

# Firms in International Trade: Firm Heterogeneity, Productivity and Trade



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**Explaining Export Growth**  
**World Bank Trade Course**  
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# Overview

- What is new in the last decade?
  - New data
  - New facts
  - New theory
- What will be new in the next decade?
  - More new data
  - Another round of facts
  - New theory

# Old and 'New' Trade Theory

- Old Trade Theory
  - Heckscher, Ohlin, Ricardo
  - Comparative advantage drives trade
  - A world of industries, factors, and countries
  - No firms
- 'New' Trade Theory
  - Krugman, Helpman, Ethier
  - Differentiated varieties, increasing returns
  - Intra-industry trade in horizontally-differentiated varieties
  - Symmetric (identical) firms

# Challenges to Old and 'New' Trade Theory

- Exporting firms are rare
- Exporting firms are everywhere
- Exporters are different
- Performance induces exporting
- Exporting does not drive productivity
- Trade induces reallocation (intra-industry)

## Table 2: Exporting and Exporting Firms in U.S. Manufacturing, 2002

NAICS Industry	Percent of Firms	Percent of Firms that Export	Mean Exports as a Percent of Total Shipments
311 Food Manufacturing	7.5	15	15
312 Beverage and Tobacco Product	0.8	21	9
313 Textile Mills	1.1	27	14
314 Textile Product Mills	1.7	14	11
315 Apparel Manufacturing	2.7	8	14
316 Leather and Allied Product	0.3	24	15
321 Wood Product Manufacturing	5.2	10	17
322 Paper Manufacturing	2.1	28	9
323 Printing and Related Support	10.1	6	13
324 Petroleum and Coal Products	1.0	12	13
325 Chemical Manufacturing	4.5	35	16
326 Plastics and Rubber Products	5.3	30	11
327 Nonmetallic Mineral Product	5.8	9	13
331 Primary Metal Manufacturing	1.8	33	11
332 Fabricated Metal Product	17.8	16	12
333 Machinery Manufacturing	8.7	36	16
334 Computer and Electronic Product	4.6	40	23
335 Electrical Equipment, Appliance,	1.9	41	13
336 Transportation Equipment	3.8	34	14
337 Furniture and Related Product	5.4	8	9
339 Miscellaneous Manufacturing	7.8	19	15
Aggregate Manufacturing	100	20	15

## Table 3: Exporter Premia in U.S. Manufacturing, 2002

	(1)	(2)	(3)
Log Employment	1.19	0.97	.
Log Shipments	1.48	1.08	0.08
Log Value Added per Worker	0.26	0.11	0.10
Log Productivity (TFP)	0.02	0.03	0.05
Log Wage	0.17	0.06	0.06
Log Capital per Worker	0.32	0.12	0.04
Log Skill per Worker	0.19	0.11	0.19
Additional Covariates	None	Industry Fixed Effects	Industry Fixed Effects, Log Employment

Exporters are bigger, faster and stronger.

# Exporting and Performance

- Large, productive firms become exporters
  - U.S. - Bernard and Jensen
  - Germany - Bernard and Wagner
  - Mexico, Colombia, Morocco - Clerides, Lach, and Tybout
  - Many others
- Exporters do not become more productive
- Exporters do grow faster, die less often

# Theoretical Responses

- Bernard, Eaton, Jensen and Kortum (2003)
- Melitz (2003)
- Bernard, Redding, Schott (2007)

# Theoretical Responses

- Heterogeneous firms
  - Fixed, innate productivity (differs across firms)
  - Single product, horizontally differentiated
  - Increasing returns
- Costs of exporting
  - Variable and fixed
- Predictions
  - High productivity firms become exporters
  - Trade liberalization leads to aggregate productivity growth through reallocation
    - Deaths, New exporters, Expanding exporters

# Plant Death and Productivity Growth

Regressor	Logit Plant Death	OLS TFP Growth
Change in Trade Cost	-6.669 **	-2.321 *
Relative Productivity	-0.202 ***	-0.545 ***
x Change in Trade Cost	12.178 **	0.545
Exporter	-0.398 ***	0.008
x Change in Trade Cost	4.179	1.182
US MNC	0.249 ***	0.022 **
x Change in Trade Cost	-3.823	2.138 **

# Summary

Firms (and firm heterogeneity) matter

- Reallocation within industries (productivity  $\uparrow$ )
- New source of welfare gains
- Role for trade in firm turnover and labor market churning
- Lingering questions about the nature of trade costs
- More work to do on which firms enter and why

# Implications for policy

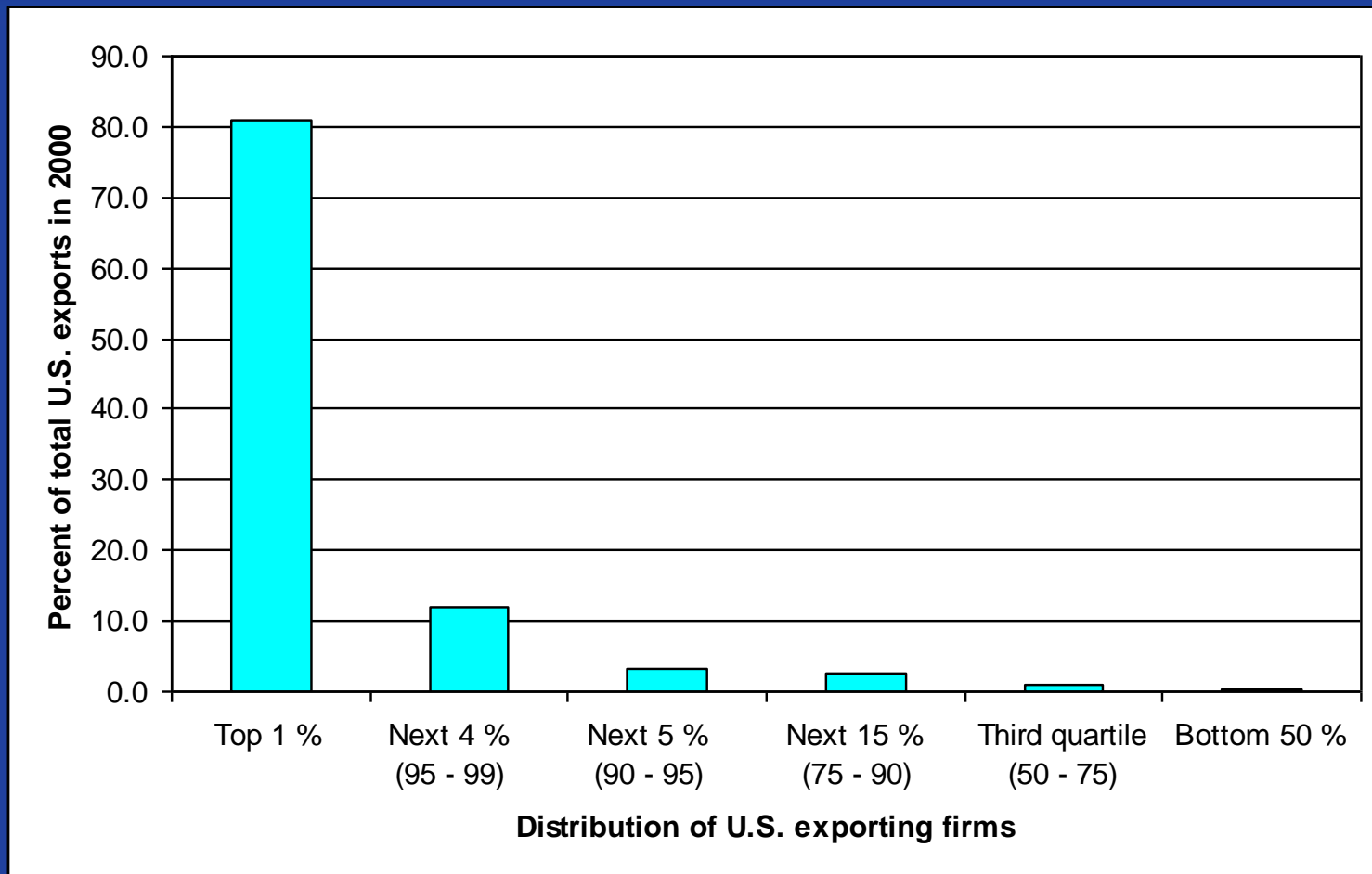
Trade cost reductions lead to

- Higher industry productivity
- Increased firm failure rates
- Great uncertainty about employer-employee job matches

# New Data - Export Transactions

- Linked/Longitudinal Firm Trade Transaction Database (LFTTD)
  - Transaction level trade data
    - Universe of US import and export transactions, 1992-2005
    - Date of shipment
    - Firm and related party (multinational) identifiers
    - Country of origin/destination
    - Product identifier
    - Value and quantity (prices)
    - Mode of transport

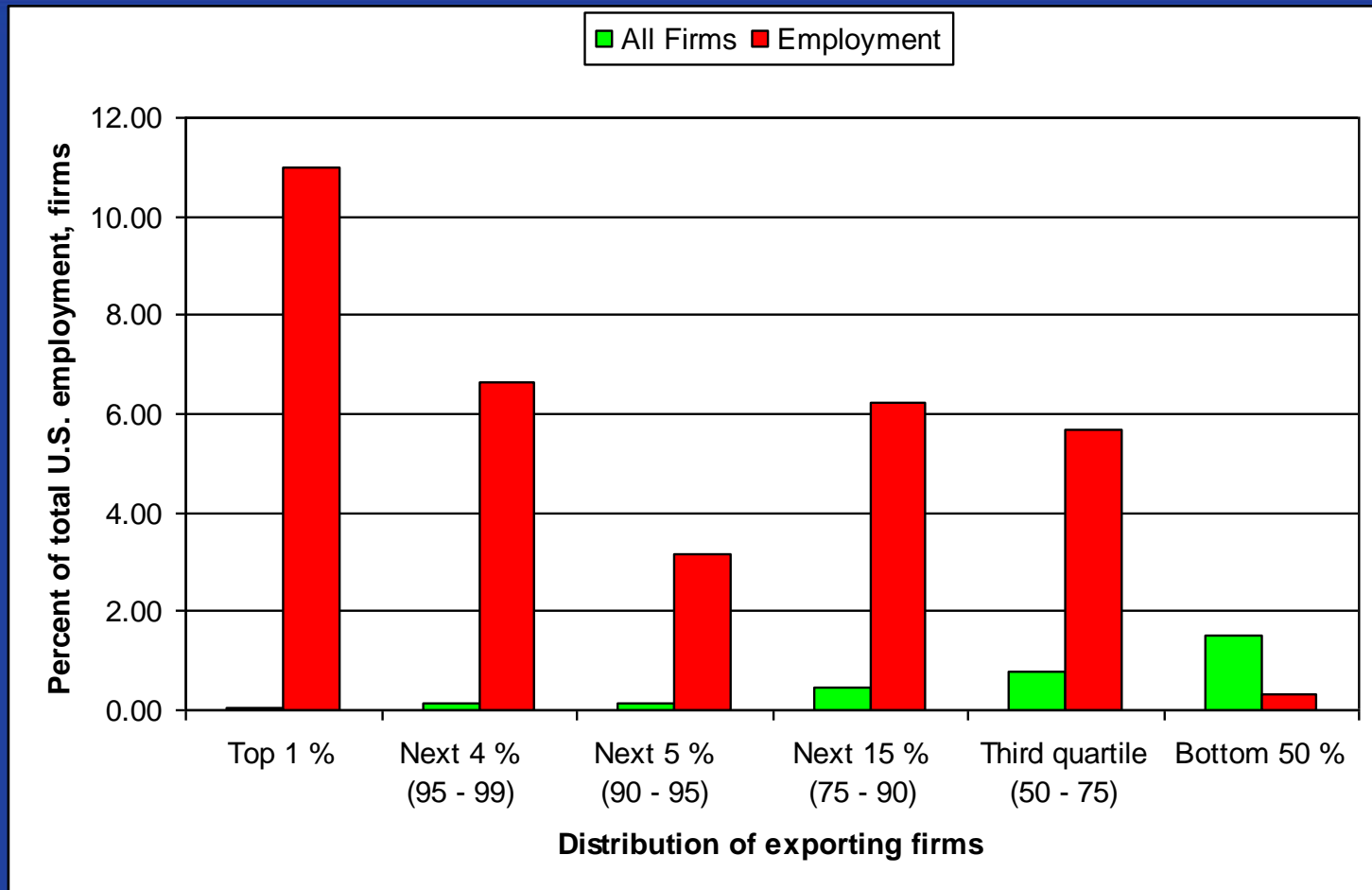
# U.S. trade is very concentrated



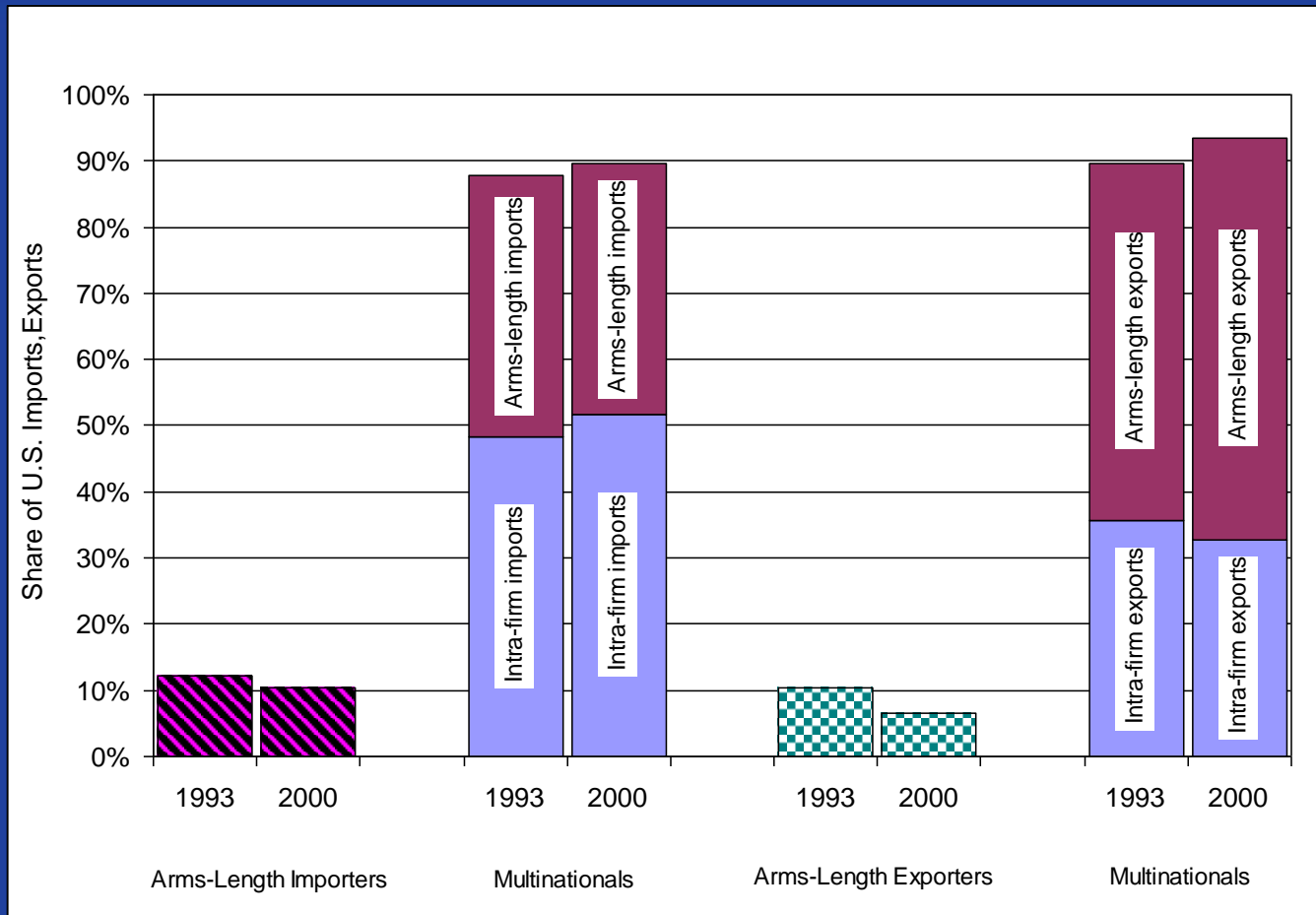
# Trade Concentration

	Gini Coefficient	
	Coefficient	Std Error
Exports	0.972	0.002
Imports	0.965	0.003
Exports+Imports	0.971	0.002
Manufacturing Shipments	0.916	0.004

# Not many firms, lots of employment



# Multinationals dominate U.S. trade



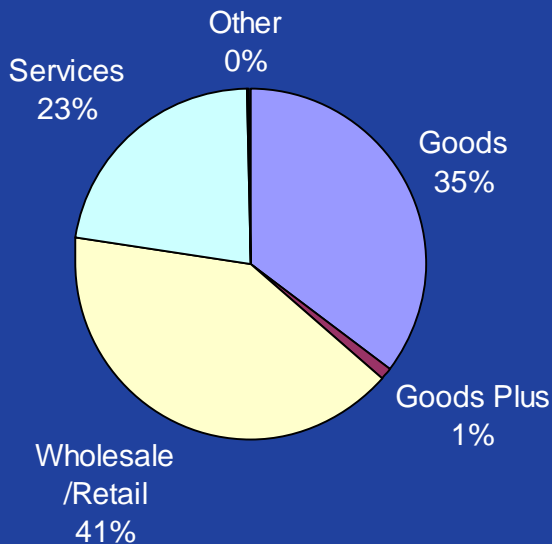
# Trade by Firm Type

- Firms are divided into 5 types based on the distribution of their US employment
  - *Goods*
    - 75+% employment in Manufacturing, Mining, Agriculture
  - *Goods plus*
    - 25-75% employment in Goods
  - *Wholesale/Retail*
    - 75+% employment in Wholesale or Retail Trade
  - *Services*
    - 75+% employment other sectors (e.g. FIRE)
  - *Other*
    - All remaining firms

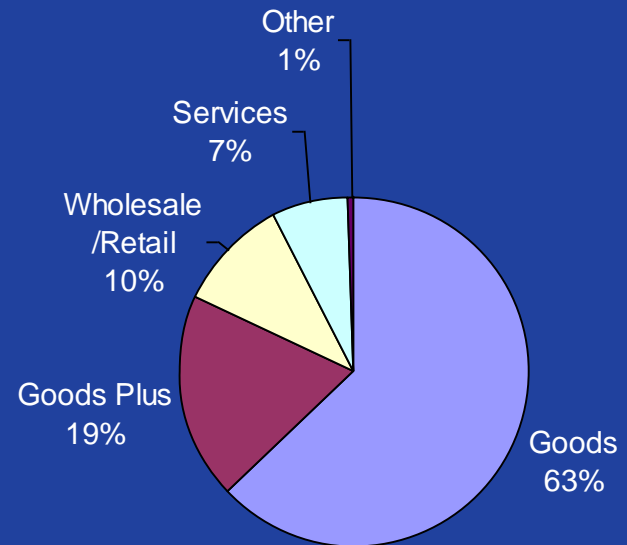
# Distribution of Firms and Exports by Type - 2000

## Goods Producers, Wholesale/Retail and Services

### Exporters



### Export Value



# Table 4: Exporters, Products and Countries

Share of Exporting Firms						
Number of Products	Number of Countries					All
	1	2	3	4	5+	
1	40.4	1.2	0.3	0.1	0.2	42.2
2	10.4	4.7	0.8	0.3	0.4	16.4
3	4.7	2.3	1.3	0.4	0.5	9.3
4	2.5	1.3	1.0	0.6	0.7	6.2
5+	6.0	3.0	2.7	2.3	11.9	25.9
All	64.0	12.6	6.1	3.6	13.7	100

Share of Export Value						
Number of Products	Number of Countries					All
	1	2	3	4	5+	
1	0.20	0.06	0.02	0.02	0.07	0.4
2	0.10	0.12	0.04	0.03	0.15	0.5
3	0.19	0.07	0.05	0.03	0.19	0.5
4	0.12	0.08	0.08	0.04	0.27	0.6
5+	2.63	1.23	1.02	0.89	92.2	98.0
All	3.3	1.5	1.2	1.0	92.9	100

## Table 5: Exporters and Products Intensive and Extensive Margins

	(1)	(2)
Log Number of Products	0.23	0.27
Log Mean Shipments/Product	1.25	0.73
Additional Covariates	None	Industry Fixed Effects

Exporters produce more products and more output per product. The intensive and extensive margins are positively correlated.

# Gravity Reconsidered

- Exports to a country can be decomposed

$$X_d = N_d M_d \bar{x}_d, \quad \bar{x}_d \equiv \frac{1}{N_d} \frac{1}{M_d} \sum_f \sum_p x_{fpd},$$

# of firms      # of products

- Simple gravity regression for each component*

$$\ln Z_d = \gamma + \delta \ln dist_d + \lambda \ln GDP_d + \varepsilon_d$$

## Table 6: Gravity and U.S. Exports

	Total Export Value	Number of Exporting Firms	Number of Exported Products	Export Value per Product per Firm
$GDP_{ct}$	0.98 ***	0.71 ***	0.52 ***	-0.25 ***
$Distance_{ct}$	-1.36 ***	-1.14 ***	-1.06 ***	0.84 ***
Observations	175	175	175	175
R <sup>2</sup>	0.82	0.74	0.64	0.25

Extensive margins are important for aggregate trade volumes. Exports are higher to closer, wealthier countries because more firms participate and more products are exported.

# Table 7: Trade and U.S. Manufacturing Firms, 1997

NAICS Industry	Percent of All Firms	Percent of Firms that Export	Percent of Firms that Import	Percent of Firms that Import & Export
311 Food Manufacturing	7	17	10	7
312 Beverage and Tobacco Product	1	28	19	13
313 Textile Mills	1	47	31	24
314 Textile Product Mills	2	19	13	9
315 Apparel Manufacturing	6	16	15	9
316 Leather and Allied Product	0	43	43	30
321 Wood Product Manufacturing	5	15	5	3
322 Paper Manufacturing	1	42	18	15
323 Printing and Related Support	13	10	3	2
324 Petroleum and Coal Products	0	32	17	14
325 Chemical Manufacturing	3	56	30	26
326 Plastics and Rubber Products	5	42	20	16
327 Nonmetallic Mineral Product	4	16	11	7
331 Primary Metal Manufacturing	1	51	23	21
332 Fabricated Metal Product	20	21	8	6
333 Machinery Manufacturing	9	47	22	19
334 Computer and Electronic Product	4	65	40	37
335 Electrical Equipment, Appliance,	2	58	35	30
336 Transportation Equipment	3	40	22	18
337 Furniture and Related Product	6	13	8	5
339 Miscellaneous Manufacturing	7	31	19	15
Aggregate Manufacturing	100	27	14	11

## Table 8: Premia at Trading Firms, 1997

	Exporter Premia	Importer Premia	Exporter & Importer Premia
Log Employment	1.50	1.40	1.75
Log Shipments	0.29	0.26	0.31
Log Value Added per Worker	0.23	0.23	0.25
Log TFP	0.07	0.12	0.07
Log Wage	0.29	0.23	0.33
Log Capital per Worker	0.17	0.13	0.20
Log Skill per Worker	0.04	0.06	0.03

Importers are bigger, faster and stronger too.

## Table 8: Gravity and U.S. Imports

	Total Import Value	Number of Importing Firms	Number of Imported Products	Import Value per Product per Firm
$GDP_{ct}$	1.14 ***	0.82 ***	0.71 ***	-0.39 ***
$Distance_{ct}$	-0.73 ***	-0.43 ***	-0.61 ***	0.31
Observations	175	175	175	175
$R^2$	0.69	0.78	0.74	0.25

Extensive margins are important for aggregate trade volumes. Imports are higher from closer, wealthier countries because more firms import and more products are imported.

# Conclusions

The new facts about firms in international trade are changing the way we think about trade

- Trade is very concentrated
- The big exporting firms are also importers
- Multinationals dominate trade
- Importing firms are also bigger, faster and stronger
- Large exporters ship many products to many countries
- Across countries, extensive margins matter
  - Number of firms
  - Number of products