$$

$$\Rightarrow q_n^{j'(k)} = \frac{d_n^{j'(k)} (P_n^{j'(k)})^{-\sigma_n^k}}{(\mathcal{P}_n^k)^{-\sigma_n^k}} Q_n^k \tag{41}$$

which can be written as

$$\left(\frac{q_n^{j(k)}}{Q_n^k} \right)^{-1/\sigma_n^k} (d_n^{j(k)})^{1/\sigma_n^k} = \frac{P_n^{j(k)}}{\mathcal{P}_n^k} \tag{42}$$

Rewriting Equation (7) as

$$\frac{p_{inf}^{j(k)}}{P_n^{j(k)}} = (\frac{q_{inf}^{j(k)}}{q_n^{j(k)}})^{-1/\sigma_n^{j(k)}} \tag{43}$$

means that we can multiply Equation (42) and Equation (43) to obtain

$$\frac{p_{inf}^{j(k)}}{\mathcal{P}_n^k} = (q_n^{j(k)})^{1/\sigma_n^k - 1/\sigma_n^{j(k)}} (Q_n^k)^{1/\sigma_n^k} (q_{inf}^{j(k)})^{-1/\sigma_n^{j(k)}} (d_n^{j(k)})^{1/\sigma_n^k} \tag{44}$$

$$\Rightarrow p_{inf}^{j(k)} = (q_n^{j(k)})^{1/\sigma_n^k - 1/\sigma_n^{j(k)}} (Q_n^k)^{1/\sigma_n^k} (q_{inf}^{j(k)})^{-1/\sigma_n^{j(k)}} (d_n^{j(k)})^{1/\sigma_n^k} \mathcal{P}_n^k \tag{45}$$

The profit-maximization problem of a firm f is hence

$$\max_{q_{inf}^{j(k)}} p_{inf}^{j(k)} q_{inf}^{j(k)} - q_{inf}^{j(k)} mc_{inf}^{j(k)} \tag{46}$$

$$\Leftrightarrow \max_{q_{inf}^{j(k)}} (q_n^{j(k)})^{1/\sigma_n^k - 1/\sigma_n^{j(k)}} (Q_n^k)^{1/\sigma_n^k} (q_{inf}^{j(k)})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}} (d_n^{j(k)})^{1/\sigma_n^k} \mathcal{P}_n^k - q_{inf}^{j(k)} mc_{inf}^{j(k)}. \tag{47}$$

We follow Atkeson and Burstein (2008) and take $\mathcal{P}_n^k$ as well as Q_n^k as given, in which case we obtain the first-order condition

$$\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}(q_n^{j(k)})^{1/\sigma_n^k-1/\sigma_n^{j(k)}}(Q_n^k)^{1/\sigma_n^k}(q_{inf}^{j(k)})^{-\frac{1}{\sigma_n^{j(k)}}}(d_n^{j(k)})^{1/\sigma_n^k}\mathcal{P}_n^k \tag{48}$$

$$+(1/\sigma_n^k-1/\sigma_n^{j(k)})(q_n^{j(k)})^{1/\sigma_n^k-1/\sigma_n^{j(k)}-1}\cdot\frac{\partial q_n^{j(k)}}{\partial q_{inf}^{j(k)}}(Q_n^k)^{1/\sigma_n^k}(q_{inf}^{j(k)})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}(d_n^{j(k)})^{1/\sigma_n^k}=mc_{inf}^{j(k)}. \tag{49}$$

Using Equation (6), we can write

$$\frac{\partial q_n^{j(k)}}{\partial q_{inf}^{j(k)}}=\left(\frac{q_n^{j(k)}}{q_{inf}^{j(k)}}\right)^{1/\sigma_n^{j(k)}} \tag{50}$$

and simply the first-order condition to

$$\begin{aligned}
&\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}(q_n^{j(k)})^{1/\sigma_n^k-1/\sigma_n^{j(k)}}(Q_n^k)^{1/\sigma_n^k}(q_{inf}^{j(k)})^{-\frac{1}{\sigma_n^{j(k)}}}(d_n^{j(k)})^{1/\sigma_n^k}\mathcal{P}_n^k\\
&+(1/\sigma_n^k-1/\sigma_n^{j(k)})(q_n^{j(k)})^{1/\sigma_n^k-1/\sigma_n^{j(k)}-1}\cdot\left(\frac{q_n^{j(k)}}{q_{inf}^{j(k)}}\right)^{1/\sigma_n^{j(k)}}(Q_n^k)^{1/\sigma_n^k}(q_{inf}^{j(k)})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}(d_n^{j(k)})^{1/\sigma_n^k}=mc_{inf}^{j(k)}\\
&\Leftrightarrow (q_n^{j(k)})^{1/\sigma_n^k-1/\sigma_n^{j(k)}}(Q_n^k)^{1/\sigma_n^k}(q_{inf}^{j(k)})^{-\frac{1}{\sigma_n^{j(k)}}}(d_n^{j(k)})^{1/\sigma_n^k}\mathcal{P}_n^k\left[(q_{inf}^{j(k)})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}(q_n^{j(k)})^{1/\sigma_n^{j(k)}-1}(\frac{1}{\sigma_n^k}-\frac{1}{\sigma_n^{j(k)}})+\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}\right]\\
&=mc_{inf}^{j(k)}\\
&\Leftrightarrow p_{inf}^{j(k)}\left[(\frac{q_{inf}^{j(k)}}{q_n^{j(k)}})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}(\frac{1}{\sigma_n^k}-\frac{1}{\sigma_n^{j(k)}})+\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}\right]=mc_{inf}^{j(k)}
\end{aligned}$$

Lastly, Equation (7) implies that

$$\frac{q_{inf}^{j(k)}}{q_n^{j(k)}}=(\frac{p_{inf}^{j(k)}}{P_n^{j(k)}})^{-\sigma_n^{j(k)}} \tag{51}$$

$$(\frac{q_{inf}^{j(k)}}{q_n^{j(k)}})^{\frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}}}=(\frac{p_{inf}^{j(k)}}{P_n^{j(k)}})^{1-\sigma_n^{j(k)}}=s_{inf}^{j(k)} \tag{52}$$

with $s_{inf}^{j(k)}$ denoting the market share of firm f when selling $j(k)$. The latter equality follows from the definition

$$s_{inf}^{j(k)}=\frac{p_{inf}^{j(k)}q_{inf}^{j(k)}}{\sum_{f'}p_{inf'}^{j(k)}q_{inf'}^{j(k)}}. \tag{53}$$

Using Equation (51), we can write

$$q_{inf}^{j(k)} = (\frac{p_{inf}^{j(k)}}{P_n^{j(k)}})^{-\sigma_n^{j(k)}} q_n^{j(k)} \tag{54}$$

and the market share becomes

$$s_{inf}^{j(k)} = \frac{(p_{inf}^{j(k)})^{1-\sigma_n^{j(k)}}}{\sum_{f'}(p_{inf'}^{j(k)})^{1-\sigma_n^{j(k)}}} = \frac{(p_{inf}^{j(k)})^{1-\sigma_n^{j(k)}}}{[(\sum_{f'}(p_{inf'}^{j(k)})^{1-\sigma_n^{j(k)}})^{1/(1-\sigma_n^{j(k)})}]^{1-\sigma_n^{j(k)}}} = (\frac{p_{inf}^{j(k)}}{P_n^{j(k)}})^{1-\sigma_n^{j(k)}}. \tag{55}$$

The first-order condition can hence be written as

$$p_{inf}^{j(k)} \left[s_{inf}^{j(k)} (\frac{1}{\sigma_n^k} - \frac{1}{\sigma_n^{j(k)}}) + \frac{\sigma_n^{j(k)} - 1}{\sigma_n^{j(k)}} \right] = mc_{inf}^{j(k)} \tag{56}$$

$$\frac{p_{inf}^{j(k)}}{mc_{inf}^{j(k)}} = \frac{1}{\left[s_{inf}^{j(k)} (\frac{1}{\sigma_n^k} - \frac{1}{\sigma_n^{j(k)}}) + \frac{\sigma_n^{j(k)}-1}{\sigma_n^{j(k)}} \right]} \tag{57}$$

Defining the weighted average of the demand elasticities as

$$\epsilon(s) = \left[\frac{1}{\sigma_n^{j(k)}(1 - s_{inf}^{j(k)}) + \frac{1}{\sigma_n^k} s_{inf}^{j(k)}} \right] \tag{58}$$

one can then show that

$$\frac{p_{inf}^{j(k)}}{mc_{inf}^{j(k)}} = \frac{\epsilon(s)}{\epsilon(s) - 1}. \tag{59}$$

B Productivity and Iceberg Cost Parameters

We derive Equation (23) using Equation (11)-(13). From Equation (13), we can write

$$s_{nnf}^{j(k)\,\frac{1}{1-\sigma_n^{j(k)}}} = \left[\frac{p_{nnf}^{j(k)}}{P_n^{j(k)}} \right]$$

Dividing this by the market share of best-firm in the country n gives us

$$\left[\frac{s_{nnf}^{j(k)}}{s_{nn1}^{j(k)}}\right]^{\frac{1}{1-\sigma_n^{j(k)}}} = \left[\frac{p_{nnf}^{j(k)}}{p_{nn1}^{j(k)}}\right]$$

From Equation (11) we substitute the prices to get

$$\left[\frac{s_{nnf}^{j(k)}}{s_{nn1}^{j(k)}}\right]^{\frac{1}{1-\sigma_n^{j(k)}}} = \left[\frac{mu_{nnf}^{j(k)}/A_{nf}^{j(k)}}{mu_{nn1}^{j(k)}/A_{n1}^{j(k)}}\right]$$

$$\frac{A_{nf}^{j(k)}}{A_{n1}^{j(k)}} = \left[\frac{s_{nnf}^{j(k)}}{s_{nn1}^{j(k)}}\right]^{\frac{1}{\sigma_n^{j(k)}-1}} \frac{\mu_{nnf}^{j(k)}}{\mu_{nn1}^{j(k)}}$$

To get the ratio of firm f's domestic market share with respect to best firm 1, we exploit the data on the firm-size distribution, number of firms in each sector-country and the overall domestic share of a country in the trade data. The firm-size distribution give us the information on the relative domestic share of the domestic firms in a sector $\left[\frac{s_{nnf}^{j(k)}}{s_{nn1}^{j(k)}}\right]$. If there are F firms in a country-sector, then:

$$s_{nn1}^{j(k)} + s_{nn2}^{j(k)} + ... + s_{nnF}^{j(k)} = s_{nn}^{j(k)}$$

Dividing the above equation by $s_{nn1}^{j(k)}$ we get

$$\frac{s_{nn1}^{j(k)}}{s_{nn1}^{j(k)}} + \frac{s_{nn2}^{j(k)}}{s_{nn1}^{j(k)}} + ... + \frac{s_{nnF}^{j(k)}}{s_{nn1}^{j(k)}} = \frac{s_{nn}^{j(k)}}{s_{nn1}^{j(k)}}$$

Thus, we can now get the domestic market share of firm 1 as

$$s_{nn1}^{j(k)} = \frac{s_{nn}^{j(k)}}{\frac{s_{nn1}^{j(k)}}{s_{nn1}^{j(k)}} + \frac{s_{nn2}^{j(k)}}{s_{nn1}^{j(k)}} + ... + \frac{s_{nnF}^{j(k)}}{s_{nn1}^{j(k)}}}$$

To estimate the iceberg cost (d_{in}), we use the CEPII data on the distance between the country-pairs ($dist_{in}$), dummy for common border ($border_{in}$), language ($lang_{in}$) and free trade agreement (fta_{in}). Specifically we use the below specification:

$$log(d_{in}^{j(k)}) = \beta_0^{j(k)} + \beta_1^{j(k)} \times dist_{in} + \beta_2^{j(k)} \times border_{in} + \beta_3^{j(k)} \times lang_{in} + \beta_4^{j(k)} \times \beta_5^{j(k)} fta_{in}$$

We estimate the iceberg cost parameters $(\beta_0, \beta_1, \beta_3, \beta_4, \beta_5)$ and the productivity of the best firm A_{n1} for each sector-country such that the model-implied market shares closely match the market shares in the data for the sector.

B.1 Estimation Procedure

The following steps elaborate on the estimation procedure for *each* sector $j(k)$

1. We start with a guess of the iceberg cost parameters $(\beta_0^{j(k)}, \beta_1^{j(k)}, \beta_3^{j(k)}, \beta_4^{j(k)}, \beta_5^{j(k)})$ and the productivity of the best firm $A_{n1}^{j(k)}$ for each country n. We normalize the best firm productivity of ROW to 1. In total, we have 34 parameters (5 iceberg and 29 country-productivity)

2. Given the best-firm productivity guess, we calculate the productivity distribution of firms in each country, given by Equation (23).

3. Given the iceberg-cost parameter guess, we calculate the marginal cost of each firm from a source country i serving in the destination country

$$mc_{inf}^{j(k)} = \frac{w_i \tau_{in}^{j(k)}}{A_{if}^{j(k)}} = \frac{w_i d_{in}^{j(k)}(1 + t_{in}^{j(k)})}{A_{if}^{j(k)}}$$

4. The foreign firms with marginal costs less than the least domestic firm F enters the destination market, i.e. A firm f in country i enters country n if $mc_{inf}^{j(k)} < mc_{nnF}^{j(k)}$

5. Given this, we solve Equation (11)-(13) to get the bi-lateral market share of each firm

$$p_{inf}^{j(k)} = \frac{\varepsilon_{inf}^{j(k)}}{\varepsilon_{inf}^{j(k)} - 1} \left[\frac{w_i \tau_{in}^{j(k)}}{A_{if}^{j(k)}} \right]$$

$$\varepsilon_{inf}^{j(k)} = \left[\frac{1}{\sigma_n^{j(k)}} (1 - s_{inf}^{j(k)}) + \frac{1}{\sigma_n^k} s_{inf}^{j(k)} \right]^{-1}$$

$$s_{inf}^{j(k)} = \left[\frac{p_{inf}^{j(k)}}{P_n^{j(k)}} \right]^{1-\sigma_n^{j(k)}}$$

6. We calculate the overall market share of country i in country n by summing over the market share of firms from country i serving in country n

$$s_{in}^{j(k),model} = \sum_f s_{inf}^{j(k)}$$

7. We find the productivity and iceberg parameters that minimizes the sum of log difference between the model-implied market shares $s_{in}^{j(k),model}$ and the market shares observed in the data.

B.2 Counterfactuals

We evaluate counterfactuals as follows

1. Start with factual quantities $q_n^{j(k)}$
2. For each sector: Assume initially that all firms sell in all markets. This is the initial set of firms F.
3. Compute each firm's marginal cost and obtain the optimal prices and shares via the inner loop
4. Compute each firm's profit as $(p_{inf}^{j(k)} - mc_{inf}^{j(k)})s_{inf}^{j(k)}q_n^{j(k)} - f_{in}^{j(k)}$
5. Update F by removing the 5% (or 1%) firms with the most negative profits, i.e. assume these firms do not enter. Do only remove firms with negative profits, i.e. if only 4% of firms have negative profits, remove only 4%.
6. Use the inner loop to obtain new prices and shares. Update $q_n^{j(k)}$.
7. Repeat steps 2 - 6 until F (and $q_n^{j(k)}$) converges.

C Additional Tables and Figures

Table C.1: Inverse Demand Elasticities and Import/Export Shares for each country's largest sectors

	Imports			Exports		
Country	Product Category (HS2 level)	Share	$1/\sigma$	Product Category (HS2 level)	Share	$1/\sigma$
Australia	Elec. Machinery/Equipment (85)	16.94	.24	Ores, Slag, and Ash (26)	27.48	.55
Australia	Vehicles (87)	12.92	.30	Mineral Fuels/Oils, etc. (27)	26.08	.33
Australia	Mineral Fuels/Oils, etc. (27)	11.21	.35	Precious Stones, Pearls (71)	7.24	.40
Austria	Elec. Machinery/Equipment (85)	14.43	.59	Elec. Machinery/Equipment (85)	15.43	.33
Austria	Vehicles (87)	10.82	.61	Machinery, Mech. Appliances (84)	14.11	.34
Austria	Machinery, Mech. Appliances (84)	9.59	.41	Vehicles (87)	9.41	.43
Bangladesh	Cotton (52)	14.89	.33	Cloth. Accessories, not knitted (62)	40.24	.35
Bangladesh	Mineral Fuels/Oils, etc. (27)	10.87	.53	Cloth. Accessories, knitted (61)	38.44	.37
Bangladesh	Machinery, Mech. Appliances (84)	8.18	.24	Paper, Paperboard (48)	4.73	.55
Belgium	Pharmaceutical Products (30)	14.63	.11	Pharmaceutical Products (30)	13.28	.55
Belgium	Mineral Fuels/Oils, etc. (27)	12.18	.39	Mineral Fuels/Oils, etc. (27)	11.61	.43
Belgium	Vehicles (87)	11.61	.27	Vehicles (87)	10.61	.40
Brazil	Elec. Machinery/Equipment (85)	16.04	.62	Ores, Slag, and Ash (26)	12.93	.54
Brazil	Mineral Fuels/Oils, etc. (27)	14.65	.30	Seeds and Grains (12)	11.25	.36
Brazil	Machinery, Mech. Appliances (84)	10.26	.36	Mineral Fuels/Oils, etc. (27)	8.53	.53
Canada	Vehicles (87)	16.33	.31	Mineral Fuels/Oils, etc. (27)	19.31	.62
Canada	Elec. Machinery/Equipment (85)	14.26	.32	Vehicles (87)	15.06	.37
Canada	Machinery, Mech. Appliances (84)	11.18	.25	Precious Stones, Pearls (71)	6.02	.55
China	Elec. Machinery/Equipment (85)	25.91	.61	Elec. Machinery/Equipment (85)	40.06	.26
China	Mineral Fuels/Oils, etc. (27)	12.97	.34	Machinery, Mech. Appliances (84)	6.24	.32
China	Precious Stones, Pearls (71)	6.37	.33	Furniture, Bedding, etc. (94)	3.82	.30
Denmark	Elec. Machinery/Equipment (85)	15.32	.42	Pharmaceutical Products (30)	14.6	.57
Denmark	Vehicles (87)	7.99	.49	Elec. Machinery/Equipment (85)	11.75	.33
Denmark	Machinery, Mech. Appliances (84)	7.53	.41	Machinery, Mech. Appliances (84)	10.37	.35
Egypt	Mineral Fuels/Oils, etc. (27)	13.93	.34	Mineral Fuels/Oils, etc. (27)	28.47	.41
Egypt	Elec. Machinery/Equipment (85)	9.04	.39	Elec. Machinery/Equipment (85)	6.61	.35
Egypt	Vehicles (87)	8.66	.26	Vegetables and Roots (7)	4.76	.49
France	Elec. Machinery/Equipment (85)	12.71	.39	Vehicles (87)	10.37	.44
France	Mineral Fuels/Oils, etc. (27)	10.61	.16	Aircraft, Spacecraft (88)	10.17	.52
France	Vehicles (87)	9.7	.31	Machinery, Mech. Appliances (84)	9.55	.36
Germany	Elec. Machinery/Equipment (85)	17.67	.64	Vehicles (87)	19.63	.39
Germany	Vehicles (87)	9.96	.48	Elec. Machinery/Equipment (85)	14.61	.31
Germany	Machinery, Mech. Appliances (84)	8.19	.42	Machinery, Mech. Appliances (84)	12.83	.33
Greece	Mineral Fuels/Oils, etc. (27)	25.94	.38	Mineral Fuels/Oils, etc. (27)	27.34	.62
Greece	Elec. Machinery/Equipment (85)	8.57	.16	Aluminium & Articles thereof (76)	5.93	.43
Greece	Pharmaceutical Products (30)	8.17	.19	Pharmaceutical Products (30)	5.32	.59
India	Mineral Fuels/Oils, etc. (27)	27.55	.28	Precious Stones, Pearls (71)	13.56	.41
India	Precious Stones, Pearls (71)	15.73	.68	Mineral Fuels/Oils, etc. (27)	12.29	.59
India	Elec. Machinery/Equipment (85)	12.65	.37	Pharmaceutical Products (30)	7.11	.57
Indonesia	Mineral Fuels/Oils, etc. (27)	17.62	.66	Mineral Fuels/Oils, etc. (27)	21.12	.35
Indonesia	Elec. Machinery/Equipment (85)	15.06	.16	Animal/Vegetable Oils & Fats (15)	11.94	.42
Indonesia	Machinery, Mech. Appliances (84)	11.38	.25	Elec. Machinery/Equipment (85)	8.02	.28

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes.

Table C.2: Inverse Demand Elasticities and Import/Export Shares for each country's largest sectors (cont.)

	Imports			Exports		
Country	Product Category (HS2 level)	Share	$1/\sigma$	Product Category (HS2 level)	Share	$1/\sigma$
Italy	Mineral Fuels/Oils, etc. (27)	12.36	.23	Machinery, Mech. Appliances (84)	15.28	.32
Italy	Elec. Machinery/Equipment (85)	10.87	.50	Elec. Machinery/Equipment (85)	10.77	.31
Italy	Vehicles (87)	8.98	.29	Vehicles (87)	8.34	.41
Japan	Mineral Fuels/Oils, etc. (27)	20.88	.30	Elec. Machinery/Equipment (85)	25.4	.33
Japan	Elec. Machinery/Equipment (85)	19.87	.69	Vehicles (87)	20.91	.38
Japan	Pharmaceutical Products (30)	5.67	.80	Machinery, Mech. Appliances (84)	12.48	.31
Mexico	Elec. Machinery/Equipment (85)	30.52	.32	Elec. Machinery/Equipment (85)	28.29	.20
Mexico	Machinery, Mech. Appliances (84)	10.6	.40	Vehicles (87)	24.3	.46
Mexico	Vehicles (87)	9.69	.20	Machinery, Mech. Appliances (84)	9.11	.25
Netherlands	Elec. Machinery/Equipment (85)	19.89	.21	Elec. Machinery/Equipment (85)	17.8	.35
Netherlands	Mineral Fuels/Oils, etc. (27)	14.92	.42	Mineral Fuels/Oils, etc. (27)	15.85	.44
Netherlands	Pharmaceutical Products (30)	5.77	.35	Pharmaceutical Products (30)	9.71	.58
New Zealand	Vehicles (87)	13.53	.23	Dairy, Eggs, Honey (4)	19.06	.58
New Zealand	Elec. Machinery/Equipment (85)	13.4	.26	Meat and Edible Meat (2)	13.92	.34
New Zealand	Mineral Fuels/Oils, etc. (27)	10.08	.31	Wood and Articles of Wood (44)	8.21	.63
Norway	Elec. Machinery/Equipment (85)	13.85	.38	Mineral Fuels/Oils, etc. (27)	48.88	.43
Norway	Vehicles (87)	10.8	.52	Fish, Seafood (3)	12.16	.31
Norway	Machinery, Mech. Appliances (84)	9.59	.48	Elec. Machinery/Equipment (85)	5.36	.33
Peru	Elec. Machinery/Equipment (85)	16.38	.23	Ores, Slag, and Ash (26)	29.75	.36
Peru	Mineral Fuels/Oils, etc. (27)	10.28	.49	Precious Stones, Pearls (71)	17.2	.67
Peru	Machinery, Mech. Appliances (84)	10.03	.35	Fruits and Nuts (8)	6.61	.45
ROW	Elec. Machinery/Equipment (85)	22.28	.16	Mineral Fuels/Oils, etc. (27)	22.38	.37
ROW	Machinery, Mech. Appliances (84)	7.97	.24	Elec. Machinery/Equipment (85)	18	.45
ROW	Vehicles (87)	7.49	.36	Precious Stones, Pearls (71)	6.12	.47
S. Korea	Mineral Fuels/Oils, etc. (27)	23.69	.22	Elec. Machinery/Equipment (85)	35.19	.42
S. Korea	Elec. Machinery/Equipment (85)	23.28	.29	Vehicles (87)	11.32	.42
S. Korea	Machinery, Mech. Appliances (84)	5.07	.46	Machinery, Mech. Appliances (84)	6.95	.29
Romania	Elec. Machinery/Equipment (85)	19.09	.31	Elec. Machinery/Equipment (85)	20.48	.35
Romania	Machinery, Mech. Appliances (84)	9.52	.39	Vehicles (87)	14.12	.46
Romania	Vehicles (87)	8.71	.49	Machinery, Mech. Appliances (84)	7.87	.36
Russia	Elec. Machinery/Equipment (85)	18.13	.14	Mineral Fuels/Oils, etc. (27)	59.59	.44
Russia	Machinery, Mech. Appliances (84)	12.45	.36	Iron and Steel (72)	4.95	.34
Russia	Vehicles (87)	8.55	.22	Precious Stones, Pearls (71)	3.2	.44
Spain	Mineral Fuels/Oils, etc. (27)	13.9	.49	Vehicles (87)	18.53	.37
Spain	Vehicles (87)	12.75	.63	Elec. Machinery/Equipment (85)	7.01	.34
Spain	Elec. Machinery/Equipment (85)	10.9	.27	Machinery, Mech. Appliances (84)	6.81	.31
Sweden	Elec. Machinery/Equipment (85)	18.07	.15	Elec. Machinery/Equipment (85)	14.83	.34
Sweden	Vehicles (87)	11.73	.48	Machinery, Mech. Appliances (84)	13.38	.34
Sweden	Mineral Fuels/Oils, etc. (27)	10.03	.58	Vehicles (87)	12.59	.37
USA	Elec. Machinery/Equipment (85)	21.96	.15	Elec. Machinery/Equipment (85)	15.1	.34
USA	Vehicles (87)	12.78	.44	Machinery, Mech. Appliances (84)	11.14	.34
USA	Mineral Fuels/Oils, etc. (27)	8.91	.66	Vehicles (87)	8.84	.32
UK	Elec. Machinery/Equipment (85)	14.12	.56	Vehicles (87)	12.67	.35
UK	Vehicles (87)	12.73	.49	Machinery, Mech. Appliances (84)	11.14	.30
UK	Machinery, Mech. Appliances (84)	8.09	.51	Precious Stones, Pearls (71)	10.67	.38
Vietnam	Elec. Machinery/Equipment (85)	28.95	.11	Elec. Machinery/Equipment (85)	38.56	.31
Vietnam	Machinery, Mech. Appliances (84)	9.08	.21	Footwear (64)	8.43	.27
Vietnam	Iron and Steel (72)	4.81	.31	Clothing Acc., not knitted (62)	6.35	.41

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes.

Table C.3: Inverse Demand Elasticities and Import/Export Shares for selected countries

	Germany				Belgium			
	Imports		Exports		Imports		Exports	
Product Category (HS2 level)	$1/\sigma$	Share	$1/\sigma$	Share	$1/\sigma$	Share	$1/\sigma$	Share
Elec. Machinery/Equipment (85)	.641	17.67	.307	14.61	.145	6.58	.335	5.04
Vehicles (87)	.483	9.96	.393	19.63	.271	11.61	.4	10.61
Machinery, Mech. Appliances (84)	.415	8.19	.332	12.83	.344	5.58	.348	4.98
Pharmaceutical Products (30)	.815	7.18	.501	7.88	.113	14.63	.549	13.28
Mineral Fuels/Oils, etc. (27)	.332	6.64	.494	1.48	.393	12.18	.425	11.61
Instruments/Apparatus (90)	.402	3.27	.303	4.55	.357	2.78	.35	2.1
Plastics and Articles thereof (39)	.399	3.02	.395	3.73	.332	3.67	.408	6.92
Paper, Paperboard (48)	.697	2.91	.529	3.18	.354	2.22	.54	2.06
Aircraft, Spacecraft (88)	.681	2.59	.635	3.04	.39	.25	.642	.32
Iron and Steel (72)	.342	2.32	.409	1.69	.307	2.18	.398	3.44
Organic Chemicals (29)	.345	2.15	.419	1.85	.36	6.32	.419	4
Furniture, Bedding, etc. (94)	.379	1.88	.323	1.16	.378	.94	.327	.54
Cloth. Accessories, not knitted (62)	.324	1.67	.342	.48	.136	.89	.41	.42
Iron and Steel Articles (73)	.5	1.62	.417	1.91	.411	1.06	.428	.95
Aluminium and Articles thereof (76)	.344	1.62	.461	1.14	.424	.83	.376	.77
Cloth. Accessories, knitted (61)	.346	1.62	.399	.44	.135	.98	.444	.57
Precious Stones, Pearls (71)	.45	1.5	.54	.93	.163	4.7	.593	6.8
Rubber and Articles thereof (40)	.304	1.39	.295	1.17	.31	1.1	.298	1.13
Footwear (64)	.315	1.07	.222	.33	.125	.99	.333	.86
Fruits and Nuts (8)	.315	1	.406	.18	.298	.92	.433	.45

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes.

Table C.4: Inverse Demand Elasticities and Import/Export Shares for selected countries (cont.)

	China			
	Imports		Exports	
Product Category (HS2 level)	$1/\sigma$	Share	$1/\sigma$	Share
Elec. Machinery/Equipment (85)	.611	25.91	.257	40.06
Vehicles (87)	.399	4.55	.386	2.54
Machinery, Mech. Appliances (84)	.279	4.7	.316	6.24
Pharmaceutical Products (30)	.328	3.01	.571	1.7
Mineral Fuels/Oils, etc. (27)	.344	12.97	.572	.91
Instruments/Apparatus (90)	.295	5.47	.22	2.86
Plastics and Articles thereof (39)	.308	3.63	.301	2.06
Paper, Paperboard (48)	.411	.77	.533	2.44
Aircraft, Spacecraft (88)	.577	1.69	.338	.09
Iron and Steel (72)	.363	1.1	.402	2.12
Organic Chemicals (29)	.315	2.93	.463	1.33
Furniture, Bedding, etc. (94)	.382	.2	.3	3.82
Cloth. Accessories, not knitted (62)	.295	.21	.402	3.05
Iron and Steel Articles (73)	.36	.52	.424	2.33
Aluminium and Articles thereof (76)	.195	.43	.486	.92
Cloth. Accessories, knitted (61)	.252	.12	.444	2.97
Precious Stones, Pearls (71)	.333	6.37	.492	1.25
Rubber and Articles thereof (40)	.351	.91	.208	.9
Footwear (64)	.373	.16	.203	2.39
Fruits and Nuts (8)	.358	.36	.541	.18

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes.

Table C.5: Inverse Demand Elasticities and Import/Export Shares for selected countries (Homogeneous Elasticities)

	Germany				Belgium			
	Imports		Exports		Imports		Exports	
Product Category (HS2 level)	$1/\sigma$	Share	$1/\sigma$	Share	$1/\sigma$	Share	$1/\sigma$	Share
Elec. Machinery/Equipment (85)	.163	17.67	.175	14.61	.166	6.58	.174	5.04
Vehicles (87)	.4	9.96	.389	19.63	.331	11.61	.366	10.61
Machinery, Mech. Appliances (84)	.272	8.19	.257	12.83	.237	5.58	.241	4.98
Pharmaceutical Products (30)	.615	7.18	.615	7.88	.615	14.63	.615	13.28
Mineral Fuels/Oils, etc. (27)	.645	6.64	.623	1.48	.602	12.18	.6	11.61
Instruments/Apparatus (90)	.197	3.27	.197	4.55	.212	2.78	.232	2.1
Plastics and Articles thereof (39)	.401	3.02	.409	3.73	.413	3.67	.445	6.92
Paper, Paperboard (48)	.658	2.91	.66	3.18	.654	2.22	.643	2.06
Aircraft, Spacecraft (88)	.422	2.59	.453	3.04	.387	.25	.253	.32
Iron and Steel (72)	.377	2.32	.407	1.69	.347	2.18	.386	3.44
Organic Chemicals (29)	.547	2.15	.493	1.85	.518	6.32	.492	4
Furniture, Bedding, etc. (94)	.228	1.88	.221	1.16	.237	.94	.281	.54
Cloth. Accessories, not knitted (62)	.381	1.67	.384	.48	.416	.89	.437	.42
Iron and Steel Articles (73)	.449	1.62	.455	1.91	.457	1.06	.389	.95
Cloth. Accessories, knitted (61)	.505	1.62	.496	.44	.5	.98	.516	.57
Aluminium and Articles thereof (76)	.542	1.62	.56	1.14	.504	.83	.546	.77
Precious Stones, Pearls (71)	.395	1.5	.499	.93	.508	4.7	.477	6.8
Rubber and Articles thereof (40)	.201	1.39	.266	1.17	.256	1.1	.252	1.13
Footwear (64)	.127	1.07	.122	.33	.128	.99	.17	.86
Fruits and Nuts (8)	.531	1	.543	.18	.617	.92	.598	.45

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes. We assume all countries share the same demand elasticities as in the U.S.

Table C.6: Inverse Demand Elasticities and Import/Export Shares for selected countries (cont., Homogeneous Elasticities)

	China			
	Imports		Exports	
Product Category (HS2 level)	$1/\sigma$	Share	$1/\sigma$	Share
Elec. Machinery/Equipment (85)	.139	25.91	.142	40.06
Vehicles (87)	.573	4.55	.433	2.54
Machinery, Mech. Appliances (84)	.255	4.7	.273	6.24
Pharmaceutical Products (30)	.615	3.01	.615	1.7
Mineral Fuels/Oils, etc. (27)	.593	12.97	.638	.91
Instruments/Apparatus (90)	.104	5.47	.127	2.86
Plastics and Articles thereof (39)	.486	3.63	.271	2.06
Paper, Paperboard (48)	.666	.77	.643	2.44
Aircraft, Spacecraft (88)	.505	1.69	.27	.09
Iron and Steel (72)	.338	1.1	.404	2.12
Organic Chemicals (29)	.478	2.93	.515	1.33
Furniture, Bedding, etc. (94)	.23	.2	.252	3.82
Cloth. Accessories, not knitted (62)	.384	.21	.403	3.05
Iron and Steel Articles (73)	.515	.52	.426	2.33
Cloth. Accessories, knitted (61)	.509	.12	.484	2.97
Aluminium and Articles thereof (76)	.574	.43	.6	.92
Precious Stones, Pearls (71)	.599	6.37	.462	1.25
Rubber and Articles thereof (40)	.326	.91	.134	.9
Footwear (64)	.149	.16	.125	2.39
Fruits and Nuts (8)	.567	.36	.596	.18

Notes: Inverse demand elasticity in each HS2 sector is the average of HS6 inverse demand elasticites, weighted by trade volumes. We assume all countries share the same demand elasticities as in the U.S.