# Supply Chain Shortages, Large Firms' Market Power, and Inflation

**Francesco Franzoni** USI Lugano, SFI, and CEPR

#### Mariassunta Giannetti

Stockholm School of Economics, SHoF, CEPR, and ECGI

#### Roberto Tubaldi

BI Norwegian Business School

ChaMP Inaugural Conference, April 25-26, 2024

Trade wars, COVID-19, and geopolitical tensions have highlighted the risks associated with global supply chains (Antras and Chor, 2022)

Companies had been addressing the uncertainties and shortages within their supply chains when updating analysts and investors even before the COVID-19 period (Ersahin, Giannetti, and Huang, 2024).

# Supply Chains and Their Importance

Trade wars, COVID-19, and geopolitical tensions have highlighted the risks associated with global supply chains (Antras and Chor, 2022)

- Companies had been addressing the uncertainties and shortages within their supply chains when updating analysts and investors even before the COVID-19 period (Ersahin, Giannetti, and Huang, 2024).
- How does the competitive position of a firm in its industry affect its ability to navigate supply chain shortages?

Trade wars, COVID-19, and geopolitical tensions have highlighted the risks associated with global supply chains (Antras and Chor, 2022)

- Companies had been addressing the uncertainties and shortages within their supply chains when updating analysts and investors even before the COVID-19 period (Ersahin, Giannetti, and Huang, 2024).
- How does the competitive position of a firm in its industry affect its ability to navigate supply chain shortages?
- What are the implications for industry structure, markups and inflation?

Theoretical Framework

We view supply chain shortages as affecting a firm's costs of production

We view supply chain shortages as affecting a firm's costs of production

Superstar firms are less exposed to supply chain shortages

We view supply chain shortages as affecting a firm's costs of production

- Superstar firms are less exposed to supply chain shortages
- Superstar firms' cost advantage over the competitors increases when supply chain shortages occur

We view supply chain shortages as affecting a firm's costs of production

- Superstar firms are less exposed to supply chain shortages
- Superstar firms' cost advantage over the competitors increases when supply chain shortages occur

Effects of changes in relative marginal costs in a simple Cournot model with homogenous product:

We view supply chain shortages as affecting a firm's costs of production

- Superstar firms are less exposed to supply chain shortages
- Superstar firms' cost advantage over the competitors increases when supply chain shortages occur

Effects of changes in relative marginal costs in a simple Cournot model with homogenous product:

#### **Prediction 1: Market Share**

Within an industry, superstar firms having lower marginal costs will gain market share

We view supply chain shortages as affecting a firm's costs of production

- Superstar firms are less exposed to supply chain shortages
- Superstar firms' cost advantage over the competitors increases when supply chain shortages occur

Effects of changes in relative marginal costs in a simple Cournot model with homogenous product:

#### **Prediction 1: Market Share**

Within an industry, superstar firms having lower marginal costs will gain market share

**Prediction 2: Markups** 

Firms with higher market share will have higher markups

Industry concentration and markups

Supply chain shortages  $\Rightarrow$  increase in dispersion of market shares across firms and higher HHI

#### Industry concentration and markups

Supply chain shortages  $\Rightarrow$  increase in dispersion of market shares across firms and higher HHI

► In equilibrium, for given aggregate cost shock, the average industry markup increases as industry concentration increases:  $\sum_{i=1}^{n} s_{i} \frac{p-c_{i}}{p} = \frac{1}{|\varepsilon|} \sum_{i=1}^{n} s_{i}^{2} = \frac{1}{|\varepsilon|} HHI$ 

#### Industry concentration and markups

Supply chain shortages  $\Rightarrow$  increase in dispersion of market shares across firms and higher HHI

▶ In equilibrium, for given aggregate cost shock, the average industry markup increases as industry concentration increases:  $\sum_{j=1}^{n} s_{j} \frac{p-c_{j}}{p} = \frac{1}{|\varepsilon|} \sum_{j=1}^{n} s_{j}^{2} = \frac{1}{|\varepsilon|} HHI$ 

#### Prediction 3: Ex ante concentration, industry markups, and inflation

Following supply chain shortages, industry concentration increases more in ex ante more concentrated industries, which experience higher increases in markups for given cost shocks

#### Industry concentration and markups

Supply chain shortages  $\Rightarrow$  increase in dispersion of market shares across firms and higher HHI

▶ In equilibrium, for given aggregate cost shock, the average industry markup increases as industry concentration increases:  $\sum_{j=1}^{n} s_j \frac{p-c_j}{p} = \frac{1}{|\varepsilon|} \sum_{j=1}^{n} s_j^2 = \frac{1}{|\varepsilon|} HHI$ 

#### Prediction 3: Ex ante concentration, industry markups, and inflation

Following supply chain shortages, industry concentration increases more in ex ante more concentrated industries, which experience higher increases in markups for given cost shocks

#### Effect of supply chain disruptions on inflation stronger in more concentrated industries

Largest firms in the industry - "superstars" - increase their **profitability** and **markups**, and acquire **market share** during supply chain disruptions

Largest firms in the industry - "superstars" - increase their **profitability** and **markups**, and acquire **market share** during supply chain disruptions

Superior stock market performance of superstar firms when supply chain shortages occur

Robust to controlling for cost shocks and heterogeneity in pass-through rates between firms with different market power

Largest firms in the industry - "superstars" - increase their **profitability** and **markups**, and acquire **market share** during supply chain disruptions

Superior stock market performance of superstar firms when supply chain shortages occur

Robust to controlling for cost shocks and heterogeneity in pass-through rates between firms with different market power

Mechanism:

- Superstar firms' costs increase to a lower extent when supply chain shortages occur
- Superstar firms are less exposed to supply chain shortages because suppliers experiencing operating difficulties favor their most important customers
- Superstar firms' suppliers are often very large themselves and are consequently less negatively affected by supply chain shortages

Largest firms in the industry - "superstars" - increase their **profitability** and **markups**, and acquire **market share** during supply chain disruptions

Superior stock market performance of superstar firms when supply chain shortages occur

Robust to controlling for cost shocks and heterogeneity in pass-through rates between firms with different market power

Mechanism:

- Superstar firms' costs increase to a lower extent when supply chain shortages occur
- Superstar firms are less exposed to supply chain shortages because suppliers experiencing operating difficulties favor their most important customers
- Superstar firms' suppliers are often very large themselves and are consequently less negatively affected by supply chain shortages

Inflation has been higher in industries that have been more exposed to supply chain shortages and where superstar firms coexist with smaller firms

▶ The mechanism we propose can explain up to 24% of average inflation after COVID-19

### Related Literature

- Supply chain risk (Ersahin, Giannetti, and Huang, 2024) and shocks matter for production networks (see. e.g., Acemoglu, Carvalho, Ozdaglar, and Tahbaz-Salehi, 2012, Barrot and Sauvagnat, 2016, Carvalho, Nirei, Saito, and Tahbaz-Salehi, 2021)
- Superstar firms and their behavior (e.g., Autor, Dorn, Katz, Patterson, and Van Reenen, 2020, Gutierrez and Philippon, 2019)
- Microeconomic frictions can affect aggregate supply and inflation (especially in response to monetary policy): financial constraints (Chevalier and Scharfstein 1996; Antoun de Almeida, 2015); regulation (effects on stagflation in the eighties: Drechsler, Savov, and Schnabl, 2023).
- Concurrent work on the post COVID-19 inflation emphasize the role of unanchored expectations and cost pass-through (Acharya, Crosignani, Eisert, and Eufinger 2023; Kemp, Portillo, and Santoro, 2023, Hansen, Toscani, and Zhou, 2023; Gagliardone, Gertler, Lenzu, and Tielens, 2023; Brauning, Fillat, and Joaquim, 2022, Konczal and Lusiani, 2022). We highlight the effects of the competitive environment, irrespective or controlling for cost shocks

**Empirical Analysis** 

- Firm level financial information from Worldscope: 18,969 firms in 83 countries across 62 2-digit SIC industries
- Customer-supplier links from Factset Revere and shipment-level US import data based on bills of landing (BoL) from S&P Panjiva
- Supply chain shortages from the Survey of Purchasing Managers of S&P Global: backlogs of work and suppliers' delivery times
- Inflation data at the industry-country level from Bloomberg, which in turn reports the series from the relevant statistical authorities. Manual reconciliation of the industries in the inflation data set with the industries in the rest of our analysis

Measuring supply chain shortages: Suppliers' delivery times

Survey participants are asked whether it is taking the firm's suppliers more or less time to provide inputs on average  $% \left( {{{\mathbf{r}}_{i}}} \right)$ 

INDEX = % percentage of survey panel responding "Faster" + 0.5 × % of survey panel responding "same"

Industry-region level measure. We consider the negative of the above index in the estimates.

### The Time-Series of Supply Chain Shortages



- A persistent increase of the proxies captures that supply chain shortages are increasing in severity because of demand or supply shocks
- Currently working on shipment-level data (Panjiva) to isolate the supply shock and reduce endogeneity concerns

Firm-level Markups, Profitability, and Market Share

We estimate the following equation for customer firm *i*, industry *j*, country *c*, in year *t*:

$$y_{i,j,c,t+1} = \beta_1 Star_{i,j,t-1} \times Delivery \ Time_{j,c,t \rightarrow t+1} + \beta_2 Star_{i,j,t-1} + \alpha_{j,c,t} + \varepsilon_{i,j,c,t}$$

We estimate the following equation for customer firm i, industry j, country c, in year t:

 $y_{i,j,c,t+1} = \beta_1 Star_{i,j,t-1} \times Delivery Time_{j,c,t \rightarrow t+1} + \beta_2 Star_{i,j,t-1} + \alpha_{j,c,t} + \varepsilon_{i,j,c,t}$ 

▶  $y_{i,j,c,t+1}$ : market share, ROA and markup

We estimate the following equation for customer firm i, industry j, country c, in year t:

 $y_{i,j,c,t+1} = \beta_1 Star_{i,j,t-1} \times Delivery Time_{j,c,t \rightarrow t+1} + \beta_2 Star_{i,j,t-1} + \alpha_{j,c,t} + \varepsilon_{i,j,c,t}$ 

- ▶  $y_{i,j,c,t+1}$ : market share, ROA and markup
- Star<sub>i,j,t-1</sub>: indicator for firms in top 10% of sales within a 2-digit SIC in year t-1

We estimate the following equation for customer firm i, industry j, country c, in year t:

 $y_{i,j,c,t+1} = \beta_1 Star_{i,j,t-1} \times Delivery \ Time_{j,c,t \to t+1} + \beta_2 Star_{i,j,t-1} + \alpha_{j,c,t} + \varepsilon_{i,j,c,t}$ 

- ▶  $y_{i,j,c,t+1}$ : market share, ROA and markup
- Star<sub>i,j,t-1</sub>: indicator for firms in top 10% of sales within a 2-digit SIC in year t-1
- Delivery Time<sub>j,c,t→t+1</sub>: previous 12-month average Delivery Time to customer's industry, in a given country

We estimate the following equation for customer firm i, industry j, country c, in year t:

 $y_{i,j,c,t+1} = \beta_1 Star_{i,j,t-1} \times Delivery Time_{j,c,t \rightarrow t+1} + \beta_2 Star_{i,j,t-1} + \alpha_{j,c,t} + \varepsilon_{i,j,c,t}$ 

- >  $y_{i,j,c,t+1}$ : market share, ROA and markup
- Star<sub>i,j,t-1</sub>: indicator for firms in top 10% of sales within a 2-digit SIC in year t-1
- Delivery Time<sub>j,c,t→t+1</sub>: previous 12-month average Delivery Time to customer's industry, in a given country
- $\alpha_{j,c,t}$ : industry-by-country-by-year fixed-effects

# Star Firms' Market Share and Profitability

Dependent variable	% Industry Sales		ROA (%)	
	Full sample	2019-2021	Full sample	2019-2021
	(1)	(2)	(3)	(4)
Star $ imes$ Delivery Time	0.036 <sup>***</sup> (0.009)	$0.040^{***}$ (0.009)	0.078 <sup>***</sup> (0.009)	0.073 <sup>***</sup> (0.009)
Star	0.713*** (0.025)	0.672*** (0.024)	0.359*** (0.018)	0.324*** (0.018)
Industry-Country-Year FE	Yes	Yes	Yes	Yes
Obs. Adj. R2	79,401 0.487	28,051 0.462	72,938 0.167	25,725 0.173

# Star Firms' Market Share and Profitability

Dependent variable	% Industry Sales		ROA (%)	
	Full sample	2019-2021	Full sample	2019-2021
	(1)	(2)	(3)	(4)
Star $ imes$ Delivery Time	0.036 <sup>***</sup> (0.009)	$0.040^{***}$ (0.009)	0.078 <sup>***</sup> (0.009)	0.073*** (0.009)
Star	0.713*** (0.025)	0.672*** (0.024)	0.359*** (0.018)	0.324*** (0.018)
Industry-Country-Year FE	Yes	Yes	Yes	Yes
Obs.	79,401	28,051	72,938	25,725
Adj. R2	0.487	0.462	0.167	0.173

Increased market share (ROA) for <u>star firms</u> when delivery time increases by 1 st.dev. equivalent to about 10% (40%) of the average market share (ROA)

Placebo: Other Cost Shocks

# Placebo: Other Cost Shocks

Dependent variable	% Industry Sales		ROA (%)	
	(1)	(2)	(3)	(4)
Energy Shock $ imes$ Star	0.007 (0.005)		0.006 (0.006)	
Star	0.807*** (0.028)		0.392*** (0.019)	
Industry-Country-Year FE	Yes		Yes	
Obs.	79,401		72,938	
Adj. R2	0.486		0.165	

# Placebo: Other Cost Shocks

Dependent variable	% Industry Sales		ROA (%)	
	(1)	(2)	(3)	(4)
Energy Shock $ imes$ Star	0.007 (0.005)	0.007 (0.005)	0.006 (0.006)	0.006 (0.006)
Star	0.807 <sup>***</sup> (0.028)	0.808 <sup>***</sup> (0.028)	$0.392^{***}$ (0.019)	$0.389^{***}$ (0.019)
Energy Shock $ imes$ Industry Emissions $ imes$ Star		-0.001 (0.005)		0.007 (0.006)
Industry Emissions $ imes$ Star		0.039 (0.029)		-0.053*** (0.012)
Industry-Country-Year FE	Yes	Yes	Yes	Yes
Obs. Adj. R2	79,401 0.486	79,401 0.487	72,938 0.165	72,938 0.166

### Supply Chain Shortages and Firms' Markups

•  $Markup = \frac{Sales}{Variable costs}$ . Variable costs =  $Opex - R\&D - 30\% \times SG\&A$  (Ayyagari, et al., 2023)
#### Supply Chain Shortages and Firms' Markups

- $Markup = \frac{Sales}{Variable costs}$ . Variable costs =  $Opex R\&D 30\% \times SG\&A$  (Ayyagari, et al., 2023)
- Robust to alternative definitions!

#### Supply Chain Shortages and Firms' Markups

•  $Markup = \frac{Sales}{Variable costs}$ . Variable costs =  $Opex - R\&D - 30\% \times SG\&A$  (Ayyagari, et al., 2023)

Robust to alternative definitions!

Dependent variable		Ma	rkup	
Dep. var. definition.	Lo	og	Lev	vels
	Full sample	2019-2021	Full sample	2019-2021
	(1)	(2)	(3)	(4)
Star $ imes$ Delivery Time	$0.078^{***}$ (0.010)	0.062 <sup>***</sup> (0.010)	0.083*** (0.010)	$0.065^{***}$ (0.010)
Star	0.311*** (0.017)	0.316*** (0.021)	0.242*** (0.019)	0.251*** (0.020)
Industry-Country-Year FE	Yes	Yes	Yes	Yes
Obs. Adj. R2	78,272 0.164	28,015 0.198	78,295 0.116	28,024 0.130

#### Supply Chain Shortages and Firms' Markups

•  $Markup = \frac{Sales}{Variable costs}$ . Variable costs =  $Opex - R\&D - 30\% \times SG\&A$  (Ayyagari, et al., 2023)

Robust to alternative definitions!

Dependent variable		Ma	rkup	
Dep. var. definition.	Lo	Log		/els
	Full sample	2019-2021	Full sample	2019-2021
	(1)	(2)	(3)	(4)
$Star \times Delivery \; Time$	$0.078^{***}$ (0.010)	0.062*** (0.010)	0.083*** (0.010)	0.065*** (0.010)
Star	0.311*** (0.017)	0.316*** (0.021)	0.242*** (0.019)	0.251*** (0.020)
Industry-Country-Year FE	Yes	Yes	Yes	Yes
Obs. Adj. R2	78,272 0.164	28,015 0.198	78,295 0.116	28,024 0.130

1 st.dev increase in *Delivery Time* leads to 7.8% of a standard deviation increase in the markups for star firms, which corresponds to 27% of the average logarithmic markups in the sample

#### Cross-sectional Differences in Cost Pass-through

High markups = firms better able to pass through cost shocks (Bräuning, Fillat, and Joaquim, 2022, Konczal and Lusiani, 2022)

#### Cross-sectional Differences in Cost Pass-through

High markups = firms better able to pass through cost shocks (Bräuning, Fillat, and Joaquim, 2022, Konczal and Lusiani, 2022)

Dependent variable		Ma	rkup			
Dep. var. definition.	Lo	og	Lev	Levels		
	Full sample	2019-2021	Full sample	2019-2021		
	(1)	(2)	(3)	(4)		
$Star \times Delivery Time$	0.058***	0.042***	0.068***	0.053***		
	(0.009)	(0.009)	(0.010)	(0.010)		
$Star  imes Delta \ COGS$	0.036**	0.031	$0.048^{***}$	0.023		
	(0.014)	(0.027)	(0.018)	(0.032)		
Delta COGS	0.003	0.018	0.015**	0.032***		
	(0.009)	(0.015)	(0.007)	(0.012)		
Star	0.265***	0.285***	0.230***	0.242***		
	(0.015)	(0.020)	(0.018)	(0.021)		
Industry-Country-Year FE	Yes	Yes	Yes	Yes		
Obs.	76,446	27,516	76,465	27,523		
Adj. R2	0.176	0.197	0.141	0.143		

Superstar firms able to increase markups to a larger extent: our channel is distinct and robust

#### Stock Returns

- ▶ After COVID-19 pandemics: strong stock market performance for large firms
- > Additional test: can our mechanism contribute to explain the outperformance of large firms?

#### Stock Returns

- ▶ After COVID-19 pandemics: strong stock market performance for large firms
- > Additional test: can our mechanism contribute to explain the outperformance of large firms?

Dependent variable		Monthly Abnorr	nal returns (bps)			
		2019-2021				
	(1)	(2)	(3)	(4)		
Star $ imes$ Delivery Time	7.069*** (1.040)	$7.355^{***}$ $(1.159)$	$8.174^{***}$ (1.091)	8.987*** (1.283)		
Star	342.425*** (46.941)	358.476*** (52.330)	387.446*** (49.285)	421.167*** (58.344)		
Delivery Time	-4.443*** (0.855)	12.245*** (1.799)	5.854** (2.872)			
Industry-Month FE Country-Month FE Industry-Country-Month FE	Yes No No	No Yes No	Yes Yes No	No No Yes		
Obs. Adj. R2	258,541 0.000	258,223 0.000	258,199 0.000	243,675 0.000		

# Mechanism

Does the cost of goods sold increase to a lower extent for superstar firms?

- Does the cost of goods sold increase to a lower extent for superstar firms?
- Do suppliers really favor star firms?

- Does the cost of goods sold increase to a lower extent for superstar firms?
- Do suppliers really favor star firms?
- Do star firms have more resilient (star) suppliers?

# Percentage Change in COGS

Dependent variable	Delta	COGS
	Full Sample	2019-2021
	(1)	(2)
Star $ imes$ Delivery Time	-0.022** (0.008)	$-0.021^{**}$ (0.010)
Star	-0.150*** (0.008)	-0.114*** (0.013)
Industry-Country-Year FE	Yes	Yes
Obs.	77,546	27,546
Adj. R2	0.082	0.100

# Percentage Change in COGS

Dependent variable	COGS	
	Full Sample	2019-2021
	(1)	(2)
Star $ imes$ Delivery Time	-0.022** (0.008)	-0.021** (0.010)
Star	-0.150*** (0.008)	-0.114*** (0.013)
Industry-Country-Year FE	Yes	Yes
Obs. Adj. R2	77,546 0.082	27,546 0.100

- ▶ Use shipment-level US import data based on bills of landing (BoL) from S&P Panjiva
- Data collected from U.S. Customs and Border Protection (CBP), which are freely available under FOIA
- A BoL is a legal document that serves as a record that a shipment has been transported from its origin to its final destination
- Transaction-level records of goods traded across borders, with information on consignees and shippers, product descriptions, quantity

- ▶ Use shipment-level US import data based on bills of landing (BoL) from S&P Panjiva
- Data collected from U.S. Customs and Border Protection (CBP), which are freely available under FOIA
- A BoL is a legal document that serves as a record that a shipment has been transported from its origin to its final destination
- Transaction-level records of goods traded across borders, with information on consignees and shippers, product descriptions, quantity
- ► We create a full customer-supplier-quarter panel and test whether, within a supplier, star customers receive more goods in time of supply chain disruptions

Dependent variable	1(Trade > 0)	Containers	Shipments	Weight	Volume	Quantity
	(1)	(2)	(3)	(4)	(5)	(6)
$Star \times Delivery \; Time$	0.024**	1.263***	0.515***	20.967***	1.661***	1.348***
	(0.009)	(0.305)	(0.182)	(6.172)	(0.444)	(0.275)
Star	-0.064***	1.002***	0.770***	19.910***	0.873*	0.174
	(0.012)	(0.328)	(0.203)	(4.690)	(0.456)	(0.274)
Supplier-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm's Industry-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	232,611	232,611	232,611	232,611	232,611	232,611
Adj. R2	0.137	0.145	0.122	0.231	0.170	0.139

Dependent variable	1(Trade > 0)	Containers	Shipments	Weight	Volume	Quantity
	(1)	(2)	(3)	(4)	(5)	(6)
Star $ imes$ Delivery Time	0.024**	1.263***	0.515****	20.967***	$1.661^{***}$	1.348***
	(0.009)	(0.305)	(0.182)	(6.172)	(0.444)	(0.275)
Star	-0.064***	1.002***	0.770***	19.910***	0.873*	0.174
	(0.012)	(0.328)	(0.203)	(4.690)	(0.456)	(0.274)
Supplier-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Firm's Industry-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	232,611	232,611	232,611	232,611	232,611	232,611
Adj. R2	0.137	0.145	0.122	0.231	0.170	0.139

1 st.dev increase in *Delivery Time* leads to 1.3 containers and 21 tons more shipped to Star customers, which corresponds to 43% and 20% of the average values, respectively

Dependent variable	% Industry Sales	ROA
	(1)	(2)
$Star\timesDeliveryTime$	$0.060^{***}$ (0.016)	0.040*** (0.015)
Star	$0.511^{***}$ (0.011)	0.350*** (0.013)
Supplier-Year FE Firm's Country-Industry-Year FE	Yes Yes	Yes Yes
Obs. Adj. R2	652,660 0.723	628,975 0.433

Dependent variable	% Industry Sales	ROA
	(1)	(2)
Star $ imes$ Delivery Time	$0.060^{***}$ (0.016)	0.040 <sup>***</sup> (0.015)
Star	0.511*** (0.011)	0.350*** (0.013)
Supplier-Year FE	Yes	Yes
Firm's Country-Industry-Year FE	Yes	Yes
Obs. Adj. R2	652,660 0.723	628,975 0.433

## Star Firms and their Suppliers: Assortative Matching

Star customer has Star supplier

## Star Firms and their Suppliers: Assortative Matching

Star customer has Star supplier				
Dependent variable		St	ar <sup>S</sup>	
	(1)	(2)	(3)	(4)
Star <sup>C</sup>	0.005*** (0.001)	0.008*** (0.002)	0.008*** (0.002)	0.006**** (0.002)
Size <sup>C</sup>				0.005** (0.002)
Size <sup>S</sup>				0.195*** (0.003)
Year FE	Yes	Yes	Yes	Yes
CS-Firm FE	Yes	Yes	Yes	Yes
CS-Industry FE	No	Yes	Yes	Yes
CS-Country FE	No	No	Yes	Yes
Obs.	1,212,121	845,443	845,443	768,206
Adj. R2	0.921	0.920	0.920	0.928

Our results are not driven by

- 1. Financial frictions constrain firm scale  $\Rightarrow$  increase prices (Chevalier and Scharfstein, 1996)
- 2. Investment in operational resilience  $\Rightarrow$  some firms better able to withstand supply chain shocks

The sample is now at the customer's industry-country-year or customer's industry-country-month level

- The sample is now at the customer's industry-country-year or customer's industry-country-month level
- Delivery Time is again averaged across the previous 12 months

- The sample is now at the customer's industry-country-year or customer's industry-country-month level
- Delivery Time is again averaged across the previous 12 months
- Star is replaced with Ex-Ante HHI: Herfindahl-Hirschman index in a 2-digit SIC code in at the beginning of the sample

- The sample is now at the customer's industry-country-year or customer's industry-country-month level
- Delivery Time is again averaged across the previous 12 months
- Star is replaced with Ex-Ante HHI: Herfindahl-Hirschman index in a 2-digit SIC code in at the beginning of the sample
- Two testable hypotheses following supply chain shortages:

- The sample is now at the customer's industry-country-year or customer's industry-country-month level
- Delivery Time is again averaged across the previous 12 months
- Star is replaced with Ex-Ante HHI: Herfindahl-Hirschman index in a 2-digit SIC code in at the beginning of the sample
- Two testable hypotheses following supply chain shortages:
  - 1. Concentration increases in ex-ante more concentrated industries

- The sample is now at the customer's industry-country-year or customer's industry-country-month level
- Delivery Time is again averaged across the previous 12 months
- Star is replaced with Ex-Ante HHI: Herfindahl-Hirschman index in a 2-digit SIC code in at the beginning of the sample
- Two testable hypotheses following supply chain shortages:
  - 1. Concentration increases in ex-ante more concentrated industries
  - 2. Effect on inflation is stronger in more concentrated industries

## Inflation, Supply Chain Shortages, and presence of Superstars: Delta HHI

Dependent variable		Delta	a HHI	
	(1)	(2)	(3)	(4)
Delivery Time $\times$ Ex-Ante HHI	0.026*** (0.006)	0.021*** (0.007)	0.021*** (0.007)	0.033*** (0.008)
Delivery Time	0.017 (0.011)	-0.025 (0.016)	-0.023 (0.016)	-0.023 (0.017)
Ex-Ante HHI	-0.100*** (0.006)	-0.105*** (0.008)	-0.111*** (0.008)	
Year FE	Yes	Yes	Yes	Yes
Country FE	No	Yes	Yes	No
Country-Industry FE	No	No	No	Yes
Obs.	9,215	9,213	9,213	9,138
Adj. R2	0.011	0.009	0.009	0.001

# Inflation, Supply Chain Shortages, and presence of Superstars: Delta HHI

Dependent variable	Delta HHI						
	(1)	(2)	(3)	(4)			
Delivery Time $\times$ Ex-Ante HHI	0.026*** (0.006)	0.021*** (0.007)	0.021*** (0.007)	0.033*** (0.008)			
Delivery Time	0.017 (0.011)	-0.025 (0.016)	-0.023 (0.016)	-0.023 (0.017)			
Ex-Ante HHI	-0.100*** (0.006)	-0.105*** (0.008)	-0.111*** (0.008)				
Year FE	Yes	Yes	Yes	Yes			
Country FE	No	Yes	Yes	No			
Country-Industry FE	No	No	No	Yes			
Obs.	9,215	9,213	9,213	9,138			
Adj. R2	0.011	0.009	0.009	0.001			

Dependent variable	Industry CPI (% YoY, monthly frequency)			
	Full sample	2019-2021		
	(1)	(2)		
Delivery Time $ imes$ Ex-Ante HHI	0.589** (0.282)	1.162*** (0.305)		
Delivery Time	$1.253^{*}$ (0.688)	2.600*** (0.648)		
Delta COGS $ imes$ Ex-Ante HHI				
Delta COGS				
Country-Industry-Year FE	Yes	Yes		
Year-Month FE	Yes	Yes		
Country-Industry FE	No	No		
Obs.	72,478	19,700		
Adj. R2	0.579	0.631		

# Macroeconomic Effects: Inflation, Supply Chain Shortages, and Concentration

Dependent variable	Industry CPI (% YoY, monthly frequency)						
	Full sample	2019-2021	Full sample	2019-2021			
	(1)	(2)	(3)	(4)			
Delivery Time $\times$ Ex-Ante HHI	0.589** (0.282)	1.162*** (0.305)	0.855*** (0.320)	1.348*** (0.209)			
Delivery Time	$1.253^{*}$ (0.688)	2.600*** (0.648)	2.483*** (0.831)	3.763*** (0.510)			
Delta COGS $\times$ Ex-Ante HHI			0.344*** (0.128)	0.994 (0.697)			
Delta COGS			1.812*** (0.463)	4.550** (2.008)			
Country-Industry-Year FE Year-Month FE Country-Industry FE	Yes Yes No	Yes Yes No	No Yes Yes	No Yes Yes			
Obs. Adj. R2	72,478 0.579	19,700 0.631	52,320 0.220	13,997 0.221			

# Macroeconomic Effects: Inflation, Supply Chain Shortages, and Concentration

## Inflation, Supply Chain Shortages, and Concentration: Other measures

Dependent variable	Industry CPI (% YoY, monthly frequency)						
Industry variable	CR4	CR4 Sales		% Sales of Stars		Has Star	
	Full sample	2019-2021	Full sample	2019-2021	Full sample	2019-2021	
	(1)	(2)	(3)	(4)	(5)	(6)	
Delivery Time $\times$ Industry Structure	0.407**	0.763 <sup>***</sup>	0.912***	1.034***	2.123***	2.320 <sup>**</sup>	
	(0.197)	(0.188)	(0.284)	(0.380)	(0.704)	(0.974)	
Delivery Time	1.176*	2.381***	1.015***	1.288***	-0.572	-0.427	
	(0.651)	(0.586)	(0.327)	(0.385)	(0.660)	(0.995)	
Country-Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes	
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes	
Obs.	72,478	19,700	57,289	18,702	57,289	18,702	
Adj. R2	0.579	0.630	0.605	0.635	0.605	0.635	

### Inflation, Supply Chain Shortages, and Concentration: Other measures

Dependent variable		Industry CPI (% YoY, monthly frequency)						
Industry variable	CR4	CR4 Sales		% Sales of Stars		Has Star		
	Full sample	2019-2021	Full sample	2019-2021	Full sample	2019-2021		
	(1)	(2)	(3)	(4)	(5)	(6)		
Delivery Time $\times$ Industry Structure	0.407**	0.763 <sup>***</sup>	0.912***	1.034***	2.123****	2.320**		
	(0.197)	(0.188)	(0.284)	(0.380)	(0.704)	(0.974)		
Delivery Time	1.176*	2.381***	1.015***	1.288***	-0.572	-0.427		
	(0.651)	(0.586)	(0.327)	(0.385)	(0.660)	(0.995)		
Country-Industry-Year FE	Yes	Yes	Yes	Yes	Yes	Yes		
Year-Month FE	Yes	Yes	Yes	Yes	Yes	Yes		
Obs.	72,478	19,700	57,289	18,702	57,289	18,702		
Adj. R2	0.579	0.630	0.605	0.635	0.605	0.635		

 $\Uparrow$  1.034pp in CPI for industries with 1-st.dev-above-mean sales of star firms:  $\sim$  24% of realized inflation (mean CPI: 4.33%)

Dependent variable	Industry CPI (% YoY, monthly frequency)					
	U	S	Europe			
	Full sample	2019-2021	Full sample	2019-2021		
	(1)	(2)	(3)	(4)		
Delivery Time $\times$ Ex-Ante HHI	0.965***	1.148***	1.121**	1.342**		
	(0.346)	(0.323)	(0.449)	(0.616)		
Delivery Time	3.106	4.466	1.928	5.986***		
	(5.316)	(8.888)	(1.245)	(2.103)		
Country-Industry-Year FE	Yes	Yes	Yes	Yes		
Year-Month FE	Yes	Yes	Yes	Yes		
Obs.	11,627	3,715	29,640	5,688		
Adj. R2	0.551	0.530	0.683	0.738		

## Inflation, Supply Chain Shortages, and Concentration: Geographical Differences

Dependent variable	Industry CPI (% YoY, monthly frequency)					
	U	S	Eur	ope		
	Full sample	2019-2021	Full sample	2019-2021		
	(1)	(2)	(3)	(4)		
Delivery Time $ imes$ Ex-Ante HHI	0.965 <sup>***</sup>	1.148***	1.121**	1.342**		
	(0.346)	(0.323)	(0.449)	(0.616)		
Delivery Time	3.106	4.466	1.928	5.986 <sup>***</sup>		
	(5.316)	(8.888)	(1.245)	(2.103)		
Country-Industry-Year FE	Yes	Yes	Yes	Yes		
Year-Month FE	Yes	Yes	Yes	Yes		
Obs.	11,627	3,715	29,640	5,688		
Adj. R2	0.551	0.530	0.683	0.738		

### Inflation, Supply Chain Shortages, and Concentration: Geographical Differences

 $\uparrow$  1.148pp in CPI for industries with 1-st.dev-above-mean delivery time and a 1-standard-deviation-above-the-mean HHI:  $\sim$  25% of realized inflation (mean CPI: 4.56%)

#### Conclusions

- Mechanism through which supply chain shortages can increase market power and lead to price hikes
- Large firms acquire market power following supply chain shortages because they are better equipped to withstand the disruptions
- Large firms increase their market shares and experience higher profit margins and markups when supply chain shortages occur
- Ex-ante more concentrated industries experience higher inflation following supply chain shortages

# Summary Statistics

Panel A				Firm-leve	l variables			
	No. obs	Mean	Std	Min	p25	Median	p75	Max
% Industry Sales	79,401	0.271	0.786	0.000	0.007	0.031	0.152	6.587
Change in % Industry Sales	79,133	0.001	0.074	-0.436	-0.003	0.000	0.003	0.470
Log Markups (Ayyagari, et al., 2023)	78,361	0.091	0.455	-2.834	0.057	0.132	0.231	1.014
Markups	78,383	1.168	0.331	0.054	1.059	1.141	1.260	2.757
Change in Markups	77,553	0.003	0.152	-0.688	-0.028	0.001	0.030	0.753
ROA	73,302	2.189	15.721	-81.353	-2.095	3.369	9.074	45.888
Change in ROA	71,730	0.050	8.405	-37.459	-2.370	0.021	2.404	38.136
Financing Constraints	68,225	0.266	0.442	0.000	0.000	0.000	1.000	1.000
Cash Available	79,073	0.270	0.444	0.000	0.000	0.000	1.000	1.000
Inventory	65,254	18.001	20.299	0.000	8.264	13.761	21.175	187.670
Delta COGS	77,592	0.090	0.414	-0.814	-0.078	0.033	0.166	2.798
Star	79,401	0.247	0.431	0.000	0.000	0.000	0.000	1.000
Mean Backlog	68,104	50.274	2.160	42.979	49.177	50.226	51.545	56.750
Delivery Time	79,401	-46.418	4.780	-51.481	-49.018	-47.640	-45.703	-22.848
Panel B	Industry-level variables							
	No. obs	Mean	Std	Min	p25	Median	p75	Max
Industry CPI (% YoY, monthly frequency)	91,873	1.646	6.858	-53.600	-0.400	1.300	3.400	193.700
CR4 (Sales)	91,873	0.905	0.180	0.430	0.912	1.000	1.000	1.000
HHI (Sales)	91,873	0.649	0.365	0.076	0.268	0.716	1.000	1.000
% Sales of Stars	86,841	70.798	36.247	0.000	60.413	89.061	95.852	100.000
Dummy Has Star	86,841	0.818	0.386	0.000	1.000	1.000	1.000	1.000
Delivery Time	52,843	-47.108	3.297	-56.502	-49.078	-47.985	-46.273	-16.858
Delta COGS	86,745	0.086	0.119	-0.254	0.023	0.074	0.135	0.557
Panel C				Shipment-le	vel variables			
	No. obs	Mean	Std	Min	p25	Median	p75	Max
1(Trade >0)	232,611	0.418	0.493	0.000	0.000	0.000	1.000	1.000
Containers	232,611	4.750	12.332	0.000	0.000	0.000	3.000	64.000
Shipments	232,611	3.052	7.198	0.000	0.000	0.000	2.000	36.000
Weight (tons)	232,611	107.123	377.995	0.000	0.000	0.000	14.960	1,909.190
Volume (TEÚ)	232,611	6.423	18.592	0.000	0.000	0.000	2.000	98.750
Quantity (1,000s)	232,611	3.409	10.803	0.000	0.000	0.000	0.618	58.270

### Shipment-level Poisson Regression

Dependent variable	Containers	Shipments	Weight	Volume	Quantity
	(1)	(2)	(3)	(4)	(5)
Star $ imes$ Delivery Time	0.177***	0.104***	0.127***	0.182***	0.320***
	(0.032)	(0.029)	(0.031)	(0.035)	(0.052)
Star	0.168***	0.213***	0.144***	0.104*	-0.004
	(0.052)	(0.047)	(0.028)	(0.056)	(0.069)
Supplier-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
Firm's Industry-Year-Qtr FE	Yes	Yes	Yes	Yes	Yes
Obs.	169,462	169,462	169,411	153,346	169,462
Pseudo R2	0.501	0.437	0.680	0.549	0.585