14.581: International Trade
— Lecture 13—
Trade Costs and Gravity (Empirics I)

Plan for Today's Lecture

1. Introduction to trade costs

2. Estimating trade costs via direct measurement

3. Using price dispersion and price gaps to infer trade costs.

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1. **Introduction to trade costs**

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Measuring Trade Costs: What do we mean by 'trade costs'?

- The sum total of all of the costs that impede trade from origin to destination.
- This includes:
  - Tariffs and non-tariff barriers (quotas etc).
  - Transportation costs.
  - Administrative hurdles.
  - Corruption.
  - Contractual frictions.
  - The need to secure trade finance (working capital while goods in transit).
- NB: There is no reason that these 'trade costs' occur only on international trade.

Introduction: Why care about trade costs?

- They enter many modern models of trade, so empirical implementations of these models need an empirical metric for trade costs.

- There are clear features of the international trade data that seem hard (but not impossible) to square with a frictionless world.

- As argued by Obstfeld and Rogoff (Brookings, 2000), trade costs may explain 'the six big puzzles' of international macro.

- Trade costs clearly matter for welfare calculations.

- Trade costs could be endogenous and driven by the market structure of the trading sector; this would affect the distribution of gains from trade. (E.g., a monopolist on transportation could extract all of the gains from trade.)

Are Trade Costs 'Large'?

- There is considerable debate (still unresolved) about this question.
- Arguments in favor:
    - Trade falls very dramatically with distance (see Figures). Need large trade costs to rationalize trade flows in standard (i.e. gravity) trade models.
    - Clearly haircuts are not very tradable but a song on iTunes is. Everything else is in between.
    - Contractual frictions of sale at a distance (Avner Greif's 'Fundamental Problem of Exchange') seem potentially severe.
    - One often hears the argument that a fundamental problem in developing countries is the poor quality of their transportation infrastructure (i.e. ports, roads, etc). E.g., see colorful anecdotes in *Economist* article on traveling with a truck driver in Cameroon.

Are Trade Costs 'Large'?

- Arguments against:
  - Inter- and intra-national shipping rates aren't that high: in March 2010 (even at relatively high gas prices) a California-Boston refrigerated truck journey cost around $5,000$. Fill this with grapes and they will sell at retail for around $100,000$.
  - Tariffs are not that big (nowadays).
  - Repeated games and reputations/brand names are likely to circumvent any high stakes contractual issues.
- Surprisingly little hard evidence has been brought to bear on these issues.
- One area where there has been a lot of work, as we shall see, involves estimating gravity equations, where a robust finding is that trade costs are large and trade appears to fall very rapidly with distance.

Trade Falls with Distance: Leamer (JEL 2007)

From Germany. Visual evidence for the gravity equation

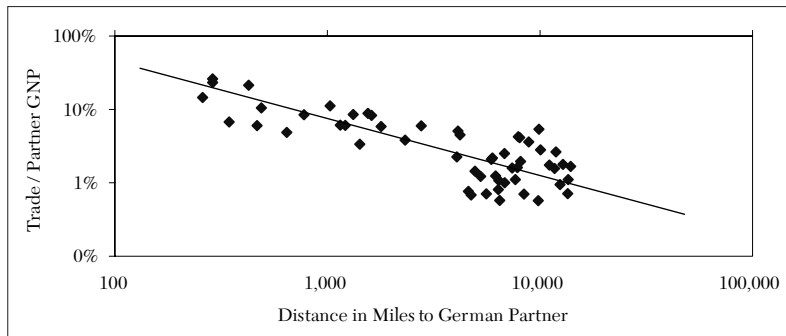*Leamer: A Review of Thomas L Friedman's* The World is Flat   111

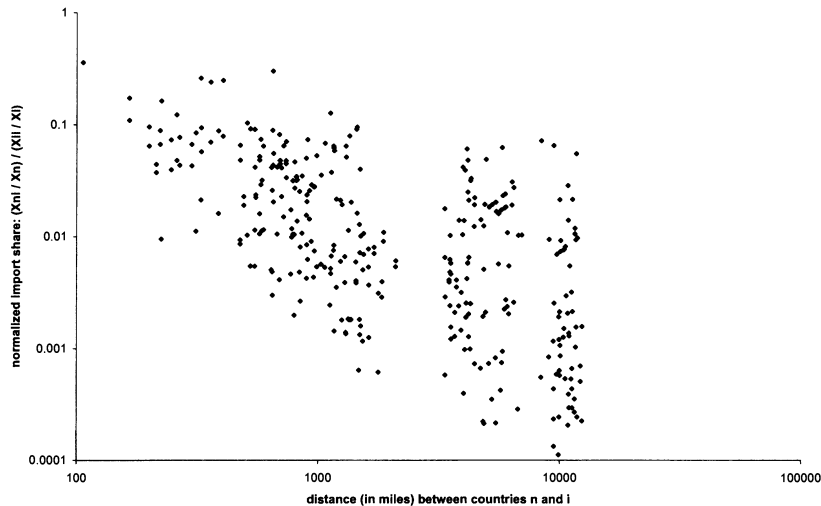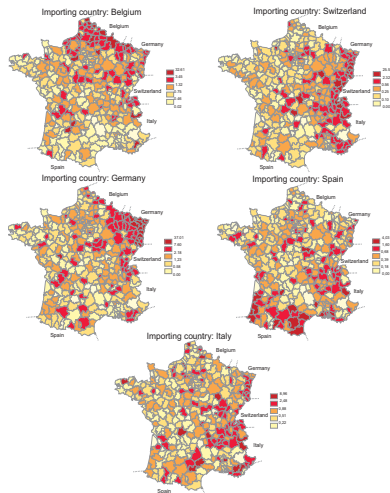*Figure* 8. West German Trading Partners, 1985

FIGURE 1.—Trade and geography.

Trade Falls with Distance: Inside France

Crozet and Koenig (2009): Intensive Margin
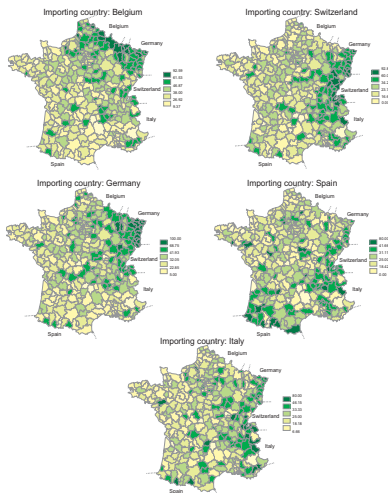

Figure 1: Mean value of individual-firm exports (single-region firms, 1992)

Trade Falls with Distance: Inside France
Crozet and Koenig (2009): Extensive Margin

Figure 2: Percentage of firms which export (single-region firms, 1992)

Trade Falls with Distance: Inside the US

Hilberry and Hummels (EER 2008) using zipcode-to-zipcode data
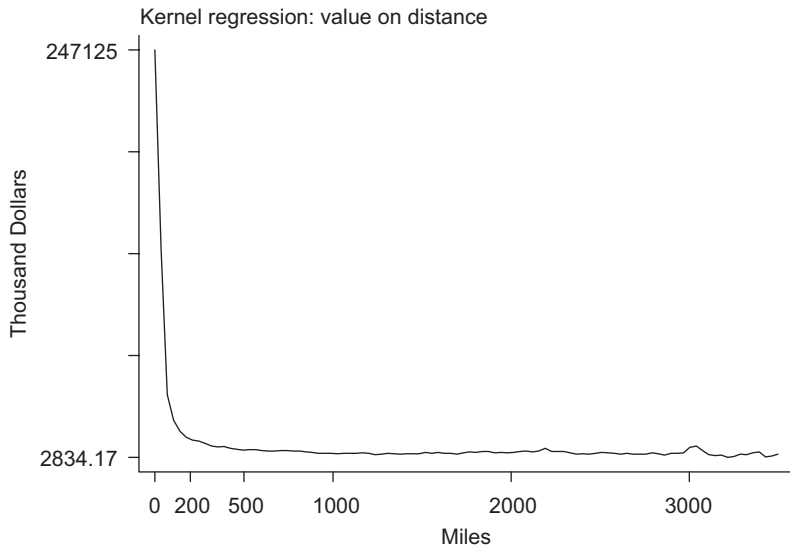
Kernel regression: value on distance

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Direct Measurement of Trade Costs

- The simplest way to measure TCs is to just go out there and measure them directly.

- Many components of TCs are probably measurable. But many aren't (that would be a bit like measuring firms' marginal costs—notoriously hard to do).

- Still, this sort of descriptive evidence is extremely valuable for getting a sense of things.

- Examples of creative sources of this sort of evidence:
  - Hummels (JEP, 2007) survey on transportation.
  - Anderson and van Wincoop (JEL, 2004) survey on trade costs.
  - Limao and Venables (2008) on shipping.
  - Barron and Olken (JPE 2008) on bribes and trucking in Indonesia.
  - Fafchamps (2004 book) on traders and markets in Africa.

Figure 1
Worldwide Air Revenue per Ton-Kilometer
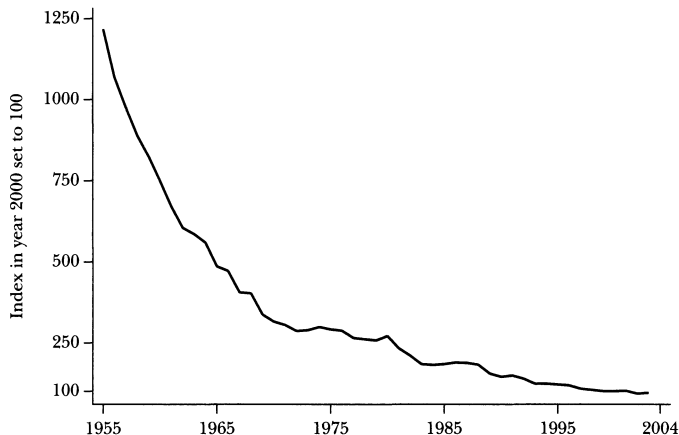
Source: International Air Transport Association, *World Air Transport Statistics,* various years.
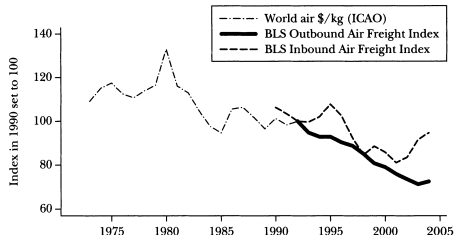
Direct Measures: Hummels (2007)

Air shipping prices falling.

Figure 2
Air Transport Price Indices

Source: International Civil Aviation Organization (ICAO), "Survey of Air Fares and Rates," various years; U.S. Department of Labor Bureau of Labor Statistics (BLS) import/export price indices, http://www.bls.gov/mxp/.

Notes: ICAO Data on Route Groups:

Annualized growth rates for 1973–80 of shipping price per kg (in year 2000 dollars): All routes 2.87; North Atlantic 1.03; Mid Atlantic 3.45; South Atlantic 3.98; North and Mid Pacific −3.43; South Pacific −2.49; North to Central America 3.63; North and Central America to South America 2.34; Europe to Middle East 4.80; Europe and Middle East to Africa 1.84; Europe/Middle East/Africa to Asia/Pacific 3.32; Local Asia/Pacific 0.97; Local North America 1.63; Local Europe 4.51; Local South America 2.53; Local Middle East 1.92; Local Africa 4.94.

Annualized growth rates for 1980–93 of shipping price per kg (in year 2000 dollars): All routes −2.52; North Atlantic −3.59; Mid Atlantic −3.36; South Atlantic −3.92; North and Mid Pacific −1.48; South Pacific −0.98; North to Central America −0.72; North and Central America to South America −1.34; Europe to Middle East −3.02; Europe and Middle East to Africa −2.34; Europe/Middle East/Africa to Asia/Pacific −2.78; Local Asia/Pacific −1.52; Local North America −1.73; Local Europe −2.63; Local Central America 0.97; Local South America −2.25; Local Middle East −1.46; Local Africa −2.43.

Figure 3
Tramp Price Index
(with U.S. GDP deflator and with commodity price deflator)
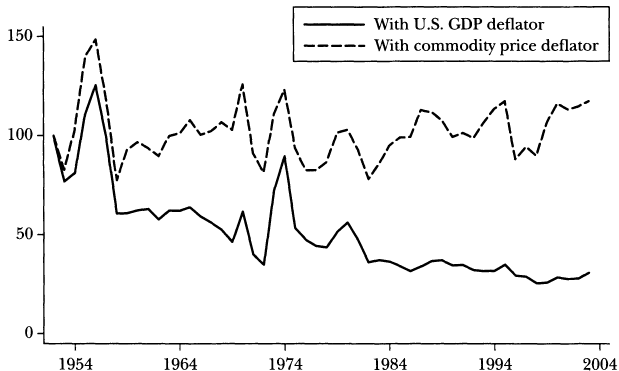
Source: United Nations Conference on Trade and Development, *Review of Maritime Transport,* various years.
Note: Tramp prices deflated by a U.S. GDP deflator and tramp prices deflated by commodity price deflator.

Direct Measures: Hummels (2007)

Sea shipping has (surprisingly, given containerization) not moved much.

Figure 4

Liner Price Index

(with German GDP deflator and with German traded goods price deflator)
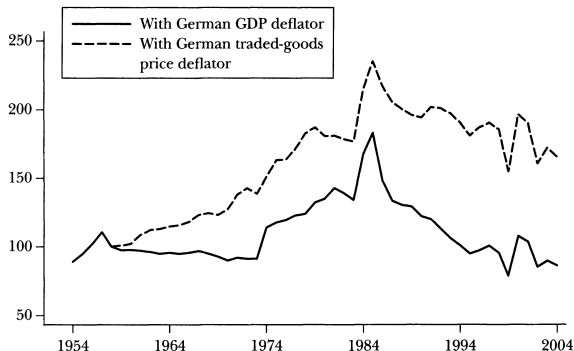
Source: United Nations Conference on Trade and Development *Review of Maritime Transport,* various years.

Note: Liner prices deflated by a German GDP deflator and liner prices deflated by a German traded-goods price deflator.

Figure 5

Ad Valorem Air Freight
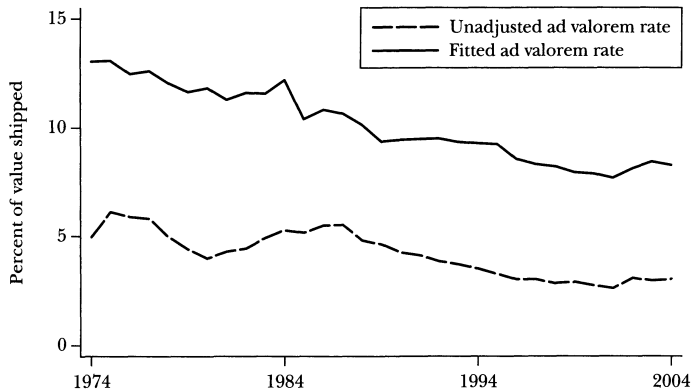
Source: Author's calculation based on U.S. Census Bureau *U.S. Imports of Merchandise.*
Note: The unadjusted ad valorem rate is simply expenditure/import value. The fitted ad valorem rate is derived from a regression and controls for changes in the mix of trade partners and products traded.

Direct Measures: Hummels (2007)

These effects are moderated by compositional changes.

Figure 6

Ad Valorem Ocean Freight
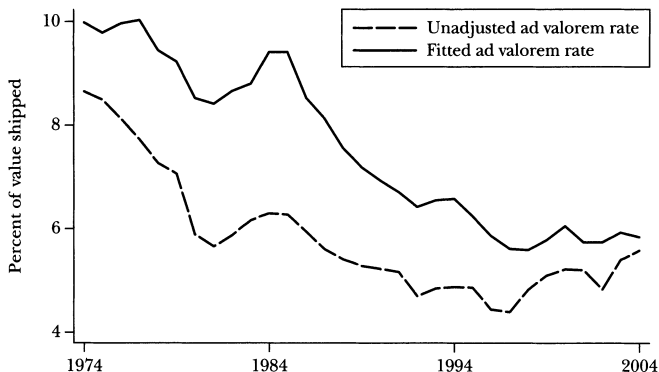
Source: Author's calculations based on the U.S. Census Bureau's *U.S. Imports of Merchandise.*

Note: The unadjusted ad valorem rate is simply expenditure/import value. The fitted ad valorem rate is derived from a regression and controls for changes in the mix of trade partners and products traded.

Direct Measures: AvW (2004) Survey

- Anderson and van Wincoop (2004) survey the literature on estimating trade costs in great detail.

- They begin with descriptive, 'direct' evidence on:
  - Tariffs—but this is surprisingly hard. (It is very surprising how hard it is to get good data on the state of the world's tariffs.)
  - NTBs—much harder to find data. And then there are theoretical issues such as whether quotas are binding.
  - Transportation costs (mostly now summarized in Hummels (2007)).
  - Wholesale and retail distribution costs (which clearly affect both international and intranational trade).

Direct Measures: AvW (2004)

Tariffs

TABLE 2
SIMPLE AND TRADE-WEIGHTED TARIFF AVERAGES—1999

Country	Simple Average	TW Average
Argentina	14.8	11.3
Australia	4.5	4.1
Bahamas	0.7	0.8
Bahrain	7.8	–
Bangladesh	22.7	21.8
Barbados	19.2	20.3
Belize	19.7	14.9
Bhutan	15.3	–
Bolivia	9.7	9.1
Brazil	15.5	12.3
Canada	4.5	1.3
Chile	10.0	10.0
Colombia	12.2	10.7
Costa Rica	6.5	4.0
Czech Republic	5.5	–
Dominica	18.5	15.8
Ecuador	13.8	11.1
European Union	3.4	2.7
Georgia	10.6	–
Grenada	18.9	15.7
Guyana	20.7	–
Honduras	7.5	7.8
Hong Kong	0.0	0.0
India	30.1	–
Indonesia	11.2	
Jamaica	18.8	16.7
Japan	2.4	2.9
Korea	9.1	5.9
Mexico	17.5	6.6
Montserrat	18.0	–
New Zealand	2.4	3.0
Nicaragua	10.5	11.0
Paraguay	13.0	6.1
Peru	13.4	12.6
Philippines	9.7	–
Romania	15.9	8.3
Saudi Arabia	12.2	–
Singapore	0.0	0.0
Slovenia	9.8	11.4
South Africa	6.0	4.4
St. Kitts	18.7	–
St. Lucia	18.7	–
St. Vincent	18.3	–
Suriname	18.7	–
Switzerland	0.0	0.0
Taiwan	10.1	6.7
Trinidad	19.1	17.0
Uruguay	4.9	4.5
USA	2.9	1.9
Venezuela	12.4	13.0

Notes: The data are from UNCTAD's TRAINS database (Haveman repackaging).
A "–" indicates that trade data for 1999 are unavailable in TRAINS.

Direct Measures: AvW (2004)

NTB 'coverage ratios' (% of product lines that are subject to an NTB).

TABLE 3
Non-Tariff Barriers—1999

Country	NTB ratio (narrow)	TW NTB ratio (narrow)	NTB ratio (broad)	TW NTB ratio (broad)
Algeria	.001	.000	.183	.388
Argentina	.260	.441	.718	.756
Australia	.014	.006	.225	.351
Bahrain	.009	–	.045	–
Bhutan	.041	–	.045	–
Bolivia	.014	.049	.179	.206
Brazil	.108	.299	.440	.603
Canada	.151	.039	.307	.198
Chile	.029	.098	.331	.375
Colombia	.049	.144	.544	.627
Czech Republic	.001	–	.117	–
Ecuador	.065	.201	.278	.476
European Union	.008	.041	.095	.106
Guatemala	.000	.000	.348	.393
Hungary	.013	.034	.231	.161
Indonesia	.001	–	.118	–
Lebanon	.000	–	.000	–
Lithuania	.000	.000	.191	.196
Mexico	.002	.000	.580	.533
Morocco	.001	–	.066	–
New Zealand	.000	.004	.391	.479
Oman	.006	.035	.134	.162
Paraguay	.018	.108	.256	.385
Peru	.021	.094	.377	.424
Poland	.001	.050	.133	.235
Romania	.001	.000	.207	.185
Saudi Arabia	.014	–	.156	–
Slovenia	.030	.019	.393	.408
South Africa	.000	.002	.113	.161
Taiwan	.057	.074	.138	.207
Tunisia	.000	.000	.317	.598
Uruguay	.052	.098	.354	.470
USA	.015	.055	.272	.389
Venezuela	.131	.196	.382	.333

Notes: The data are from UNCTAD's TRAINS database (Haveman repackaging). The "narrow" category includes,
quantity, price, quality and advance payment NTBs, but does not include threat measures such as antidumping
investigations and duties. The "broad" category includes quantity, price, quality, advance payment and threat
measures. The ratios are calculated based on six-digit HS categories.
A "–" indicates that trade data for 1999 are not available.

Direct Measures: AvW (2004)

Multi-Fibre Agreement (MFA): An example of a case/industry where good quota data exists. Deardorff and Stern (1998) converted to tariff equivalents.

TABLE 5
Tariff Equivalents of U.S. MFA Quotas, 1991 and 1993 (Percent)

Sector	1991		1993			
	Rent Tar Eq.	Rent Tar Eq.	S Tariff	TW Tariff	Rent + TW Tariff	%US Imports
Textiles:						
Broadwoven fabric mills	8.5	9.5	14.4	13.3	22.8	0.48
Narrow fabric mills	3.4	3.3	6.9	6.7	10.0	0.22
Yarn mills and textile finishing	5.1	3.1	10.0	8.5	11.6	0.06
Thread mills	4.6	2.2	9.5	11.8	14.0	0.01
Floor coverings	2.8	9.3	7.8	5.7	15.0	0.12
Felt and textile goods, n.e.c.	1.0	0.1	4.7	6.2	6.3	0.06
Lace and knit fabric goods	3.8	5.9	13.5	11.8	17.7	0.04
Coated fabrics, not rubberized	2.0	1.0	9.8	6.6	7.6	0.03
Tire cord and fabric	2.3	2.4	5.1	4.4	6.8	0.08
Cordage and twine	3.1	1.2	6.2	3.6	4.8	0.03
Nonwoven fabric	0.1	0.2	10.6	9.5	9.7	0.04
Apparel and fab. textile products:						
Women's hosiery, except socks	5.4	2.3				
Hosiery, n.e.c.	3.5	2.4	14.9	15.3	17.7	0.04
App'l made from purchased mat'l	16.8	19.9	13.2	12.6	32.5	5.71
Curtains and draperies	5.9	12.1	11.9	12.1	24.2	0.01
House furnishings, n.e.c.	8.3	13.9	9.3	8.2	22.1	0.27
Textile bags	5.9	9.0	6.4	6.6	15.6	0.01
Canvas and related products	6.3	5.2	6.9	6.4	11.6	0.03
Pleating, stitching, ... embroidery	5.2	7.6	8.0	8.1	15.7	0.02
Fabricated textile products, n.e.c.	9.2	0.6	5.2	4.8	5.4	0.37
Luggage	2.6	10.4	12.1	10.8	21.2	0.28
Women's handbags and purses	1.0	3.1	10.5	6.7	9.8	0.44

Notes: "S" indicates "simple" and "TW" indicates "trade-weighted." Rent equivalents for U.S. imports from Hong Kong were estimated on the basis of average weekly Hong Kong quota prices paid by brokers, using information from International Business and Economic Research Corporation. For countries that do not allocate quota rights in public auctions, export prices were estimated from Hong Kong export prices, with adjustments for differences in labor costs and productivity. Sectors and their corresponding SIC classifications are detailed in USITC (1995) Table D-1. Quota tariff equivalents are reproduced from Deardorff and Stern (1998), Table 3.6 (Source USITC 1993,1995). Tariff averages, trade-weighted tariff averages and U.S. import percentages are calculated using data from the UNCTAD TRAINS dataset. SIC to HS concordances from the U.S. Census Bureau are used.

Direct Measures: AvW (2004)
Domestic distribution costs (measured from I-O tables).

TABLE 6
DISTRIBUTION MARGINS FOR HOUSEHOLD CONSUMPTION AND CAPITAL GOODS

Select Product Categories	Aus. 95	Bel. 90	Can. 90	Ger. 93	Ita. 92	Jap. 95	Net. 90	UK 90	US 92
Rice	1.239	1.237	1.867	1.423	1.549	1.335	1.434	1.511	1.435
Fresh, frozen beef	1.485	1.626	1.544	1.423	1.605	1.681	1.640	1.390	1.534
Beer	1.185	1.435	1.213	1.423	1.240	1.710	1.373	2.210	1.863
Cigarettes	1.191	1.133	1.505	1.423	1.240	1.398	1.230	1.129	1.582
Ladies' clothing	1.858	1.845	1.826	2.039	1.562	2.295	1.855	2.005	2.159
Refrigerators, freezers	1.236	1.586	1.744	1.826	1.783	1.638	1.661	2.080	1.682
Passenger vehicles	1.585	1.198	1.227	1.374	1.457	1.760	1.247	1.216	1.203
Books	1.882	1.452	1.294	2.039	1.778	1.665	1.680	1.625	1.751
Office, data proc. mach.	1.715	1.072	1.035	1.153	1.603	1.389	1.217*	1.040	1.228
Electronic equip., etc.	1.715	1.080	1.198	1.160	1.576	1.432	1.224*	1.080	1.139
Simple Average (125 categories)	1.574	1.420	1.571	1.535	1.577	1.703	1.502	1.562	1.681

Notes: The table is reproduced from Bradford and Lawrence, "Paying the Price: The Cost of Fragmented International Markets", Institute of International Economics, forthcoming (2003). Margins represent the ratio of purchaser price to producer price. Margins data on capital goods are not available for the Netherlands, so an average of the four European countries' margins is used.

Direct Measures: Djankov, Freund and Pham ReStat 2010
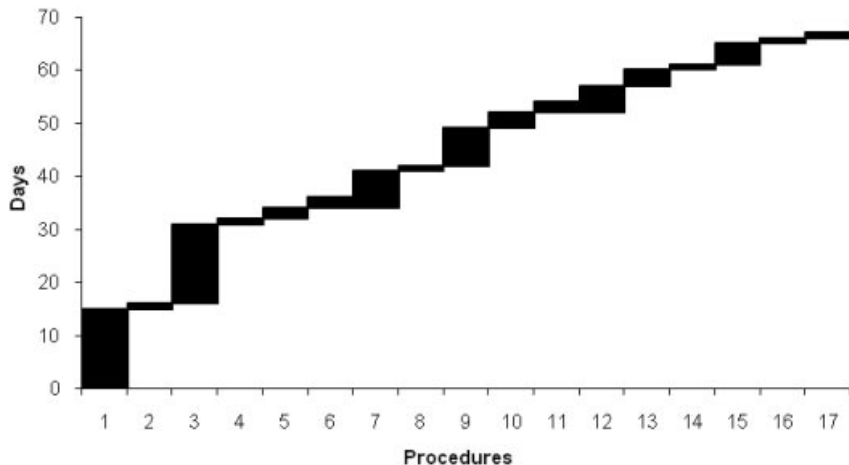'Doing business' style survey on freight forwarding firms around the world.

List of Procedures to Export from Burundi

1. Secure letter of credit
2. Obtain and load containers
3. Assemble and process export documents
4. Pre-shipment inspection and clearance
5. Prepare transit clearance
6. Inland transportation to port of departure
7. Arrange transport; waiting for pickup and loading on local carriage
8. Wait at border crossing
9. Transportation from border to port
10. Terminal handling activities
11. Pay of export duties, taxes or tariffs
12. Waiting for loading container on vessel
13. Customs inspection and clearance
14. Technical control, health, quarantine
15. Pass customs inspection and clearance
16. Pass technical control, health, quarantine
17. Pass terminal clearance

Direct Measures: Djankov, Freund and Pham (ReStat, 2010)

'Doing business' style survey on freight forwarding firms around the world.

FIGURE 1.—EXPORT PROCEDURES IN BURUNDI

Direct Measures: Djankov, Freund and Pham (ReStat, 2010)

'Doing business' style survey on freight forwarding firms around the world.

TABLE 1.—DESCRIPTIVE STATISTICS BY GEOGRAPHIC REGION
REQUIRED TIME FOR EXPORTS

	Mean	Standard Deviation	Minimum	Maximum	Number of Observations
Africa and Middle East	41.83	20.41	10	116	35
COMESA	50.10	16.89	16	69	10
CEMAC	77.50	54.45	39	116	2
EAC	44.33	14.01	30	58	3
ECOWAS	41.90	16.43	21	71	10
Euro-Med	26.78	10.44	10	49	9
SADC	36.00	12.56	16	60	8
Asia	25.21	11.94	6	44	14
ASEAN 4	22.67	11.98	6	43	6
CER	10.00	2.83	8	12	2
SAFTA	32.83	7.47	24	44	6
Europe	22.29	17.95	5	93	34
CEFTA	22.14	3.24	19	27	7
CIS	46.43	24.67	29	93	7
EFTA	14.33	7.02	7	21	3
ELL FTA	14.33	9.71	6	25	3
European Union	13.00	8.35	5	29	14
Western Hemisphere	26.93	10.33	9	43	15
Andean Community	28.00	7.12	20	34	4
CACM	33.75	9.88	20	43	4
MERCOSUR	29.50	8.35	22	39	4
NAFTA	13.00	4.58	9	18	3
Total sample	30.40	19.13	5	116	98

Note: Seven countries belong to more than one regional agreement.
Source: Data on time delays were collected by the Doing Business team of the World Bank/IFC. They are available at www.doingbusiness.org.

Direct Measures: Barron and Olken (JPE 2009)

Survey of truckers in Aceh, Indonesia.

TABLE 1
SUMMARY STATISTICS

	Both Roads (1)	Meulaboh Road (2)	Banda Aceh Road (3)
Total expenditures during trip (rupiah)	2,901,345	2,932,687	2,863,637
	(725,003)	(561,736)	(883,308)
Bribes, extortion, and protection payments	361,323	415,263	296,427
	(182,563)	(180,928)	(162,896)
Payments at checkpoints	131,876	201,671	47,905
	(106,386)	(85,203)	(57,293)
Payments at weigh stations	79,195	61,461	100,531
	(79,405)	(43,090)	(104,277)
Convoy fees	131,404	152,131	106,468
	(176,689)	(147,927)	(203,875)
Coupons/protection fees	18,848	. . .	41,524
	(57,593)		(79,937)
Fuel	1,553,712	1,434,608	1,697,010
	(477,207)	(222,493)	(637,442)
Salary for truck driver and assistant	275,058	325,514	214,353
	(124,685)	(139,233)	(65,132)
Loading and unloading of cargo	421,408	471,182	361,523
	(336,904)	(298,246)	(370,621)
Food, lodging, etc.	148,872	124,649	178,016
	(70,807)	(59,067)	(72,956)
Other	140,971	161,471	116,308
	(194,728)	(236,202)	(124,755)
Number of checkpoints	20	27	11
	(13)	(12)	(6)
Average payment at checkpoint	6,262	7,769	4,421
	(3,809)	(1,780)	(4,722)
Number of trips	282	154	128

NOTE.—Standard deviations are in parentheses. Summary statistics include only those trips for which salary information was available. All figures are in October 2006 rupiah (US$1.00 = Rp. 9,200).

Direct Measures: Barron and Olken (JPE 2009)

Survey of truckers in Aceh, Indonesia.

Fig. 1.—Routes

Direct Measures: Barron and Olken (JPE 2009)
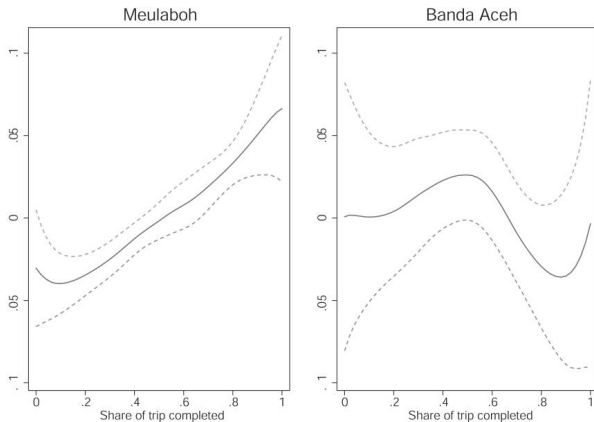
Survey of truckers in Aceh, Indonesia.

Fig. 4.—Payments by percentile of trip. Each graph shows the results of a nonparametric Fan (1992) locally weighted regression, where the dependent variable is log payment at checkpoint, after removing checkpoint × month fixed effects and trip fixed effects, and the independent variable is the average percentile of the trip at which the checkpoint is encountered. The bandwidth is equal to one-third of the range of the independent variable. Dependent variable is log bribe paid at checkpoint. Bootstrapped 95 percent confidence intervals are shown in dashes, where bootstrapping is clustered by trip.

Direct Measures: Sequeira (AER 2016)

Mozambique: When tariffs are high, pay bribes to assign to different tariff code

Table 6: **Summary Statistics: Bribe Payments**

	Pre Tariff Change	Post Tariff Change	
	2007	2008	2011-2012
Probability of Paying a Bribe (%)	80	26	16
Avg Bribe Amount per Ton (Metical 2007, CPI Adjusted)	2,164 (7,800)	280 (963)	494 (2,746)
Primary Bribe Recipient	Customs (97%)	Customs (84%)	Customs (72%)
Primary Reason for Bribe Payment	Tariff Evasion (61%)	Congestion (59%)	Congestion (38%)
Ratio of Bribe Amount to Tariff Duties Saved [0-1]*	0.07 (0.13)	0.028 (0.09)	0.008 (0.02)
Avg clearing time for all shipments (days)	2.4 (1.4)	2.6 (1.4)	2.6 (3.6)
Avg clearing time with the payment of a bribe (days)	2.5 (1.5)	2.3 (1.2)	2.5 (3.1)
Avg clearing time without the payment of a bribe (days)	1.9 (0.74)	2.7 (1.38)	2.6 (3.7)
Avg clearing time with bribe payment for tariff evasion (days)	2.2 (1.7)	2.6 (1.4)	2.4 (1.8)

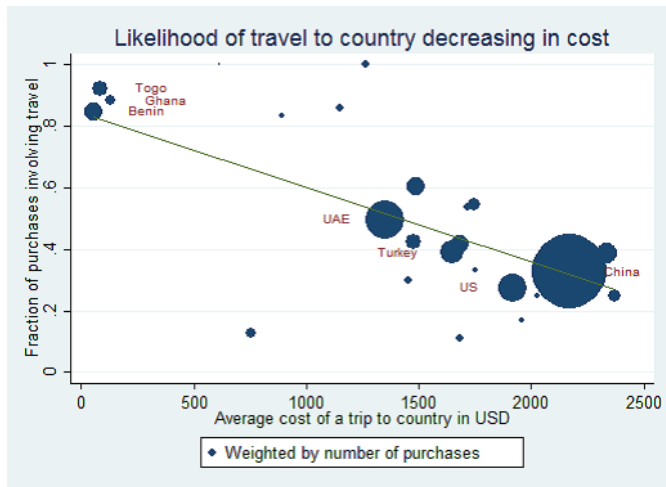[a] *Conditional on the bribe being paid for tariff evasion.
[b] Source: Audit study conducted by the author.
[c] NOTES: Average clearing times moved in tandem with increases in the overall volume of cargo handled at the port between 2007 and 2011. Total volumes increased by 13% in 2008 and 18% in 2011. Note that in 2009, the port of Maputo was still functioning at 30% of capacity so it was capable of handling the observed increase in volumes without substantially increasing congestion.

Figure 2: Likelihood of traveling and travel cost

Likelihood of travel to country decreasing in cost

Figure 3: Travel, transport, and tariff expenditures relative to goods value

Table 4: Probability of traveling for a purchase

	(1) Traveled	(2) Traveled	(3) Traveled
Business age	0.006		
	(0.005)		
Years buying from country	0.010	-0.016**	
	(0.007)	(0.007)	
Years buying from supplier	-0.004	0.005	0.004
	(0.006)	(0.004)	(0.004)
Observations	3035	3037	3213
Sector x country FEs	yes		
Trader and country FEs		yes	
Trader x country FEs			yes
Mean levels of independent variables			
Business age	10.64		
Years buying from country	5.37		
Years buying from supplier	3.88		

Notes: All columns are linear probability models. Robust standard errors clustered at the trader level are shown in parentheses.

Direct Measures: Startz (2016)

Nigerian Traders: When travel pay lower prices, charge higher markups, buy newer styles, change suppliers

Table 5: Travel and transaction outcomes

	(1) Log unit cost	(2) Markup (price/cost)	(3) New style	(4) New supplier	(5) Log unit cost	(6) Markup (price/cost)	(7) New style	(8) New supplier
Traveled	-0.30**	0.34***	0.07**	0.05*	-0.13**	0.09*	0.02	0.12***
	(0.119)	(0.109)	(0.032)	(0.028)	(0.054)	(0.048)	(0.044)	(0.046)
Observations	2741	2614	3536	3354	2647	2513	3431	3259
Mean of outcome	1.90	2.07	0.51	0.20	1.90	2.07	0.51	0.20
Sector x country FEs	yes	yes	yes	yes				
Trader x country FEs					yes	yes	yes	yes

Notes: Columns 3/4/7/8 are LPMs. Robust standard errors clustered at the trader level are shown in parentheses.
* significant at 10% ** significant at 5% *** significant at 1%.

Plan for Today's Lecture

1. Introduction to trade costs

2. Estimating trade costs via direct measurement

3. **Using price dispersion and price gaps to infer trade costs**

Using price dispersion to estimate trade costs

- A large literature does this instead of using quantities/expenditure as in the gravity appraoch.
  - See, e.g., Fackler and Goodwin (2001 Handbook survey) or Anderson and van Wincoop (2004, JEL)

- The attraction is that it is less parametric. Purely rests on the arbitrage idea that if i is currently exporting homogeneous product k to location j at time t (ie $X_{ijt}^k > 0$ is true) then we must have, if we believe in arbitrage:

$$\ln p_{jt}^k - \ln p_{it}^k = \ln \tau_{ijt}^k \tag{1}$$

Challenges in doing this

1. Have to observe homogeneous products. (Otherwise price gaps will reflect quality differences.)

2. Have to know whether two locations are trading that product
   - This is challenging in practice since at the level of 'products' for which you can plausibly overcome problem 1, it is often impossible to see trade flow data that narrowly

3. Have to believe in perfect arbitrage (and hence also perfect competition) or else have a convincing way of correcting for this

Much recent progress has been made on this. Examples include:
- Donaldson (2012) on solving 1 and 2 in certain settings.
- Cosar, Greico and Tintelnot (2015) and Atkin and Donaldson (2015) on attempts to solve 1-2 and also make progress on 3