Market Power at Sea: Micro Evidence, Macro Implications*

Anna Ignatenko[†]
Norwegian School of Economics, CESifo

Pierre Cariou[‡]
Kedge Business School

Haiying Jia[§]
Norwegian School of Economics

François Charles Wolff[¶]
Nantes Université

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Abstract

We separate the effects of market power and capacity constraints in transportation. A simple model shows imperfect competition—not capacity constraints—generates differential freight price changes across buyers following a demand shock. Consistent with this, difference-in-differences estimates reveal, after COVID-19 demand surge, freight forwarders faced a 30 pp larger increase in base freight rates than direct shippers despite identical contract terms. This reflects rising carrier markups that disproportionately burden smaller firms and explain at least 35% of freight price growth and 16% of U.S. import price inflation. Thus, competition in transportation is crucial for supply-chain resilience and macroeconomic stability.

JEL Classification: F1

Keywords: market power, transportation, price discrimination, trade costs, inflation, intermediaries

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[†]Corresponding author: Anna.Ignatenko@nhh.no

[‡]Email: Pierre.Cariou@kedgebs.com

[§]Email: Haiying.Jia@nhh.no

[¶]Email: francois.wolff@univ-nantes.fr

1 Introduction

The surge in global freight prices over the past few years—first during the COVID-19 pandemic and later amid disruptions such as the war in Ukraine and the Red Sea crisis—has captured the attention of economists across fields. Recent research shows that fluctuations in freight prices have large aggregate effects, contributing substantially to inflation and economic slowdowns (Alessandria et al., 2023; Bai et al., 2024; Dunn and Leibovici, 2025). However, the mechanisms behind these fluctuations remain poorly understood. On the one hand, soaring freight rates may reflect capacity constraints in an otherwise competitive transportation sector (Brancaccio et al., 2024, 2025). On the other hand, they may stem from the exercise of market power in an industry characterized by high market concentration (Hummels et al., 2009; Brancaccio et al., 2020). Distinguishing between these explanations is challenging but critical for both competition and investment policies.

This paper identifies the market power of transport companies by testing behavior that can arise only in imperfectly competitive markets. Specifically, we examine whether transport companies raise freight prices differentially across buyers in response to a positive demand shock, holding capacity constraints fixed. A differential increase in prices offered simultaneously to different buyers is indicative of imperfect competition: in a competitive industry, freight price changes would be uniform once buyer-specific costs are fully accounted for. By contrast, under market power, carriers optimally adjust prices across buyers based on their demand elasticities, leading to systematic price discrimination. We formalize this idea in a simple model of trade and show that a rise in carriers' market power predicts a differential freight price change across heterogeneous buyers of transportation. By testing its prediction, we quantify the rise in transport companies' market power and assess its contribution to firms' transportation costs and import price inflation.

We use proprietary data on maritime shipping contracts between ocean carriers and their customers on routes between China and the U.S. West Coast from 2018 to 2021. These data are uniquely suited for investigating the change in transport companies' market power during the Covid-19 pandemic. They report base freight rates for 40-foot container shipments—excluding fuel surcharges, port and documentation fees—which allows us to focus directly on carriers' pricing decisions. Crucially, a large share of contract quotes share common start dates, enabling comparisons holding capacity conditions fixed at a point in time. The data also distinguish between two types of transport buyers: direct shippers and freight forwarders, who aggregate shipments from many small firms. This distinction enables us to compare simultaneous prices for the same service within carrier–route–date and test for the change in the extent of price discrimination, a classic marker of market power (Holmes,

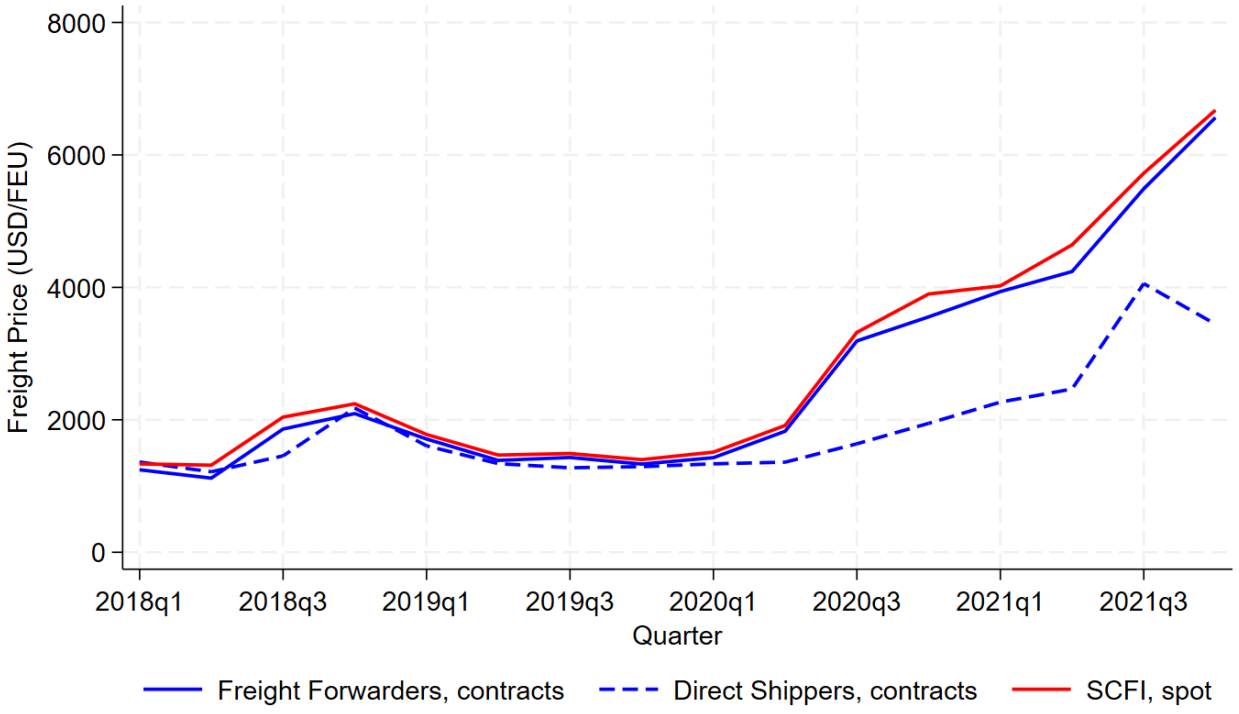


Figure 1: Heterogeneity in quarterly average freight prices across firms and contracts

Notes: Figure depicts quarterly average base freight rates charged by carriers to freight forwarders and direct shippers in shipping contracts longer than 14 days, and the Shanghai Containerized Freight Rate Index (SCFI).

1989; Stole, 2007; Dafny, 2010).[1]

The individual freight price quotes reveal heterogeneity in freight prices that is masked by aggregate indices commonly used in prior work (Alessandria et al., 2023; Isaacson and Rubinton, 2023; Carrière-Swallow et al., 2023). First, contract freight rates are systematically below spot market prices, captured by most aggregate freight price indices. Second, and central to our identification strategy, even within contract markets, prices vary systematically across buyer types: direct shippers pay lower base freight rates and experience smaller price increases during the pandemic than freight forwarders. Figure 1 illustrates this for the China–U.S. West Coast routes by comparing quarterly average contract prices (for contracts longer than 14 days) with the Shanghai Containerized Freight Index (SCFI).

We identify the role of transport companies' market power in a difference-in-differences framework complemented by an event-study design. Our empirical strategy compares the evolution of base freight rates charged to freight forwarders and direct shippers by the same

[1] Without observing prices that freight forwarders charge to their downstream clients, we focus on carriers' market power, abstracting from any potential markups within freight forwarding.

carrier, on the same route, at the same time. To separate markup changes from changes in supply conditions, we include carrier-route-quote-date fixed effects. They absorb all common shocks to marginal costs and capacity constraints faced by a carrier on a given date. We further control for contract duration to account for differences in contractual relationships across buyer types. To address residual concerns about buyer-specific shipping costs, we include buyer fixed effects and control for average buyer characteristics (shipment size, frequency, and route diversification) using data from U.S. Maritime Bills of Lading. This design isolates differential price changes across buyer types that cannot be rationalized by cost differences and must therefore reflect changes in carriers' markups. The identification assumption, which we test in an event-study, is that, conditional on these controls, freight forwarders and direct shippers would have experienced parallel trends in prices absent an increase in carriers' market power.

We find strong evidence that transport companies substantially increased markups during the pandemic. Before 2020, freight forwarders were charged 15% higher base freight rates than direct shippers served by the same carrier on the same route and date. However, this difference was fully explained by the shorter contract length of freight forwarders relying mainly on spot market. Following the surge in shipping demand during the pandemic, freight prices charged to freight forwarders, conditional on contract length, rose by 30-40 pp more than those charged to direct shippers, conditional on identical shipping conditions. Event-study estimates show that this freight price wedge opened rapidly in the third quarter of 2020 and remained large through 2021. The differential freight price increase was especially larger on initially less competitive or more concentrated routes and for carriers with higher pre-pandemic market share on a route. These patterns are inconsistent with cost-based explanations—which would generate uniform price changes across buyers. Instead, they reveal an increase in carriers' market power to price discriminate.

The effects of rising transport market power extend beyond freight forwarders themselves and matter for the majority of firms engaged in international trade. Using U.S. Maritime Bills of Lading, we find that 56% of U.S. import shipments from China—and more than 70% of importer–exporter relationships—were mediated by freight forwarders before the pandemic. Reliance on freight forwarders was even higher among smaller firms, which lack the volume necessary to contract directly with carriers. As a result, the rise in carriers' markups had unequal effects across firms: it generated higher trade costs precisely for the firms that are least able to absorb them and most reliant on imported inputs. Through these distributional effects market power in transportation not only raises average import prices, but also distorts the allocation of trade by disproportionately penalizing smaller firms.

We quantify the aggregate implications of this rise in transport companies' market power

by measuring its contribution to U.S. import price inflation during the pandemic. We use a back-of-the-envelope aggregation based on route exposure to freight forwarders, baseline freight shares, and the estimated markup wedge. We find that the increase in transport companies' markups raised U.S. import prices by 0.9 pp between the 2018–2019 and 2020–2022 periods. This lower bound excludes changes in direct-shipper markups and all cost-based freight price movements. Over the same period, Bureau of Labor Statistics Import Price Index rose by 5.6% on average, which implies that transport companies' market power accounts for 16% of total U.S. import price inflation. Therefore, market power in transportation—not just supply chain disruptions—was an independent and quantitatively meaningful driver of inflation during the pandemic.

This paper contributes to three strands of literature. First, it adds to recent work on the macroeconomic consequences of disruptions in transportation (Alessandria et al., 2023; Isaacson and Rubinton, 2023; Carrière-Swallow et al., 2023; Bai et al., 2024; Dunn and Leibovici, 2025; Brancaccio et al., 2025). We show that the surge in freight prices during the pandemic reflected not only rising costs and capacity constraints, but also a significant increase in transport companies' markups. Second, it contributes to the growing literature on markups and market power in global value chains (De Loecker and Eeckhout, 2018; De Loecker et al., 2020; Amiti and Heise, 2025) by shifting the focus upstream. Instead of studying producers' markups, we document an increase in market power in transportation, a key input to all traded goods, whose role has been largely overlooked. Third, our findings speak to the literature on intermediaries in international trade (Ahn et al., 2011; Bernard et al., 2015; Blum et al., 2018, 2023; Manova et al., 2025), by showing that intermediation can amplify market power of sellers. Taken together, our results show that market power in transportation has meaningful aggregate consequences, raising import prices even before goods reach the border. They highlight the importance of competition policy in global shipping and suggest that supply chain resilience cannot be achieved through infrastructure investment alone.

2 Theoretical Framework

We develop a simple framework to interpret the surge in freight prices during the pandemic. The framework highlights two points. First, the *magnitude* of a freight price spike cannot, by itself, distinguish whether it is driven by capacity constraints or market power. Second, differential changes in the prices paid by freight forwarders and direct shippers can identify the role of market power.

2.1 Freight Prices under Capacity Constraints and Market Power

Environment. Consider a representative route with the inverse demand for transportation services

$$t^d = t(Q, \varepsilon)$$

where ε is a demand shock. Transport companies' marginal costs of transportation $MC(Q)$ may be increasing in total quantity Q because of *capacity constraints*—for instance, limited vessel or container space, port congestion, or labor shortages:

$$MC(Q) \geq 0.$$

Market structures. Consider two extreme market structures in transportation. Under perfect competition, the equilibrium freight prices are set equal to the transport companies' marginal costs:

$$t(Q) = MC(Q).$$

In contrast, under monopoly, freight prices are set as a mark-up, $\mu(Q)$, on top of the marginal costs $MC(Q)$:

$$t(Q) = \mu(Q) \times MC(Q),$$

The equilibrium freight prices under either market structure can be generalized as:

$$t(Q) = (\mu(Q))^{\theta} \times MC(Q), \tag{1}$$

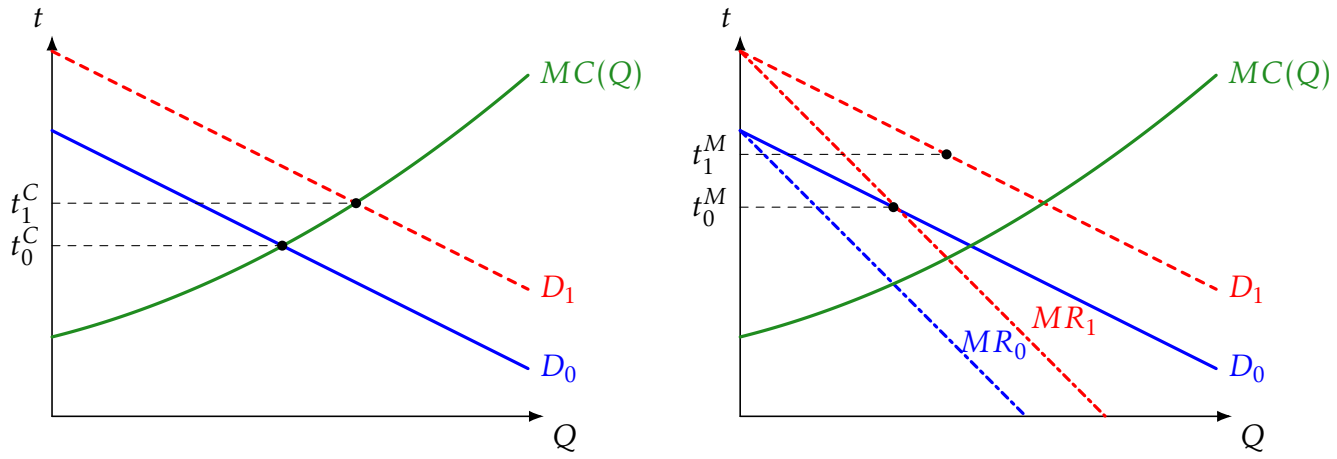
where $\theta \equiv \{0, 1\}$ is a conduct parameter equal to 1 under monopoly and 0, otherwise.

Equilibrium freight price changes in response to a demand shock. Now suppose there is a positive demand shock. Taking logs and differentiating the equilibrium freight price in (1) with respect to ε, yields the following:

$$\frac{d \log t(Q)}{d \log \varepsilon} = \frac{d \log Q}{d \log \varepsilon} \left(\theta \frac{d \log \mu(Q)}{d \log Q} + \frac{d \log MC(Q)}{d \log Q} \right)$$

This expression shows that even under perfect competition ($\theta = 0$), capacity constraints ($MC'(Q) > 0$) can result in a steep increase in freight price, as depicted in Figure 2a. However, under monopoly, a transport company internalizes the slope of demand and adjusts quantity less than a competitive market would. This results in a larger freight price increase for the same outward shift in demand, as shown in Figure 2b.

Hence, both capacity constraints (through $MC'(Q) > 0$) and market power can generate



(a) Competition with capacity constraints

(b) Monopoly with capacity constraints

Figure 2: Freight prices after a demand shock under different market structures

Notes: Both panels depict a demand shift from D_0 to D_1 with a convex marginal cost $MC(Q)$. Under perfect competition (a), equilibrium prices reflect rising marginal costs. Under monopoly (b), prices rise more strongly because the monopolist sets quantity where $MR = MC$ and charges along the demand curve.

sharp spikes in freight prices when demand increases. The magnitude of the spike alone is therefore not informative about which mechanism is at play.

2.2 Buyer Types and Identification of Market Power

Now suppose that there are two types of buyers observed (to both researchers and transport companies) on a route at a time: F and D, $Q_F + Q_D = Q$. Then the ratio of their equilibrium freight prices is

$$\frac{t_F(Q_F)}{t_D(Q_D)} = \left(\frac{\mu_F(Q_F)}{\mu_D(Q_D)}\right)^{\theta}.$$

Assuming that buyer-specific marginal costs of transport companies are fully controlled for, this ratio differs from unity only if a transport company has market power to charge and vary mark-ups across buyer types ($\theta = 1$).

Taking logs and then differentiating with respect to a demand shock, ε, we obtain:

$$\frac{d\log t_F/t_D}{d\log \varepsilon} = \theta\left[\frac{d\log \mu_F(Q_F)}{d\log Q_F}\frac{d\log Q_F}{d\log \varepsilon} - \frac{d\log \mu_D(Q_D)}{d\log Q_D}\frac{d\log Q_D}{d\log \varepsilon}\right] \tag{2}$$

This expression implies that the freight price ratio responds to a demand shock if and only if there is market power in the transportation sector: $\theta = 1$. Therefore, the differential change in the prices of freight offered to two types of buyers at the same time when a transport

company faced identical capacity constraints can be used to identify its market power.

Moreover, this freight price ratio increases in response to a positive demand shock if

$$\frac{d\log\mu_F(Q_F)}{d\log Q_F}\frac{d\log Q_F}{d\log\varepsilon} > \frac{d\log\mu_D(Q_D)}{d\log Q_D}\frac{d\log Q_D}{d\log\varepsilon}$$

This condition is satisfied if, all else equal, the demand of F-buyers is more elastic than the demand of D-buyers, or, mark-up elasticity of F-buyers is greater than that of D-buyers.

To illustrate this mechanism, Online Appendix A develops a trade model with imperfectly competitive transportation sector by extending the intermediation framework of Ahn et al. (2011). A monopoly transport company chooses different freight prices to two types of buyers: *freight forwarders* (F-buyers) and *direct shippers* (D-buyers). Direct shippers i receive individualized prices t_{Di}, while freight forwarders—who aggregate many small exporters—are offered a single pooled price t_F that applies to all firms they represent. As in standard models of third-degree price discrimination (e.g. Holmes, 1989; Stole, 2007), prices reflect differences in residual demand elasticities across buyers. The key result is that t_F is a weighted average of individualized direct prices, but places more weight on the most price-sensitive firms in the forwarder pool. When demand for transportation increases, capacity tightens (raising all prices), but the demand shock also induces entry of marginal, less productive firms that rely on freight forwarders. This shifts the composition of the freight forwarders' segment towards buyers with lower residual demand elasticity, increasing the carrier's optimal markup on F-buyers relative to D-buyers. Thus, even holding capacity conditions fixed, a positive demand shock generates a rise in the *freight forwarder premium* t_F/t_D, consistent with our identification argument above.

3 Data

3.1 Data sources

Shipping contracts. We use a novel dataset of freight contracts between transport companies and their customers for container shipping from China to US West Coast from January 2018 to December 2021. The data is kindly provided by one of the world's largest ocean freight rate benchmarking platform, which offers benchmarks for the ocean freight rates to its clients in exchange for their freight rate quotes. Clients are buyers or sellers of transportation. Buyers are of two types: freight forwarders, which are intermediaries between shippers and transport companies, and direct shippers themselves. Since the benchmarks they pay to receive are based on their committed quotes, firms using this platform have

incentives to report their freight rate quotes truthfully.

The ocean freight contracts include transport companies' names, identifiers of their customers, ports in the origin and destination, freight rates quoted for transportation of a standardized 40 foot container (FEU), mainly in US$, and their starting and ending dates. All freight rates are base rates – they do not include any surcharges and additional fees such as fuel surcharges, terminal handling charges, documentation and security fees, which are reported separately. These are quoted rather than actually paid freight rates and do not include prices charged by freight forwarders to their downstream clients. In the absence of information on the realized transported or minimal required volumes under these contracts, we construct their proxies using the U.S. Maritime Bills of Lading.

US Maritime Bills of Lading. To obtain additional information on routes, freight forwarders, direct shippers, and transport companies, we complement the shipping contracts data with US Maritime Bills of Lading. This data describes the universe of containerized US maritime imports from China from 2017 to 2022. For each shipment, it reports its ports of origin and destination, transport company's name, number of containers per shipment and their size (40- or 20-foot), their volume (in TEU), weight (in kilos), estimated value (in US$), and Harmonized systems' codes (4- or 6- digit) of transported products. US Bills of Lading also provide company names of US importers and Chinese exporters for most shipments (65% and 60%, respectively). Moreover, the data identifies shipments whose transportation was arranged by freight forwarders or other ocean freight intermediaries and their standardized alpha codes for 80% of such shipments.

3.2 Summary Statistics

Shipping contracts. We observe 143,096 contracts for maritime transportation of containers on 65 port-to-port routes from China to U.S. West Coast between transport companies (carriers) and shippers in the period from 2018 to 2022. In an average year, there are 19 transport companies and 49 distinct buyers of transportation, 20% of which are freight forwarders, which are shipping intermediaries. For a given transport company on a route, we observe, on average, 7 shipping contracts with distinct buyers, 70% of which are freight forwarders. The average base freight rate is 2,283 US$/FEU and the average contract length is 45 days (see Table B.1.)

The base freight rates in these shipping contracts closely mirror the dynamics observed in broader measures of shipping costs during the pandemic. Average contract rates in our sample increased more than fourfold, from $1,460 per FEU in January 2020 to $6,336 per

FEU in September 2021. This surge is consistent with alternative indicators of freight prices. As shown in Figure 1, this evolution closely tracks the Shanghai Containerized Freight Index (SCFI), which reports spot market rates for 40-foot containers on the Shanghai–U.S. West Coast routes. Similarly, the Drewry World Container Index rose from around $2,000 per FEU at the start of 2020 to nearly $10,000 per FEU by late 2021 (Dunn and Leibovici (2025)). Over the same period, the Freightos Global Container Index increased more than fivefold, and the Baltic Dry Index—which measures bulk shipping costs—tripled (Carrière-Swallow et al. (2023)). These patterns confirm that the base rates we analyze are representative of the broader trends in global maritime transportation.

Routes and transport companies. The routes we observe in the shipping contracts comprise 5% of all routes from China to the US, by count, but represent 55% of total US imports from China, by value and volume. These routes are, on average, about 10 times larger by volume, weight, and estimated value of transported goods, than the average route between China and the US. They are also more competitive, as they are each served by 17 transport companies, on average, while the average route has only 4 transport companies (see Panel A of Table B.2). Yet, they are still highly concentrated. The average Herfindahl-Hirschman Index of market concentration on these routes is 0.55-0.6 throughout the sample period (see Figure B.2a), while the U.S. Department of Justice cutoff for high market concentration is 0.25. This high level of market concentration suggests that the market power of transport companies can at least partly explain the increase in freight prices during the pandemic.

The transport companies that appear in the shipping contracts are mainly the largest (top-20) transport companies. They represent 15% of transport companies operating between China and the U.S., but carry more than 95% of their volume. These companies are 6 - 7 times larger than the average transport company operating between China and the US, by volume, weight, and imported value, and serve 6 times more routes (see Panel B in Table B.2). An average transport company in the shipping contracts has 15-20% market share on a route, by volume, which is higher than the average 8% market share across all transport companies operating between China and the U.S. (see Figure B.2b). This again suggests at least some degree of market power in transportation.

Freight forwarders and direct shippers. Freight forwarders as buyers of transportation are equally as important in the realized trade flows observed in the U.S. Bills of Lading, as they are in the shipping contracts. In 2017, freight forwarders represented 19% or 28% of buyers of transport companies on routes in the shipping contracts, depending on whether exporters or importers that never used freight forwarders are counted as direct shippers

(Panel A of Table B.3). This closely matches the 20% share of freight forwarders as buyers of transportation in the shipping contracts. Across all U.S. – China routes and transport companies operating on them, this share is lower at 12% (Panel B of Table B.3). Despite their relatively small number, freight forwarders handle a substantial 60% share of the US imports from China on an average route, by value (see Figure B.3b). This makes them an important actor in international transportation and trade in general.

Using the US Bills of Lading, we characterize and compare freight forwarders and direct shippers (exporters or importers) in Table B.3. Across all US shipments from China, freight forwarders, on average, transport 30% smaller shipments but 400 times more frequently, which amounts to 300 times larger annually transported volume, relative to direct shippers (Panel A). In addition, freight forwarders operate on, on average, 48 routes between China and the US and interact with 11 transport companies. In contrast, average exporters and importers that do not use freight forwarders transport their goods on only 2 and 17 routes, respectively, using only one transport company. These differences between freight forwarders and direct shippers are representable of all routes between China and the U.S. (see Panel B of Table B.3).

4 The role of market power in transportation

4.1 Empirical strategy

To identify the role of market power in maritime transportation, we test whether freight forwarders experienced a differential change in base freight prices relative to direct shippers after the onset of the pandemic. We estimate the following difference-in-differences specification:

$$\log Price_{srbt} = \alpha Freight\ Forwarder_b + \beta Freight\ Forwarder_b \times Post_t + \gamma X_{srbt} + \theta_{srt} + \epsilon_{srbt} \tag{3}$$

where $FreightForwarder_b$ is an indicator equal to one if buyer b is a freight forwarder, $Post_t$ equals one for contracts initiated after January 2020, X_{srbt} is a vector of contract and buyer characteristics, and θ_{srt} denotes carrier–route–time fixed effects. The coefficient β captures the change in the freight price wedge between freight forwarders and direct shippers in the post-pandemic period. This wedge is interpreted as a revealed measure of transport companies' market power, since both groups purchase the same service from the same company on the same route-date.

Our identification strategy disentangles markup changes from cost-based price variation. First, the inclusion of θ_{srt} absorbs all common shocks to marginal costs and capacity faced

by a carrier on a given route and date—such as fuel prices, congestion, equipment availability, and supply disruptions. Second, we control directly for contract duration, which proxies for relationship intensity and contract risk. Third, we include observable average characteristics of freight forwarders and direct shippers that may influence cost-based pricing. They include average shipment size, shipment frequency, number of routes served, and transshipment intensity, constructed from U.S. Bills of Lading (see Section B.1). Finally, we introduce buyer fixed effects and buyer–carrier and buyer-route fixed effects to absorb all time-invariant buyer heterogeneity, including endogenous selection into carriers and routes. These specifications are intentionally conservative: they remove any influence of buyer composition or selection and isolate price differences that can only arise from carriers' market power.

To interpret β as the causal effect of rising carrier market power on freight prices, we rely on a standard parallel trends assumption. It states that absent the increase in carriers' market power during the pandemic, freight forwarders and direct shippers would have experienced similar trends in base freight rates. To test this assumption, we implement an event-study design and estimate the following equation:

$$\log Price_{srbt} = \sum_{k \neq -1} \beta_k Freight\ Forwarder_b \times D\{t = k\} + \gamma X_{srbt} + \theta_{srt} + \psi_{bsr} + \epsilon_{srbt}, \tag{4}$$

where $D\{t = k\}$ is a set of event-time dummies indicating quarters relative to the last quarter of 2019, and ψ_{bsr} is a set of buyer-seller-route fixed effects. The coefficients β_k trace the evolution of the freight forwarder price premium over time, conditional on common shocks and observable contract characteristics. Under parallel trends, $\beta_k = 0$ for all $k < 0$, indicating no pre-existing divergence in prices between freight forwarders and direct shippers before the pandemic.

To provide additional evidence that the widening freight price wedge reflects market power rather than cost differences, we examine how the effect varies across routes with different market structures. Specifically, we estimate:

$$\begin{aligned} \log Price_{srbt} = \beta Freight\ Forwarder_b \times Post_t + \rho Freight\ Forwarder_b \times Post_t \times Z_{r(s)} \\ + \theta_{srt} + \gamma X_{srbt} + \psi_{bsr} + \epsilon_{srbt}, \end{aligned} \tag{5}$$

where $Z_{r(s)}$ is a vector of pre-pandemic route (or carrier-route) characteristics measured between 2017 and 2019. The coefficient β captures the average post-2020 increase in the freight forwarder premium, while ρ measures how this change varies with market conditions. We focus on three dimensions motivated by theory: (i) market concentration or com-

petition on a route, and (ii) a carrier's market share on a route. A positive ρ implies that the freight forwarder premium rose more where carriers faced weaker competitive pressure —a pattern consistent with markups rising when residual demand elasticities fall, as predicted by models of imperfect competition.

4.2 Main Results

Table 1 presents the difference-in-differences estimates of the change in the freight price wedge between freight forwarders and direct shippers after the onset of the pandemic. In column (1), without additional controls, the premium charged to freight forwarders by the same transport company on the same route and date increases from 15% before 2020 to 50% after 2020. Column (2) shows that this pre-pandemic premium is fully explained by differences in contract duration across buyer types. While freight forwarders relied primarily on short-term contracts (22 days on average), direct shippers secured longer-term contracts (301 days on average), which received significant price discounts. Doubling the contract length results in 3% lower freight prices offered by the same transport company on the same date for transportation on the same route. However, even after conditioning on contract duration, the post-pandemic freight forwarder premium remains large at 37%, which cannot be explained by either capacity constraints or contractual differences.

The remaining columns of Table 1 show that the increase in the freight forwarders' premium is explained by the rise in the carriers' market power to price discriminate rather than cost differences. To control for buyer-specific shipping costs for a carrier, we construct a rich set of buyer-type-specific characteristics for each route-carrier-quarter, using the U.S. Maritime Bills of Lading, as detailed in Section B.2. These include average shipment size, shipment frequency, number of transport companies used, number of routes, and transshipment incidence. Column (3) shows that including these buyer-specific cost controls has no effect on the estimated increase in the freight forwarder premium after 2020. These variables have the expected signs, but they do not attenuate the post-pandemic freight price wedge, indicating that the divergence in freight prices cannot be attributed to differences in shipping scale, logistics intensity, or cost pass-through across buyer types.

Next, we show that the increase in the freight forwarder premium is not driven by unobserved buyer heterogeneity or endogenous selection into carriers or routes. Column (4) adds buyer fixed effects, which absorb all time-invariant differences across buyers, including firm size, industry affiliation, bargaining ability, and relationship history. Including these fixed effects prevents the identification of the pre-pandemic freight price differences, but results in an even larger post-pandemic freight forwarder premium. This means that the rise in the

Table 1: The effect of the Covid-19 pandemic on freight price dispersion

Dependent variable:	log *Freight Price*					
	(1)	(2)	(3)	(4)	(5)	(6)
Freight Forwarder	0.148***	0.057	0.113			
	(0.042)	(0.050)	(0.097)			
Freight Forwarder X Post	0.373***	0.372***	0.380***	0.399***	0.304***	0.304*
	(0.094)	(0.093)	(0.082)	(0.089)	(0.075)	(0.157)
Log *Contract Length*		-0.030***	-0.027***	-0.041***	-0.040***	-0.034
		(0.008)	(0.008)	(0.008)	(0.010)	(0.044)
Log *Shipment Size*			-0.074*	-0.070*	-0.047	-0.094
			(0.043)	(0.038)	(0.037)	(0.059)
Log *Shipment Frequency*			-0.035***	-0.031***	-0.023**	-0.037**
			(0.007)	(0.008)	(0.011)	(0.018)
Log *#Sellers/Buyer-Route*			0.017	0.045	0.104*	0.163
			(0.027)	(0.033)	(0.053)	(0.111)
Log *#Routes/Buyer*			-0.009	-0.023	-0.067**	-0.087
			(0.027)	(0.022)	(0.028)	(0.057)
Transshipment Probability			-0.142	-0.114	0.038	-0.049
			(0.105)	(0.115)	(0.036)	(0.095)
Constant	7.283***	7.456***	7.617***	7.755***	7.818***	8.060***
	(0.040)	(0.061)	(0.069)	(0.069)	(0.097)	(0.310)
Carrier-Route-Date	✓	✓	✓	✓	✓	✓
Buyer				✓		
Buyer-Carrier, Buyer-Route					✓	✓
No entry/exit in Post						✓
N obs	87871	87871	66329	66322	66117	32024
N clusters	67	67	66	60	54	26
Adj. R^2	0.857	0.857	0.854	0.888	0.949	0.929

Notes: This table presents the results of estimating equation (3). The dependent variable is the log of the base freight price (excluding surcharges and fees) from carrier s to buyer b on route r and date t. *Freight Forwarder* is an indicator for buyer type; *Post* equals 1 for periods after January 2020. Robust standard errors clustered at buyer level in parentheses: * p<0.10, ** p<0.05, *** p<0.01. Column (6) reports bootstrapped standard errors.

freight price differences is not explained by shifts in buyer composition.

Column (5) further introduces buyer–route and buyer-carrier fixed effects to account for the possibility that buyers reallocated across routes or carriers in response to the pandemic. Column (6) additionally restricts the sample to buyers observed in both years following the onset of the pandemic, to eliminate the effects of their endogenous entry and exit dur-

ing the pandemic. In these demanding specifications, the estimated increase in the freight forwarder premium remains large at 30 percentage points.[2] By absorbing all sources of cost-based variation and buyer selection, the remaining post-pandemic wedge can only be attributed to a greater ability of carriers' to price discriminate—that is, to an increase in market power.

We further validate the causal interpretation of the difference-in-differences estimates using an event-study design. Figure 3 plots the coefficients β_k from equation (4), along with 95% confidence intervals, using the same specification as in column (6) of Table 1. Including buyer–carrier, buyer-route and carrier–route–date fixed effects, it leaves four pre-pandemic and eight post-pandemic quarters for dynamic estimation. The estimated coefficients in the pre-pandemic period are close to zero and statistically insignificant, providing no evidence of differential trends in freight prices between freight forwarders and direct shippers before 2020. Beginning in the third quarter of 2020, the coefficients become positive, large, and statistically significant, and the premium widens steadily thereafter. This supports the parallel trends assumption and confirms that the divergence in prices is caused by the pandemic shock and its interaction with carrier market power, rather than by pre-existing trends. The timing of the divergence coincides with the surge in shipping demand (Amiti et al. (2024))[3], reinforcing a market power interpretation.

To provide additional support for the market power mechanism, we examine how the freight forwarder premium evolved across routes with different competitive conditions and exposure to the pandemic demand shock. Estimating equation (5), we find that the increase in the premium after 2020 is systematically larger on routes where carriers faced less competition. (Appendix Table B.4). The premium rose less on routes with more competing carriers (column (1)) and more on routes with higher pre-pandemic HHI (column (2)). Additionally, carriers with larger pre-pandemic market shares on a route increased their freight forwarder's premia more, although insignificantly (column (3)).

5 Quantifying the effects of market power in transportation

5.1 The rise in transport companies' markups

We use the difference-in-differences estimates of the relative freight price increase faced by freight forwarders to quantify the contribution of rising carrier markups to the increase in freight prices during the pandemic. In our empirical design, carrier–route–time fixed effects

[2] In column (6), inference is based on bootstrapped standard errors.

[3] See also McKinsey & Company's report Navigating the current disruption in containerized logistics.

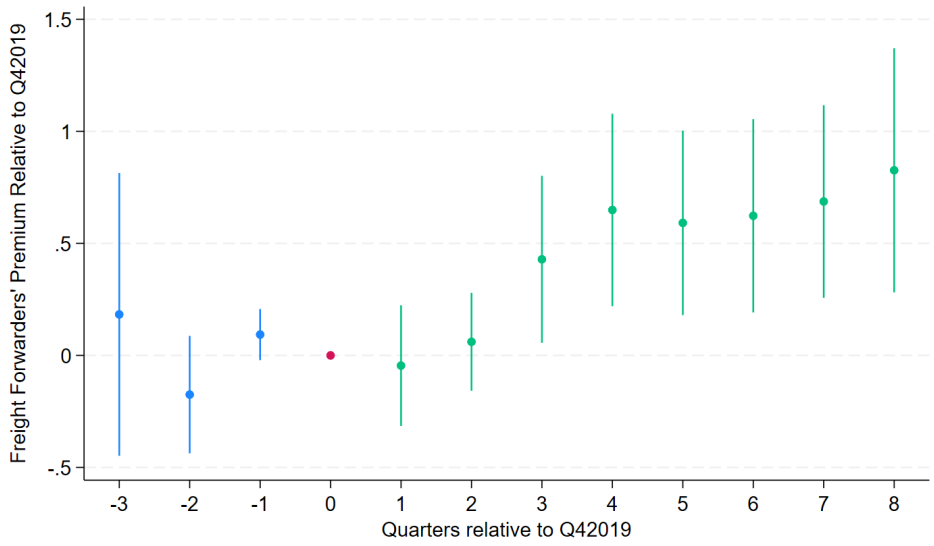


Figure 3: Event study of the rise of the freight forwarders' premium

Notes: Event-time coefficients β_k from Eq. (4); 2019Q4 is omitted. Specification includes carrier–route–quote-date FE, buyer-route FE, buyer-carrier FE, contract length, and buyer controls; sample restricted to buyers observed in both 2020 and 2021. Bands show 95% CIs with SE clustered at the buyer level and bootstrapped.

absorb marginal costs for a given carrier on a given route at a point in time. Under this assumption, all residual price differences within a carrier–route–date cell reflect markup differences, so that

$$\Delta \log \frac{t_F}{t_D} = \theta \left(\Delta \log \mu_F - \Delta \log \mu_D \right).$$

Our most conservative difference-in-differences estimate shows that the freight price ratio t_F/t_D increased by 30% after 2020. Since μ_D may also have increased, we use the fact that $\Delta \log \mu_D \geq 0$ to obtain a lower bound:

$$\Delta \log \mu_F \;\geq\; \Delta \log \frac{t_F}{t_D} = 0.3.$$

Given that total freight prices for forwarders increased by 84% over the same period, we obtain a lower bound on the contribution of carrier markups to freight price inflation:

$$\frac{\Delta \log \mu_F}{\Delta \log t_F} \;\geq\; \frac{0.3}{0.84} \;\approx\; 0.36.$$

Thus, at least one third of the observed increase in freight prices paid by freight forwarders during the pandemic is attributable to rising carrier markups rather than marginal costs. We next show that, besides increasing transportation costs for most firms, this has distributional

Table 2: Heterogeneous exposure to freight forwarders across routes, products, and firms

Dependent variable:	*Intermediated Shipment*				
	(1)	(2)	(3)	(4)	(5)
log *Volume/Route*	0.01***				
	(0.00)				
log *Volume/Shipment*		-0.06***	-0.03***	-0.01***	-0.01***
		(0.00)	(0.00)	(0.00)	(0.00)
log *Value/Shipment*		0.01***	-0.00	-0.00**	-0.00
		(0.00)	(0.00)	(0.00)	(0.00)
log *Volume/Exporter*			-0.01***	0.00	0.00
			(0.00)	(0.00)	(0.00)
log *Volume/Importer*				-0.03***	-0.03***
				(0.00)	(0.00)
Hazardous Materials		0.04***	0.01	0.01	0.03***
		(0.01)	(0.01)	(0.01)	(0.01)
Reefer		-0.19***	-0.03***	-0.04***	-0.03***
		(0.02)	(0.01)	(0.01)	(0.01)
Roll-On/Roll-Off		0.02*	-0.04***	-0.04***	-0.04*
		(0.01)	(0.02)	(0.01)	(0.02)
Constant	0.72***	0.74***	0.92***	1.03***	1.04***
	(0.03)	(0.02)	(0.02)	(0.02)	(0.03)
Carrier-Year	✓				
Carrier-Route-Year		✓			
Carrier-Route-HS4-Year			✓	✓	✓
In Shipping Contracts					✓
N obs	8611985	8546116	8088154	8088146	4676466
Adj. R^2	0.041	0.157	0.449	0.469	0.406

Notes: The dependent variable equals one if a shipment is intermediated by a freight forwarder. All specifications are estimated using a linear probability model. Column (5) uses only carrier-routes in the shipping contracts. Robust standard errors clustered at route-level in parentheses: * p<0.10, ** p<0.05, *** p<0.01

consequences for importers and exporters that differ in their reliance on freight forwarders.

5.2 Distributional consequences of market power in transportation

Since carriers increased markups more on freight forwarders, the effects of rising market power were uneven across firms depending on their reliance on intermediaries. Table 2 shows that this reliance systematically declines with route scale, shipment size, and importer and exporter sizes. On larger routes (column (1)), doubling total volume reduces intermediation by about one percentage point. Within carrier–route cells (column (2)), smaller and hazardous shipments are more likely to use freight forwarders, while refrigerated cargoes are less so. Adding product and firm controls (columns (3)–(4)) reveals that larger exporters and especially importers are less dependent on intermediaries. Doubling import volume lowers intermediation by about three percentage points making the effect of exporter size insignificant. These patterns, robust in the contracts subsample (column (5)), show that market power in transportation amplifies trade-cost inequality by disproportionately burdening smaller firms and and less standardized shipments.

5.3 Aggregate implications for import price inflation

We quantify the contribution of *transport companies' market power* to import price inflation using a simple exposure-weighted aggregation. Let i denote routes combinations in the pre-pandemic baseline year 2019, and define:

$$w_{i,2019} \equiv \frac{\text{CIF value}_{i,2019}}{\sum_j \text{CIF value}_{j,2019}}, \qquad \Omega_{i,2019} \equiv \frac{\text{Freight}_{i,2019}}{\text{CIF value}_{i,2019}}, \qquad s^F_{i,2019} \equiv \frac{\text{CIF via F}_{i,2019}}{\text{CIF value}_{i,2019}}.$$

Here $w_{i,2019}$ is the import expenditure share, $\Omega_{i,2019}$ is the freight share in CIF value, and $s^F_{i,2019}$ is the value share of trade intermediated by freight forwarders.

To construct a conservative lower bound on the role of market power in import price inflation, we make four assumptions:

(i) **No markup growth for direct shippers.** We set $\Delta\mu_D = 0$, so the observed change in t_F/t_D maps directly into markup growth for forwarders.

(ii) **Fixed exposures (Laspeyres weights).** We hold $w_{i,2019}, \Omega_{i,2019}, s^F_{i,2019}$ fixed at pre-pandemic levels to abstract from re-sorting and composition effects.

(iii) **Full pass-through into import prices.** We assume that changes in freight charges pass through one-for-one into CIF import prices. This is theoretically justified if neither exporters relying on freight forwarders nor freight forwarders themselves have market

power to adjust their markups.[4]

(iv) **Only markup changes are counted.** We exclude cost-based drivers of freight price increases (fuel, congestion, surcharges).

Under these assumptions, the contribution of transport companies' market power to import price inflation satisfies:

$$\Delta^{MP} \ln P^{\text{import}} \geq \left(\sum_i w_{i,2019} \cdot \Omega_{i,2019} \cdot s^F_{i,2019} \right) \times \Delta \ln \left(\frac{tF}{t_D} \right), \tag{6}$$

where $\Delta \ln(t_F/t_D)$ is our estimated increase in the freight forwarder price premium.

We compute $w_{i,2019}$ and $\Omega_{i,2019}$ using U.S. import data from Schott (2008). Since these data report U.S. port of entry and partner country (not origin port), we define a route as a U.S. port × partner country. The freight forwarder share $s^F_{i,2019}$ is observed from U.S. Maritime Bills of Lading but only for imports from China (distributions of $\Omega_{i,2019}$ and $s^F_{i,2019}$ are shown on Figure B.3). We therefore first compute the markup contribution for China–U.S. imports only, and then extend to total U.S. imports by assuming that freight forwarder exposure is U.S. port-specific. For U.S. ports without imports from China, we assign the freight forwarders' value from the nearest port with observed data.

We find that the rising markups of transport companies contributed 1.07 percentage points to the price inflation of goods imported to the US from China, and 0.89 percentage points to the overall U.S. import price inflation. We compare these estimates to the cumulative change in U.S. import prices reported by the Bureau of Labor Statistics (BLS). According to the BLS Import Price Index, total import prices rose by approximately 5.6 percent between the 2018–2019 and 2020–2022 periods (Table B.5). Our back-of-the-envelope calculation therefore implies that the increase in transport companies' markups accounted for roughly 21% of import price inflation for Chinese goods and 16% of the total rise in U.S. import prices. These findings are consistent with Isaacson and Rubinton (2023), who use a very different strategy and estimate that rising freight prices explain at least 68% of U.S. import price inflation during the pandemic. Combining this with our estimate that 30% of the freight price increase reflects markups implies that carriers' market power accounts for roughly 20% of total import price inflation. Therefore, market power in ocean transportation is a quantitatively meaningful driver of import price inflation.

[4]This is empirically plausible given the small size of exporters that rely on freight forwarders (Table 2) and highly competitive freight forwarding markets with low entry barriers (Federal Maritime Commission (2024).)

6 Conclusions

This paper shows that market power in global shipping—not just capacity constraints—is an important driver of the freight price surges following a demand shock. Using novel contract data, we identify this mechanism through differential price increases charged to freight forwarders and direct shippers by the same carrier on identical routes. The evidence reveals a substantial rise in carriers' markups, accounting for roughly one-third of total freight price growth and one-fifth of U.S. import price inflation, during the Covid-19 pandemic. Because, as we show, smaller firms depend more on freight forwarders, this market-power shock amplified trade-cost inequality firms participating in international trade. The results suggest that ensuring competitive conditions in global maritime transportation is central not only for trade efficiency, but also for macroeconomic stability.

For Online Publication

Appendix

A Theoretical Appendix

A.1 A simple model of trade with price discriminating carriers

Environment. On a given route–date, a monopoly carrier supplies transport services. A set of exporters $i \in \mathcal{I}$ sell CES-differentiated varieties to the destination market with elasticity $\sigma > 1$. Each exporter has a mill price $p_i > 0$, which we endogeneize below. The carrier charges per-unit freight prices: t_i for each direct shipper $i \in \mathcal{D}$ and a single per-unit freight prices t_F to a freight forwarder that purchases transportation for a pool $\mathcal{F} \subseteq \mathcal{I}$.

For a buyer of transportation of type $s \in \{i, F\}$ facing (additive) freight t_s, the demand is

$$q_i(t_s) \;=\; a_i\,(p_i + t_s)^{-\sigma}, \qquad a_i > 0.$$

The carrier chooses $\{t_i\}_{i\in\mathcal{D}}$ and t_F to maximize

$$\Pi \;=\; \sum_{i\in\mathcal{D}} t_i\, a_i\,(p_i + t_i)^{-\sigma} \;+\; t_F \sum_{i\in\mathcal{F}} a_i\,(p_i + t_F)^{-\sigma}.$$

Freight prices for direct shippers. For a direct shipper i, the carrier solves: $\max_{t_i}\ t_i a_i (p_i + t_i)^{-\sigma}$. The first order condition (FOC) yields: $(p_i + t_i) - \sigma t_i = 0$. Hence,

$$t_i^* = \frac{p_i}{\sigma - 1}. \tag{7}$$

Freight prices for freight forwarders. The demand for transportation from the freight forwarder is $Q_F(t_F) = \sum_{i\in\mathcal{F}} a_i (p_i + t_F)^{-\sigma}$. Then, the FOC with respect to t_F gives

$$\sum_{i\in\mathcal{F}} a_i (p_i + t_F)^{-\sigma-1} p_i = (\sigma - 1) t_F \sum_{i\in\mathcal{F}} a_i (p_i + t_F)^{-\sigma-1},$$

so

$$t_F^* = \frac{1}{\sigma - 1} \cdot \frac{\sum_{i\in\mathcal{F}} a_i\, p_i\, (p_i + t_F^*)^{-\sigma-1}}{\sum_{i\in\mathcal{F}} a_i\,(p_i + t_F^*)^{-\sigma-1}} \;=\; \mathbb{E}_w\!\left[\frac{p_i}{\sigma - 1}\right], \quad w_i \propto a_i (p_i + t_F^*)^{-\sigma-1}. \tag{8}$$

Proposition 1 (Freight Forwarder price as a weighted average of the indirect shippers' prices if they shipped directly)**.** *Under CES demand and additive transportation costs, the monopoly*

carrier's price offered to the freight forwarder equals a weighted average of individualized direct prices of shippers in the pool that uses the freight forwarder: $t_F^* = \mathbb{E}_w[t_i^*]$*, with weights* $w_i \propto a_i(p_i + t_F^*)^{-\sigma+1}$.

Proof. Immediate from (7) and (8). □

Implication for the freight forwarder's premium. For an average direct shipper d with price p_d, the (per-unit) forwarder premium satisfies

$$\frac{t_F^*}{t_d^*} = \frac{\mathbb{E}_w[p_i]}{p_d}.$$

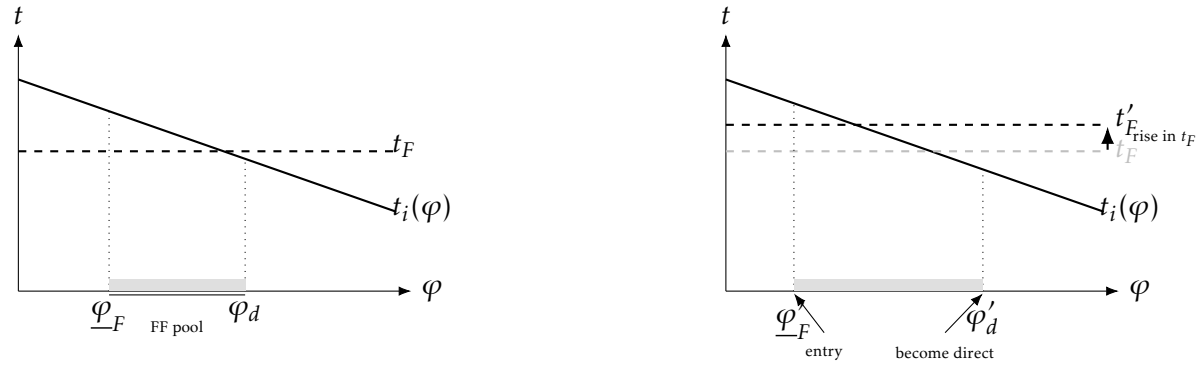
Any force that raises the w-weighted mean of p_i in the freight forwarder's pool of shippers, relative to an average direct shipper's price p_d, increases the premium.

Microfoundation: Pareto productivity and entry at the margin

Let exporters draw productivity φ from a Pareto distribution on $[\varphi_{\min}, \infty)$ with shape $k > 1$. Marginal production cost is w/φ, where w is a wage rate in the exporter's country, and fixed production cost is f. Exporters face iceberg trade costs $\tau > 1$ (such as tariffs), and fixed costs f_d if they export directly or $f_x < f_d$ if they use a freight forwarder.

Then, under CES demand, exporter φ charges mill price $p(\varphi) = \frac{\sigma}{\sigma-1}\frac{w\tau}{\varphi}$. Due to the higher fixed costs of exporting directly, low-productivity firms select into exporting through the freight forwarder, while larger firms export directly. In other words, the set of exporter using the freight forwarder is $\mathcal{F} = \{\varphi : \varphi \in [\bar{\varphi}_F, \varphi_d)\}$ while the set of direct exporters is $\mathcal{D} = \{\varphi : \varphi \geq \varphi_d\}$. Since exporter's prices are decreasing in productivity φ, so is the carrier's price offered to direct shippers. Since the freight forwarder is used by relatively low-productivity firms that lack the scale, $t_F^* > t_d$. Figure A.4a illustrates the relationship between carrier's prices and firm productivity.

A positive demand shock encourages more firms to export, thus decreasing the lower bound in the pool of exporters using the freight forwarder. It also encourages some relatively more productive firms in the freight forwarder's pool to start exporting directly. This increases the upper bound in the freight forwarder's pool, φ_d. If the first effect dominates and there is substantial entry at the margin of exporting, the average productivity of firms in the freight forwarder's pool decreases. This, in turn, raises the price the carrier offers to the freight forwarder without changing the average direct shipper's price much. In this case, the freight forwarder's premium increases, in line with our empirical finding.



(a) Pre-shock (b) Post-shock

Figure A.4: Exporter productivity and the rise in the freight forwarder premium

Notes: Carriers set individualized prices $t_d(\varphi)$ for direct shippers (decreasing in productivity φ) and a pooled price t_F for forwarders serving exporters with $\varphi \in [\underline{\varphi}_F, \varphi_d]$. A demand shock induces entry of low-productivity exporters and switching of higher-productivity exporters to direct shipping. If entry dominates, the forwarder pool becomes less productive on average, raising $t'_F > t_F$ while t_d changes little, increasing the premium charged to the freight forwarder.

Proposition 2 (Demand-driven rise in the freight forwarder's premium via entry)**.** *Consider a positive demand shock that increases market participation on the route and induces entry predominantly among low-productivity exporters into the freight forwarder's pool. Then the freight forwarder's price t_F^* increases, raising the premium charged to the freight forwarder relative to an average direct shipper, t_F^*/t_d^*.*

Proof. See above. □

B Data Appendix

B.1 Data overview

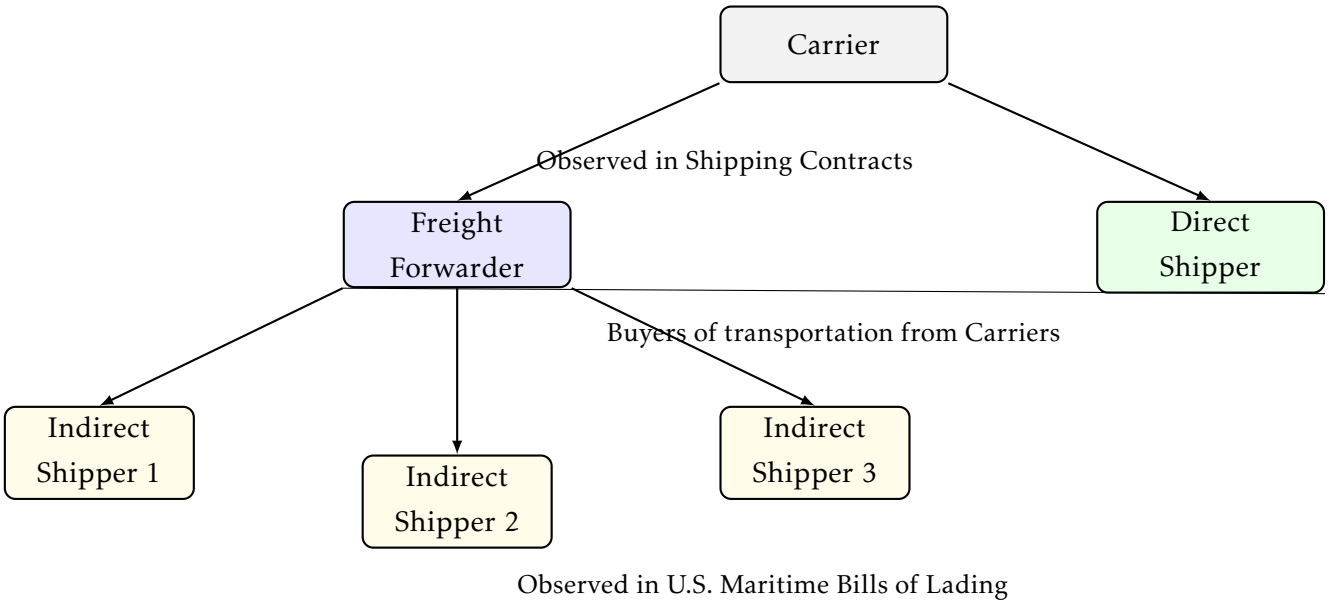


Figure B.1: Schematic structure of the data linking carriers, freight forwarders, and shippers

Notes: Shipping contracts record carrier→buyer relationships (carrier to freight forwarder or direct shipper), including base freight rates. U.S. Maritime Bills of Lading record buyer→exporter/importer relationships. Prices charged by freight forwarders to their downstream clients are not observed.

Figure B.1 shows how we link our two main dataset: shipping contracts from a benchmarking platform and the U.S. Maritime Bills of Lading from Panjiva. We use shipping contracts to study the pricing relationships between transport companies (carriers) and their buyers of transportation (freight forwarders and direct shippers). However, since we do not see any characteristics of buyers in the shipping contracts besides their identifiers, we construct their average characteristics, by type, for each route-carrier-quarter-year cell, using U.S. Maritime Bills of Lading data. These are the characteristics that we include in Table 1 as controls that account for buyer-specific cost differences. Moreover, we use information on characteristics of direct and indirect shippers in each shipment from the US Bills of Lading to document heterogeneous exposure to freight forwarders in Table 2.

B.2 Construction of controls

Using U.S. Maritime Bills of Lading, we construct the following average buyer-type specific characteristics for each carrier-route-quarter-year:[5]

- **Shipment Size:** total volume (TEU) of goods in the same bill of lading defining a shipment.
- **Shipment Frequency:** number of distinct bills of lading per buyer in a year.
- **#Carriers/Buyer-Route**: number of carriers a buyer uses on a route in a year.
- **# Routes/Buyer:** number of routes per buyer in a year.

We assume that shipments not intermediated by freight forwarders are shipped directly by their exporters.[6] Then we average the characteristics above separately for freight forwarders and direct shippers (exporters) within carrier-route-quarter-year cells. These average buyer-type characteristics are included in Tables 1 B.4 and Figure 3, to control for any buyer-type-specific costs of transportation of a given carrier on a given route in a quarter.

B.3 Summary statistics

Table B.1: Ocean transportation contracts from China to US West coast, 2018 - 2021

	mean	med	std
Freight rate, USD/FEU	2283	1550	1725
Contract length, days	45	14	94
# Routes/Year	65	65	0
# Transport companies/Year	19	18	2
# Buyers/Year:	45	57	27
# Freight forwarders	9	12	6
# Buyers/Year-Route-Transport company:	7	6	3
Freight forwarders	0.69	0.75	0.31
N observations	143 096		

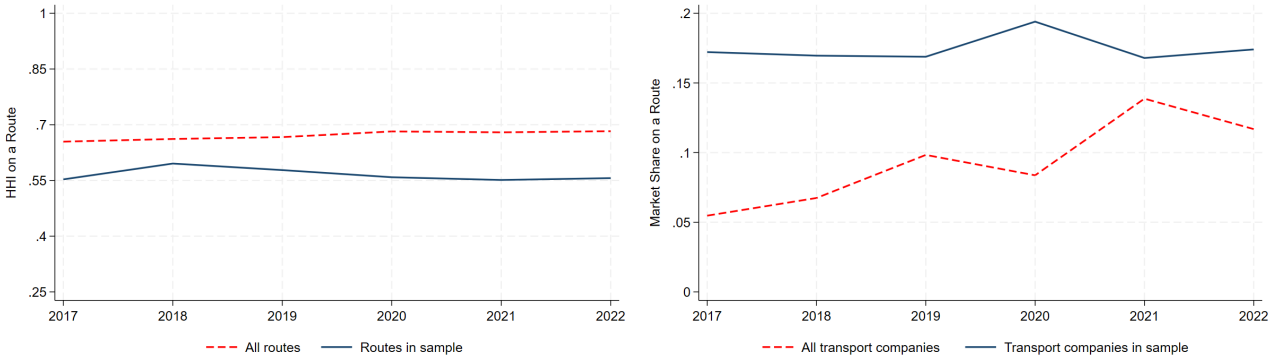
[5]When multiplied, these buyer-specific characteristics yield overall buyer size (in TEU) in a year.

[6]Assuming that non-intermediated shipments are directly shipped by the importers yield similar results (available upon request).

Table B.2: Characteristics of routes and transport companies, 2017

	Shipping contracts			All shipments		
	mean	med	std	mean	med	std
Panel A: Routes						
Volume, '000 TEU	108	22	209	10	13	56
Weight, '000 Ton	605	192	1084	67	1	303
Estimated value, mln USD	3666	139	7313	338	2	1921
N transport companies	14	15	6	4	2	5
N routes	55			1107		
Panel B: Transport Companies						
Volume, '000 TEU	534	449	394	77	0	237
Weight, '000 Ton	3271	2661	2529	527	24	1468
Estimated value, mln USD	18049	15434	13066	2674	24	7947
N routes	205	221	122	35	2	84
N transport companies	20		140			

Notes: * exporter and importer counts are based on their company names. Exporters and importers with known names account for 60% and 65% of US imports by value, respectively.



(a) Routes are highly concentrated

(b) Transport companies have high market shares

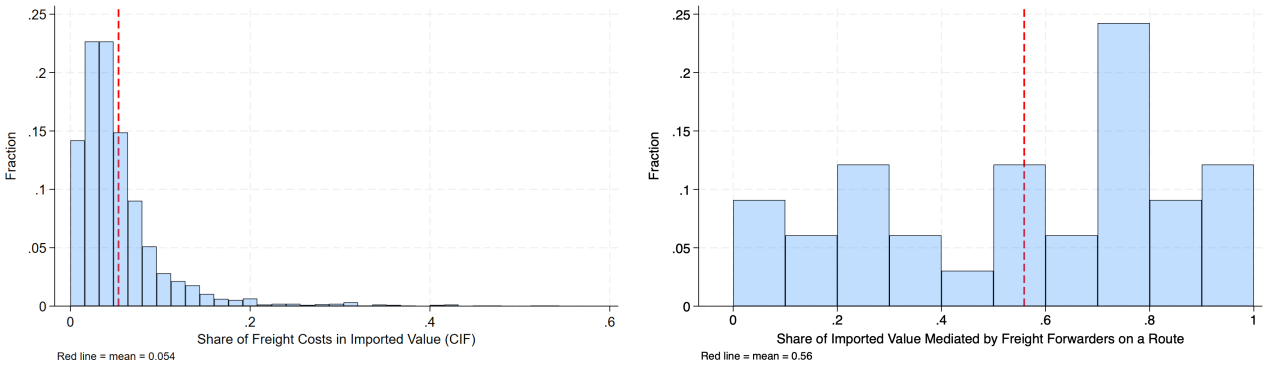
Figure B.2: Routes' market concentration and transport companies' market shares

Notes: The figures plot average HHI on a route (a) and carrier's volume shares on a route (b) in 2017 - 2022.

Table B.3: Buyers of transportation from China to the US, 2017

	Freight forwarders		Exporters		Importers	
	mean	std	mean	std	mean	std
Panel A: All routes and transport companies						
TEU/shipment	2	3	3	5	3	6
TEU/buyer	6108	22686	19	95	25	137
N shipments/buyer	3285	11146	7	30	9	38
N routes/buyer	48	59	2	2	17	214
N transport companies/buyer	11	7	1	1	1	1
N buyers	813		6554		5790	
Panel B: Routes and transport companies in shipping contracts						
TEU/shipment	2	3	3	3	3	4
TEU/buyer	14589	215838	32	132	55	230
N shipments/buyer	3607	11634	11	42	18	64
N routes/buyer	53	64	2	2	50	441
N transport companies/buyer	12	8	1	1	1	1
N buyers	740		3161		1878	

Notes: * exporter and importer counts are based on their company names. Exporters and importers with known names account for 60% and 65% of US imports by value, respectively.



(a) Freight costs share in imported value (CIF) (b) Freight forwarders share in imported value (CIF)

Figure B.3: Freight costs' and freight forwarders' shares in imported goods' value, 2019

Notes: The figures show the distributions of freight cost shares in imported value (CIF) on a route (a) and the share of imported value (CIF) on a route intermediated by freight forwarders (b), in year 2019.

B.4 Additional Results

Table B.4: Heterogeneous effects across routes and carriers

Dependent variable:	log *Freight Price*		
	(1)	(2)	(3)
Freight Forwarder X *Post*	0.313***	0.322***	0.320***
	(0.074)	(0.073)	(0.067)
Freight Forwarder X *Post* X Log *#Carriers/Route*	-0.131**		
	(0.058)		
Freight Forwarder X *Post* X Log *HHI/Route*		0.108**	
		(0.054)	
Freight Forwarder X *Post* X Log *Carrier's Share/Route*			0.077
			(0.054)
Freight Forwarder X Log *Carrier's Share/Route*			-0.048
			(0.038)
Log *Contract Length*	-0.040***	-0.040***	-0.040***
	(0.010)	(0.010)	(0.010)
Log *Shipment Size*	-0.048	-0.048	-0.045
	(0.037)	(0.037)	(0.036)
Log *Shipment Frequency*	-0.023**	-0.023**	-0.023**
	(0.011)	(0.011)	(0.011)
Log *#Carriers/Buyer-Route*	0.106*	0.107*	0.103*
	(0.053)	(0.054)	(0.051)
Log *#Routes/Buyer*	-0.067**	-0.068**	-0.067**
	(0.027)	(0.028)	(0.027)
Transshipment Probability	0.039	0.037	0.047
	(0.036)	(0.037)	(0.031)
Carrier-Route-Date	✓	✓	✓
Buyer-Route, Buyer-Carrier	✓	✓	✓
N obs	66117	66117	65997
N clusters	54	54	54
Adj. R^2	0.949	0.949	0.949

Notes: This table presents the results of estimating equation (5). The dependent variable is the log of the base freight rate (excluding surcharges and fees). Constant is not shown, for conciseness. Robust standard errors clustered at the buyer level are in parentheses: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

Table B.5: Cumulative change in U.S. import prices, 2018–2019 to 2020–2022

	Cumulative Import Price Inflation (%)	
Source	All imports	Imports from China
BLS Import Price Index	5.6	5.2

Notes: Author's calculations based on the Bureau of Labor Statistics (BLS) Import Price Index, excluding fuels. Series codes: IR142300000 (all imports) and IR142300200 (imports from China). For each series, cumulative import price inflation is computed as the log difference between the average index value for 2020–2022 and that for 2018–2019: $\Delta \ln P^{\text{import}} = \ln\left(\overline{P}_{2020\text{–}2022}\right) - \ln\left(\overline{P}_{2018\text{–}2019}\right)$. Numerically, the BLS Import Price Index for all imports rose from an average of 99.4 (2018–2019) to 104.9 (2020–2022), implying $\Delta \ln P^{\text{import}} = 0.056$ (5.6%). For imports from China, the index increased from 99.7 to 104.9, yielding $\Delta \ln P^{\text{import}} = 0.052$ (5.2%).

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