

# How Wide Is the Firm Border?

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# A Fundamental Question

“Theory of the firm” a central issue in economics since Coase (1937)

Key question: When are transactions more efficiently moderated by firms than by markets?

Theories appeal to some benefit of bringing transactions inside the firm

- Transaction costs savings
- Residual decision rights

# A Fundamental Question

These benefits are almost always motivated intuitively and qualitatively

Little explicit quantification

Reason: Measurement of these benefits is inherently difficult

- Shadow values dominate
- Trying to “piece together” values from components (e.g., transaction costs) requires incredibly detailed and typically unobtainable data
- Even if measurement were possible in specific data-heavy environments, results would be case specific with unclear generality

# Our Approach

We offer a new approach to measure what makes a firm a firm

Use “revealed preference” of firms’ shipment patterns to downstream units that they own versus those they do not

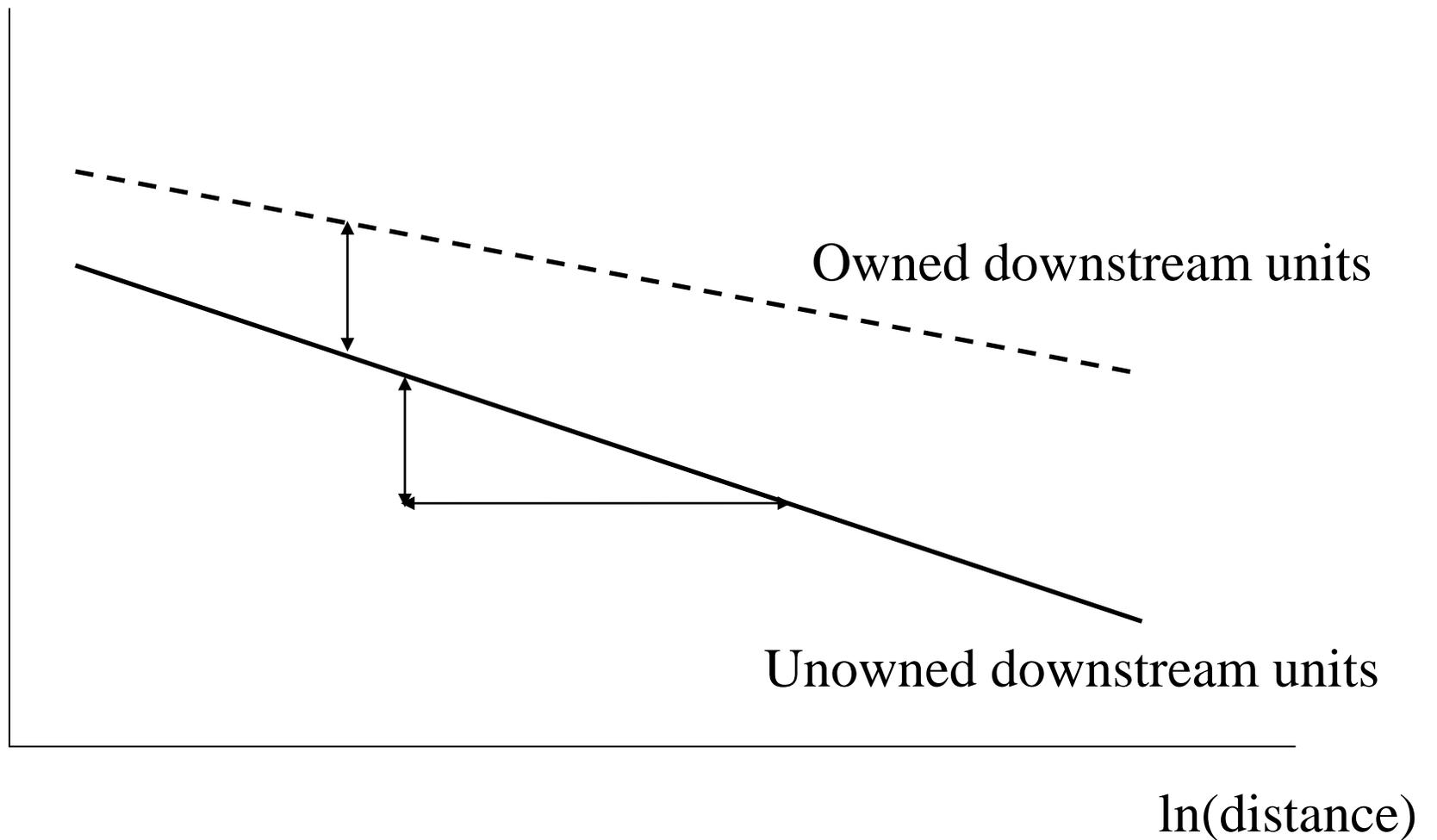
- Gravity model (and data): transaction volumes decline with distance
- Differential willingness to ship by distance to owned versus unowned units reflects additional benefit of internal transactions

Yields a cardinal metric of benefits *at the transaction level*

Pretty generalizable, too: data cover millions of transactions across goods-producing and goods-moving sectors of the U.S.

# Our Approach: Illustration

Volume of shipments



# Summary of Results

On average, ownership related to same boost in shipments as a 30-40% reduction in distance to the downstream recipient

- Median shipment distance in sample is 250 miles

Ownership boost stronger for:

- More distant shipments
- High value-to-weight products
- Producers in less capital-intensive industries
- Goods makers rather than pure shippers (e.g., warehouses)
- Differentiated products

# Empirical Specification

We use an augmented gravity model

- Derived from primitives using our modified version of Eaton, Kortum, and Sotelo (2012)
- Allows for zeroes (by far the most common observation in our data)

$$E \left[ \frac{X_{zi^e}}{X_z} \right] = \exp\{\alpha_1 \ln(\text{miles}_{z \leftarrow i}) + \alpha_2 s_{zi^e} + \alpha_3 s_{zi^e} \ln(\text{miles}_{z \leftarrow i}) + \alpha_{i^e} + \alpha_z\}$$

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Expected share of shipments originating at establishment  $i^e$  located in zip code  $z^e$  ending up in zip code  $z$  is a function of:

- Distance from  $i^e$  to  $z$
- $s_{zi^e}$ , (expenditure-weighted) share of downstream establishments in  $z$  that are owned by the firm that owns  $i^e$
- Their interaction
- Origin and destination fixed effects

Implemented as FE Poisson model. Two-sided FEs are computationally impractical; we instead keep origin establishment FEs while controlling for destination-specific “multilateral resistance” terms

# Data: U.S. Commodity Flow Survey

Random sample of establishments and their shipments in 2007

Covers goods-producing (mining, manufacturing, publishing) and goods-distributing (wholesale) sectors

Shipments sampled in one week of each quarter

Total coverage is 58,000 establishments and 4.3 million shipments

- Origin and destination ZIP, distance, dollar value, weight, & more
- Critically, also: owning-firm ID
  - We link commonly owned establishments using the Census LBD

We focus on 35,000 establishments in multi-unit firms

Establishment shipments are aggregated by zip code

# Results: Summary Stats

## Sample:

- 174 million  $i^e$ - $z$  pairs
- 3.5 million shipments
- 34,800 shipping establishments

On average six times as many downstream establishments in  $i^e$ 's firm in destination zips where  $i^e$  ships than zips where it does not

- Still, not many overall; mean number of downstream establishments to  $i^e$  across zip codes is about 30, but only 1% are owned.

Owned downstream establishments located closer than non-owned

# Results: Main Specifications

Dependent Variable: $\frac{X_{zite}}{X_z}$						
	(1)	(2)	(3)	(4)	(5)	(6)
Same-firm ownership fraction	3.164 (0.059)	3.487 (0.059)	3.626 (0.059)	3.186 (0.052)	3.489 (0.054)	3.587 (0.056)
Log mileage	-0.915 (0.003)	-0.955 (0.003)	-0.936 (0.004)			
Distance $\leq 50$ miles				3.679 (0.015)	3.8546 (0.015)	3.902 (0.017)
Distance $\in (50, 100]$ miles				2.635 (0.015)	2.809 (0.015)	2.835 (0.016)
Distance $\in (100, 200]$ miles				1.754 (0.013)	1.904 (0.013)	1.901 (0.014)
Distance $\in (200, 500]$ miles				0.716 (0.008)	0.811 (0.0109)	0.764 (0.010)
Distance $\geq 1000$ miles				-0.494 (0.010)	-0.592 (0.013)	-0.372 (0.020)
Multilateral Resistance	None	Unweighted	Weighted	None	Unweighted	Weighted

Coeffs imply adding same-firm downstream establishment to a zip increases shipment share the same amount as a 40% drop in distance

# Results: Main Specifications

Dependent Variable: $\frac{X_{zje}}{X_z}$	(1)	(2)	(3)	(4)	(5)
Same-firm ownership fraction	4.191 (0.051)			3.376 (0.032)	3.921 (0.033)
Log mileage	-0.957 (0.003)	-0.957 (0.003)	-0.956 (0.003)	-0.951 (0.001)	-0.952 (0.001)
Interaction between log mileage and same-firm ownership fraction	0.385 (0.029)				0.292 (0.018)
Indicator: Number of downstream same-firm establishments > 0		1.421 (0.019)			
Number of downstream same-firm establishments			0.206 (0.013)		
Destination Zip Code Fixed Effects	No	No	No	Yes	Yes
Multilateral Resistance	Unweighted	Unweighted	Unweighted	None	None

Interaction implies adding same-firm downstream establishment to zips at 10<sup>th</sup>, 50<sup>th</sup>, and 90<sup>th</sup> percentile distances increases shipments by same amounts as declines in distance of (respectively) 39%, 44%, and 46%

# Results: Heterogeneity

We interact ownership with industry- or commodity-level characteristics

- “Distance premium” of establishments shipping commodities with above-median value-to-weight ratios is 55%; below median is 35%
- Establishments in industries below median K/L have a distance premium of 55%; those above median 45%
- Establishments that are wholesalers have a distance premium of 35%; other industries have 48%
- Establishments producing “differentiated” (Rauch, 1999) commodities have a 52% distance premium, those making reference-priced commodities 38%, those in exchange markets have 45%

# Results: “Incidental” Ownership Changes

Ownership, location, and shipment propensity could be jointly determined

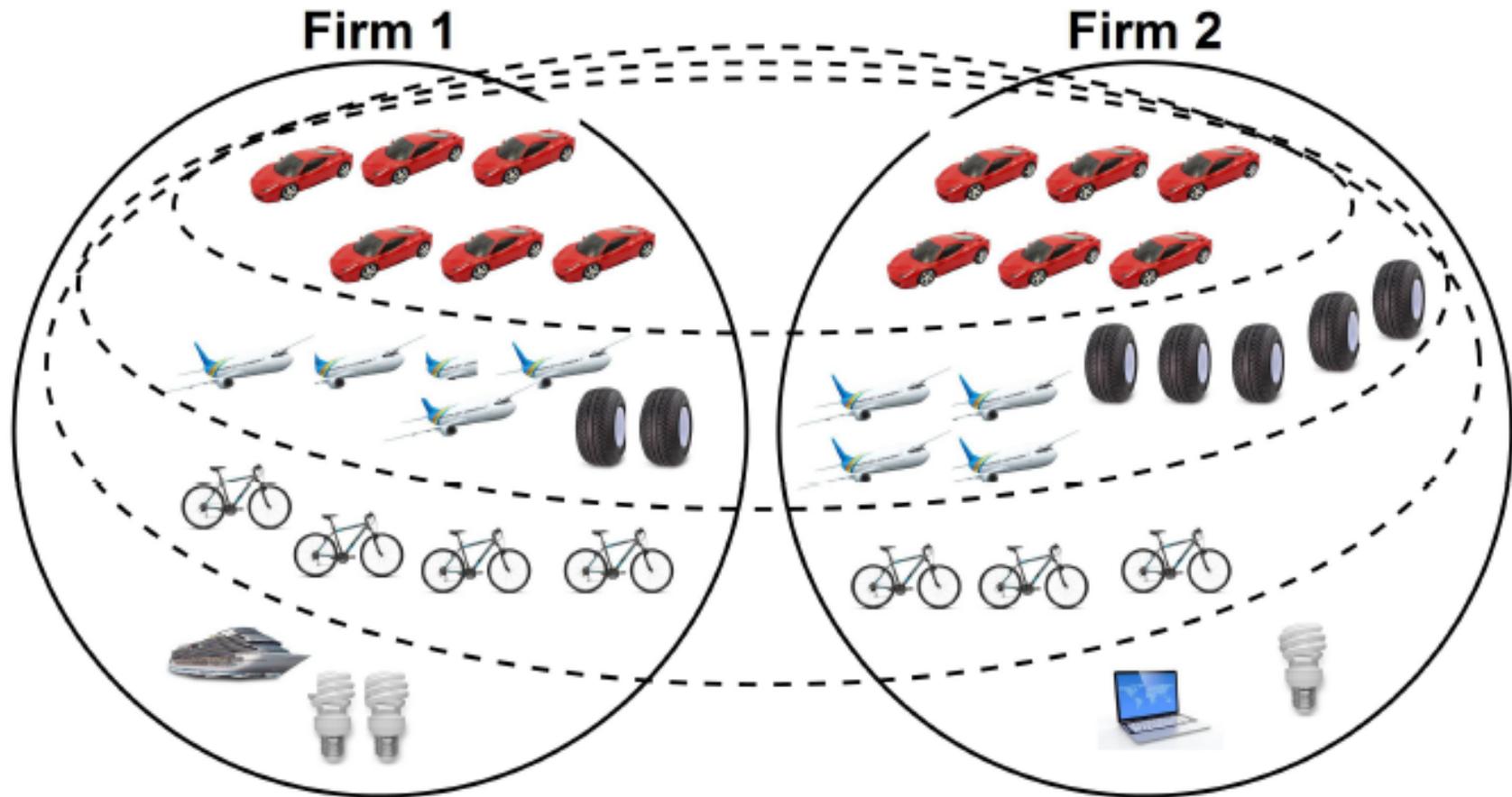
We use “incidental mergers” (Hastings and Gilbert, 2005; Hortaçsu and Syverson, 2007) to identify changes in ownership that are more likely to be exogenous

“Incidental mergers”:

- When two firms merge, their secondary and tertiary lines of business were unlikely to trigger the merger and therefore more likely to have common ownership that is incidental
- We instrument for ownership using firms shares of “lesser” establishments after mergers

# Results: "Incidental" Ownership Changes

Figure 2: Incidental Merger Example



# Results: “Incidental” Ownership Changes

<b>Dependent Variable:</b> $\frac{X_{zie}}{X_z}$				
	(1)	(2)	(3)	Baseline OLS
Log Mileage	-0.956 (0.003)	-0.955 (0.003)	-0.956 (0.003)	-0.955 (0.003)
Same-firm ownership fraction	2.572 (0.584)	2.791 (0.291)	2.633 (0.294)	3.487 (0.059)
Residual from first the Stage	0.925 (0.586)	0.703 (0.296)	0.861 (0.299)	– –
<i>First Stage:</i>				
Fraction of establishments in z in an incidental merger	1.051 (0.001)	1.040 (0.001)	1.032 (0.001)	– –
Number of segments	1	2	3	–

Adding same-firm downstream establishment to a zip increases shipment share by amount equal to 30% drop in distance

# Results: Macro Implications

Apply version of Caliendo and Parro (2015) and Caliendo et al. (2016) to compute implied macroeconomic implications of trade cost reductions of common ownership

- Model contains geographic input-output structure (MSA x 29 industries) of heterogeneous producers
- Implies a gravity-type equation
- Predicts trade flows, wages, and output.

Using our estimated distance and ownership coefficients, we compute counterfactual outcomes when common ownership either eliminated or increased 10-fold

# Results: Macro Implications

Same-firm ownership fraction	0×	10×	0×	10×
Welfare	-0.7%	2.8%	-0.7%	2.9%
Gross Output	-1.2%	0.8%	-1.2%	1.1%
Is labor mobile?	Yes	Yes	No	No

# Conclusions (Tentative)

We propose a new way to quantify the benefits of ownership—what is gained when transactions are brought within a firm

Ownership has considerable effects on transactions at both the micro and macro levels

There's a lot more to do