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TWO-SIDED MARKET POWER IN FIRM-TO-FIRM TRADE

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ABSTRACT

This paper develops a theory of bargaining in firm-to-firm trade with two-sided market power. The framework accommodates flexible market structures, yielding analytical expressions for pair-specific markups and pass-through elasticities. In U.S. import data, we estimate strong importer bargaining power and an upward-sloping export supply curve, consistent with oligopsony power. Pass-through of the 2018 tari!s in firm-to-firm relationships is incomplete, in contrast to product-level studies, primarily due to exporter cost reductions driven by falling demand from dominant buyers. Our study highlights how bargaining and network rigidities shape price outcomes, with implications for markup dispersion and shock propagation in global value chains.

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A online appendix is available at http://www.nber.org/data-appendix/w31253

1 Introduction

The recent resurgence of protectionist trade policies has reignited debate over how tariffs affect international prices. This question is particularly salient in today's global economy, where production is fragmented across global value chains and most trade occurs within ongoing relationships between importers and exporters. These firm-to-firm linkages shape the cross-border transmission of shocks (Boehm et al., 2019); however, their implications for price setting and tariff pass-through remain less well understood.

A growing body of literature highlights the limitations of standard trade models in this context. Rather than engaging in anonymous spot-market transactions, firms often trade within long-term relationships shaped by contract incompleteness, relationship-specific investments, and lock-in frictions (Antràs, 2015). In this environment, prices arise from bilateral negotiations between exporters and importers, both of whom may hold significant market power (Antràs and Staiger, 2012; Morlacco, 2019; Dhyne et al., 2022).

This paper develops a theory of bargaining in firm-to-firm trade that incorporates two-sided market power and network rigidities. The framework accommodates flexible upstream and downstream market structures and delivers closed-form expressions for markups and pass-through elasticities as functions of market shares and a small set of structural parameters. We estimate these parameters using U.S. import data, validate the model's cross-sectional predictions against observed pricing patterns, and use the estimated framework to quantify aggregate pass-through in firm-to-firm trade, highlighting how bargaining and network structure shape both the level and sources of pass-through in response to trade shocks.

Section 2 introduces the theory. We consider a fixed network of importer-exporter (or buyer-supplier) relationships, where each pair negotiates bilaterally over the price of an intermediate input. Given the price, the importer unilaterally chooses the traded quantity to minimize costs, making prices allocative. In the event of a disagreement, each party falls back on trade with its other existing partners. As a result, the network structure influences the value of each party's outside option, and in turn, their effective bargaining power.

Our framework offers a unified theory of exporter and importer market power in firm-to-firm trade. Exporter rents arise from three sources: *monopoly power* through product differentiation, *oligopoly power* due to supplier concentration, and *quasi-rents* from an upward-sloping residual supply curve. When exporters hold full bargaining power, the model nests standard trade settings in which prices reflect an *oligopoly markup* over marginal cost (Atkeson and Burstein, 2008; Dhyne et al., 2022). This markup increases with the exporter's share of the buyer's total input purchases—a measure we refer to as the exporter's *supplier share*.

Our first contribution is to characterize the role of importer market power in price-setting. This power arises when suppliers earn economic rents, creating scope for buyers to extract surplus by negotiating lower prices. It also reflects *oligopsony power*, as concentrated buyers can negotiate lower prices. When importers hold full bargaining power, prices can fall below marginal cost, generating a negative price–cost margin akin to an *oligopsony markdown*. This markdown declines with the importer's share of the supplier's total output–a measure we refer to as the importer's *buyer share*.[1] In general, the negotiated price reflects a convex combination of oligopoly and oligopsony forces, with weights determined by the firms' outside options and other exogenous determinants of bargaining power.

Our second contribution is to characterize how importer market power shapes the pass-through of tariff shocks to bilateral prices. We focus on short-run pass-through elasticities, derived as local perturbations around the static price equilibrium, while holding the network and general equilibrium conditions fixed. This isolates the intensive margin of price adjustment from longer-run responses driven by entry, reallocation, or macroeconomic feedback.

Importer market power affects pass-through through two distinct mechanisms: a *markup channel* and a *cost channel*. The markup channel captures how bilateral markups respond to price changes. When exporters hold full bargaining power, markups exhibit *strategic complementarities*, a well-known source of incomplete pass-through (Amiti et al., 2014, 2019a). With two-sided market power, the markup elasticity becomes a convex combination of strategic complementarities and *strategic substitutabilities*, as importers reduce markdowns in response to higher prices, amplifying pass-through.

The cost channel captures how tariffs affect the exporter's marginal cost through scale effects. While prior work links pass-through to cost adjustment under decreasing returns to scale (e.g., Burstein and Gopinath 2015), our framework introduces a new source of heterogeneity: the elasticity of residual supply increases with an importer's buyer share. As a result, larger buyers face more incomplete pass-through. Although both channels interact to shape price responses, the cost channel dominates when bargaining power is two-sided and returns to scale are decreasing. In this setting, markup adjustments are modest and offset by opposing strategic forces, while cost-side responses amplify the heterogeneity of pass-through.

Section 3 describes the data and presents preliminary empirical evidence. Our main data source is the U.S. Census Longitudinal Firm Trade Transaction Database (LFTTD), which reports prices and quantities for each import transaction involving a U.S. importer, along with identifiers for the foreign exporter and the 10-digit product code. These features allow

[1]Our definition of the importer's markdown differs from the standard price–marginal revenue wedge. See Section 2 for details.

us to construct bilateral market shares on both sides of the transaction, which are the key sufficient statistics in the model governing the distribution of markups and pass-through elasticities. Our main sample focuses on repeated, arm's-length relationships involving the exchange of intermediate inputs, excluding related-party links as flagged in the LFTTD.

Pricing and pass-through patterns in the data closely align with the model's predictions under two-sided market power. Controlling for supplier–product–time fixed effects to proxy for marginal costs, we find that prices rise with the exporter's supplier share and fall with the importer's buyer share, consistent with the presence of both oligopoly and oligopsony forces. In contrast, tariff pass-through declines with buyer share and is non-decreasing in supplier share, suggesting that price adjustments are primarily driven by the cost channel, with a more limited role for the markup channel, as expected under two-sided market power.

These empirical comovements reinforce the model's central mechanisms and are difficult to reconcile with conventional pricing frameworks that assume one-sided or purely competitive behavior. Nonetheless, reduced-form estimates may conflate the effects of competitor behavior, input price variation, or broader macroeconomic shocks, limiting their interpretability. A structural approach is therefore needed to isolate the underlying mechanisms.[2]

To do so, Section 4 develops a structural estimation strategy around two key parameters: the importer's bargaining power and the exporter's returns to scale, which determines the slope of the input supply curve. We estimate that U.S. importers hold bargaining power of approximately 0.8, roughly four times greater than that of their foreign suppliers, and that the returns to scale parameter is about 0.45, consistent with upward-sloping supply. Identification exploits cross-sectional price variation across U.S. importers within a supplier–product–year. As the estimating equations hold independently of the general equilibrium environment, the approach remains valid without explicitly modeling broader equilibrium feedback.

We assess the model's validity by evaluating its ability to replicate both the average and heterogeneous effects of the 2018 tariffs on prices and quantities. First, the model closely matches the average price response as well as its variation with buyer and supplier shares, consistent with the role of oligopoly, oligopsony, and cost-side adjustments. Second, applying the IV-based test proposed by Adão et al. (2023), we find that our model outperforms alternatives that either impose constant returns to scale or exclude bargaining. Third, while the model underestimates the magnitude of quantity changes, it successfully captures their direction, lending support to its core allocative mechanism. Together, these results validate the model's key assumptions and suggest that general equilibrium feedback or omitted strategic interactions are unlikely to materially bias its pass-through predictions.

[2] For a related discussion in a different context, see Berger et al. (2022).

In Section 5, we use the estimated model to assess how the 2018 Trump tariffs affected aggregate U.S. import prices through firm-to-firm relationships. Rather than providing a full accounting of tariff incidence, which lies beyond the scope of our framework, we focus on one key margin: price adjustment within ongoing matches, and its decomposition into changes in markups and marginal costs.

We find that aggregate pass-through in firm-to-firm trade is substantially incomplete, with elasticities ranging from 65 to 71%. The model sheds light on the mechanisms behind this muted response. The key insight is that most of the adjustment occurs on the cost side: exporters facing weaker demand from powerful buyers move down their marginal cost curves, absorbing a sizable share of the tariff burden. Markup changes occur but contribute little to the aggregate response due to offsetting effects of strategic complementarities and substitutabilities. This distinction is important. While prior work often attributes incomplete pass-through to variable markups and strategic pricing, our results highlight the dominant role of cost adjustment and supply-side forces.

Our results stand in contrast to studies documenting near-complete pass-through of the 2018 tariffs (e.g., Amiti et al., 2019b, 2020; Cavallo et al., 2020; Fajgelbaum et al., 2020; Flaaen et al., 2020). We reconcile this divergence on two grounds. First, our analysis focuses on intermediate inputs and arm's-length transactions, where pass-through may be lower due to input specificity, contractual frictions, or capacity constraints. Second, we isolate pricing within repeated matches between importers and exporters. By contrast, product-level unit values used in aggregate studies conflate within-match price changes with compositional shifts in trading partners, notably including one-off exchanges. Such one-off transactions are more likely to reflect marginal cost pricing and exhibit full pass-through.[3]

Related Literature Our paper contributes to the literature on pricing and shock transmission in firm-to-firm trade, with a particular focus on the role of importer market power. A growing body of empirical work highlights the influence of dominant buyers in shaping supplier outcomes. Bernard et al. (2019) and Bernard et al. (2022) document the pivotal role of large buyers in determining supplier performance and market access. Using French customs data, Fontaine et al. (2020) show substantial variation in unit values across importers transacting with the same exporter, consistent with buyer-specific pricing. Similar patterns are found by Huang et al. (2021) in France, Chile, and China. Among the few studies to model buyer power directly, Morlacco (2019) estimates substantial oligopsony power among French importers, while Atkin et al. (2024) show that bargaining between Argentinian importers

[3] See Cajal-Grossi et al. (2023) for evidence that markups are lower and prices more competitive in spot transactions than in relational matches.

and foreign suppliers affects the price impact of trade policy.

Formal models of pricing in firm-to-firm trade remain limited. Dhyne et al. (2022) develops a network-based model of oligopoly in which suppliers' markups increase with their relationship-specific market share. Our framework nests this model as a special case but extends it to incorporate bilateral bargaining and importer market power. Grossman et al. (2024) also study firm-to-firm pricing under Nash-in-Nash bargaining, emphasizing how supply-chain links adjust in response to trade shocks. In contrast, we take the trade network as fixed and focus on how bargaining and network rigidities interact to determine equilibrium prices and short-run pass-through.

We also contribute to the literature on the firm-level determinants of cost shock pass-through. A large body of work attributes incomplete pass-through to variable markups and strategic complementarities in price-setting (e.g., Amiti et al., 2014, 2019a).[4] We extend these insights to a bilateral oligopoly setting that reflects the structure of a large share of international trade. Our framework nests these existing mechanisms but allows for a richer characterization of both markup and cost channels, shaped by bargaining power and network position. Related work includes Gopinath and Itskhoki (2011) and Goldberg and Tille (2013), who model bargaining in firm-to-firm trade but abstract from importer market power and cost-side adjustment. Empirically, we find that these cost-based responses, rather than variable markups, are the primary driver of incomplete pass-through in these settings.

Finally, we contribute to the literature on shock propagation in production networks. A large body of work demonstrates that shocks can spread through input–output linkages and affect aggregate outcomes (Acemoglu et al., 2012; Di Giovanni et al., 2014; Grassi, 2018), often using natural experiments to trace transmission along supply chains (Barrot and Sauvagnat, 2016; Boehm et al., 2019; Carvalho et al., 2021). Recent work by Acemoglu and Tahbaz-Salehi (2025) highlights how bilateral bargaining can amplify supply chain disruptions through the price channel. We complement this perspective by modeling how idiosyncratic shocks to individual relationships affect prices under two-sided market power. While we abstract from general equilibrium feedback, our focus is on the within-network transmission of trade shocks through pricing, a key but underexplored margin in the propagation of shocks across production networks.

[4] See also Berman et al. (2012), Auer and Schoenle (2016), and Garetto (2016) for firm-level evidence consistent with this class of models.

2 Theoretical Framework

This section develops a bargaining theory of firm-to-firm trade with two-sided market power. The model links markups and pass-through elasticities to importer and exporter market shares, along with a small set of structural parameters that capture key features of market structure upstream and downstream. The model yields analytic structural equations and testable predictions, which we later bring to the data using U.S. customs records.

We impose the following assumptions to keep the model tractable. First, we treat the trade network as fixed. This assumption captures the lock-in effects in firm-to-firm trade and allows us to focus on the price-setting problem while abstracting from firms' decisions to form or sever links.[5] Second, we abstract from nominal rigidities, such as fixed-price contracts or currency denomination, as these are unlikely to materially affect tariff pass-through.[6] Third, we consider a static framework of single-product negotiations, despite our data reflecting repeated, multi-product interactions between firms.[7] We return to these features and discuss how we incorporate information on relationship duration in Section 3 and 4.

2.1 Environment

We focus on the relationship between exporter i and importer j of an intermediate input. We denote by $\mathcal{Z}_i$ the set of importers connected to exporter i, and by $\mathcal{Z}_j$ the set of exporters connected to importer j. These sets vary across firms and are treated as given.

Exporters and Supply Exporter i produces q_i units of the unique input variety and sells them to all importers in $\mathcal{Z}_i$, where total output satisfies $q_i \equiv \sum_{j \in \mathcal{Z}_i} q_{ij}$, and q_{ij} denotes the quantity of the intermediate input purchased by importer j.

We assume that exporter i operates a short-run production technology with returns to scale parameter $\theta \in (0, 1]$. Marginal cost (or equivalently, the short-run supply curve) is given by:

$$c_i \equiv MC_i(q_i) = k_i \, q_i^{\frac{1-\theta}{\theta}}, \tag{2.1}$$

where k_i captures exogenous factors such as the exporter productivity or foreign wages.

[5] This separation between extensive and intensive margin decisions is consistent with prior work showing that dynamic sourcing choices, while important for long-run outcomes, are not necessary to analyze the short-run price effects of trade shocks (Blaum et al., 2018).

[6] Evidence from Amiti et al. (2020) supports this view, showing similar short- and long-run pass-through rates of 2018 U.S. import tariffs. See Goldberg and Tille (2013) for a theory of importer-exporter bargaining over the transaction price and exchange rate exposure.

[7] Repeated relationships affect contract structure and trade volumes (Macchiavello and Morjaria, 2015), exchange rate pass-through (Heise, 2024), and the propagation of shocks (Martin et al., 2023).

This cost structure implies that the average cost of q_i units is θ-times the marginal cost. When $\theta < 1$, indicating decreasing returns to scale, the short-run average cost lies below the marginal cost, and the gap between them widens as q_i increases. In contrast, $\theta = 1$ indicates a constant returns technology, with marginal and average costs constant and equal to k_i.

Importers and Demand Importer j combines domestic and foreign inputs, denoted by q_j^d and q_j^f respectively, to produce q_j units of a final good, which is subsequently sold in a downstream market. The production technology of importer j is given by:

$$q_j = \varphi_j \left(q_j^f\right)^{\gamma} \left(q_j^d\right)^{\varrho-\gamma}, \tag{2.2}$$

where φ_j is the importer's productivity, γ and $\varrho - \gamma$ are the output elasticities of foreign and domestic inputs, respectively, with ϱ governing the degree of returns to scale in production.[8]

The foreign input q_j^f is a constant elasticity of substitution (CES) composite of differentiated input varieties sourced from exporters in the set $\mathcal{Z}_j$. Each variety q_{ij} is weighted by a demand shifter ς_{ij}, and the elasticity of substitution across varieties is given by $\rho > 1$:

$$q_j^f = \left(\sum_{i \in \mathcal{Z}_j} \varsigma_{ij}\, q_{ij}^{\frac{\rho-1}{\rho}}\right)^{\frac{\rho}{\rho-1}}. \tag{2.3}$$

Downstream, each importer operates in a monopolistically competitive market, facing CES demand with constant elasticity $\nu > 1$ and an importer-specific demand shifter D_j.

2.2 Bargaining Protocol and Gains From Trade

Each $i - j$ vertical interaction proceeds in two stages. In the first stage, the importer chooses input quantity q_{ij} to minimize total input costs, taking the price p_{ij} as given:

$$\min_{q_{ij}} \; TC_j(q_{ij}; p_{ij}) = p_{ij} q_{ij} + \sum_{\ell \in \mathcal{Z}_j \setminus i} p_{\ell j} q_{\ell j} + p_j^d q_j^d.$$

The solution to this problem yields importer j's input demand:

$$q_{ij} = q_j^f\, \varsigma_{ij}^{\rho} \left(\frac{p_{ij}}{p_j^f}\right)^{-\rho} \quad \text{with} \quad q_j^f = \gamma\, c_j\, q_j \left(p_j^f\right)^{-1}, \tag{2.4}$$

[8] The domestic input q_j^d can be interpreted as a constant returns to scale aggregator of primary factors, such as labor and domestic intermediates. Due to the lack of data on domestic input purchases, we model foreign and domestic intermediates as distinct rather than symmetric or substitutable.

where $p_j^f = \left(\sum_i \varsigma_{ij}^{\rho} p_{ij}^{1-\rho}\right)^{\frac{1}{1-\rho}}$ is the foreign input price index.

In the second stage, the importer and exporter determine the negotiated price p_{ij} through Nash bargaining, taking the importer's demand in equation (2.4) as given:

$$\max_{p_{ij}} \left(\underbrace{\pi^i(p_{ij}; q_{ij}) - \tilde{\pi}^i_{(-j)}}_{GFT^i_{ij}} \right)^{1-\phi} \left(\underbrace{\pi^j(p_{ij}; q_{ij}) - \tilde{\pi}^j_{(-i)}}_{GFT^j_{ij}} \right)^{\phi}. \tag{2.5}$$

In equation (2.5), $\phi \in (0,1)$ denotes the importer's bargaining leverage, and GFT^k_{ij} for $k \in \{i,j\}$ captures the gains from trade, defined as the difference between a firm's profits with and without the bilateral relationship. In case of disagreement, each party falls back on trade with its other existing partners. All bilateral matches generate strictly positive surplus, and trade occurs in equilibrium across all relationships.

To solve equation (2.5), we adopt the Nash-in-Nash bargaining solution concept, in which each bilateral negotiation takes as given the outcomes of all other matches in the network (Horn and Wolinsky, 1988; Collard-Wexler et al., 2019).[9] For this reason, we leave the dependence on prices and quantities in other links in the network implicit throughout the analysis.

This setup implies two key properties. First, prices are allocative: the negotiated price p_{ij} pins down the traded quantity q_{ij}. Second, the equilibrium allocation (p_{ij}, q_{ij}) satisfies the importer's demand in equation (2.4). We discuss the allocative implications of these assumptions, along with alternative bargaining protocols, in Section 2.5.

2.3 Equilibrium Prices and Allocations

The solution to (2.5) yields a bilateral price of the form $p_{ij} = \mu_{ij} \cdot c_i$, where c_i is exporter i's marginal cost, and μ_{ij} is a pair-specific markup.

We define two bilateral market shares that serve as key sufficient statistics in the model:

$$s_{ij} \equiv \frac{p_{ij} q_{ij}}{\sum_{k \in \mathcal{Z}_j} p_{kj} q_{kj}} \in [0,1], \qquad x_{ij} \equiv \frac{q_{ij}}{\sum_{k \in \mathcal{Z}_i} q_{ik}} \in [0,1],$$

[9] A common alternative is the sequential bargaining model of Stole and Zwiebel (1996), in which disagreement with one partner triggers renegotiation with others. This framework is suited to one-to-many settings such as labor markets, but is less appropriate for global supply chains, where firms engage in many-to-many relationships and isolated breakdowns rarely affect unrelated contracts. Moreover, it introduces additional complexity without yielding clear empirical gains in our context.

where s_{ij} denotes exporter i's *supplier share*, defined as its sales to importer j as a fraction of j's total foreign input expenditures, and x_{ij} denotes importer j's *buyer share*, equal to its purchases as a share of exporter i's total output.

The following proposition characterizes the equilibrium markup as a convex combination of two limiting pricing regimes:

Proposition 1. *The bilateral markup μ_{ij} can be expressed as*

$$\mu_{ij} = (1 - \omega_{ij}) \cdot \mu_{ij}^{\text{oligopoly}} + \omega_{ij} \cdot \mu_{ij}^{\text{oligopsony}}, \tag{2.6}$$

where the weight

$$\omega_{ij} = \frac{\frac{\phi}{1-\phi}\lambda_{ij}}{1 + \frac{\phi}{1-\phi}\lambda_{ij}} \in (0, 1) \tag{2.7}$$

represents the importer's effective bargaining power*, and $\lambda_{ij} \equiv -\frac{d \ln \pi_j}{d \ln(p_{ij}\, q_{ij})} \cdot \frac{\pi_j}{GFT_{ij}^j}$ captures the strength of the importer's outside option.*

Proof: See Appendix A.1.

Equation (2.6) shows that the equilibrium markup lies between two polar cases. When the exporter holds all the bargaining power ($\phi \to 0$), the markup converges to the oligopoly case $\mu_{ij}^{\text{oligopoly}}$. When the importer holds full bargaining power ($\phi \to 1$), it converges to the oligopsony case $\mu_{ij}^{\text{oligopsony}}$. For intermediate values, the outcome reflects the influence of both parties, with weight ω_{ij} determined by bargaining power and the importer's outside option (see Section 2.3.3).

We now examine these limiting cases in more detail and characterize how the bilateral markup depends on market shares and model primitives.

2.3.1 Oligopoly Markup

Under full exporter bargaining power ($\phi = 0$), the markup takes the standard form:

$$\mu_{ij}^{\text{oligopoly}} = \frac{\varepsilon_{ij}}{\varepsilon_{ij} - 1} \geq 1, \tag{2.8}$$

where ε_{ij} denotes the residual demand elasticity faced by exporter i, given by:

$$\varepsilon_{ij} = (1 - s_{ij}) \cdot \rho + s_{ij} \cdot \eta. \tag{2.9}$$

This elasticity is a weighted average of two components: the elasticity of substitution across foreign suppliers, ρ, and the elasticity η of the importer's foreign input bundle q_j^f with respect to its price index p_j^f:

$$\eta \equiv -\frac{d \ln q_j^f}{d \ln p_j^f} = \frac{(\varrho - \gamma) + \nu \cdot (1 - (\varrho - \gamma))}{\varrho + \nu \cdot (1 - \varrho)}.$$

Provided that $\rho > \eta$, a standard parameter condition, the exporter's markup (2.8) increases with its supplier share s_{ij}, reflecting greater oligopoly power.

This case corresponds to the firm-to-firm trade setting in Dhyne et al. (2022). It is also closely related to the oligopolistic competition model of Atkeson and Burstein (2008), but differs in three key respects. First, supplier shares are defined at the match level, rather than at the firm or industry level, reflecting our assumption of a fixed network. Second, whereas the outer nest elasticity η is typically treated as a fixed preference parameter, here it summarizes how downstream market structure–determined by both technology (γ, ϱ) and demand (ν)–shapes the bargaining environment. Third, we allow for decreasing returns to scale in production, in contrast to the constant returns assumption common in related models.

Figure 1 illustrates the equilibrium outcome for a representative $i-j$ match. The downward-sloping residual demand and marginal revenue curves (black and gray) intersect with the upward-sloping residual marginal and average cost curves (blue and red).

Panel (A) depicts the case with $\phi = 0$. The equilibrium quantity is determined by the intersection of marginal cost and marginal revenue, and the price lies on the residual demand curve. Exporter rents have two components: the *oligopoly rent* (red), which corresponds to the markup in equation (2.8), and the *quasi-rent* (purple), which arises from the gap between marginal and average cost under decreasing returns to scale.

2.3.2 Oligopsony Markdown

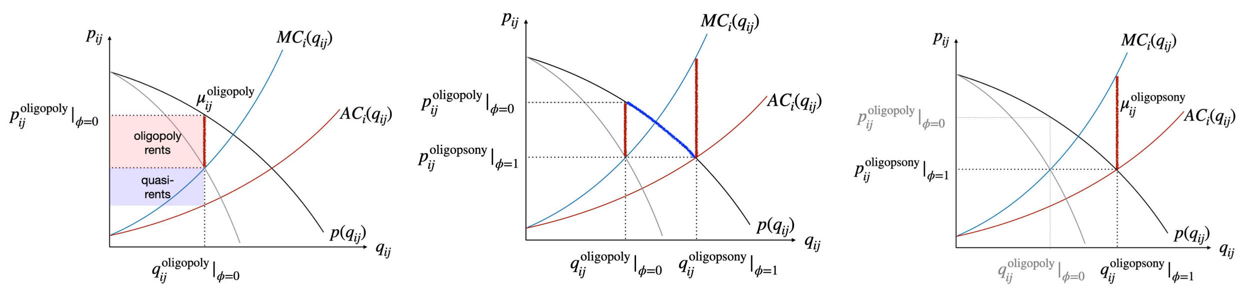
Under full importer bargaining power ($\phi = 1$), the bilateral markup simplifies to:

$$\mu_{ij}^{\text{oligopsony}} = \theta \cdot \frac{1 - (1 - x_{ij})^{\frac{1}{\theta}}}{x_{ij}} \leq 1, \tag{2.10}$$

which we refer to as an *oligopsony* markup, or *markdown*, since it lies weakly below one.[10]

[10] Although $\mu_{ij}^{\text{oligopsony}}$ denotes a price–cost ratio, we refer to it as a markdown because it falls below one. This differs from standard oligopsony models, where markdowns typically reflect a wedge between input prices and marginal revenue product. See Section 2.5 for further discussion.

Figure 1: Illustration of Equilibrium Allocations With Different Bargaining Power



(A) $\phi = 0$ (B) $\phi \in (0, 1)$ (C) $\phi = 1$

Notes: Each panel illustrates the negotiated price and quantity under a different value of ϕ. The exporter's residual demand function $p(q_{ij})$ is shown in black; the importer's residual supply function $MC_i(q_{ij})$ is shown in blue and the average cost function $AC_i(q_{ij})$ is in red. All panels assume $\theta < 1$.

Expression (2.10) characterizes the lowest price at which the exporter is willing to supply, with the importer extracting the exporter's entire surplus through bargaining.[11] The markdown declines with the buyer's share x_{ij}: larger buyers induce greater quasi-rents and can negotiate lower prices. As $x_{ij} \to 0$, the importer behaves atomistically, generates no quasi-rents, and pays a price equal to marginal cost.

This dependence of the price–cost ratio on x_{ij} reflects a form of *oligopsony power* that arises only under decreasing returns to scale. When $\theta = 1$, marginal and average costs coincide, quasi-rents vanish, and the importer can extract only oligopoly rents. In this case, the price cannot fall below marginal cost, and the markdown remains fixed at one.

Panel (C) of Figure 1 illustrates the equilibrium under $\phi = 1$. Compared to Panel (A), the price lies at the intersection of the downstream demand curve and the exporter's residual average cost curve, leaving no surplus to the exporter. The result is a lower price and higher quantity relative to the oligopoly case.

Clarification of Terminology The terms "buyer power" and "oligopsony power" are often used interchangeably in the literature, but rarely precisely defined (Noll, 2005). We distinguish between these concepts in our framework.

We use *buyer power* or *importer market power* to refer broadly to the importer's ability to influence prices through bargaining (i.e., any $\phi > 0$). In contrast, we reserve *oligopsony power* for the specific case when a higher buyer share x_{ij} enables the importer to negotiate lower prices, holding ϕ fixed. Importantly, oligopsony power requires both $x_{ij} > 0$ and $\theta < 1$, as it depends on the scale-dependent gap between marginal and average cost.

[11] Formally, the markdown is proportional to the percentage increase in quasi-rents attributable to the $i - j$ match. See equation (A.9) in Appendix A.1.

2.3.3 Two-Sided Market Power and Bargaining Weights

Panel (B) of Figure 1 shows the intermediate case with $\phi \in (0, 1)$. The equilibrium price lies on the thick blue curve and reflects a weighted average of the outcomes in Panels (A) and (C), consistent with Proposition 1. The resulting price–marginal cost ratio can exceed or fall below one, depending on the relative bargaining power of the exporter and importer.

Determinants of ω_{ij}. The bargaining weight ω_{ij} in equation (2.6), defined in equation (2.7), governs the balance between oligopoly and oligopsony forces in price setting. It depends both on the exogenous bargaining power ϕ and an endogenous term λ_{ij}, defined as:

$$\lambda_{ij} \equiv \underbrace{-\frac{d\ln \pi_j}{d\ln(p_{ij}\, q_{ij})}}_{\text{Cost exposure } (\lambda_{ij}^C)} \cdot \underbrace{\frac{\pi_j}{GFT_{ij}^j}}_{\text{Network dependence } (\lambda_{ij}^N)} \geq 0.$$

To interpret λ_{ij}, we decompose it into two terms. The *cost exposure* component, $\lambda_{ij}^C = \frac{(\eta-1)s_{ij}}{\varepsilon_{ij}-1}$, captures how sensitive importer j's profits are to price changes from supplier i and increases with the supplier share s_{ij}. The *network dependence* term, $\lambda_{ij}^N = \left(1-(1-s_{ij})^{\frac{\eta-1}{\rho-1}}\right)^{-1}$, reflects how much of importer j's profits rely on the match with i, and declines with s_{ij} as reduced diversification weakens the importer's outside option.

Taken together, λ_{ij} captures both the importer's incentive to negotiate aggressively (through cost exposure) and the strength of its fallback option (through network dependence). It follows a hump-shaped pattern in s_{ij}, increasing at low values and declining at higher ones, and converges to 1 as $s_{ij} \to 0$ or $s_{ij} \to 1$.

This interpretation clarifies the meaning of ω_{ij} as a measure of the importer's *effective bargaining power*. While ϕ governs baseline influence in Nash bargaining, λ_{ij} endogenously adjusts it based on the structure of the trading relationship.

Testable Implications. Equation (2.6) writes the bilateral markup μ_{ij} as a convex combination of the oligopoly markup and the oligopsony markdown, with bargaining power as weight. Since these components scale with bilateral market shares, the model delivers clear predictions on how markups co-move with s_{ij} and x_{ij} under two-sided market power.

Proposition 2. *The bilateral markup μ_{ij} exhibits the following properties:*

1. **Markup and Exporter's Share.** *If μ_{ij} increases with s_{ij}, then $\phi < 1$.*

2. **Markup and Importer's Share.** *If μ_{ij} decreases with x_{ij}, then $\phi > 0$ and $\theta < 1$.*

Proof: See Appendix A.2.

Proposition 2 provides sufficient conditions for detecting two-sided market power. A positive relationship between μ_{ij} and supplier share s_{ij} implies $\phi < 1$, since exporters retain pricing power and $\mu_{ij}^{\text{oligopoly}}$ increases with s_{ij}. If $\phi = 1$, prices are fully disciplined by buyers, and no such pattern should emerge. While the dependence of ω_{ij} on s_{ij} may attenuate this effect, a positive slope remains inconsistent with full buyer power.

Conversely, a negative relationship between μ_{ij} and buyer share x_{ij} signals oligopsony power. This requires both positive bargaining leverage for importers ($\phi > 0$) and decreasing returns to scale ($\theta < 1$). When both conditions are met, markups reflect the joint influence of importer and exporter market power.

2.4 Equilibrium: Tariff Pass-Through Elasticities

Our pricing framework provides a basis for analyzing the short-run impact of an unanticipated tariff imposed on imports from country c. Let T_c denote the gross tariff rate. The (log) price that exporter i from country c charges importer j is given by:

$$\ln p_{ij} = \ln \mu_{ij} + \ln c_i + \ln T_c.$$

While a tariff on country c may, in principle, affect all trade relationships involving exporters from c, we focus on the short-run, direct effect at the relationship level. We interpret the tariff shock as a small, unanticipated perturbation around the initial equilibrium. Accordingly, we treat T_c as a pair-specific shock and hold constant prices in all other relevant matches such that $dp_{rj} = 0$ for all $r \in \mathcal{Z}_j \setminus i$ and $dp_{i\ell} = 0$ for all $\ell \in \mathcal{Z}_i \setminus j$.

The following proposition characterizes this direct component of tariff pass-through.

Proposition 3. *The tariff pass-through elasticity into the bilateral import price p_{ij}, holding fixed all other prices in the network and general equilibrium variables, is:*

$$\Phi_{ij} \equiv \frac{d \ln p_{ij}}{d \ln T_c} = \frac{1}{1 + \Gamma_{ij} + \Lambda_{ij}}, \tag{2.11}$$

where:

$$\Gamma_{ij} \equiv -\frac{d \ln \mu_{ij}}{d \ln p_{ij}} \quad \text{and} \quad \Lambda_{ij} \equiv -\frac{d \ln c_i}{d \ln p_{ij}}$$

denote the partial elasticities of the equilibrium markup μ_{ij} and the exporter's marginal cost c_i to changes in the bilateral price p_{ij}, respectively.

Proof: See Appendix A.3.

Proposition 3 highlights two distinct mechanisms shaping tariff pass-through in firm-to-firm trade: a markup channel, capturing strategic pricing responses, and a cost channel, capturing how the exporter's marginal cost adjusts in response to price changes. In models with CES demand, monopolistic competition, and constant marginal costs, both Γ_{ij} and Λ_{ij} are zero, yielding full pass-through ($\Phi_{ij} = 1$). More generally, Φ_{ij} may lie above, below, or at one depending on the magnitudes of Γ_{ij} and Λ_{ij}.

2.4.1 Markup Elasticity

The markup elasticity Γ_{ij} measures how the equilibrium markup μ_{ij} responds to changes in the bilateral price p_{ij}. It is given by:

$$\Gamma_{ij} = \left[(1-\omega_{ij}^{\Gamma}) \cdot \Gamma_{ij}^{\text{oligopoly}} + \omega_{ij}^{\Gamma} \cdot \Gamma_{ij}^{\text{oligopsony}}\right] + \left(1 - \frac{\mu_{ij}^{\text{oligopoly}}}{\mu_{ij}}\right) \Gamma_{ij}^{\omega},$$

where $\omega_{ij}^{\Gamma} \equiv \omega_{ij} \cdot \frac{\mu_{ij}^{\text{oligopsony}}}{\mu_{ij}} \in [0,1]$, $\Gamma_{ij}^{\text{oligopoly}}$ denotes the oligopoly markup elasticity, $\Gamma_{ij}^{\text{oligopsony}}$ the oligopsony markup elasticity, and Γ_{ij}^{ω} the elasticity of the bargaining weight with respect to the bilateral price.

The term in square brackets captures the direct elasticity of the markup, expressed as a convex combination of the oligopoly and oligopsony components. The second term reflects how the bargaining weight ω_{ij} itself responds to price changes. We discuss each component in turn.

Oligopoly Markup Elasticity The oligopoly markup elasticity dominates when $\phi \to 0$, in which case $\Gamma_{ij} \to \Gamma_{ij}^{\text{oligopoly}}$. It is given by

$$\Gamma_{ij}^{\text{oligopoly}} \equiv -\frac{d \ln \mu_{ij}^{\text{oligopoly}}}{d \ln p_{ij}} = \frac{1}{\varepsilon_{ij} - 1} \cdot \frac{\rho - \varepsilon_{ij}}{\varepsilon_{ij}} \cdot (\rho - 1)(1 - s_{ij}) \geq 0.$$

This elasticity reflects the standard logic of *strategic complementarities* in price-setting: when a tariff raises the bilateral price p_{ij}, exporter i reduces its markup to limit trade diversion, resulting in incomplete pass-through (see Amiti et al., 2014; Auer and Schoenle, 2016; Garetto, 2016; Amiti et al., 2019a). The response is strongest at intermediate supplier shares, giving rise to a U-shaped relationship between $\Gamma_{ij}^{\text{oligopoly}}$ and s_{ij}.[12]

[12] Amiti et al. (2014) shows that, to a first-order approximation, pass-through decreases with the exporter's share through strategic complementarities. However, we cannot rely on the same approximation, given our focus on bilateral markets, where both very low and very high market shares are observed in the data.

Oligopsony Markdown Elasticity The oligopsony markdown elasticity dominates when $\phi \to 1$, in which case $\Gamma_{ij} \to \Gamma_{ij}^{\text{oligopsony}}$. It is given by

$$\Gamma_{ij}^{\text{oligopsony}} \equiv -\frac{d\ln \mu_{ij}^{\text{oligopsony}}}{d\ln p_{ij}} = \left(\frac{x_{ij} \cdot (1-x_{ij})^{\frac{1}{\theta}-1}}{\theta \cdot (1-(1-x_{ij})^{\frac{1}{\theta}})} - 1 \right) (1-x_{ij})\, \varepsilon_{ij} \leq 0.$$

This elasticity captures the logic of *strategic substitutabilities* among importers.[13] As the price p_{ij} rises, importer j reduces demand, shrinking the exporter's quasi-rents. This weakens the importer's bargaining position, reducing the markdown and amplifying the price response, potentially resulting in more-than-complete pass-through.

The elasticity $\Gamma_{ij}^{\text{oligopsony}}$ depends on both the importer's buyer share x_{ij} and the exporter's supplier share s_{ij}. It is U-shaped in x_{ij}: the elasticity vanishes when $x_{ij} \to 0$ (atomistic buyer) or $x_{ij} \to 1$ (monopsonist), and reaches its peak at intermediate values. It also declines with s_{ij}, since a higher supplier share reduces the demand elasticity ε_{ij}, limiting changes in x_{ij} and weakening the markdown response.

The Role of the Endogenous Bargaining Weight The elasticity $\Gamma_{ij}^{\omega} \equiv \frac{d\ln \omega_{ij}}{d\ln p_{ij}}$ captures how the bargaining weight ω_{ij} responds to price changes. Its sign and magnitude depend on the exporter's supplier share s_{ij} and are derived in Appendix A.3. For empirically relevant values of s_{ij} and parameter ranges, this elasticity is typically small. In particular, as s_{ij} approaches zero or one, where ω_{ij} converges to the importer's exogenous bargaining strength ϕ, the elasticity Γ_{ij}^{ω} goes to zero.

2.4.2 Cost Elasticity

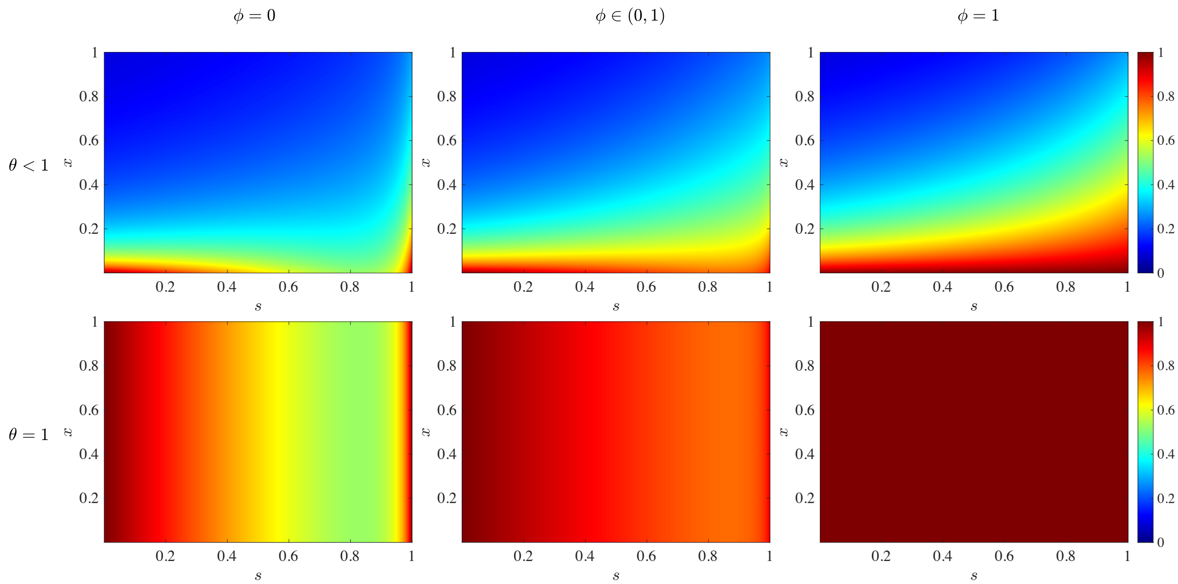
The cost elasticity Λ_{ij} measures how exporter i's marginal cost c_i responds to changes in the bilateral price p_{ij}, via adjustments in traded quantity. While prior work emphasizes the role of the cost channel in shaping pass-through (e.g., Burstein and Gopinath, 2015; Amiti et al., 2019a), our contribution is to show that this elasticity varies systematically across matches through both demand and supply channels.

Formally:

$$\begin{aligned} \Lambda_{ij} \equiv -\frac{d\ln c_i}{d\ln p_{ij}} &= \frac{d\ln c_i}{d\ln q_{ij}} \cdot \left(-\frac{d\ln q_{ij}}{d\ln p_{ij}} \right) \\ &= \frac{1-\theta}{\theta} \cdot x_{ij} \cdot \varepsilon_{ij} \geq 0. \end{aligned}$$

[13] Strategic substitutabilities arise because a decline in demand by other buyers lowers marginal costs and prices, encouraging importer j to expand purchases.

FIGURE 2: Pass-Through Elasticity and Bilateral Market Shares



Notes: The figure presents heatmaps of the pass-through elasticity Φ_{ij} across combinations of s_{ij} (x-axis) and x_{ij} (y-axis), under alternative assumptions about ϕ and θ. We set $\theta = 0.5$ in the decreasing returns case and $\phi = 0.5$ in the intermediate bargaining case. Other parameters are fixed at $\gamma = 0.5$, $\varrho = 1$, $\nu = 4$, and $\rho = 10$.

The elasticity declines with the exporter's supplier share s_{ij}, which reduces the residual demand elasticity ε_{ij}, and increases with the importer's buyer share x_{ij}, which amplifies the residual supply elasticity $\frac{d \ln c_i}{d \ln q_{ij}}$. Importantly, this mechanism operates independently of bargaining power (ϕ), and instead reflects the concentrated nature of the trade network.

2.4.3 Pass-Through Elasticity and Bilateral Market Shares

The interaction between markup and cost channels generates rich heterogeneity in pass-through elasticities across matches, shaped by bargaining power (ϕ), returns to scale (θ), and bilateral market shares (s_{ij} and x_{ij}). Figure 2 illustrates these patterns using heatmaps of the pass-through elasticity Φ_{ij} as a function of supplier share (s_{ij}) and buyer share (x_{ij}), under three bargaining regimes—$\phi \to 0$, $\phi \in (0, 1)$, and $\phi \to 1$—with decreasing returns to scale ($\theta < 1$) in the top row and constant returns to scale ($\theta = 1$) in the bottom row.

Several key insights emerge. First, pass-through Φ_{ij} increases with importer bargaining power ϕ. As ϕ rises, the markup elasticity shifts toward the oligopsony markdown elasticity, increasing pass-through through strategic substitutabilities. This is most visible in the shift from the left to the right columns within each row.

Second, when $\theta < 1$, pass-through is incomplete across most of the (s_{ij}, x_{ij}) space. This is because the cost elasticity Λ_{ij}, which is always non-negative, dominates the overall pass-through elasticity ($\Gamma_{ij} + \Lambda_{ij}$) when Γ_{ij} is negative due to strong buyer power. Moreover, pass-through values under $\phi \in (0,1)$ and $\phi = 1$ are nearly indistinguishable, indicating that pass-through is relatively insensitive to the exact level of ϕ in this regime. This reflects two forces: (i) the cost channel is strong when returns to scale are decreasing and importers' bargaining power is high, and (ii) the markup elasticity Γ_{ij} is either muted by offsetting effects of strategic complementarities and substitutabilities or generally low in values.[14]

Third, pass-through Φ_{ij} depends on x_{ij} only when $\theta < 1$, in which case it declines with x_{ij}. This yields a sharp empirical prediction: a negative relationship between pass-through and buyer share x_{ij} implies decreasing returns to scale, regardless of the level of bargaining power. This result is formalized below.

Proposition 4. *If pass-through Φ_{ij} decreases with the importer's buyer share x_{ij}, then $\theta < 1$.*

Proof: See Appendix A.4.

By contrast, the relationship between Φ_{ij} and the supplier share s_{ij} is less clear-cut. As shown in Figure 2, pass-through declines with s_{ij} primarily when ϕ is low and θ is near one, a setting in which the markup channel dominates and cost-based adjustments are limited. In this region, strategic complementarities give rise to a U-shaped relationship between Φ_{ij} and s_{ij}. As either ϕ or x_{ij} increases, the cost channel becomes more prominent, and pass-through tends to rise with s_{ij}. While we do not formally characterize the conditions under which this reversal occurs, we show below that ϕ is weakly increasing in s_{ij}. This monotonicity supports interpreting the empirical evidence as inconsistent with the low-ϕ, high-θ case.

2.5 Discussion

This section reviews key modeling assumptions and discusses potential extensions.

2.5.1 Bargaining Protocol and Quantities

The baseline model assumes *demand-determined quantities*, whereby the importer chooses input quantities to minimize total cost, taking the price as given. This assumption provides analytical tractability, yields closed-form solutions for markups and pass-through, and nests standard models of international trade. An important implication is that prices are allocative, a feature that aligns with our empirical findings and with firm-level evidence in related settings (Gopinath and Itskhoki, 2011).

We consider two alternative bargaining protocols as benchmarks for understanding the role

[14] For more details, see Appendix A.4.

of quantity determination. The first is *efficient bargaining*, discussed more formally in Appendix B.1. This case corresponds to the vertically integrated benchmark, where importer and exporter jointly negotiate over both price and quantity to maximize total surplus. While theoretically appealing, this setup implies that prices are non-allocative transfers, inconsistent with the empirical evidence. Moreover, the vertically integrated case may be unrealistic in the context of arm's-length firm-to-firm trade, where limited commitment and contracting frictions are prevalent (Antràs, 2020).

The second alternative, detailed in Appendix B.2, is *supply-driven* bargaining: the exporter sets quantity for a given price, and price is then negotiated based on the resulting supply curve. As $\phi \to 1$, this nests the classic monopsony benchmark commonly used in labor markets (e.g., Berger et al., 2022). The key distinction between this setup and our baseline lies in their welfare implications: in the supply-driven case, buyer power lowers both prices and quantities, while supplier power helps restore efficiency. In contrast, under demand-driven bargaining, buyer power mitigates upstream distortions and improves efficiency.[15]

While both alternatives offer useful benchmarks, they are less suited to the goals of this paper. The supply-driven model, in particular, does not provide closed-form expressions for key variables, which makes it challenging to generate clear predictions or link the model to data compared to our baseline setup. Still, it remains a valuable direction for future work, especially for studying welfare effects when buyer power leads to inefficiencies.

2.5.2 Outside Options

In our model, each firm's outside option reflects payoffs from trade with all other existing partners, excluding the focal match. This assumption allows us to express markups and pass-through in terms of market shares and a small set of parameters, facilitating structural estimation and counterfactual analysis.

While analytically convenient, the assumption may appear restrictive if disagreement leads a firm to form or sever other relationships. Appendix B.3 explores a more flexible setup in which disagreement affects the importer's cost and the exporter's revenue non-parametrically. Although more realistic, this extension introduces an identification problem: the parameters ϕ and θ can no longer be separately identified from the outside option, which limits their interpretability and empirical tractability.

[15] See Avignon et al. (2024) and Demirer and Rubens (2025) for recent discussions of how quantity-setting assumptions affect welfare outcomes.

2.5.3 General Equilibrium Forces

We conclude the theoretical section by noting that all results are derived under a partial equilibrium approach, holding fixed general equilibrium variables such as wages, demand shifters, and competitor behavior. This approach simplifies the analysis but also raises questions about the role of general equilibrium adjustments in the results.

General equilibrium considerations are critical for interpreting pass-through elasticities. The structural pass-through elasticity derived in Section 2.4 is a *direct* or *partial* elasticity, holding constant aggregate variables such as wages, demand conditions, and, importantly, competitors' prices and sourcing decisions. In reality, tariff shocks may also affect variables such as foreign wages or domestic export prices. If these effects are not fully observed or controlled for, reduced-form estimates may conflate the direct impact with general equilibrium responses, making it harder to align empirical pass-through coefficients with model-based elasticities (Burstein and Gopinath, 2015).[16] Therefore, our goal is not to recover structural elasticities from reduced-form regressions, which would be inappropriate in this context (Berger et al., 2022).

Instead, we pursue a structural approach, which helps mitigate similar concerns. Our approach has three advantages. First, the theoretical relationship between bilateral shares, markups, and pass-through holds parametrically regardless of the specific general equilibrium environment. While the parameter values depend on how aggregate variables such as tariffs, demand shifters, and wages co-move in equilibrium, we do not need to model their relationships explicitly. Instead, identification is based on the cross-sectional variation of prices across importers within exporter–product–year cells, without making assumptions on the general equilibrium environment.

Second, we can also isolate and test the cross-sectional predictions of the model independently of general equilibrium forces. In particular, even if aggregate variables shift over time, the model predicts specific patterns between firm-to-firm shares, markups, and pass-through at a given point in time. These predictions can be assessed empirically using within-period variation across matches, which we exploit in the next sections.

Third, we can evaluate the performance of the estimated model by comparing its ability to replicate observed price changes in response to tariff shocks, thereby gauging the significance of general equilibrium forces. As shown in the empirical analysis, the estimated model fits the

[16] In Appendix B.4, we extend equation (2.11) to account for indirect effects, such as how a shock to exporter i influences other prices and quantities, which may in turn affect p_{ij}. While we do not model full general equilibrium dynamics, this extension illustrates how spillovers across relationships may lead to reduced-form estimates diverging from structural ones.

observed price changes well. This suggests that the short-run effects of tariffs on prices can be understood primarily through the lens of partial equilibrium mechanisms, and supports the usefulness of our framework for studying firm-to-firm pricing and pass-through.

3 Data and Stylized Facts

This section describes the data and preliminary empirical analysis. Section 3.1 outlines the main data sources. Section 3.2 discusses how we adapt the baseline model to the data to construct key variables. Section 3.3 details the sample selection and provides summary statistics. Finally, Section 3.4 presents evidence testing the model's predictions.

3.1 Data Sources

Our main dataset is the U.S. Census Bureau's Linked/Longitudinal Firm Trade Transaction Database (LFTTD), which covers the universe of U.S. import transactions from 2001 to 2018. Each observation corresponds to a shipment from a foreign exporter to a U.S. importer and includes the transaction date, product classification at the 10-digit Harmonized System (HS10) level, FOB import value in U.S. dollars, physical quantity, transportation mode, and country of origin. Exporters are identified using a manufacturer ID (MID) constructed by the Census Bureau from the exporter's name, street address, city, and country.[17]

To focus on arm's-length trade, we exclude related-party transactions from the baseline sample. The LFTTD includes a related-party indicator based on a mandatory field in U.S. Customs forms, flagging relationships with ownership stakes of at least five percent. While widely used, this measure may misclassify firms due to its reliance on self-reporting and a low reporting threshold (Ruhl, 2015). To improve accuracy, we construct an alternative indicator using ORBIS, which provides firm-level cross-border ownership links. We merge ORBIS to the LFTTD as described in Appendix C.1.

We supplement the transaction-level data with information on statutory U.S. import tariffs introduced during the 2018 trade war. We use the dataset from Fajgelbaum et al. (2020), which records the timing, product coverage, and country-specific scope of these measures at the HS8–month level. The tariffs averaged 25 percentage points and were imposed on top of existing rates, targeting selected goods. They were implemented in phases over the course of

[17]The MID combines the country code, (elements from) the firm name, city, and address (Kamal and Monarch, 2018). Because the algorithm is not standardized, it may generate inconsistent identifiers due to misspellings or minor location changes, leading to one firm having multiple MIDs or several firms sharing one. Following Kamal and Monarch (2018), we construct a robustness version that truncates location fields to improve consistency. Our baseline uses the full MID, and results are robust to this alternative.

the year, beginning with imports from China and later expanding to goods from other trade partners, including Canada, Mexico, and the European Union. Tariff changes are annualized based on the number of months each measure was in effect.

3.2 Measuring Key Variables of the Model

To construct the key variables of interest, we extend the model to include multiple foreign inputs, indexed by h. Each input corresponds to an HS10 product category. We model the foreign input bundle as a Cobb-Douglas composite of individual product quantities:

$$q_j^f = \prod_{h \in \mathcal{H}_j} \left(q_{jh}^f \right)^{\alpha_{jh}}, \quad \text{where} \quad q_{jh}^f = \left(\sum_{i \in \mathcal{Z}_j^h} \varsigma_{ijh} \cdot (q_{ijh})^{\frac{\rho-1}{\rho}} \right)^{\frac{\rho}{\rho-1}},$$

and $\alpha_{jh} \in (0,1)$ denotes the (observed) Cobb-Douglas share of input h in firm j's total imports of foreign intermediates. This formulation implies that the elasticity of the importer's marginal cost with respect to the price of foreign input h is $\frac{d \ln c_j}{d \ln p_{jh}^f} = \alpha_{jh}\gamma \in (0,1]$.

We construct the exporter's supplier share as $s_{ijh} \equiv \frac{p_{ijh} q_{ijh}}{\sum_{k \in \mathcal{Z}_j^h} p_{kjh} q_{kjh}}$, where $\mathcal{Z}_j^h$ denotes the set of firm j's foreign suppliers of input h. The numerator captures the total value of imports of product h from exporter i (a MID in our data) to firm j in a given year. The denominator aggregates imports of product h from all foreign suppliers to j.

In contrast, the importer's buyer share is constructed as $x_{ijh} \equiv \frac{q_{ijh}}{\sum_{k \in \mathcal{Z}_i^h} q_{ihk}}$, where $\mathcal{Z}_i^h$ is the set of all U.S. importers buying product h from exporter i. Since our dataset only includes U.S. importers, we assume that exporter i operates product- and destination-specific production lines. Under this assumption, the denominator of x_{ijh}, which captures the total quantity of product h from exporter i, includes only those sold to U.S. buyers. This restriction reflects a data limitation, as we do not observe importer destinations beyond the U.S. and thus cannot account for the full set of an exporter's buyers.[18]

3.3 Sample Construction and Summary Statistics

We apply a series of restrictions to the LFTTD to align the empirical sample with the model's focus on decentralized bargaining over intermediate inputs. Full details are provided in Appendix C.2. The selection criteria are designed to ensure that we observe relationship-

[18] To address the possibility that the importer's buyer share x_{ij} may be overstated due to unobserved sales to other destinations, we replicate the analysis using only exporters from Canada and Mexico. These countries direct the majority of their exports to the U.S. (71% for Canada and 73% for Mexico in 2019), making the assumption of destination-specific production less restrictive. Reassuringly, our estimates remain stable in this subsample. Full results are available upon request.

level price changes, exclude related-party transactions, and maintain sufficient variation in buyer–supplier matches for identification purposes. Appendix Table C.1 summarizes how the sample evolves with each restriction across key dimensions.

We begin by restricting the sample to importer–exporter–product triples observed in two consecutive years, allowing us to compute relationship-level price changes, which are central to our analysis. While this requirement eliminates over half of the raw matches, it retains a substantial share of trade, covering roughly 88% of import value between 2001–2016 and 80% between 2017–2018, highlighting the importance of repeated relationships.

Next, we restrict the sample to capital and intermediate inputs by excluding products classified as consumption goods under the Broad Economic Categories (BEC) system. This step reduces the number of suppliers and relationships, as shown in Table C.1.[19] To further mitigate measurement error, we apply three filters: (i) exclude transactions involving energy goods, (ii) drop observations with unit values outside the 1st–99th percentile within product, and (iii) remove transactions with absolute log price changes above four.

We then exclude related-party transactions, which are less likely to reflect decentralized bargaining and may involve internal pricing strategies such as transfer pricing.[20] In our baseline definition, a buyer–supplier pair is considered related if ORBIS identifies a shared corporate parent.[21] For robustness, we consider two alternative definitions: one based solely on the LFTTD's related-party flag, and another that combines this flag with ORBIS data identifying the U.S. importer as a multinational (domestic or foreign-owned).

Lastly, we impose restrictions based on our identification strategy. Since the latter relies on observing the variation in prices across U.S. buyers for the same supplier-product-year combination, we restrict our sample to supplier–product pairs in which the supplier transacts with at least two U.S. buyers in consecutive years. Table C.1 reports that after these restrictions, the sample accounts for approximately $160 billion in import value and 250 thousand buyer-supplier-product-year combinations between 2017-2018.

[19]As a robustness check, we also consider a broader sample that includes consumption goods. Appendix Table C.2 reports the composition of this sample and Table C.3 reports the corresponding summary statistics. These statistics are broadly similar to the baseline, indicating that including consumption goods does not significantly alter the data composition.

[20]Bernard et al. (2006) document that prices in related-party trade differ systematically from arm's-length transactions, with lower average prices and distinct pass-through behavior.

[21]We retain all observations not flagged as related in either ORBIS or the LFTTD. This approach preserves sample size while ensuring that limited ORBIS coverage does not unduly constrain the selection. See Appendix C.1 for details.

Summary Statistics Table 1 reports summary statistics for our final sample. Panel A shows that the concentration of importers and exporters is substantial. On average, an exporter supplies 32% of an importer's total imports of a given HS10 product, with a median share of 15%. The average buyer share is lower, at 25%, with a median of 10%. The two shares are highly dispersed and largely uncorrelated, with a correlation of 0.04.

TABLE 1: Summary Statistics for Main Estimation Sample (2001–2018)

Variable	Mean	Std. Dev.	P25	Median	P75
Panel A: Characteristics of Trade Relationships					
s_{ijh}: Supplier share	0.32	0.35	0.03	0.15	0.57
x_{ijh}: Buyer share	0.25	0.29	0.02	0.10	0.40
Relationship length (product h)	4.00	2.80	2.50	3.50	5.50
Relationship length (all products)	4.80	3.30	2.50	4.50	6.50
# Transactions (product h)	120	1100	6.50	16	50
# Transactions (all products)	360	3000	11	36	140
# Products per pair	3.80	7.30	1.50	2.50	4.50
Multi-HS10 dummy	0.59	0.49	0.00	1.00	1.00
# Suppliers per buyer (HS10)	1.80	3.20	1.50	2.50	5.50
Buyer tenure (all products)	9.90	5.00	6.50	10.00	14.00
Buyer tenure (product h)	6.90	4.40	3.50	6.50	10.00
# Buyers per supplier (HS10)	3.20	3.90	2.50	3.50	7.50
Supplier tenure (all products)	8.00	4.60	4.50	8.50	12.00
Supplier tenure (product h)	6.40	4.00	3.50	6.50	9.50
Corr. between s_{ijh} and x_{ijh}	0.041	—	—	—	—
Panel B: Prices					
$\log p$ (pre-duty)	3.50	2.80	1.40	3.10	5.40
$\log p$ (pre-duty, excl. charges)	3.40	2.80	1.30	3.00	5.40
$\log p^{\text{duty}}$ (post-duty)	3.50	2.80	1.40	3.10	5.40

Notes: This table reports summary statistics for the estimation sample used in the empirical analysis. The data span 2001–2016 and include importer–supplier–product matches observed in two consecutive years. The sample excludes consumption goods (based on BEC), energy products, statistical outliers, and related-party trade, and is restricted to suppliers trading with at least two U.S. buyers in two consecutive years. This sample corresponds to the "+ Supplier Multi-Buyer" row in Panel B of Table C.1. Columns report the mean, standard deviation, and selected quantiles (25th, 50th, 75th percentile) for each variable. Prices in Panel B are log unit values (FOB value over quantity), with variants including charges or duties. s_{ijh} denotes exporter i's share in buyer j's imports of product h; x_{ijh} denotes buyer j's share in exporter i's U.S. exports of the same product. Relationship length and tenure are in years; concentration is measured at the HS10–year level. Counts of buyers, suppliers, and origin countries are per product per firm. Statistics are based on confidential LFTTD data and rounded to four significant digits per U.S. Census Bureau Disclosure Guidelines. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

Long-term relationships are a hallmark of intermediate input trade (Antràs and Chor, 2013; Monarch, 2022). In our data, importer–exporter pairs trade the same product for an average of four years and remain connected across all products for nearly five years. Pairs transact frequently (median: 16 times per product), often spanning multiple products (mean: 3.8), and typically involve durable links, with average tenures ranging from 7 to 10 years.

Panel B of Table 1 reports descriptive statistics for three bilateral (log) price measures based on FOB unit values: baseline pre-duty prices, pre-duty prices excluding insurance and other ancillary charges, and post-duty prices. All three exhibit wide dispersion across importer–exporter–product matches, with interquartile ranges exceeding four log points.

To assess the sources of this variation, we perform a variance decomposition exercise, as described in Appendix D.1. Table D.1 shows that product-year fixed effects explain about 50% of the total variance, while match-specific residuals account for 4%. Crucially, when we focus only on variation within supplier–product–year cells, 77% of the remaining dispersion is explained by match-specific factors. This pattern holds across price definitions, underscoring the importance of relationship-specific forces in pricing.[22]

3.4 Test of Model Predictions

We now examine how the comovements between markups, pass-through, and bilateral market shares align with the model's predictions in Propositions 2 and 4. While not a formal test, this analysis provides supporting evidence for the mechanisms emphasized in the theory. Section 4 then develops a structural approach to quantify these forces more directly.

3.4.1 Test of Proposition 2: Markups and Bilateral Market Shares

We begin by testing Proposition 2, which predicts that with two-sided market power ($\phi \in (0, 1)$ and $\theta < 1$), bilateral markups increase with the exporter's supplier share (s_{ijht}) and decrease with the importer's buyer share (x_{ijht}). Since markups are not observed, we use log prices, equal to log markups plus log marginal costs, and include supplier–product–time fixed effects to absorb cost variation and isolate the markup component.

We estimate the following specification:

$$\ln p_{ijht} = \alpha_s \, s_{ijht} + \alpha_x \, x_{ijht} + \mathbf{X}_{ijht}\boldsymbol{\gamma} + \mathbf{FE} + \upsilon_{ijht}, \qquad (3.1)$$

where the coefficients of interest are α_s and α_x, which we expect to be positive and negative, respectively.

[22] See Fontaine et al. (2020) for related evidence in French data.

To address endogeneity concerns, we construct leave-one-out instruments that isolate variation in market structure plausibly exogenous to the pricing decision of a given buyer–supplier pair. Specifically, we use the average supplier share (excluding i) among other buyers of exporter i (excluding j) to instrument for s_{ijh}. Similarly, to instrument for x_{ijh}, we use the average buyer share (excluding j) among other suppliers to importer j (excluding i).

Table 2 shows the results. Columns (1)–(2) include exporter (FE_i), importer (FE_j), and product–year (FE_{ht}) fixed effects. Column (3)–(4) replaces exporter fixed effects with exporter–product–year (FE_{iht}) to account for unobserved marginal costs. Columns (5) and (6) further replace importer fixed effects with importer–product–year (FE_{jht}) to capture buyer-specific demand shocks. All regressions control for the relationship duration, measured as years since the first shipment of product h between i and j.

We estimate $\alpha_s > 0$ and $\alpha_x < 0$, with both coefficients statistically and economically significant. A positive α_s indicates oligopoly power, requiring exporter bargaining power ($\phi < 1$), while a negative α_x reflects oligopsony power, requiring importer bargaining power ($\phi > 0$) and upward-sloping supply ($\theta < 1$). These findings are consistent with the model's core assumption of two-sided market power, i.e., $\phi \in (0, 1)$ and $\theta < 1$.

3.4.2 Test of Proposition 4: Pass-Through and Bilateral Market Shares

We next test Proposition 4, which links tariff pass-through to the importer's buyer share. Under decreasing returns ($\theta < 1$), the model predicts that pass-through declines with the buyer share via the cost channel, providing a direct test for $\theta < 1$.

For this analysis, we focus on 2017–2018, when U.S. imports experienced sharp and unanticipated tariff increases under the Trump administration. We estimate the following regression specification:

$$\begin{aligned}\Delta \ln p_{ijht} = \alpha_0 + \alpha_1 \Delta \ln(1 + \tau_{cht}) + \alpha_s \Delta \ln(1 + \tau_{cht}) \cdot s_{ijh,t-1} + \alpha_x \Delta \ln(1 + \tau_{cht}) \cdot x_{ijh,t-1} \\ + \alpha_2\, s_{ijh,t-1} + \alpha_3\, x_{ijh,t-1} + \mathbf{X}_{ijht}\boldsymbol{\gamma} + \mathbf{FE} + \epsilon_{ijht}. \qquad (3.2)\end{aligned}$$

where we use the change in the duty-exclusive price as the dependent variable, defined as $\Delta \ln p_{ijht} = \Delta \ln p^{\text{duty}}_{ijht} - \Delta \ln(1 + \tau^{\text{app}}_{cht})$, where τ^{app}_{cht} is the applied ad-valorem tariff. This transformation isolates price changes net of applied duties, mitigating measurement error.

The interaction terms capture heterogeneity in pass-through with respect to bilateral market shares, $s_{ijh,t-1}$ and $x_{ijh,t-1}$, measured at the beginning of the period. The vector $\mathbf{X}_{ijht}$ includes controls for changes in exporter i's sales to other U.S. buyers and the average price

Table 2: Prices and Bilateral Concentration

Dependent Variable:	$\ln p_{ijht}$					
	(1) OLS	(2) IV	(3) OLS	(4) IV	(5) OLS	(6) IV
s_{ijht}	0.183	0.174	0.251	0.169	0.269	0.681
	(0.0033)	(0.0296)	(0.0036)	(0.029)	(0.0065)	(0.0147)
x_{ijht}	-0.537	-0.077	-0.594	-0.186	-0.533	-0.777
	(0.0030)	(0.0175)	(0.0028)	(0.0249)	(0.0061)	(0.0112)
$\text{FE}_i + \text{FE}_j + \text{FE}_{ht}$	Yes	Yes	No	No	No	No
$\text{FE}_{iht} + \text{FE}_j$	No	No	Yes	Yes	No	No
$\text{FE}_{iht} + \text{FE}_{jht}$	No	No	No	No	Yes	Yes
Observations	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000	1,200,000
R-squared	0.957	0.010	0.976	0.032	0.991	0.032
First-stage F stat.	—	5,270	—	3,485	—	19,760
SW F stat (s_{ijht})	—	10,710	—	7,464	—	39,830
SW F stat (x_{ijht})	—	21,120	—	7,197	—	43,550

Notes: This table reports OLS and IV estimates of equation (3.1), where the dependent variable is the log FOB unit value of product h imported by buyer j from supplier i in year t. Columns alternate between OLS and IV specifications. All regressions control for log relationship length (in years) within HS10 products. Columns (1)–(2) include buyer (FE_j), supplier (FE_i), and product-year (FE_{ht}) fixed effects. Columns (3)–(4) use supplier–product–year (FE_{iht}) and buyer (FE_j) fixed effects. Columns (5)–(6) include fully interacted buyer–product–year and supplier–product–year fixed effects (FE_{jht}, FE_{iht}), flexibly controlling for sourcing and pricing patterns. IV estimates (even-numbered columns) use leave-one-out instruments: s_{ijht} is instrumented with the average share of other suppliers across buyers of i (excluding j), and x_{ijht} with the average share of other buyers across suppliers to j (excluding i). Because the model includes multiple endogenous regressors, we report both first-stage and conditional F-statistics from Sanderson and Windmeijer (2016), which assess instrument strength for each endogenous regressor conditional on the others, addressing limitations of standard first-stage tests in multi-equation IV settings. Standard errors are robust. The number of observations is rounded to four significant digits in accordance with U.S. Census Bureau disclosure guidelines. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

Table 3: Pass-Through and Relationship Heterogeneity

Dependent variable:	$\Delta \ln p_{ijht}$					
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln(1 + \tau_{cht})$	-0.151	-0.188	-0.171	-0.045	-0.066	-0.123
	(0.093)	(0.105)	(0.095)	(0.099)	(0.093)	(0.104)
$\Delta \ln(1+\tau_{cht}) \cdot \ln \text{longevity}_{ijht}$		0.026				0.042
		(0.019)				(0.018)
$\Delta \ln(1 + \tau_{cht}) \cdot s_{ijht-1}$			0.050		0.054	0.053
			(0.075)		(0.072)	(0.071)
$\Delta \ln(1 + \tau_{cht}) \cdot x_{ijht-1}$				-0.403	-0.403	-0.411
				(0.113)	(0.113)	(0.114)
$\text{FE}_{ht} + \text{FE}_{cs}$	Yes	Yes	Yes	Yes	Yes	Yes
Observations	249,000	249,000	249,000	249,000	249,000	249,000
R-squared	0.04	0.04	0.04	0.04	0.04	0.04

Notes: This table reports estimates of the pass-through of statutory tariffs, $\Delta \ln(1 + \tau_{cht})$, to duty-exclusive prices at the exporter–importer–product–year level, $\Delta \ln p_{ijht}$. Columns (2) and (6) interact tariffs with the log of relationship longevity, measured as the number of years that buyer j and supplier i have transacted in product h. Columns (3) and (5) interact tariffs with the lagged supplier share, s_{ijht-1}, defined as supplier i's share in buyer j's imports of product h. Columns (4) and (5) interact tariffs with the lagged buyer share, x_{ijht-1}, defined as buyer j's share in supplier i's exports of product h. All regressions include product–year and exporter country–sector fixed effects ($\text{FE}_{ht} + \text{FE}_{cs}$). Controls include: (i) $\ln \text{longevity}_{ijht}$; (ii) $\Delta \ln q_{i(-j)ht}$, the change in exporter i's total sales of h to U.S. buyers other than j; and (iii) $\Delta \ln p_{(-i)jht}$, the weighted average price change charged by other suppliers of h to buyer j, using lagged shares as weights. Standard errors are clustered at the HS8 product and exporter-country level. The sample corresponds to the "+ Supplier Multi-Buyer" definition in Table C.1. Observation counts are rounded to four significant digits per U.S. Census Bureau disclosure guidelines. See Table D.11 for results using an alternative definition of arm's-length trade based on LFTTD. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

change faced by importer j from alternative suppliers, helping to isolate bilateral responses emphasized in the model.

We estimate two specifications. The first includes product–time (FE_{ht}) and exporting country–sector (FE_{cs}) fixed effects, following standard practice in the pass-through literature. This is our baseline. The second is more demanding, adding importer–time (FE_{jt}) and exporting country–time (FE_{ct}) fixed effects.

Table 3 presents the results using the baseline fixed effects. Column (1) shows that, on average, pass-through into duty-exclusive prices is incomplete: a 10% tariff increase reduces exporter prices by 1.5% , corresponding to 85% pass-through rate. Column (2) adds an interaction with relationship age to account for the role of match longevity, which has been shown to influence price adjustments. The results confirm that pass-through rises with relationship length, consistent with the results in Heise (2024).

Columns (3)–(6) show that the coefficient on supplier share (α_s) is positive but insignificant, suggesting limited pass-through heterogeneity on the exporter side. In contrast, the coefficient on buyer share (α_x) is consistently negative and statistically significant, indicating that importers with greater buyer share face lower pass-through. Table D.2 in Appendix D.2 confirms that these patterns hold under more demanding fixed effects. Table D.3 shows they are robust to alternative price definitions and general equilibrium controls.

To assess nonlinearities, we interact tariff changes with quartiles of lagged supplier and buyer shares. Figure D.1 shows no systematic pattern across supplier share quartiles but a clear, monotonic decline across buyer share quartiles, regardless of fixed effects.

Together, these results suggest that pass-through is largely unresponsive to supplier concentration but declines strongly with buyer concentration. This pattern aligns with the model's predictions under two-sided market power: the strong buyer share gradient provides direct evidence of decreasing returns, as formalized in Proposition 4, while the weak supplier share gradient reflects the dominance of cost-channel, which suggests a high-ϕ, low-θ environment.

4 Structural Estimation

The patterns documented above are consistent with the model's predictions under two-sided market power. However, as discussed, they do not warrant direct inference on the structural parameters. We now turn to a structural estimation approach to quantify the role of two-sided market power in shaping international prices.

Our estimation targets two key parameters: the importer's bargaining power, ϕ, and the returns to scale parameter, θ, which governs the elasticity of foreign export supply. The remaining parameters are taken from the literature or directly measured from the data.

We set the elasticity of substitution across foreign varieties to $\rho = 10$, consistent with Anderson and van Wincoop (2004) and Edmond et al. (2023), who adopt similar values to match observed U.S. markups. The downstream demand elasticity faced by importers is set to $\nu = 4$, based on the estimates in Broda and Weinstein (2006).[23] The elasticity of importer j's marginal cost with respect to the foreign input price index is set to $\gamma = 0.5$, following Eldridge and Powers (2018), who document the share of imported inputs in total material costs for U.S. manufacturers. Input cost shares α_{jht} are directly measured from the data.

Finally, we set the importer's returns to scale parameter to $\varrho = 1$ in the baseline specification. As discussed in Section 2.3.1, the parameters ν, γ, and ϱ jointly determine the elasticity η of importer j's foreign input bundle q_j^f with respect to its price index p_j^f. Since ϱ enters the

[23] Appendix E.1 provides further discussion.

model only through η, fixing it to one does not restrict generality. We verify that our results are robust to alternative values of η.

4.1 Identification and Estimation of the Parameters θ and ϕ

Let Ω_{ijt} denote the information set available to a given $i-j$ pair during negotiations. This includes observed market shares (s_{ijht}, x_{ijht}, α_{jht}) and calibrated parameters (ν, γ, ρ, ϱ). As shown in equation (2.6), the bilateral markup depends only on the model primitives (ϕ, θ) conditional on Ω_{ijt}, i.e., $\mu_{ij} = \mu\left(\phi, \theta \mid \Omega_{ijt}\right)$. The log price of product h transacted between exporter i and importer j in year t can thus be written as:

$$\ln p_{ijht} = \ln \mu\left(\phi, \theta \mid \Omega_{ijt}\right) + \ln c_{iht},$$

where $\ln c_{iht}$ denotes the exporter's marginal cost. From equation (2.1), this is given by:

$$\ln c_{ijht} = \frac{1-\theta}{\theta} \ln q_{iht} + \ln k_{iht}.$$

In the theoretical model, the term k_{iht} captured exporter-level cost shifters. In the empirical implementation, we generalize this term to allow for match-specific cost components, such as relationship-specific know-how or specialization, by letting it vary flexibly at the match-year level, k_{ijht}, thereby absorbing all (i, j, h, t)-specific variation. In contrast, the term $\frac{1-\theta}{\theta} \ln q_{iht}$ is constant across importer matches for a given supplier–product–year. Identification of (ϕ, θ) thus relies on cross-sectional variation in bilateral market shares, as discussed next.

Consider an exporter i matched with two importers, j and ℓ. Conditional on the joint information set $\boldsymbol{\Omega}_{ij\ell t} \equiv (\Omega_{ijt}, \Omega_{i\ell t})$, we assume that the unobserved component of marginal cost is mean-independent of the buyer identity: $\Delta k_{ij\ell ht} \equiv \mathbb{E}_k\left[k_{ijht} - k_{i\ell ht} \mid \boldsymbol{\Omega}_{ij\ell t}\right] = 0.$[24] Taking log price differences across buyers j and ℓ served by the same exporter i in year t yields the following moment condition:

$$g(\phi, \theta \mid \boldsymbol{\Omega}_{ij\ell t}) \equiv \mathbb{E}_k\Big[\ln p_{ijht} - \ln p_{i\ell ht} - \Big(\ln \mu(\phi, \theta \mid \Omega_{ijt}) - \ln \mu(\phi, \theta \mid \Omega_{i\ell t})\Big)\Big|\boldsymbol{\Omega}_{ij\ell t}\Big] = 0. \quad (4.1)$$

Identification requires that equation (4.1) does not hold for two pairs (ϕ, θ) such that $(\phi^A, \theta^A) \neq (\phi^B, \theta^B)$. Since the oligopoly markup is independent of the returns to scale

[24] Omitted variables may induce $\Delta k_{ij\ell ht} \neq 0$, raising endogeneity concerns. One possible issue is endogenous network formation: unobserved factors may simultaneously affect both match formation and pricing, biasing estimates of $\hat{\phi}$ and $\hat{\theta}$. We address this by differencing across buyers of the same exporter, which removes exporter-level shocks common to all matches. To address remaining concerns, we further implement an instrumental variable strategy.

parameter θ, identification of θ requires that the oligopsony channel plays a role in price determination, i.e., $\phi > 0$, a condition supported by the reduced-form evidence in Tables 2 and 3.

We therefore focus on the empirically relevant case of bilateral bargaining power $\phi \in (0, 1)$. The markup function $\mu(\phi, \theta \mid \Omega)$ is strictly monotonic in both parameters and thus invertible in each. It follows that the moment condition in equation (4.1) is also invertible in ϕ and θ. Identification then relies on observing multiple importer–exporter pairs in the same year, or multiple matches for a given exporter over time, under the assumption that bargaining weights remain constant across matches.[25]

Importantly, our identification strategy does not hinge on strong assumptions about the exogeneity of tariffs or other aggregate variables. While the estimated parameters may be shaped by general equilibrium forces, identification relies solely on cross-sectional variation across buyers within supplier–product–year cells. As a result, we do not need to specify or model the broader general equilibrium environment.

Estimation We estimate equation (4.1) via generalized method of moments (GMM),

$$\min_{\{\phi,\theta\}} \; \mathbf{g}(\phi,\theta)\; \mathbf{Z}'\; \mathbf{W}\; \mathbf{Z}\; \mathbf{g}(\phi,\theta)', \tag{4.2}$$

where $\mathbf{g}(\phi, \theta)$ stacks all moment conditions in equation (4.1) across all i–j–ℓ pairs and years and $\mathbf{W}$ is the optimal weighting matrix.[26]

To address endogeneity concerns, we first include fixed effects by demeaning $\mathbf{g}(\phi, \theta)$ at the HS10 product, year, and buyer level. This removes average variation across those dimensions, so that only time-varying, pair-specific shocks could bias $\Delta k_{ij\ell ht}$. In addition, we employ instrumental variables ($\mathbf{Z}$) that are plausibly exogenous with respect to the network formation process and other omitted variables.

In particular, the vector $\mathbf{Z}$ includes the total number of importers and exporters in each HS10 product-year, which we interpret as proxies for the pool of potential US buyers and foreign suppliers in a given variety. We also include in $\mathbf{Z}$ the mean and median of the distributions of the two bilateral shares within each year, excluding the focal pairs $i - j$ and $i - \ell$ to preserve over-identification. These instruments vary with the competitive structure within

[25] Formally, identification relies on the nonlinearity of the markup equation (2.6) in s_{ijht} and x_{ijht}. Consider moment conditions from two periods t and $t-1$: the associated derivatives with respect to (ϕ, θ) are not collinear, satisfying the full-rank condition. Similar variation across multiple matches for the same exporter in a given year (e.g., i–j–k vs. i–j–ℓ) also secures identification.

[26] Appendix E.2 presents Monte Carlo simulations based on a data-generating process that mirrors the setup in Section 2. The results confirm that our estimators is consistent.

each HS10 product-year and are correlated with the endogenous variables through market structure, but, by construction, are not correlated with the idiosyncratic shocks affecting individual matches.

Extension: pair-specific bargaining weights While our baseline assumes a constant bargaining weight ϕ across all importer–exporter pairs, we also consider an extension to allow ϕ to vary at the pair level.

Given the large number of trade pairs in the data, estimating a separate ϕ_{ij} for each is computationally burdensome. Moreover, our identification strategy does not allow bargaining weights to vary both across pairs and over time. We therefore model bargaining power as a function of observable characteristics:

$$\phi_{ijt} = \frac{\exp\left(\mathbf{X}_{ijht}\,\boldsymbol{\kappa}\right)}{1 + \exp\left(\mathbf{X}_{ijht}\,\boldsymbol{\kappa}\right)} \in [0, 1], \tag{4.3}$$

where $\boldsymbol{\kappa}$ is a parameter vector to be estimated and $\mathbf{X}_{ijht}$ includes covariates that plausibly influence bargaining outcomes but are not direct determinants of gains from trade in our model. Specifically, we include: (i) the longevity of the $i-j$ relationship, (ii) the number of transactions between $i-j$ in a year, (iii) the relative outside option of the two, measured by the ratio of the quantity of the exporter i's sales to buyers other than j in year $t-1$ over the quantity of the importer j' purchases from suppliers other than i in year $t-1$, and (iv) an indicator variable of whether the buyer and supplier transact multiple HS10 products.

4.2 Estimation Results

We estimate equation (4.2) using data from 2001 to 2016. We exclude 2017 and 2018, as these years will be used to validate the model out-of-sample in Section 4.3, leveraging the tariff shocks that occurred during this period. To avoid convergence issues when ϕ is near one, we estimate the transformed parameter $\bar{\phi} \equiv \ln \frac{\phi}{1-\phi}$, which enters the markup equation linearly.

Table 4 presents the estimation results. Panel B reports the GMM estimates. Columns (1) and (3) assume a constant ϕ, while Columns (2) and (4) allow ϕ_{ij} to vary by trade pair as specified in equation (4.3). The specifications in Columns (1) and (2) are estimated without fixed effects; those in Columns (3) and (4) include year, product, and importer fixed effects. Panel C shows the implied values of ϕ or ϕ_{ijt}.

The parameters are precisely estimated. Across specifications, U.S. importers appear to wield substantial bargaining power, with estimated values of ϕ ranging from 0.70 to 0.92.

Table 4: Estimated Model Primitives

Panel A: Calibrated Parameters		
$\hat{\nu}$	$\hat{\gamma}$	$\hat{\rho}$
4	0.5	10

Panel B: Estimated Parameters (GMM)	(1)	(2)	(3)	(4)
Rel. bargaining power: $\widehat{\ln \frac{\phi}{1-\phi}}$	1.565		0.863	
	(0.055)		(0.043)	
Returns to scale ($\hat{\theta}$)	0.454	0.497	0.383	0.502
	(0.004)	(0.006)	(0.006)	(0.007)
Constant		4.118		1.454
		(0.428)		(0.180)
Longevity		-0.360		0.332
		(0.062)		(0.064)
Number of HS10 transactions		-0.264		-0.003
		(0.029)		(0.014)
Multiple HS10 dummy		-0.180		0.131
		(0.047)		(0.034)
Lagged outside option		-0.235		-0.230
		(0.031)		(0.030)
None	Yes	Yes	No	No
$\text{FE}_h + \text{FE}_t + \text{FE}_j$	No	No	Yes	Yes
Observations	3,120,000			
Panel C: Implied Bargaining Powers ($\hat{\phi}$)				
Mean	0.827	0.922	0.703	0.860
	(0.008)	(0.074)	(0.009)	(0.099)
Median	–	0.945	–	0.886
	–	(0.074)	–	(0.099)

Notes: This table presents model estimates based on our main estimation sample, which focuses on U.S. imports of intermediate inputs and capital goods for the period 2001-2016. Panel A reports calibrated parameters: the elasticity of demand (ν), the elasticity of costs with respect to foreign input prices (γ), and the elasticity of substitution across foreign varieties (ρ). We set $\varrho = 1$, so that $\eta = 2.5$. Panel B presents GMM estimates. Columns (1) and (3) impose a constant ϕ across bilateral pairs, while Columns (2) and (4) estimate the full vector $\boldsymbol{\kappa}$ to allow for heterogeneity in bargaining power. Specifications differ in the inclusion of fixed effects. Controls include: (i) the log of relationship longevity between exporter i and importer j; (ii) the log of the number of transactions between i and j in a given year; (iii) the log of the relative outside option, defined as the ratio of exporter i's sales to other U.S. buyers (excluding j) over importer j's purchases from other suppliers (excluding i), both in year $t-1$; and (iv) a dummy variable equal to one if the $i-j$ pair transacts in more than one HS10 product. Panel C reports the mean and median of the implied bargaining power. Standard errors are robust; those in Panel C are computed using the delta method. The set of instruments includes the number of exporters and importers at the HS10 level, as well as lagged bilateral shares (excluding the focal pair). The number of observations is rounded to four significant digits in accordance with U.S. Census Bureau disclosure guidelines. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

Our preferred estimate, reported in Column (1), is $\hat{\phi} = 0.83$, implying that U.S. importers have, on average, roughly four times the bargaining power of their foreign suppliers.[27]

The returns to scale parameter $\hat{\theta}$ is consistently estimated below one, ranging from 0.40 to 0.50 across specifications, with a preferred estimate of 0.45.[28] This implies a residual export supply elasticity between 0.25 and 0.375 for the average importer, indicating relatively steep foreign supply curves.[29] These values are consistent with evidence from U.S. manufacturing under short-run constraints: Boehm and Pandalai-Nayar (2022) report median inverse elasticities around 0.3 at typical capacity levels, and Broda et al. (2008) document similarly low elasticities across many traded goods.

Moving to the estimates of the vector $\hat{\boldsymbol{\kappa}}$, we find that the coefficients on relationship longevity, frequency of transactions, and the multiple-product indicator are highly significant, although their sign varies depending on the set of fixed effects included. By contrast, the coefficient on the relative outside option is stable across specifications: importers hold less bargaining power when their supplier has a stronger outside option. Specifically, an increase in the supplier's past sales to other buyers relative to the importer's purchases from other suppliers is consistently associated with lower bargaining power for the importer.

Robustness We assess the robustness of our structural estimates to alternative sample definitions and model calibrations. Appendix D.3 first considers a broader sample that includes all products in the BEC classification, notably extending the baseline by adding consumption goods. We also examine an alternative sample that uses related-party trade indicators from the LFTTD instead of ORBIS. On the calibration side, we consider a lower elasticity of substitution across foreign varieties ($\rho = 5$ instead of 10) and introduce decreasing returns to scale in downstream production by setting $\varrho = 0.5$ rather than 1. This choice aligns with the estimated returns to scale on the exporter side and allows us to test the robustness of the estimates to alternative values of the importer's downstream demand elasticity, η. Across all variations, the structural estimates remain highly stable.

Implied Markups Using equation (2.6), we compute markups for all buyer–supplier–product matches given the estimated parameters and the observed distribution of market shares.

[27] These findings are consistent with evidence from related settings. Morlacco (2019) documents significant markdowns by French importers in input trade, while Atkin et al. (2024) show that Argentine importers often exercise considerable bargaining power.

[28] While standard estimates of returns to scale often cluster near one, θ here captures a short-run returns to scale elasticity, i.e., the slope of the exporter's marginal cost curve during bargaining.

[29] The implied residual supply elasticity is computed from the marginal cost slope $c'_{q_{ijh}} = \frac{1-\theta}{\theta} \cdot x_{ijh}$, using the average buyer share of 0.25 from Table 1.

The resulting markup distribution is clustered near the competitive benchmark. Our preferred estimates yield a mean markup of 0.94, with the median even closer to competitive levels. These low markups reflect the strong countervailing power of importers. The model implies that observed markups are a convex combination of oligopoly and oligopsony markups, which average 1.34 and 0.87, respectively. The large estimated bargaining power of buyers ($\hat{\phi} \approx 0.8$) shifts weight toward the oligopsony case, allowing importers to extract a substantial share of the surplus from exporters.[30]

4.3 Model Validation

We assess the model's empirical validity by testing its ability to predict both the level and heterogeneity of price and quantity changes following the 2017–2018 tariff increases. These moments were not targeted in the estimation.

Model-predicted price changes are computed as:

$$\widehat{\Delta \ln p_{ijht}} = \Phi_{ijht}(s_{ijht}, x_{ijht} \mid \hat{\mathbf{\Theta}}) \cdot \Delta \ln(1 + \tau_{cht}), \tag{4.4}$$

where τ_{cht} denotes the ad-valorem tariff on product h from country c, and Φ_{ijht} is the model-implied pass-through elasticity defined in equation (2.11), which depends on bilateral shares and the estimated parameter vector $\hat{\mathbf{\Theta}}$.

Although the model is primarily designed to explain prices, it embeds a demand-driven allocation rule that links prices to quantities (and sales) via the importer's demand curve. This mapping imposes a specific quantity-setting structure, enabling a direct comparison between predicted price responses and observed adjustments in quantities and trade values. Predicted quantity changes are given by $\widehat{\Delta \ln q_{ijht}} = -\hat{\varepsilon}_{ijht} \cdot \widehat{\Delta \ln p_{ijht}}$, where $\hat{\varepsilon}_{ijht}$ denotes the match-specific residual demand elasticity implied by the model. For sales, the corresponding mapping is $\widehat{\Delta \ln r_{ijht}} = -(1 - \hat{\varepsilon}_{ijht}) \cdot \widehat{\Delta \ln p_{ijht}}$.

4.3.1 Price Predictions

We begin with price outcomes. Table 5 compares tariff pass-through elasticities in the data (Panel A) and in the model (Panel B), in terms of average effects and their heterogeneity with respect to buyer and supplier shares. Columns (1) and (2) adopt a baseline specification with product–time and country–sector fixed effects, while Columns (3) and (4) adopt the more demanding specification with buyer–time and country–time fixed effects.

[30] The effective bargaining weight ω_{ijh} averages 0.77 (standard deviation 0.05), slightly below $\hat{\phi}$. This indicates that network effects, on average, dampen the importers' effective bargaining power relative to ϕ, although the gap is small.

TABLE 5: Price Responses and Relationship Heterogeneity: Data vs. Model

	(1)	(2)	(3)	(4)
Panel A: Data				
$\Delta \ln(1+\tau_{cht})$	-0.151	-0.066	-0.223	-0.163
	(0.093)	(0.093)	(0.109)	(0.107)
$\Delta \ln(1+\tau_{cht}) \cdot s_{ijht-1}$		0.054		0.029
		(0.072)		(0.157)
$\Delta \ln(1+\tau_{cht}) \cdot x_{ijht-1}$		-0.403		-0.271
		(0.113)		(0.135)
R-squared	0.04	0.04	0.31	0.31
Panel B: Model				
$\Delta \ln(1+\tau_{cht})$	-0.248	-0.144	-0.249	-0.136
	(0.008)	(0.009)	(0.010)	(0.011)
$\Delta \ln(1+\tau_{cht}) \cdot s_{ijht-1}$		0.104		0.091
		(0.011)		(0.010)
$\Delta \ln(1+\tau_{cht}) \cdot x_{ijht-1}$		-0.475		-0.486
		(0.026)		(0.029)
R-squared	0.32	0.46	0.50	0.59
$\text{FE}_{ht} + \text{FE}_{cs}$	Yes	Yes	No	No
$\text{FE}_{ht} + \text{FE}_{ct} + \text{FE}_{jt}$	No	No	Yes	Yes
Observations	249,000			

Notes: This table reports the pass-through of tariffs to duty-exclusive prices at the exporter–importer–product level. Panel A presents reduced-form estimates from the data. Panel B shows corresponding pass-through estimates generated by the model. Columns (2)–(4) interact tariff changes with lagged supplier share (s_{ijht-1}) and lagged buyer share (x_{ijht-1}). Columns (1) and (2) use baseline fixed effects ($\text{FE}_{ht} + \text{FE}_{cs}$), while Columns (3) and (4) employ a more stringent specification with product–year, country–year, and buyer–year fixed effects ($\text{FE}_{ht} + \text{FE}_{ct} + \text{FE}_{jt}$). Standard errors are clustered at the HS8 product and exporter-country level. Observation counts are rounded to four significant digits per U.S. Census Bureau disclosure guidelines. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

The model predicts an average pass-through elasticity on duty-exclusive prices of -0.25, which translates to a 75% pass-through rate (Columns (1) and (3) of Panel B). These values fall within the 95% confidence intervals of the corresponding reduced-form estimates in the data (Columns (1) and (3) of Panel A).

Columns (2) and (4) of Panel A, consistent with Column (6) of Table 3, show that pass-through declines significantly with buyer share (x_{ijht}) but exhibits no robust relationship with supplier share (s_{ijht}). The model closely replicates these patterns: as shown in Panel B, pass-through declines steeply in x_{ijht} and increases mildly in s_{ijht}, with magnitudes comparable to those in the data. This alignment supports our interpretation of Table 3 as consistent with a low-θ, high-ϕ environment, which is also consistent with our structural estimates.

4.3.2 Goodness-of-fit Test

Having shown that the model replicates average and heterogeneous price responses to tariff shocks, we formally test its predictive performance by evaluating how well model-implied price changes explain observed variation. This exercise complements Table 5 by providing a direct measure of goodness of fit relative to standard alternatives.

Specifically, we estimate:

$$\Delta \ln p_{ijht} = \beta \, \widehat{\Delta \ln p_{ijht}} + \mathbf{FE} + u_{ijht}, \tag{4.5}$$

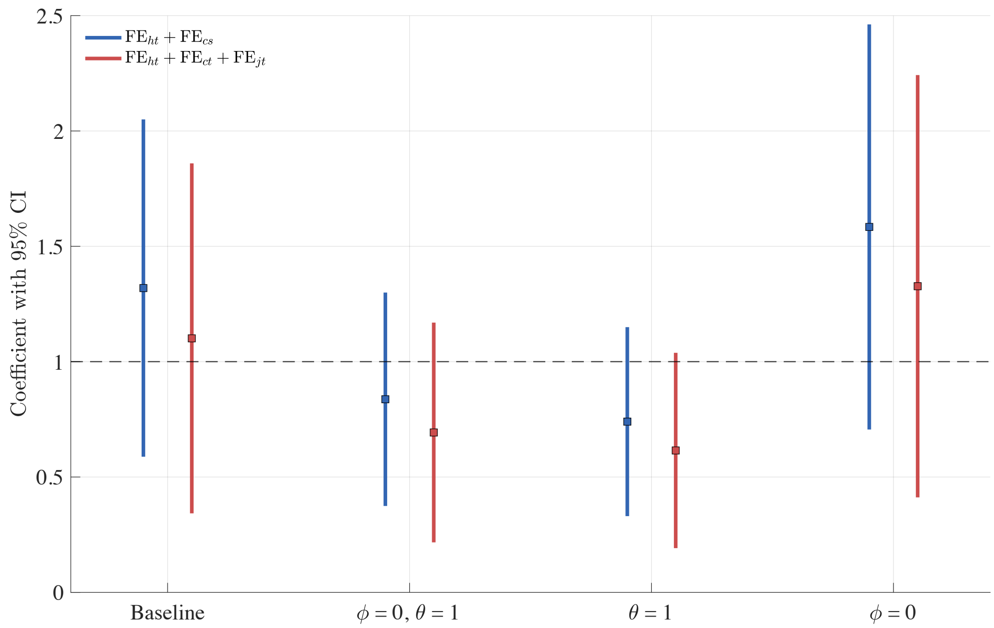
where $\Delta \ln p_{ijht}$ is the observed change in the duty-inclusive price for product h between exporter i and importer j, and $\widehat{\Delta \ln p_{ijht}}$ is the corresponding model-predicted change.

To benchmark the results, we compare the full model to three nested alternatives that sequentially shut down bilateral bargaining ($\phi = 0$), decreasing returns to scale ($\theta = 1$), or both. The fully restricted case ($\phi = 0$, $\theta = 1$) corresponds to a standard Nash-Bertrand model with constant marginal costs (e.g., Dhyne et al., 2022); the intermediate case with $\phi > 0$ and $\theta = 1$ mirrors the bargaining framework of Gopinath and Itskhoki (2011), which overlooks the heterogeneous buyer dimension. In all cases, we use the same parameter values from Column (1) of Table 4, without re-estimating.[31]

A key challenge is that observed price changes may reflect shocks unrelated to tariffs, increasing the risk of rejecting a valid model for reasons unrelated to its tariff predictions. In addition, while the model uses statutory tariff changes, observed duty-inclusive prices re-

[31] As discussed in Section 4.1, θ is not identified when $\phi = 0$. Moreover, fixing $\theta = 1$ and estimating equation (4.5) using the value of ϕ jointly obtained with θ from equation (4.2) yields an upper bound on the value of $\hat{\beta}$ attainable with a re-estimated ϕ. Appendix E.3 provides formal proof and supporting simulation evidence.

Figure 3: IV-Based Goodness-of-Fit Test



Notes: Each point reports the coefficient from an IV regression of observed log price changes on model-predicted changes $\Delta \widehat{\ln p_{ijht}}$, using statutory tariffs as instruments. Lines show 95% confidence intervals. Blue and red denote regressions with $FE_{ht} + FE_{cs}$ and $FE_{ht} + FE_{ct} + FE_{jt}$, respectively. Standard errors are clustered by product and exporter-country. Observation counts (249,000) are rounded per Census disclosure guidelines. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

flect actual duties paid, potentially introducing measurement error. To address both issues, we follow the logic of the IV-based goodness of fit test in Adão et al. (2023) and estimate equation (4.5) using two-stage least squares, instrumenting $\Delta \widehat{\ln p_{ijht}}$ with statutory tariff changes. This isolates variation in predicted prices that is directly attributable to tariff shocks, which is the one targeted by the model. Under the null that the model accurately captures pass-through, the IV coefficient $\hat{\beta}$ should equal one.

Figure 3 presents the results across the four model variants, each estimated under two alternative fixed effects specifications. Blue points and lines correspond to regressions with product–time and country–sector fixed effects, while red ones use the more stringent specification with product–time, country–time, and buyer–time fixed effects. In all cases, the baseline model provides the best fit: the estimated coefficient is very close to one and not statistically different from it under both specifications.

Models with constant returns to scale ($\theta = 1$), whether or not they include bargaining, perform noticeably worse, although their coefficients are not rejected at conventional significance levels. These variants lack a cost channel, and while the case with $\phi = 0$ features strategic complementarities that generate some degree of incomplete pass-through, this mechanism alone does not produce sufficient variation to match the data. Similarly, the fourth model with decreasing returns but no bargaining ($\phi = 0$, $\theta < 1$), which was previously rejected based on price-level evidence (Table 2), also underperforms relative to the baseline model. In this case, markup responses driven by strategic complementarities amplify cost-based adjustments, but in a way that also fails to replicate the observed pass-through patterns.[32]

Overall, these results suggest that cost adjustments, along with weak strategic complementarities, are necessary to account for the empirical evidence. This is consistent with a setting in which oligopsony forces are dominant.

4.3.3 Quantity Predictions

Next, we assess the model's ability to predict changes in bilateral quantities. Table D.7 in Appendix D.4 reports relationship-level quantity responses to tariff changes. Columns (3)–(4) of Panel A show that tariff increases reduce traded volumes, with larger declines under more stringent fixed effects. However, the interaction terms with supplier and buyer shares are statistically imprecise, suggesting inconclusive evidence of heterogeneity in the data.[33]

Panel B shows that the model generates sizable average quantity declines and predicts heterogeneity across relationships. In particular, quantity responses become less negative with higher buyer shares, consistent with the model's allocative logic: stronger buyers face smaller price increases and thus smaller quantity reductions. In contrast, the positive interaction with supplier share is not explained by price adjustments because the model predicts little variation in pass-through along this dimension. Instead, it reflects the curvature of the importer's demand curve embedded in the model.

Table D.8 in Appendix D.4 evaluates model fit for quantities (Panel A) and sales (Panel B) across the four alternative parameterizations discussed above. Since all models share the same demand system, performance differences reflect variation in price predictions rather than differences in quantity mechanisms. While all specifications are formally rejected, the baseline model and the specification with decreasing returns to scale perform best, mirroring their superior performance in prices.

Despite differences in magnitude and precision, the model captures the broad directional

[32] Appendix D.4 (Table D.6) presents additional robustness checks using alternative calibrations, including $\rho = 5$ instead of 10 and $\varrho = 0.5$ instead of 1. The model's predictive performance remains stable across these variations, lending further support to our main findings.

[33] In robustness exercises (not shown), the signs on the interaction coefficients with supplier and buyer shares occasionally flip, though they largely remain statistically insignificant. We therefore conclude that the data do not offer robust evidence of heterogeneous quantity responses by relationship structure.

patterns in quantity responses, lending support to its core allocative mechanism. However, its weaker quantitative fit suggests that additional forces beyond price-based allocation shape the observed quantity adjustments. The model's strong performance on prices highlights this asymmetry and points to potential gains from extending the framework to incorporate supply-side responses.

5 Aggregate Implications of Bargaining in Firm-to-Firm Trade

This section examines the impact of the Trump tariffs on aggregate import prices through the lens of our bargaining model. We begin by situating our analysis within the broader literature on tariff pass-through. We then use the model to simulate the aggregate effects of the tariffs and assess the mechanisms driving price adjustments.

5.1 Comparison with Existing Pass-Through Estimates

Several recent studies find near-complete pass-through of the 2018 Trump tariffs to U.S. import prices (e.g., Fajgelbaum et al., 2020; Amiti et al., 2019b, 2020). These analyses primarily rely on product-level data. In contrast, our match-level estimates indicate incomplete pass-through. For instance, in a standard specification similar to those used in the literature, Column (1) of Table 5 (Panel A) reports a pass-through elasticity on duty-exclusive prices of -0.15, implying an 85% pass-through rate.

This divergence partly reflects differences in sample composition. As discussed in Section 3.3, our estimates are based on repeated firm-to-firm relationships where bilateral prices can be observed over time. They therefore capture within-relationship price changes net of compositional shifts across firms or products, rather than on changes in product-level unit values. In addition, we restrict attention to arm's-length transactions involving intermediate goods and suppliers with two or more buyers. Within this sample, we estimate pass-through rates ranging from 78 to 85%, depending on the fixed effects used, as shown in Table 5. The model's predicted pass-through closely matches these empirical patterns.

To further assess the role of sample composition, Table D.9 in Appendix D.5 reports pass-through estimates across alternative sample definitions. Expanding the baseline to include single-buyer relationships raises the estimate to approximately 83%. Adding matches involving related parties, energy goods, or extreme price changes increases it to roughly 90%. The most inclusive specification, which further incorporates final consumption goods, yields pass-through elasticities between 93% and 95%, depending on the fixed effects. Although these broader samples imply higher pass-through, they still fall short of full pass-through, in contrast to product-level studies.[34]

These product-level estimates are based on aggregated unit values that combine within-match price changes with shifts in the composition of transactions, particularly the inclusion of one-off (spot) exchanges. Such transactions may differ systematically from repeated firm-to-firm relationships. In particular, incomplete pass-through may be a feature of relational trade, where prices reflect bilateral bargaining and upward-sloping residual supply. Spot exchanges, by contrast, are more likely to reflect marginal cost pricing and thus exhibit full pass-through. While speculative, this interpretation is consistent with Cajal-Grossi et al. (2023), who find lower markups and more competitive pricing in spot relationships.

5.2 Tariffs and Aggregate Import Prices

We use the estimated model to assess the impact of the 2018 tariffs on aggregate import prices and decompose the underlying contributions of markup and marginal cost changes. A full evaluation of the tariffs' macroeconomic effects would require a general equilibrium framework that incorporates changes in expenditure, wages, export prices, and retaliation, as in Fajgelbaum et al. (2020). While such elements are essential for welfare analysis, they lie beyond the scope of our model.

Instead, we focus on one central component of tariff incidence: the change in aggregate import prices within ongoing firm-to-firm relationships. We compute model-implied bilateral price changes using equation (4.4) and estimate aggregate pass-through by regressing these predicted changes on the tariff shock, weighting each observation by its initial-period import value. The approach connects the model's micro-level predictions to aggregate outcomes and provides a framework for decomposing the contribution of distinct adjustment channels.

To that end, we separately isolate the roles of markup and marginal cost adjustments. For each mechanism, we compute the model-implied price changes while holding the other channel constant, and re-estimate the weighted regression. The predicted price change due solely to markup adjustment is defined as:

$$\widehat{\Delta^{\Gamma} \ln p_{ijht}} = \Phi^{\Gamma}_{ijht}(s_{ijht},\, x_{ijht} \mid \hat{\boldsymbol{\Theta}}) \cdot \Delta \ln T_{cht}, \quad \text{where} \quad \Phi^{\Gamma}_{ijht} \equiv \frac{1}{1 + \Gamma_{ij}}.$$

[34] Using the monthly LFTTD data, we show in Table D.10 in Appendix D.5 that pass-through remains incomplete in product-level regressions when restricting to the firms and products used in our baseline sample, confirming that this is a feature of repeated firm-to-firm relationships.

Table 6: Aggregate Tariff Pass-Through and Decomposition

	Baseline FE	Stringent FE
	(1)	(2)
Panel A: Aggregate Passthrough (%)		
Agg. pass-through elasticity	70.7	64.6
Cost channel only: $1/(1+\Lambda_{ij})$	69.3	62.7
Markup channel only: $1/(1+\Gamma_{ij})$	97.1	88.0
Panel B: Variance Decomposition of $\Lambda_{ij}+\Gamma_{ij}$		
Cost Elasticity: Λ_{ij}	1.01	0.99
Markup Elasticity: Γ_{ij}	-0.01	0.01

Notes: This table reports model-implied aggregate pass-through estimates following the 2018 U.S. tariff increases. Column (1) includes product–time and country–sector fixed effects. Column (2) includes product–time, country–time, and buyer–time fixed effects. The overall pass-through elasticity is computed as 1+ the estimated coefficient on $\Delta \ln(1+\tau)$, and decomposed into contributions from the cost channel (Λ_{ij}) and the markup channel (Γ_{ij}). The counterfactual "Cost channel only" row shows the predicted pass-through when markup elasticities are set to zero, while the "Markup channel only" row sets cost elasticities to zero. Panel B reports the relative contribution of each channel to the cross-sectional variance of $\Lambda_{ij}+\Gamma_{ij}$, the total elasticity governing pass-through. These shares sum to one and are derived from a variance decomposition. Source: FSRDC Project Number 2109 (CBDRB-FY25-P2109-R12520).

Similarly, the predicted price change driven solely by cost adjustment is given by:

$$\widehat{\Delta^{\Lambda} \ln p_{ijht}} = \Phi^{\Lambda}_{ijht}(s_{ijht},\, x_{ijht} \mid \hat{\mathbf{\Theta}}) \cdot \Delta \ln T_{cht}, \quad \text{where} \quad \Phi^{\Lambda}_{ijht} \equiv \frac{1}{1+\Lambda_{ij}}.$$

Panel A of Table 6 reports the aggregate tariff pass-through predicted by the model, which incorporates both markup and marginal cost adjustments: 71% under the baseline specification (Column (1)) and 65% under the alternative using product–time, country–time, and buyer–time fixed effects (Column (2)). These estimates are lower than the average pass-through of 75% obtained from unweighted regressions (Table 5), reflecting the more incomplete pass-through associated with larger, high-share buyers who account for a greater share of aggregate trade.

Nearly all of the predicted price response is driven by the cost channel. When markup elasticities are shut down (i.e., setting $\Gamma_{ij} = 0$), the model yields pass-through rates between 69 and 63%, closely matching the full-model estimates. By contrast, shutting down the cost elasticities results in much higher pass-through, ranging from 88 to 97%.

Panel B offers an alternative approach to quantify the contribution of each channel by decomposing the variance of the term $\Lambda_{ij} + \Gamma_{ij}$, which governs the pass-through elasticity $1/(1+\Lambda_{ij}+\Gamma_{ij})$. This decomposition attributes the cross-sectional variation in pass-through to cost and markup elasticities, with their shares summing to one by construction. The results reinforce the earlier findings: nearly all of the variation is explained by the cost elasticity Λ_{ij}, underscoring its dominant role in shaping price responses.

Together, the results suggest a clear conclusion: tariff pass-through is incomplete, reflecting the combined effects of cost-side adjustments and bargaining. The underlying mechanism is intuitive. When tariffs reduce demand from large U.S. buyers, exporters move down their marginal cost curves, dampening the price impact of the shock. Although markups adjust endogenously, the opposing forces of strategic complementarities and substitutabilities limit their quantitative contribution to aggregate price change. This is a robust implication of our framework. As illustrated in Figure 2, when returns to scale are decreasing ($\theta < 1$) and buyer power is high (large ϕ), most of the variation in pass-through across the (s_{ij}, x_{ij}) space is driven by cost adjustments, with a comparatively smaller role for markup responses.

5.3 The Importance of Bargaining in Firm-to-Firm Trade

Although bargaining plays a central role in our model, it appears to have limited influence on tariff pass-through, which primarily reflects cost-side adjustments. This is not because bargaining is unimportant, but because it endogenously mutes the markup channel. When buyer power is strong (ϕ high), the markup elasticity (Γ_{ij}) tends toward zero. As a result, pass-through is driven almost entirely by cost adjustments and appears relatively unresponsive to markup variation. In this sense, the weak role of the markup channel in shaping pass-through is itself a consequence of strong importer market power.

In addition, bargaining remains essential to understand price levels, markups, and the welfare consequences of market power. As shown in Table 2, two-sided market power is critical to explaining the cross-sectional variation in prices and markups. Moreover, as discussed in Section 2.5, ϕ governs how markup dispersion maps into misallocation. When exporters hold bargaining power, markup heterogeneity leads to underproduction. But when bargaining power shifts toward importers, the same dispersion can improve efficiency by reallocating output toward lower-cost suppliers. Ignoring bargaining would therefore yield misleading conclusions about the allocative effects of firm-to-firm trade.

6 Conclusions

Firm-to-firm relationships are a central feature of international trade. These relationships often involve market power on both sides, with prices determined through bilateral negotiations rather than market-clearing conditions. We develop a framework that departs from standard models of price-taking buyers by allowing both importers and exporters to influence price formation through bargaining. This approach yields analytical and empirical tools to study how market power and network frictions shape prices, markups, and the transmission of shocks in firm-to-firm trade.

Using transaction-level data, we show that U.S. importers wield substantial bargaining power and face upward-sloping residual supply, consistent with oligopsonistic behavior. Within ongoing firm-to-firm relationships, tariff pass-through during the 2018 trade war was incomplete, with exporters absorbing much of the tariff through cost-side adjustments. This muted price response is primarily driven by cost-side adjustments: while markups do adjust, their contribution to pass-through is limited because strong buyer power endogenously flattens the markup elasticity. In this sense, the limited role of markups in shaping tariff responses is itself a consequence of strong importer power.

Although not the primary focus of our analysis, the results highlight the importance of bargaining for understanding the allocative implications of market power in firm-to-firm trade. In our model, when supplier power dominates, markup dispersion reflects inefficiencies and underproduction. By contrast, when buyer power is strong, the same dispersion can lead to efficient reallocation and higher aggregate output. These findings suggest that markup heterogeneity does not uniformly signal misallocation, and that its welfare consequences depend critically on the distribution of bargaining power. Extending the framework to study these welfare implications more formally remains a promising avenue for future work.

More broadly, our study offers a foundation for analyzing how market power shapes the incidence and transmission of shocks through the price channel. While we focus on detailed price-setting within firm-to-firm relationships, Acemoglu and Tahbaz-Salehi (2025) emphasize the general equilibrium implications of market power in production networks in shaping aggregate fluctuations. A promising direction for future research is to integrate these perspectives by combining micro-level bargaining dynamics with macro-level spillovers to study the broader implications of buyer and supplier power, including in domestic supply chains.

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