Global Production: Firms, Contracts, and Trade Structure

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Road Map

- Broad Introduction
- Contracts and International Trade
  - Introduction
  - Preliminary Evidence
  - A Model of Exporting
  - A Model of Global Sourcing
  - Empirical Tests
- Multinational Firm Boundaries
  - Transaction-Cost Theory
  - Property-Rights Theory
  - Empirical Tests

BROAD INTRODUCTION

Three Major Developments

- Three major developments in the world economy in the last 25 years:

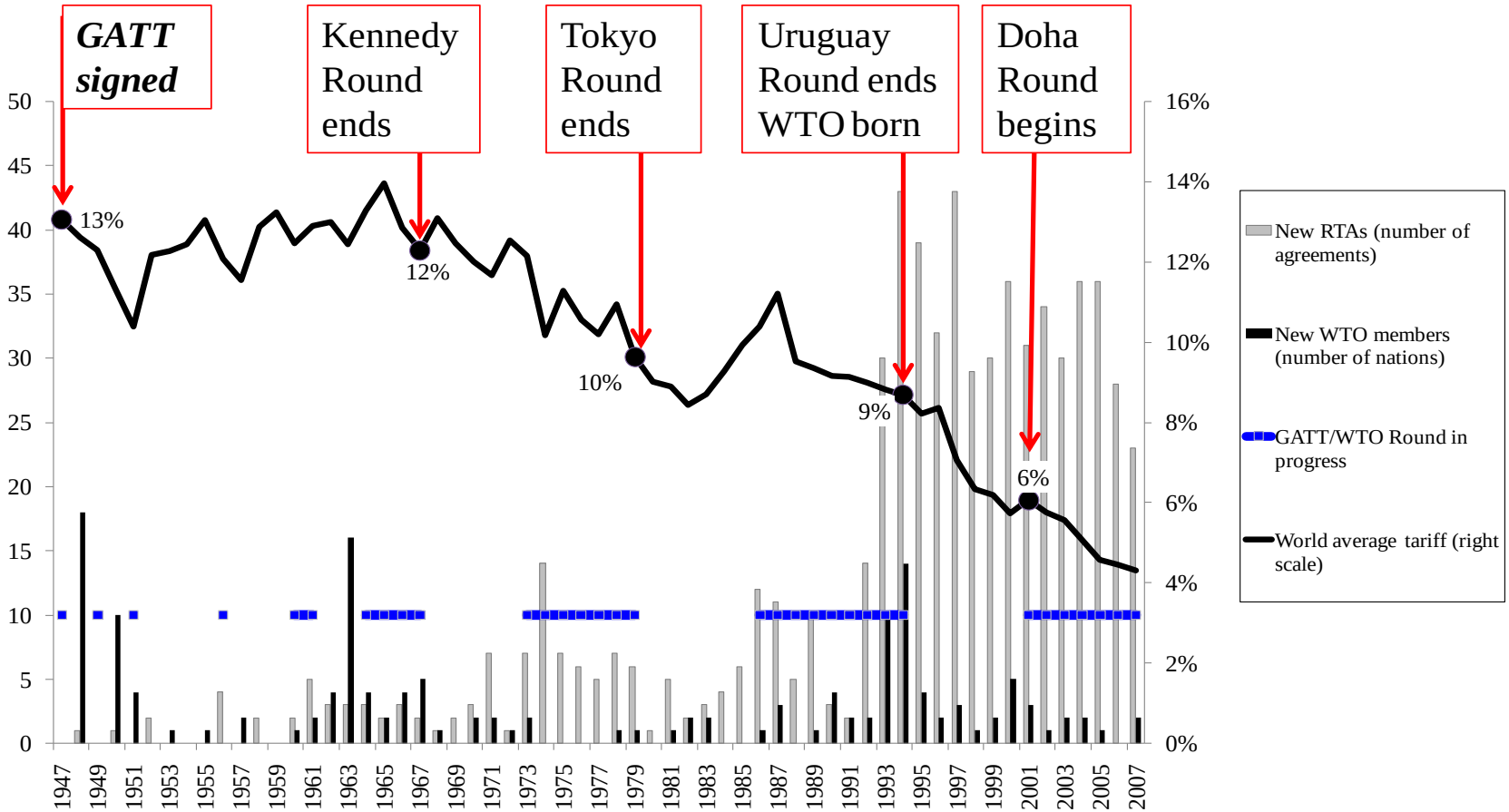
1. Information and communication technology (ICT) revolution
2. Deepening of trade liberalization and continuing transportation cost reduction
3. Political developments expanding the reach of globalization

ICT Revolution

1. Information and communication technology (ICT) revolution
   - Processing power and memory capacity of computers
   - Cost of transmitting information over an optical network

Falling Trade Costs

2. Deepening trade liberalization and falling transportation costs
   - EU, NAFTA, Mercosur, ASEAN FTA, China's WTO accession, etc.



Sources: RTAs: WTO online databases & Hufbauer-Schott RTA database; tariffs: Clemson and Williamson (2004) up to 1988, then World DataBank (weighted tariffs all products)

Political Developments

3. Political developments expanding the reach of globalization
   - Fall of communism, worldwide ideological shift to the right in large parts of the globe

An Implication: Rise of Global Value Chains

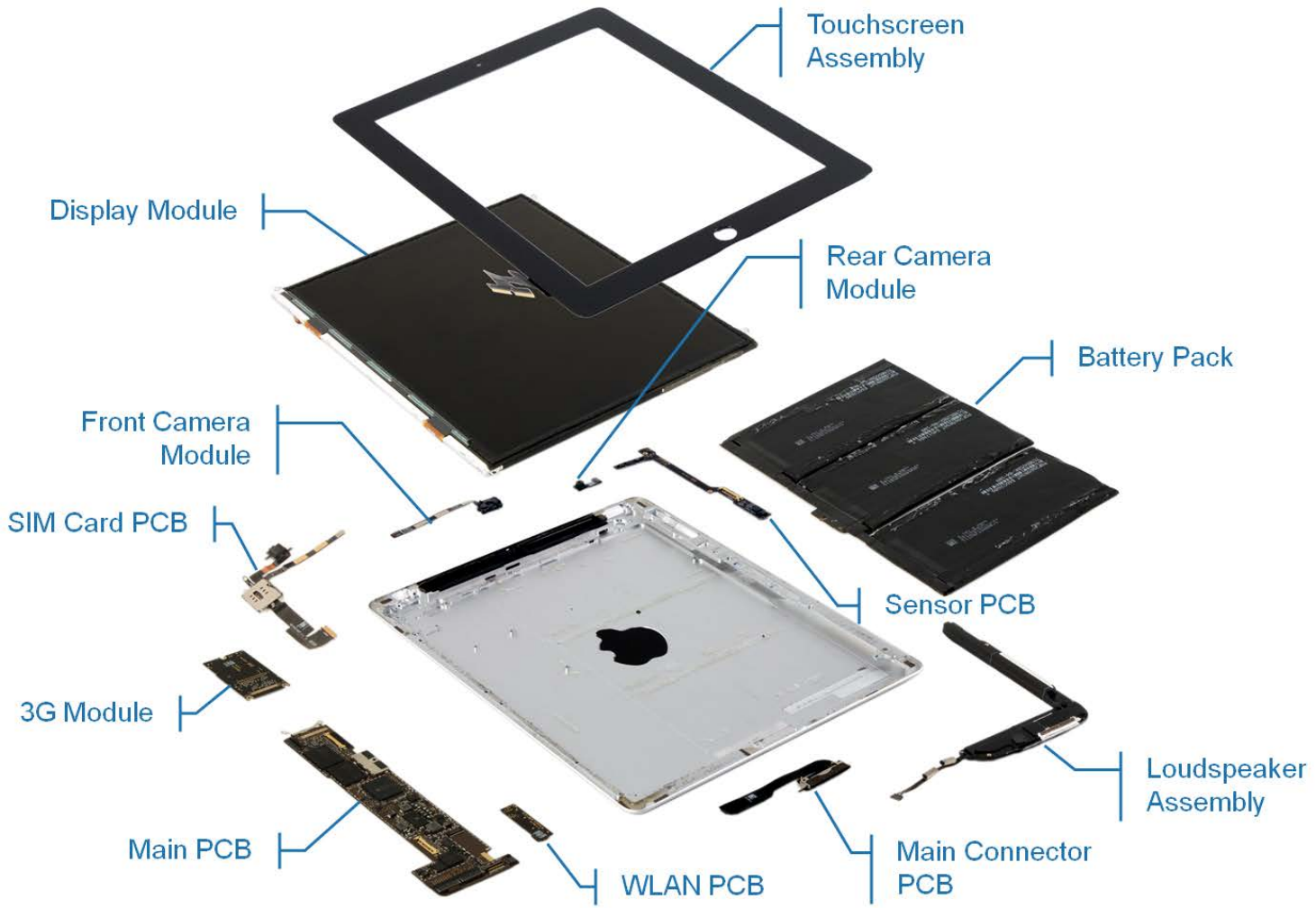
- Gradual disintegration of production processes across borders
- "Made in" labels in manufactured goods have become archaic symbols of an old era
- Every author has his/her pet word to describe this phenomenon:
  - "slicing of the value chain"
  - "fragmentation of the production process"
  - "disintegration of production"
  - "delocalization"
  - "vertical specialization"
  - "global production sharing"
  - "unbundling"
  - "offshoring"
  - "flattening of the world"

An Example: Everybody's Favorite Toy

Designed by Apple in California, Assembled in China

Assembled in China (and now also in Brazil) by Foxconn and Pegatron

Tearing Down an iPad 3



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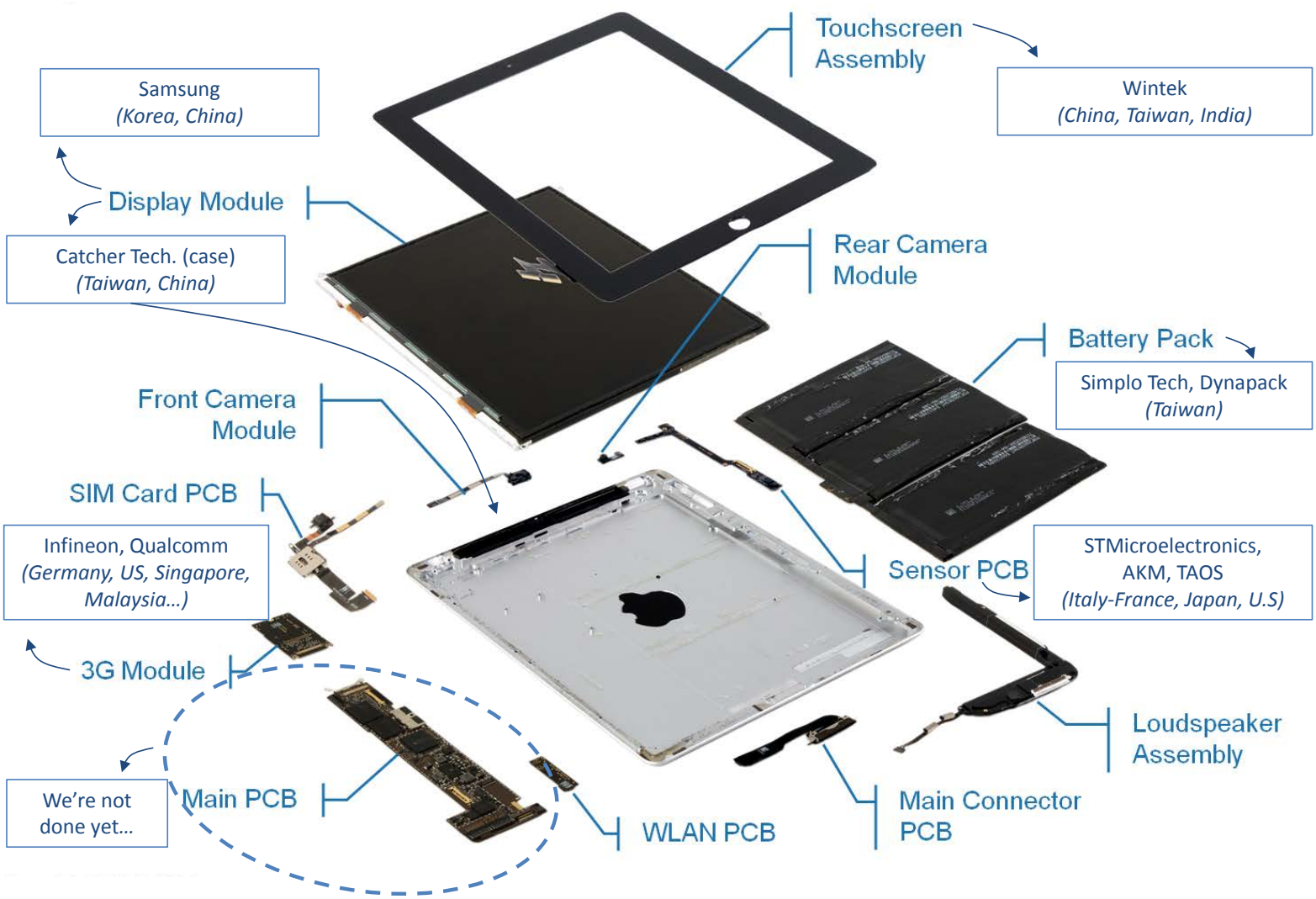
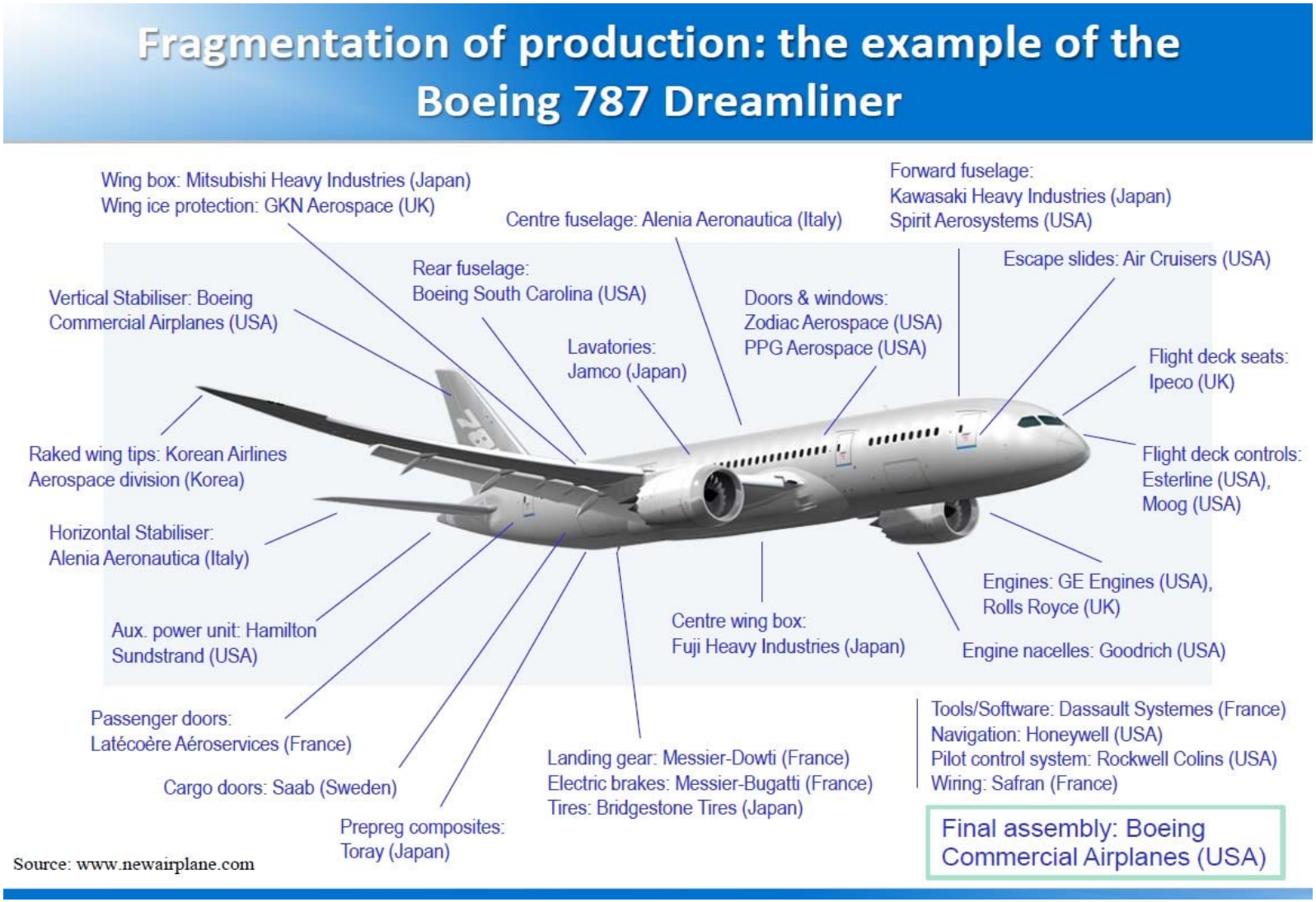


It's Not Just North-South Fragmentation



It's Not Just Manufacturing

- Offshoring of Services: "Third Industrial Revolution"
  - India's customer service call centers
  - Reading X-rays
  - Software development
  - Tax form preparation

Man outsources his own job to China, watches cat videos

1/17/13 | By James Eng of MSN News

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A software developer for a U.S. company paid a fraction of his six-figure salary to a contractor in China to do his work, then spent the bulk of his workday surfing the Web.

By all accounts, Bob was a model employee, a software developer who consistently wrote clean code for his company and never missed deadlines. Then investigators found out it wasn't Bob who was doing his job.

Turns out Bob had outsourced his work to China, paying a lowly overseas surrogate a fraction of his six-figure salary to do his 9-to-5 job. All the while, Bob sat at his desk, pretending to be busy while actually surfing the Internet, updating his Facebook page and watching cat videos.

Different Types of Fragmentation

- Two key organizational decisions of firms:

1. *Location* of different stages in the value chain
2. Extent of *control* that firms exert over these different production stages

	Within-Firm	**Arm's-Length**
Domestic	Domestic Insourcing	Domestic Outsourcing
Foreign	Foreign Insourcing (*intra-firm trade*)	Foreign Outsourcing (*arm's-length trade*)

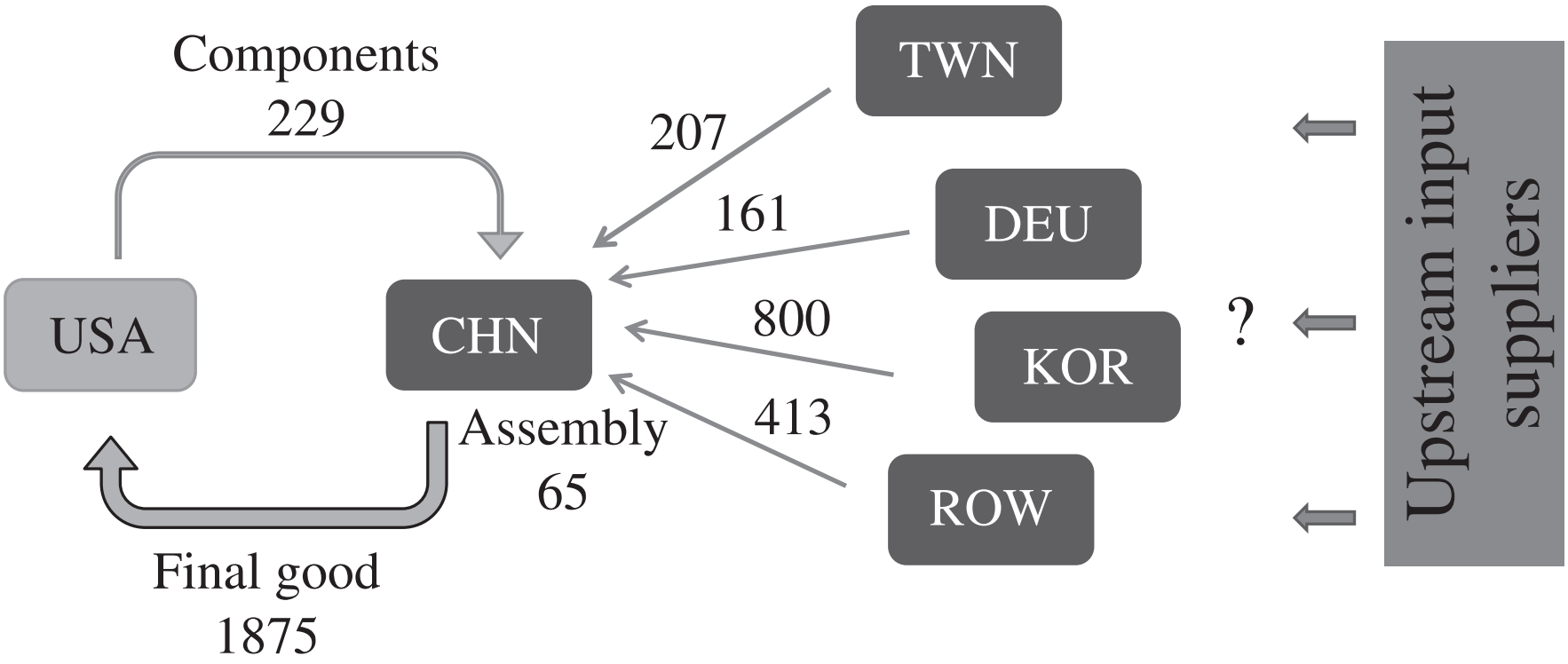
MEASUREMENT

Conceptual Issues

- **Goal:** Quantify the geography of worldwide production
  - allocating value added along the value chain across borders;
  - which countries' value added is used as an input in generating a country's value added?
- **Challenge:** International trade flow data is recorded on a gross output (sales) basis
- **Recent Approach:** Construction of World Input Output Tables (WIOD project)
  - combines International Trade Statistics + Various Countries' Input-Output Tables + Assumptions

An Illustration

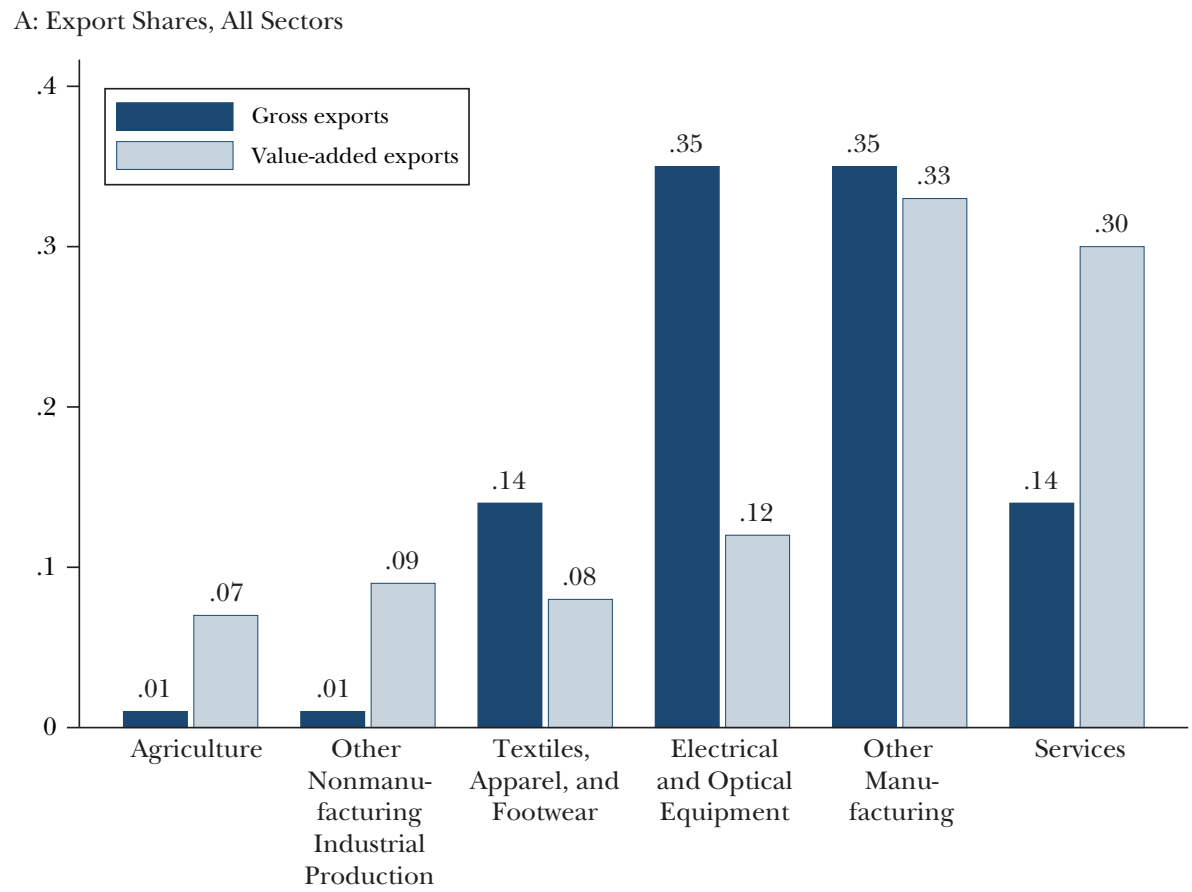
- Approach essentially amounts to a scaled-up version of this iPhone example



Some Interesting Implications

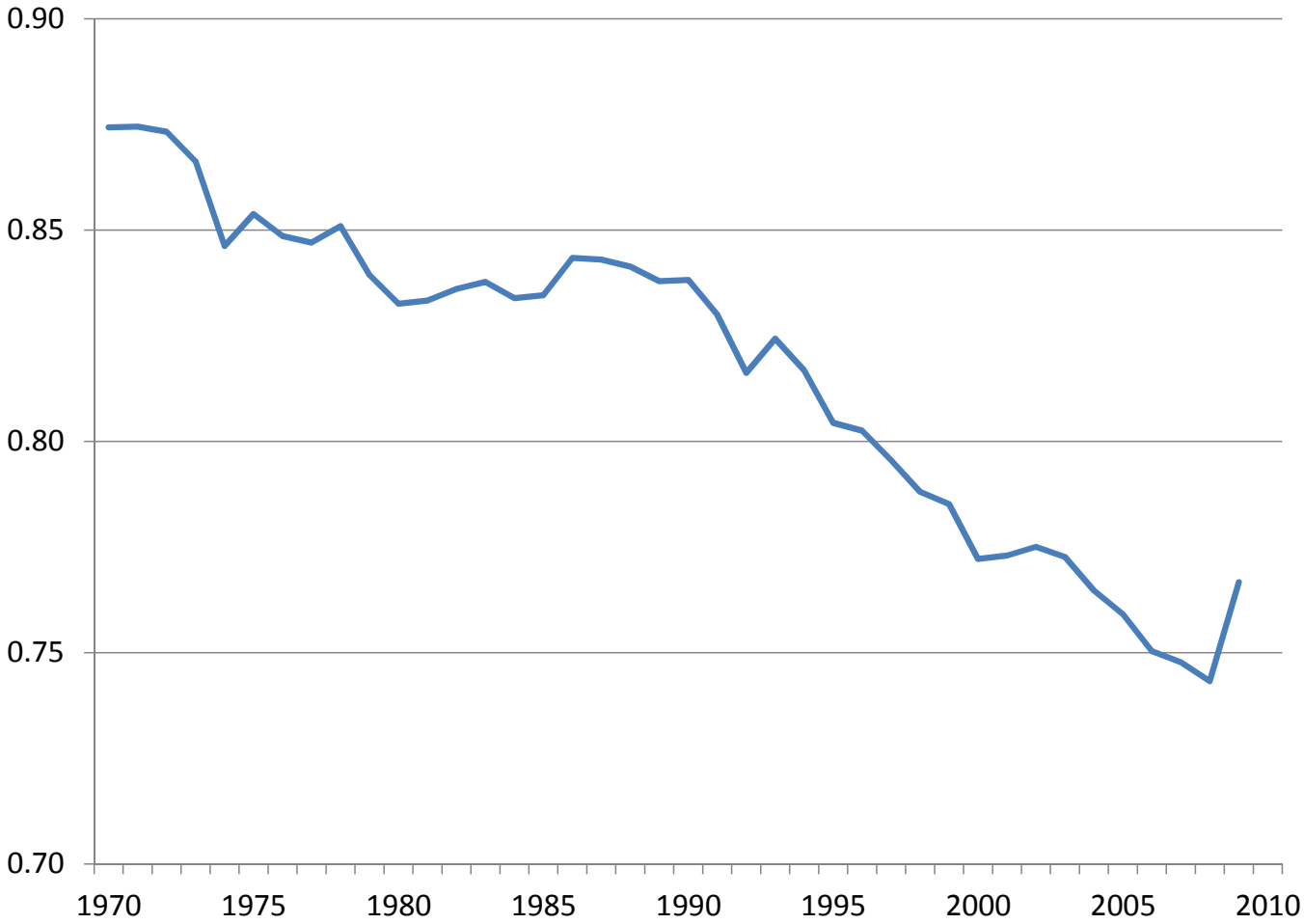
- China does not appear to dominate certain sectors as much as standard trade statistics would suggest

Sector-Level Export Shares for China



A Smoking Gun

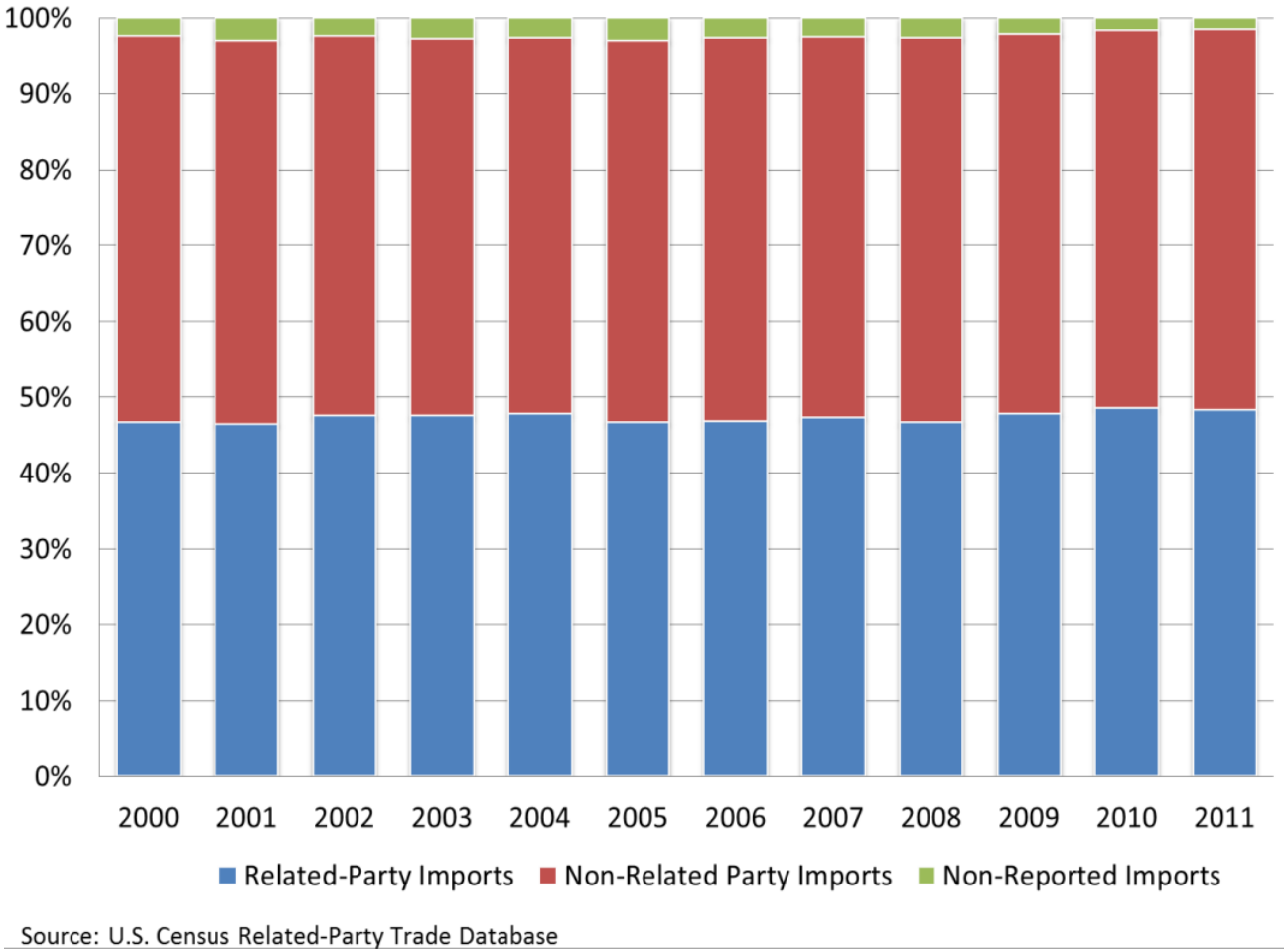
- Declining valued-added share in exports demonstrates rise of GVCs



Source: Johnson and Noguera (2012b)

Relevance of Intrafirm Trade Flows

- Intrafirm transactions are remarkably **prevalent** in U.S. trade (close to 50% of imports and around 30% of exports)



Old and New Theories

- First wave of work: fragmentation in otherwise neoclassical models
  - Feenstra and Hanson (1996), Jones (2000), Deardorff (2001), Grossman and Rossi-Hansberg (2008)
- Common theme: fragmentation generates nontrivial effects on productivity
  - novel predictions for the effects of reductions in trade costs on patterns of specialization and factor prices
- Insightful body of work, but misses (at least) two important characteristics of intermediate input trade

Some Limitations of Neoclassical Models of Fragmentation

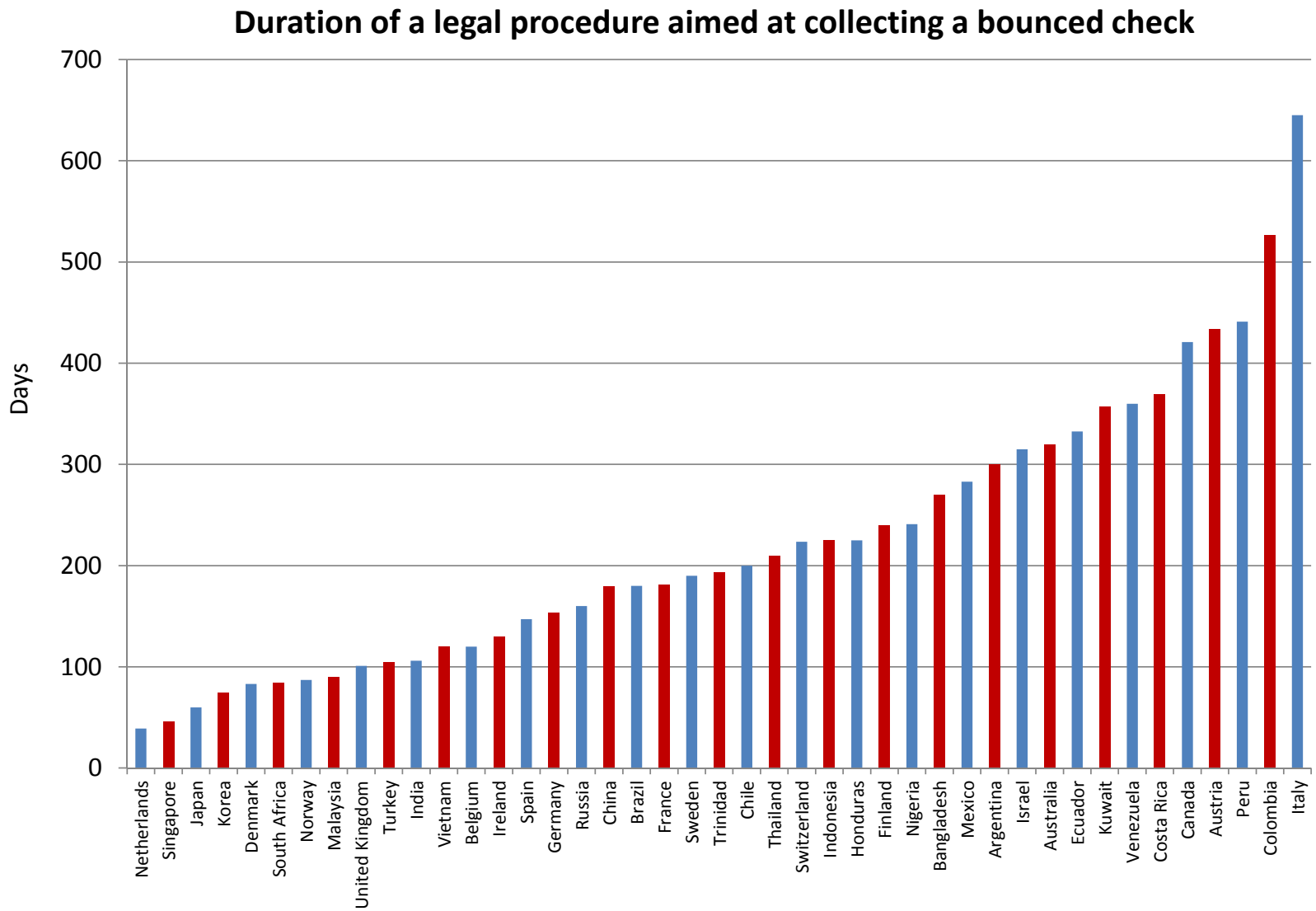
1. Parts and components are frequently customized to the needs of their intended buyers (e.g, iPad 3)
   - growth of trade in *differentiated* intermediate inputs
2. Global production entails intensive *contracting* between parties subject to distinct legal systems
   - irrelevant in a world with perfect (or complete) contracting across borders
   - but real-world commercial contracts are incomplete (or incompletely enforceable)

CONTRACTS IN INTERNATIONAL TRADE

Contract Difficulties in International Trade

- Contract disputes in international trade: which country's laws apply?
  - *choice-of-law* clause is not often included and, when it is included, adjudicating courts may not uphold it
- Local courts may be unwilling to enforce a contract signed between residents of two different countries
  - particularly, if unfavorable outcome for local residents
- Complication with enforcement of remedies stipulated in verdicts
  - what if the party having to pay damages does not have any assets in the court's country?
- Detrimental effects of imperfect contract enforcement are particularly acute for transactions involving intermediate inputs
  - longer time lags between order and delivery
  - more relationship-specific investments and other sources of lock-in

Heterogeneity in Contracting Institutions

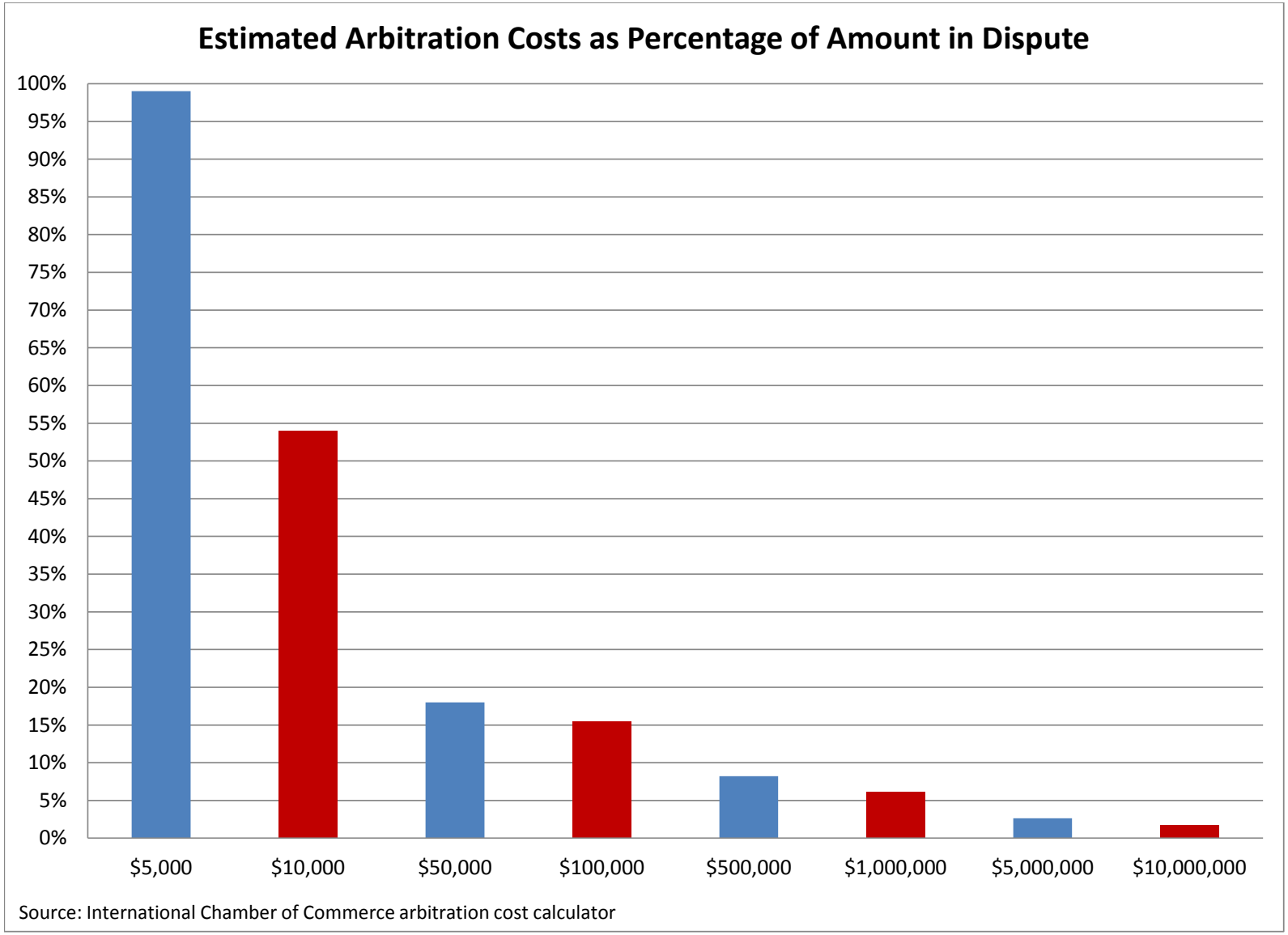


Source: Djankov et al. (2003)

Attempts to Reduce Contractual Insecurity

1. United Nations Convention on Contracts for the International Sale of Goods (CISG) or Vienna Convention
   - uniform rules to govern contracts for the international sale of goods
   - but...
     - several countries (e.g., Brazil, India, the UK) have yet to sign it
     - other countries do not apply certain parts of the agreement
     - private parties can opt out of it via Article 6
2. Use of International Arbitration (e.g., Int'l Chamber of Commerce)
   - can be invoked via a *forum-of-law* clause in a contract
   - appealing because
     - lower uncertainty as to which law will be applied
     - arbitrators tend to have more commercial expertise and rule faster
     - arbitration rulings are confidential and are generally perceived to be more enforceable (New York Convention)
   - But international arbitration is rarely used because it is **very costly**

International Arbitration Costs



Attempts to Reduce Contractual Insecurity

3. Resort to implicit contracting to sustain 'cooperation'
   - implicit contracts may be harder to sustain due to limited repeated interactions (e.g., exchange rate shocks)
   - collective or community enforcement hampered by long distance and differences in cultural and societal values

- Rodrik (2000): "ultimately, [international] contracts are often neither explicit nor implicit; they simply remain incomplete"

Firm Responses to Contractual Insecurity

- Two key organizational decisions of firms:

1. *Location* of different stages in the value chain
   - R&D and product development, parts and components production, assembly, and so on
2. Extent of *control* that firms exert over these different production stages
   - should these production stages be kept within firm boundaries or should they be contracted out to suppliers or assemblers

- Neoclassical models of fragmentation are all about location
  - firms fragment to achieve unit cost reductions (thanks to differences in relative factor endowments or technologies across countries)
  - but these models have **nothing** to say about control or the firm boundary decision

PRELIMINARY EVIDENCE ON LOCATION DECISION

Empirics of Contracts and Specialization

1. Brief Overview of Key Empirical Contributions
    1. Gravity-style empirical evidence using bilateral aggregate level data
    2. Comparative-advantage-style evidence using country and sectoral data
2. Interpretation of the Results
3. Later in this Lecture: Further evidence based on recent U.S. import data

Gravity-Style Empirical Evidence

- Anderson and Marcoullier (2002) show that, controlling for standard gravity determinants of trade flows, countries with weak contracting institutions tend to import less from their trading partners (relative to the United States)
  - effect identified in the cross-section of importing countries
- Berkowitz, Moenius and Pistor (2006)
  - emphasize and demonstrate the importance of the institutions of the exporting country (related to the New York Convention)
  - show that the effects are concentrated in 'complex' goods (in the Rauch sense) rather than in 'simple' or homogeneous goods
  - estimation includes country fixed effects, so identification uses time series variation in quality of institutions (also timing of signing of New York convention)

Gravity-Style Empirical Evidence

TABLE 2.—IMPORT REGRESSIONS POOLED FOR 1982–1992 OVERALL TRADE

Regression column	1	2	3	4[t]
GDP importer	0.81 (39.07)	0.81 (38.53)	−0.10 (−0.43)	−0.15 (−0.52)
GDP exporter	0.77 (39.78)	0.76 (39.13)	−0.13 (−0.60)	−0.19 (−0.65)
GDP per capita importer	0.72 (23.30)	0.53 (11.16)	1.00 (3.80)	1.18 (4.00)
GDP per capita exporter	1.04 (32.09)	0.74 (13.96)	1.20 (4.50)	1.39 (4.63)
Distance	−1.12 (−27.30)	−1.16 (−27.97)	−1.02 (−27.09)	−1.03 (−27.11)
Adjacent	0.31 (2.33)	0.35 (2.43)	0.40 (2.64)	0.40 (2.65)
Links	0.51 (4.91)	0.42 (4.07)	0.45 (4.42)	0.45 (4.40)
Language similarities	−0.09 (−0.54)	0.09 (0.51)	0.99 (5.72)	1.00 (5.74)
Remoteness	0.37 (3.79)	0.58 (6.04)	1.46 (2.21)	1.79 (2.31)
Quality of importer legal institutions		0.61 (5.41)	0.17 (0.18)	0.05 (0.51)
Quality of exporter legal institutions		0.91 (7.12)	0.32 (3.07)	0.36 (3.26)
Probability that the quality-of-legal-institution coefficients are the same		0.076	0.035	0.035
Country dummies			Yes	Yes
Time dummies				Yes
Constant	−20.04 (−12.13)	−21.45 (−13.16)		
Number of clusters (country pairs)	2792	2792	2792	2792
R^2	0.69	0.70	0.77	0.77
Observations	26,577	23,564	23,564	23,564

t-statistics reported in parentheses are computed from robust standard errors that allow for within-group correlation.

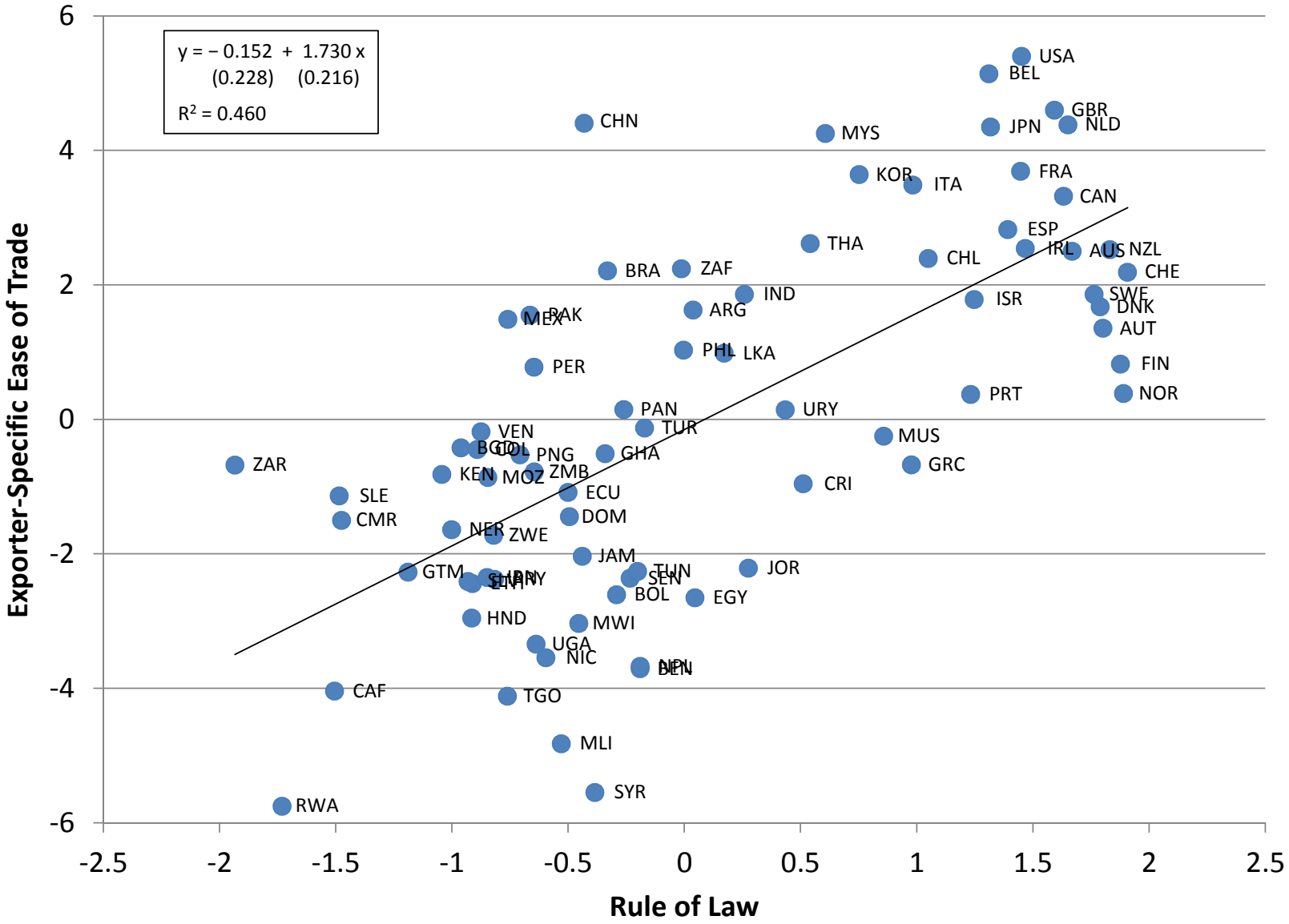
Gravity-Style Empirical Evidence

TABLE 3.—IMPORT REGRESSIONS POOLED FOR 1982–1992, COMPLEX VERSUS SIMPLE GOODS

Regression column	1	2	3	4
Goods	Complex	Simple	Complex	Simple
GDP importer	0.34	−1.50	0.08	−1.06
	(1.65)	(−4.59)	(0.27)	(−2.52)
GDP exporter	0.58	−1.81	0.32	−1.38
	(2.82)	(−5.55)	(1.08)	(−3.26)
GDP per capita importer	0.77	2.35	1.17	2.03
	(3.16)	(6.05)	(4.05)	(4.70)
GDP per capita exporter	0.71	2.27	1.10	1.95
	(2.92)	(5.77)	(3.86)	(4.48)
Distance	−0.98	−1.26	−0.98	−1.26
	(−24.90)	(−22.76)	(−24.98)	(−22.72)
Adjacent	0.44	0.27	0.44	0.27
	(2.62)	(1.55)	(2.62)	(1.54)
Links	0.54	0.18	0.54	0.18
	(5.11)	(1.21)	(5.09)	(1.22)
Language similarities	1.27	0.11	1.28	0.11
	(6.73)	(0.41)	(6.77)	(0.40)
Remoteness	−0.81	7.83	0.74	6.69
	(−1.30)	(7.91)	(0.96)	(5.50)
Quality of importer institutions	−0.51	0.66	−0.44	0.66
	(−5.18)	(4.54)	(−4.24)	(4.42)
Quality of exporter institutions	0.85	−0.53	0.93	−0.53
	(7.92)	(−3.66)	(8.41)	(−3.45)
Probability that the absolute value of the quality of institutions coefficients are the same	0.02	0.54	0.00	0.53
Country dummies	Yes	Yes	Yes	Yes
Time dummies			Yes	Yes
Number of clusters (country pairs)	2755	2550	2755	2550
R^2	0.79	0.50	0.79	0.38
Observations	22,669	18,948	22,669	18,948

t-statistics reported in parentheses are computed from robust standard errors that allow for within-group correlation.

Gravity-Style Empirical Evidence



Comparative-Advantage-Style Evidence

- Recently, several authors have pointed out that the effect of weak contracting institutions should affect different sectors differently
  - some sectors are more 'contract dependent' than others
- This builds on the Berkowitz et al.'s (2006) results but considers finer differences across goods (not just complex vs. simple)
- Specifications are reminiscent of the 'identification' strategy in Rajan and Zingales (1997) in a finance context and Romalis (2004) in a trade context
- Different papers offer alternative measures of contract dependence at the industry level
  - Costinot (2009): complexity measured as average number of months necessary to be fully trained and qualified in that industry from PSID
  - Levchenko (2007): complexity measured as Herfindahl index of input use from I-O tables
  - Nunn (2007): relationship-specificity (see next slide)

Nunn (2007): Data

- Trade data for 146 countries and 222 industries classified according to the BEA's I-O industry classification system (roughly NAICS 6-digit) in 1997
- Contract enforcement across countries
  - 'Rule of Law' variable from the Governance Matters III Database.
  - Weighted average of 17 measures of "judicial quality and contract enforcement"
  - **Examples of these measures**:
    - "Enforceability of Private Contracts Index" from Global Insight Inc.
    - "Enforceability of Contracts Index" from Economist Intelligence Unit
    - "Strength and Impartiality of the Legal System Index" from Political Risk Services.

Nunn (2007): Contracting Institutions

Countries in the sample, ordered by rule of law

Switzerland	.972	Thailand	.580	Venezuela	.375
Singapore	.948	Trin. & Tobago	.577	Ecuador	.375
Norway	.943	Argentina	.548	Maldives	.370
New Zealand	.935	India	.543	Kiribati	.369
Austria	.921	South Africa	.543	Solomon Islands	.369
Finland	.912	Turkey	.538	Colombia	.367
U.K.	.909	Egypt	.534	Yemen	.365
Netherlands	.904	Lebanon	.532	Niger	.360
Australia	.898	Guyana	.513	Guatemala	.359
Denmark	.897	Belize	.507	Pakistan	.357
Canada	.896	Mongolia	.505	Bangladesh	.356
Sweden	.890	Zimbabwe	.501	Sierra Leone	.356
Germany	.881	Panama	.495	Cambodia	.354
Iceland	.880	Philippines	.492	Suriname	.353
Ireland	.863	Ghana	.488	Russia	.345
U.S.A.	.854	Bhutan	.486	Paraguay	.344
Hong Kong	.846	Brazil	.482	Algeria	.342
Japan	.844	Sri Lanka	.479	Vietnam	.339
France	.789	Uganda	.477	Nicaragua	.337
Qatar	.779	El Salvador	.461	Togo	.335
Spain	.770	Bulgaria	.457	Burundi	.330
Portugal	.761	China	.456	Centr. African Rep.	.326
Belgium	.758	Ethiopia	.453	Guinea	.322
Oman	.755	Jamaica	.452	Yugoslavia	.317
U.A.E.	.754	Romania	.451	Cameroon	.316
Chile	.752	Nepal	.450	Albania	.304
Taiwan	.734	Syria	.449	Comoros	.306
Kuwait	.731	Senegal	.447	Indonesia	.305
Israel	.717	Tanzania	.444	Chad	.304
Italy	.714	Gambia	.443	Haiti	.302
Bahrain	.706	Papua New Guinea	.436	Madagascar	.298
Bahamas	.698	Djibouti	.435	Mozambique	.297
Mauritius	.692	Bolivia	.434	Kenya	.296
Brunei Dar.	.683	St. Kitts	.433	Myanmar	.288
Saudi Arabia	.679	Seychelles	.433	Laos	.286
Costa Rica	.676	Zambia	.432	Libya	.278
Cyprus	.675	Mexico	.425	Afghanistan	.274
South Korea	.664	Benin	.424	Rwanda	.259
Malaysia	.663	Fiji	.420	North Korea	.258
Hungary	.656	Burkina Faso	.415	Congo	.254
Malta	.638	Peru	.412	Guinea-Bissau	.252
Greece	.633	Gabon	.404	Nigeria	.240
Czech Rep.	.623	Mauritania	.403	Angola	.211
Jordan	.620	Iran	.402	Iraq	.164
Poland	.615	Cuba	.400	Equatorial Guinea	.162
Barbados	.610	Malawi	.397	Liberia	.141
Morocco	.607	Ivory Coast	.396	Somalia	.139
Uruguay	.599	Mali	.386	Zaire	.106
Tunisia	.588	Honduras	.376		

Nunn (2007): Contract Intensity

- Nunn's measure of contract intensity is the proportion of an industry's intermediate inputs that are relationship-specific
- What does this mean? An investment is relationship-specific if its value inside the buyer-seller relationship is significantly higher than outside the relationship
- How is it constructed?
  1. Use the United States' Input-Output Accounts to identify the intermediate inputs used to produce each good and in what proportions
  2. Identify which inputs are relationship-specific (or rather, which are not)
     1. Sold on an organized exchange
     2. Reference priced in trade publications (ambiguous – constructs 2 measures)
     3. Neither
  3. Construct share of "non-standardized" inputs
- Data are from Rauch (1999)

Nunn (2007): Contract Intensity

Table 1: The least and most contract intense industries.

20 Least Contract Intense: lowest z_i^{rs1}		20 Most Contract Intense: highest z_i^{rs1}	
z_i^{rs1}	Industry Description	z_i^{rs1}	Industry Description
.024	Poultry processing	.810	Photographic & photocopying equip. manuf.
.024	Flour milling	.819	Air & gas compressor manuf.
.036	Petroleum refineries	.822	Analytical laboratory instr. manuf.
.036	Wet corn milling	.824	Other engine equipment manuf.
.053	Aluminum sheet, plate & foil manuf.	.826	Other electronic component manuf.
.058	Primary aluminum production	.831	Packaging machinery manuf.
.087	Nitrogenous fertilizer manufacturing	.840	Book publishers
.099	Rice milling	.851	Breweries
.111	Prim. nonferrous metal, ex. copper & alum.	.854	Musical instrument manufacturing
.132	Tobacco stemming & redrying	.872	Aircraft engine & engine parts manuf.
.144	Other oilseed processing	.873	Electricity & signal testing instr. manuf.
.171	Oil gas extraction	.880	Telephone apparatus manufacturing
.173	Coffee & tea manufacturing	.888	Search, detection, & navig. instr. manuf.
.180	Fiber, yarn, & thread mills	.891	Broadcast & wireless comm. equip. manuf.
.184	Synthetic dye & pigment manufacturing	.893	Aircraft manufacturing
.190	Synthetic rubber manufacturing	.901	Other computer peripheral equip. manuf.
.195	Plastics material & resin manuf.	.904	Audio & video equipment manuf.
.196	Phosphatic fertilizer manufacturing	.956	Electronic computer manufacturing
.200	Ferroalloy & related products manuf.	.977	Heavy duty truck manufacturing
.200	Frozen food manufacturing	.980	Automobile & light truck manuf.

Notes: The measures have been rounded from seven digits to three digits.

Nunn (2007): Examining the Raw Data

- Do countries with better contracting environments produce and export more contract intensive goods, on average?
- Compute average contract intensity of a country's exports or production
- In the case of production, this is constructed using data from UNIDO's Industrial Statistics Database
- The answer appears to be "yes"

Nunn (2007): Examining the Raw Data

TABLE III

JUDICIAL QUALITY AND THE AVERAGE CONTRACT INTENSITY OF PRODUCTION AND OF EXPORTS

	Output regressions		Export regressions	
	$\bar{Z}_c^{rs1}$	$\bar{Z}_c^{rs2}$	$\bar{Z}_c^{rs1}$	$\bar{Z}_c^{rs2}$
Judicial quality: Q_c	.392**	.465**	.290**	.291**
	(.109)	(.109)	(.081)	(.065)
Number of obs.	78	78	146	146
R^2	.15	.22	.08	.08

The dependent variables are the average contract intensity of production or exports. Standardized beta coefficients are reported, with robust standard errors in brackets. ** indicates significance at the 1 percent level.

Nunn (2007): Econometric Evidence

- Nunn runs

$$\ln(x_{ic}) = \alpha_i + \alpha_c + \beta_1 z_i Q_c + \beta_2 h_i H_c + \beta_3 k_i K_c + \varepsilon_{ic},$$

where

- x_{ic} denotes total exports in industry i from country c to all other countries in the world
- z_i is a measure of the importance of relationship-specific investments (i.e., contract intensity) in industry i
- Q_c is a measure of the quality of contract enforcement in country c
- H_c and K_c denote country c's endowments of skilled labor and capital, and h_i and k_i are the skill and capital intensities of production in industry i
- α_i and α_c denote industry fixed effects and country fixed effects
- Later in paper, robustness tests and endogeneity corrections

Nunn (2007): Econometric Evidence

TABLE IV
THE DETERMINANTS OF COMPARATIVE ADVANTAGE

	(1)	(2)	(3)	(4)	(5)
Judicial quality interaction: $z_i Q_c$	.289**	.318**	.326**	.235**	.296**
	(.013)	(.020)	(.023)	(.017)	(.024)
Skill interaction: $h_i H_c$			.085**		.063**
			(.017)		(.017)
Capital interaction: $k_i K_c$			.105**		.074
			(.031)		(.041)
Log income × value added: $va_i \ln y_c$				−.117*	−.137*
				(.047)	(.067)
Log income × intra-industry trade: $iit_i \ln y_c$				.576**	.546**
				(.041)	(.056)
Log income × TFP growth: $\Delta tfp_i \ln y_c$				.024	−.010
				(.033)	(.049)
Log credit/GDP × capital: $k_i CR_c$				.020	.021
				(.012)	(.018)
Log income × input variety: $(1 - hi_i) \ln y_c$				.446**	.522**
				(.075)	(.103)
Country fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
R^2	.72	.76	.76	.77	.76
Number of observations	22,598	10,976	10,976	15,737	10,816

Dependent variable is $\ln x_{ic}$. The regressions are estimates of (1). The dependent variable is the natural log of exports in industry i by country c to all other countries. In all regressions the measure of contract intensity used is z_i^{rs1}. Standardized beta coefficients are reported, with robust standard errors in brackets. * and ** indicate significance at the 5 and 1 percent levels.

Interpretation of the Results

- Recent studies show that the quality of contract enforcement is important for the types of goods countries export
  - driven by variation in **within-country** contracting across producers
- The interpretation of the importance of the institutions of exporting countries is very different in Berkowitz et al. (2006)
  - they emphasize security of contracting **across countries** (effect of New York convention)
- When considering offshoring by US-based companies, again variation in the quality of the institutions of the countries from which they buy parts or contract manufacturing is likely to be important
- **Later in the Lecture:** simple adaptation of Nunn's approach to data on U.S. imports
  - I will replicate some of his results and test other predictions that emerge from offshoring models with contractual frictions

CONTRACTING IN A MODEL OF EXPORTING

Modelling Contractual Frictions

- I will next begin to discuss simple ways to introduce contractual imperfections in recent benchmark models in international trade
- I will start with a simple variant of the Melitz (2003) model of exporting
- Next time I will introduce contractual frictions into the model of vertical FDI with heterogeneous firms

Contractual Frictions in the Melitz Model

- In the Melitz model, it is assumed that firms decide on the volume of output sold in each market in a profit-maximizing manner
- Remember that the profits that a firm from country i with productivity φ anticipates obtaining in country j are given by

$$\pi_{ij}(\varphi) = \max\left\{(\tau_{ij} w_i)^{1-\sigma} B_j \varphi^{\sigma-1} - w_i f_{ij}, 0\right\}$$

- But to realize those profits, we implicitly assume that the firm:
  1. has full information on all parameters of the model (including the level of demand implicit in the term B_j)
  2. can hire (efficiency units of) labor at a wage rate w_i (or inputs) without frictions
  3. can costlessly contract with a local distributor (an agent, employee, or a firm) that will collect the sales revenue in country j and will hand them over to the exporter in i in exchange for a fee

Contractual Frictions in the Melitz Model

- A lot of interesting recent work in Trade has been devoted to studying the implications of relaxing Assumptions #1 and #2
  - Segura-Cayuela and Vilarrubia (2008), Albornoz et al. (2012) on demand uncertainty
  - Helpman et al. (2010) on imperfect labor markets
  - Nunn (2007) and Levchenko (2007) on local inputs
- I will instead outline some implications of relaxing Assumption #3

Complete-Contracting Benchmark

- Consider the complete-contracting assumption implicit in the Melitz (2003) model and its applications
- Take a firm in country i with productivity level φ
- For each market j for which $\pi_{ij}(\varphi) > 0$:
  - the firm agrees to ship an amount of goods equal to $q_{ij}(\varphi)$ at some initial date $t = 0$
  - the distributor agrees to pay an amount $s_{ij}(\varphi)$ at some later date (perhaps when the good has been sold and revenue has been collected)
- For simplicity, take the case in which the firm makes a take-it-or-leave it offer to the distributor in j and the latter's cost of distribution is equal to $w_i f_{ij}$
  - if the cost was in terms of country j's labor (not i's) not much would change

Complete-Contracting Benchmark

- The firm will then solves

$$\begin{aligned} \max_{q_{ij}(\varphi), s_{ij}(\varphi)} \quad & s_{ij}(\varphi) - \tau_{ij} w_i q_{ij}(\varphi) \\ \text{s.t.} \quad & p_{ij}(q_{ij}(\varphi)) q_{ij}(\varphi) - w_i f_{ij} - s_{ij} \geq 0 \end{aligned}$$

  where $p_{ij}(\cdot)$ is the inverse demand function faced by the distributor
- Quite naturally, the participation constraint will bind and we will revert to the expressions in the Melitz model

Imperfect Contracting

- Suppose, however, that this contract is **imperfectly enforceable**
- We discussed before a variety of reasons why that might be the case
- For instance, if the distributor were to abscond with the sales revenue
  - the exporter would only be able to recoup a share of the expected proceeds via litigation
  - or it would anticipate recouping all the proceeds with lower-than-one probability
- For concreteness, suppose that absconding (or defaulting) would leave the distributor with an expected share χ_D of sales revenue minus the cost of distribution $w_i f_{ij}$

Optimal Imperfect Contract

- When signing the initial contract, the exporter then knows that any payment to the distributor lower than $\chi_D p_{ij}\left(q_{ij}\left(\varphi\right)\right) q_{ij}\left(\varphi\right) - w_i f_{ij}$ would lead the distributor to abscond and would thus trigger litigation
- The firm will then solve

$$\begin{aligned} \max_{q_{ij}(\varphi), s_{ij}(\varphi)} \quad & s_{ij}\left(\varphi\right) - \tau_{ij} w_i q_{ij}\left(\varphi\right) \\ \text{s.t.} \quad & p_{ij}\left(q_{ij}\left(\varphi\right)\right) q_{ij}\left(\varphi\right) - w_i f_{ij} - s_{ij} \geq 0 \\ & p_{ij}\left(q_{ij}\left(\varphi\right)\right) q_{ij}\left(\varphi\right) - s_{ij} \geq \chi_D p_{ij}\left(q_{ij}\left(\varphi\right)\right) q_{ij}\left(\varphi\right) \end{aligned}$$

- For a sufficiently high χ_D, the IC constraint is more binding than the PC constraint
- In such a case, imperfect contracting will reduce the profitability of selling in j and the more so, the larger is χ_D

Institutional Quality

- What does χ_D depend on? Makes sense to think of it as inversely related to the effective cost for the distributor of defaulting on the exporter
- One would imagine that countries with better contracting institutions and higher quality legal systems would tend to enforce lower levels of χ_D
- In sum, controlling for standard determinants of exporting, the extensive and intensive margins of exporting should respond positively to better contracting institutions of the importing country
  - see Araujo, Mion and Ornelas (2012) for a dynamic model and empirical evidence with Belgian firm-level dataset
- Related work: Manova (2012) emphasizes the role of financial institutions in the **exporting country**
  - firms need working capital to produce and to cover exporting costs and may be constrained in obtaining it

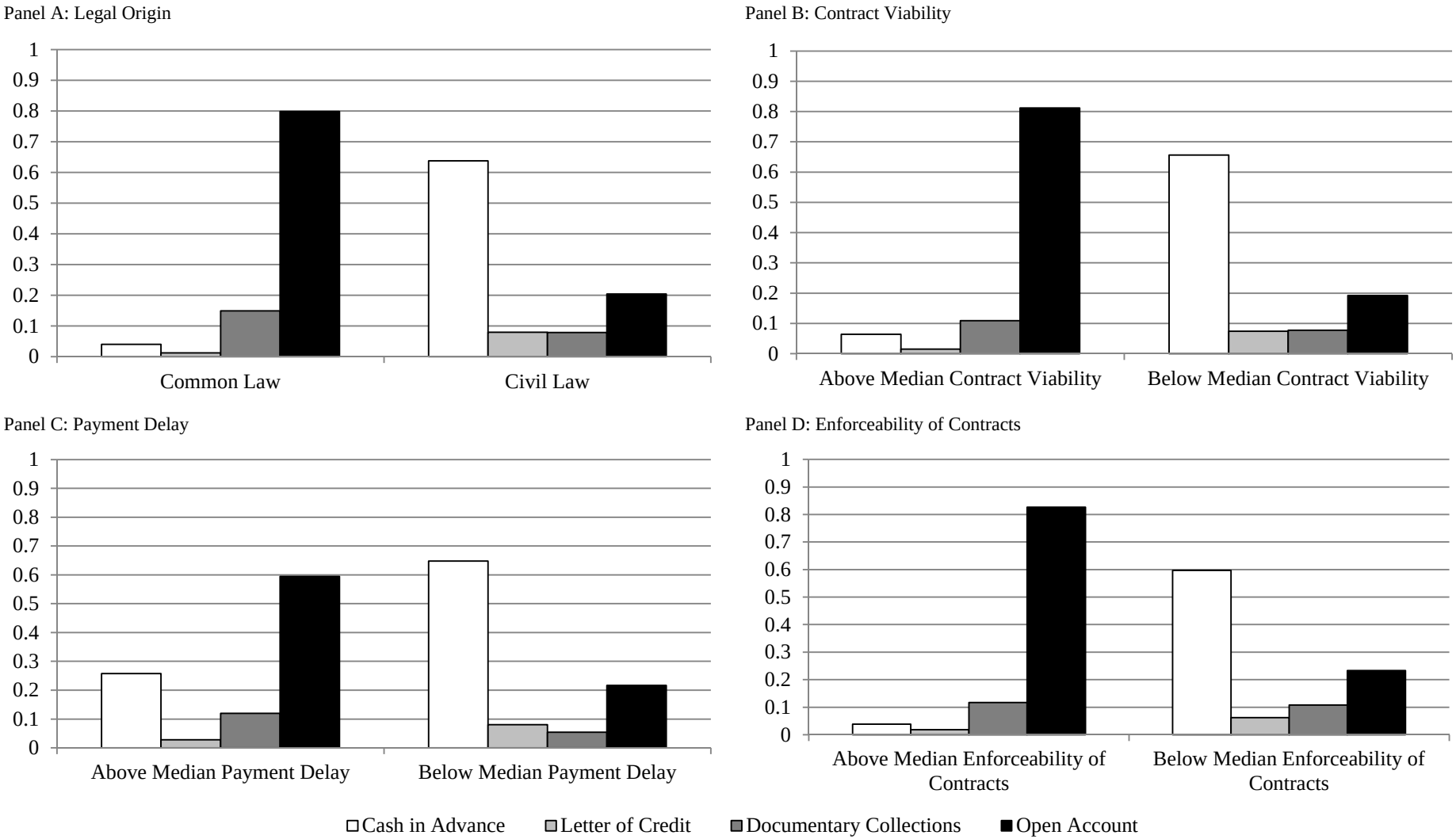
A Simple Solution?

- In the example above, it may seem that a simple solution to the problem is to have the distributor pay for the goods in advance
- In that case, the exporter can insist on a payment equal to $p_{ij}\left(q_{ij}\left(\varphi\right)\right)q_{ij}\left(\varphi\right) - w_i f_{ij}$, as implemented by the optimal complete (or fully enforceable) contract
- Why would this typically not work?
  1. The distributor might worry about moral hazard on the part of the exporter (quality of goods being shipped is difficult to contract upon)
  2. The distributor might face borrowing constraints which would limit the ability of the exporter to obtain the desired amount of revenue ex-ante

Choice of Mode of Trade Finance

- Antràs and Foley (2011) model the tradeoff between "cash in advance" versus "open account" export contracts
  - crucially shaped by the contracting environment of the importing country, but in subtle ways
  - higher risk of default makes CIA appealing, but high borrowing costs (due to weak institutions) make OA appealing
- Active literature: Ahn (2010), Olsen (2010), Schmidt-Eisenlohr (2009), Amiti and Weinstein (2011)
- Empirically, we analyze transaction level data from U.S. based exporter of frozen and refrigerated food products, particularly poultry

Choice of Mode of Trade Finance



CONTRACTING IN A MODEL OF GLOBAL SOURCING

Contractual Frictions in a Vertical FDI Model

- Consider a differentiated good sector, in which production requires an initial headquarters fixed cost of entry (or innovation) f_E
- Producers then learn their productivity φ which is drawn from $G(\varphi)$
- Firms then decide to exit or stay in the market and produce
- In the latter case, headquarters need to incur an additional fixed cost f_D after which they can choose a variable amount of headquarter services h to combine with manufacturing in production
- Home is assumed to be much more productive than Foreign in innovation/entry and in the production of headquarter services, so these are always produced at Home.

Heterogeneity in the Benchmark Vertical FDI Model

- All fixed costs are in terms of Northern labor
- Units of h can be produced one-to-one with labor at Home
- Manufacturing entails no overhead costs and units of m can be produced one-to-one with labor in both countries
- Foreign thus has comparative advantage in manufacturing.
- Final-good production combines h and m according to the technology

$$q^i(\varphi) = \varphi \left(\frac{h^i}{\eta}\right)^{\eta} \left(\frac{m^i}{1-\eta}\right)^{1-\eta},$$

where $1 < \eta < 1$ is a sectoral level of headquarter intensity, while φ measures firm-level productivity

Heterogeneity in the Benchmark Vertical FDI Model

- There are costs associated with the fragmentation of production.

1. An additional fixed cost $f_I - f_D > 0$ is required from the headquarters at Home when h and m are geographically separated
2. Fragmentation also entails an iceberg transportation cost $\tau > 1$ associated with shipping the manufactured input m back to the Home country (τ could also reflect communication or coordination costs)

- Trade in final goods remains free.

Heterogeneity: Choice of Location

- To characterize firm behavior, we first solve for optimal choices of headquarter services (h) and input manufacturing (m) for each option
- The operating profits (net of entry costs) associated with domestic sourcing (or no fragmentation) are given by

$$\pi_D(\varphi) = (w_N)^{1-\sigma} B \varphi^{\sigma-1} - w_N f_D \tag{1}$$

- Those under vertical FDI or offshoring by

$$\pi_O(\varphi) = \left((w_N)^{\eta} (\tau w_S)^{1-\eta}\right)^{1-\sigma} B \varphi^{\sigma-1} - w_N f_O \tag{2}$$

with

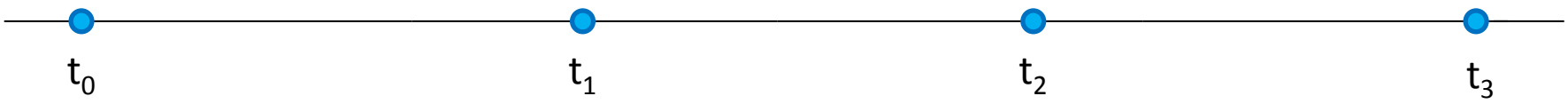
$$B = \frac{1}{\sigma}\left(\frac{\sigma}{(\sigma-1)P}\right)^{1-\sigma} \beta \left(w_N L_N + w_S L_S\right)$$

- Is it reasonable to assume that these 'first-best' (or joint-maximizing) profit levels will be attained?

Underlying Microeconomic Structure

- Headquarter services h are controlled by a final-good producer (agent F)
- Manufacturing or plant production m is controlled by an operator of the production facility (agent M)
- h and m produced one-to-one with labor
- Let us focus for now on the case in which M is not an employee of F and is thus an independent supplier
- How can the profit levels in (7) and (2) be attained?
- Let us first discuss the timing of events more formally

Timing of Events



Initial Contract

Investments in h and m

Renegotiation / Bargaining

Final good produced and sold

A Simple Contract

- Consider the case of offshoring manufacturing to the South
- Suppose that F offers a Southern M a contract that stipulates a quantity m^C of manufacturing 'services' to be provided by M in exchange for a fee s^C received by M
- F will then choose $h^C(\varphi)$, $m^C(\varphi)$ and $s^C(\varphi)$ to solve

$$\max_{h(\varphi),m(\varphi),s(\varphi)} \quad p(q(\varphi))\,q(\varphi) - w_N h(\varphi) - w_N f_O - s(\varphi)$$

$$\text{s.t.} \quad s(\varphi) \geq \tau w_S m(\varphi)$$

- Naturally, $s^C(\varphi)$ will be set to make M's participation constraint bind, and the joint-profit maximizing level of investments and output delivering (2) will be attained
  - timing of events or payments is irrelevant here

Limitations of the Simple Contract

- For M to abide by the terms of the contract, it is important that a court of law be able to verify that m^C was indeed provided
- In practice, manufacturing 'services' are not only a function of the **quantity** of manufacturing provided (say the number of units of the input or finished good delivered)
- But they are also affected by their **quality or compatibility** with other parts of the production process
- Whether a given quantity was delivered may be easily verifiable, but their quality or compatibility might be much harder to verify
- Quality-contingent contracts (specifying the purchase of a given quantity of goods *m of a particular quality* for a certain price) would still deliver the 'first-best' profits in (2)
    - But it is much less reasonable to assume that courts of law will be able to enforce such contracts

Alternatives to the Simple Contract

- When quality or compatibility issues are important, contracts specifying *only* quantities and prices (regardless of quality) will tend to be unappealing to F
  - particularly when the independent supplier M can produce a useless, low-quality version of m at a negligible cost (or by heavily reducing production costs)
- In some cases, revenue-sharing contracts might be appealing, although they will not be able to attain the first-best when the provision of headquarter services is not verifiable either (see Holmstrom, 1982)
  - and they might be prone to manipulation thus making them unappealing in some settings
- I will discuss below several possible types of initial contract terms, with varying degrees of incompleteness
  - but I will abstract from mechanisms and other foundational issues

'Totally Incomplete' Contracts

- For now, however, let us focus on a stark example in which:
  1. either contracts are **complete**: quality-contingent contracts are perceived to be enforceable
  2. or they are **totally incomplete**: no aspect of the initial contract is perceived to be enforceable, except for an initial transfer occuring at the time of the agreement
- For reasons discussed last time, it seems natural to assume that certain contracts that are feasible or enforceable in domestic transactions might not be feasible or enforceable in international transactions
- Again it is useful to start with a stark example in which:
  1. Contracting is complete or perfect in the absence of offshoring
  2. Contracting is totally incomplete in offshoring relationships

Implications of Incomplete Contracts

- What happens when the initial contract does not stipulate m nor a price for its purchase (in an enforceable manner)?
- F and M can still negotiate over the terms of exchange after m has been produced
  - i.e.: at t_2 in the timing of events chart above
- Does the lack of a complete contract necessarily lead to inefficiencies?
- Not always: only when a separation (or absence of a transaction between F and M) is costly to these parties
- In global sourcing environments, there are however two natural sources of 'lock in':
  - inputs (and also headquarter services) are often customized to their intended buyers and cannot easily be resold at full price to alternative buyers
  - even in the absence of customization, search frictions make separations costly for both F and M

Lock In and Hold Up

- In the presence of lock-in effects, incomplete contracting leads to a **two-sided hold-up problem** in offshoring relationships
- The exchange price for m will only be determined ex-post (at t_2), at which point the investments incurred by both agents are sunk and have a relatively lower value outside the relationship
- F will try to push the price of the input as low as possible (but not "too much" if separation is costly to him/her)
- Instead, M will try to raise the price of m as much as possible, knowing that it is also in F's best interest to go through with the transaction
- Even when bargaining is efficient and trade takes place in equilibrium, the possibility of a disagreement implies that F and M will tend to have lower incentives to invest in h and m than in the complete contracting case

More Structure on Bargaining Stage

- It is common to characterize the ex-post bargaining at t_2 using the Nash Bargaining solution and assuming symmetric information between F and M (abstract from mechanisms)
- This leaves F and M with their outside options plus a share of the ex-post gains from trade (i.e., the difference between the sum of the agent's payoffs under trade and their sum under no trade)
- For the time being, I will assume that the outside options of both parties are 0
- In other words, I am assuming that m is fully specialized to F (and useless to other producers), while h is also fully tailored to M and useless to other agents
- I will also consider the case of symmetric Nash bargaining, so that F and M share equally the ex-post gains
- These are strong assumptions which I will relax below

Investment Stage

- Denote revenue by

$$r(h,m) = p(q(h,m))\, q(h,m)$$

- Then in the ex-post bargaining at t_2, F will obtain $\frac{1}{2} r(h,m)$ and, at t_1, will set h to solve

$$\max_h \quad \frac{1}{2} r(h,m) - w_N h \tag{3}$$

- M will in turn obtain $\frac{1}{2} r(h,m)$ at t_2 and will choose m at t_1 to solve

$$\max_m \quad \frac{1}{2} r(h,m) - \tau w_S m \tag{4}$$

Initial Contract

- For comparability with the complete-contracting case, I will assume that F has full bargaining power ex-ante, so it can make a take-it-or-leave-it offer to M
- Because the initial contract is allowed to include a lump-sum transfer between parties, F can set the transfer such that the PC constraint of M exactly binds
- So, as with complete contracts, F ends up with a payoff of

$$\pi_O = r(h, m) - w_N h - \tau w_S m - w_N f_O$$

Equilibrium Profitability of Offshoring

- Plugging the equilibrium values of h and m resulting from programs (3) and (4) delivers the following expression for the profits obtained by F:

$$\pi_O = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma \varphi^{\sigma-1} - w_N f_O \tag{5}$$

where

$$\Gamma = (\sigma + 1) \left(\frac{1}{2} \right)^{\sigma} < 1 \quad \text{for } \sigma > 1$$

- This is identical to the complete-contracting expression except for the term $\Gamma < 1$, which reflects the loss of efficiency due to incomplete contracting
- Γ is decreasing in σ reflecting the higher cost of incomplete-contracting frictions in more competitive environments

Choice of Location

- Note that we can write

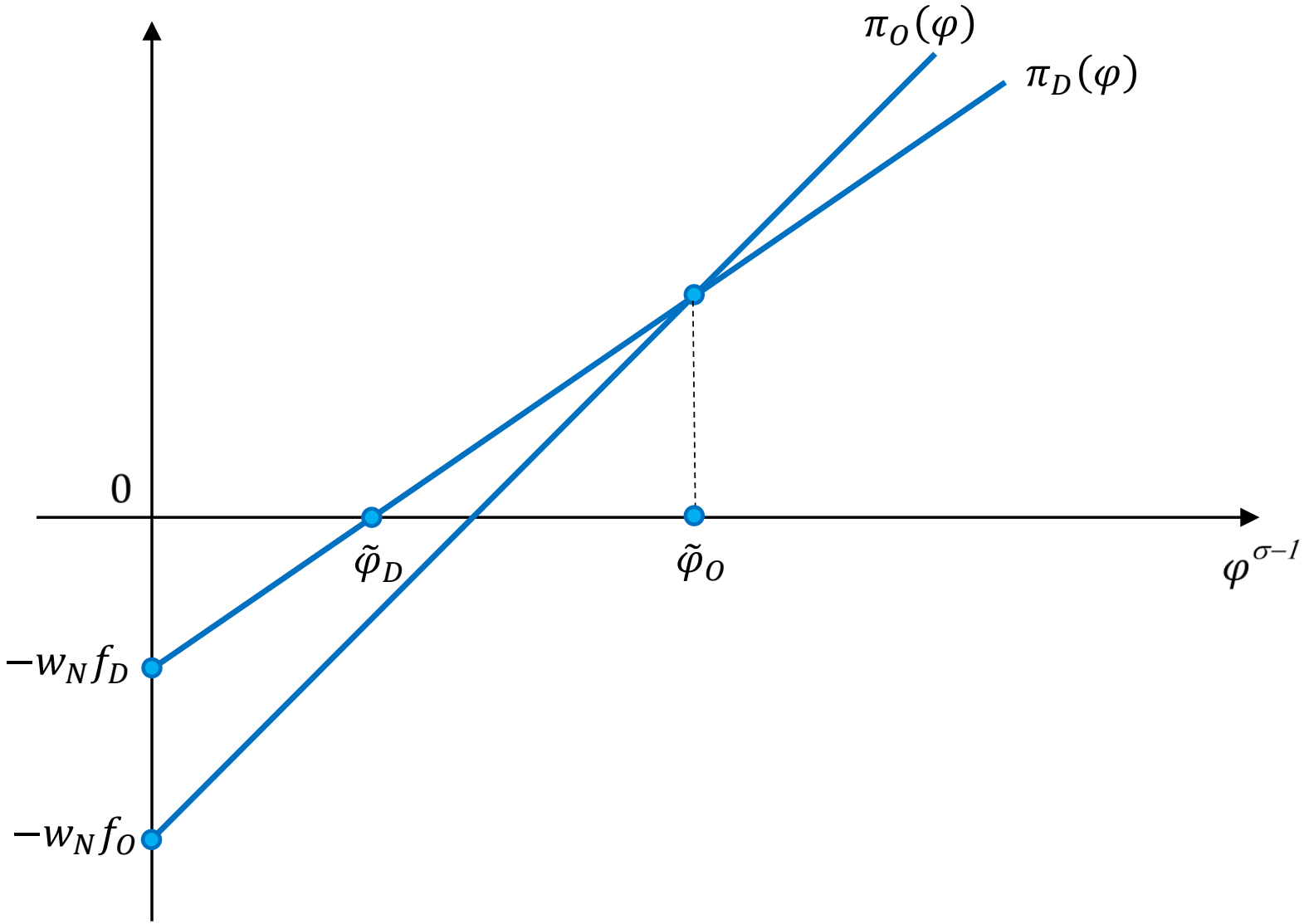
$$\pi_\ell(\varphi) = \psi_\ell B \varphi^{\sigma-1} - w_N f_\ell \quad \text{for } \ell = D, O$$

and that

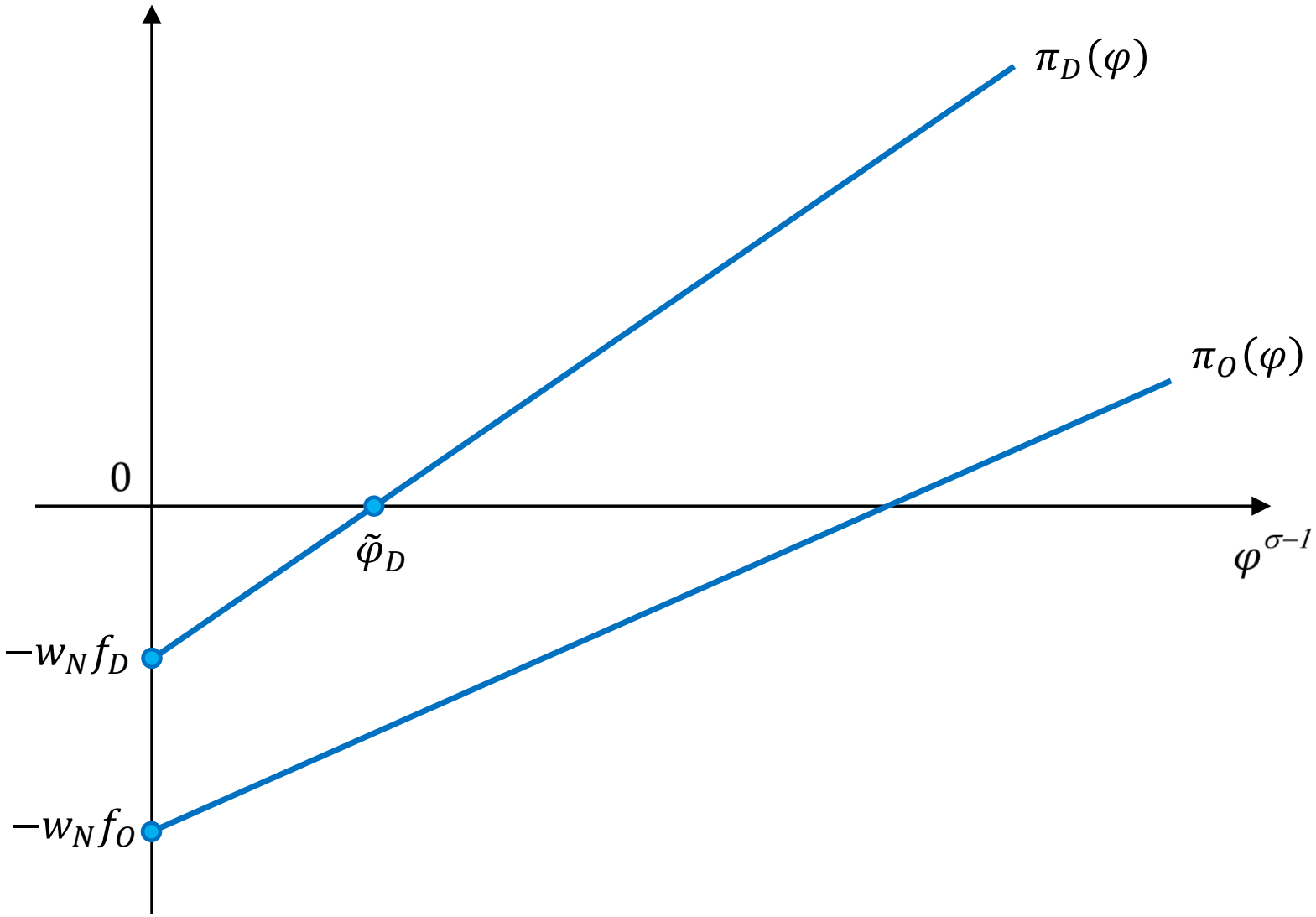
$$\frac{\psi_D}{\psi_O} = \frac{1}{\Gamma}\left(\frac{w_N}{\tau w_S}\right)^{-(1-\eta)(\sigma-1)}$$

- So when $w_N \approx \tau w_S$, we necessarily have $\psi_D/\psi_O > 1$ (because $\Gamma < 1$)
  - analogous to productivity in South being low (little cost advantage)
- But for sufficiently different wage levels, we restore $\psi_D/\psi_O < 1$ as long as $w_N > \tau w_S$ (as with perfect contracting)

Equilibrium Sorting with Large Wage Differences



Equilibrium Sorting with Small Wage Differences



Comparative Statics

- With a Pareto distribution of productivity, the share of active firms engaged in offshoring is given by

$$\frac{\int_{\tilde{\varphi}_O}^{\infty} \varphi^{\sigma-1} dG(\varphi)}{\int_{\tilde{\varphi}_D}^{\tilde{\varphi}_O} \varphi^{\sigma-1} d\varphi} = \frac{1}{\left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_D}\right)^{k-(\sigma-1)} - 1}$$

with

$$\left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_D}\right)^{\sigma-1} = \frac{f_O - f_D}{f_D} \frac{1}{\Gamma\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)} - 1}$$

- This share is clearly increasing in $w_N/\tau w_S$ and decreasing in k and η as with complete contracts
- But because $\Gamma < 1$, this share is lower than with complete contracting

An Application: Product Cycles

- Vernon (1966)'s PC hypothesis: new goods are not only developed in high-wage countries, but they are also manufactured there for a while
- Theoretical perspectives:
  - Imitation (Krugman, 1979, Grossman and Helpman, 1991)
  - Vernon emphasized the role of multinational firms in the eventual production transfer to less developed countries
- Empirical evidence suggests that indeed it takes time for low-wage countries to start producing relatively unstandardized goods
- Antràs (2005) provides a theory where the decision to shift production to low-wage South is a profit-maximizing one from the point of view of firms in North

An Application: Product Cycles

- The time lag between the first appearance of the product and its manufacturing in the South is explained by appealing to incomplete contracts *in international transactions* (not exogenous or driven by imitation)
- Intuitively, if headquarter intensity η falls along the life cycle of a good, the model above would suggest that the incentives to offshore increase over time
- Production lag persists even in the absence of trade costs and even when wages in South remain lower with free trade (a feature of Antràs' 2005, general equilibrium)
- Antràs (2005) also shows that an improvement in contracting moves the terms of trade in favor of the South. This enhances welfare in the South, but has an ambiguous effect on Northern welfare

Robustness and Generalizations

- We have made a bunch of simplifying assumptions to illustrate the negative role of contractual frictions on the profitability of offshoring
- It is important to study more general environments for two reasons:
  - verify the robustness of the key comparative statics
  - generalize the framework to more realistic environments to better guide empirical work
- I will discuss five generalizations below
  1. Generalized Nash bargaining
  2. Restrictions on ex-ante transfers (financial constraints?)
  3. Partial contractibility
  4. Partial relationship-specificity
  5. Multiple-supplier environments

Generalized Nash Bargaining

- We have assumed that F and M share the ex-post gains from trade equally
- In some circumstances it may make sense to assume that the primitive bargaining power of F might be higher or lower than $1/2$
- Later we will develop models in which the effective ex-post bargaining power of F will be endogenous and shaped by competition across suppliers
- For now just assume that F gets a share β of the ex-post gains from trade

Generalized Nash Bargaining

- This amounts to replacing $\frac{1}{2}$ with β in (3) and with $1-\beta$ in (4), and equilibrium profits obtained by F can be written as:

$$\pi_O = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma \varphi^{\sigma-1} - w_N f_O$$

where

$$\Gamma = (\sigma - (\sigma-1)(\beta\eta + (1-\beta)(1-\eta))) \left(\beta^{\eta} (1-\beta)^{1-\eta} \right)^{\sigma-1} < 1$$

- Hence, regardless of the primitive bargaining power β, incomplete contracting continues to reduce the profitability of offshoring
- The main comparative statics derived above continue to hold, except for some qualifications in the negative effect of η on offshoring (see Antràs, 2005)
- The effect of β on the profitability of offshoring will be studied in detail later in these lectures

Financial Constraints

- So far, the choice of location has been assumed to be ex-ante efficient, in the sense that it maximizes joint profits of F and M
- For this it is important that F and M can freely exchange lump-sum transfers when signing the initial contract at t_0
- In practice, it is not clear that firms can easily resort to nondistortionary transfers in their initial negotiations
  - some firms might be financially constrained and might have difficulties raising the amount of cash needed for that efficient location to be individually rational for both agents
- What happens when constraints are set on ex-ante transfers?
- Consider the case in which M can pledge to external financiers at most a share ϕ of the net income it receives from transacting with F, which is $\frac{1}{2}r(h,m) - \tau w_S m$

Financial Constraints

- In such a case, F obtains a payoff of

$$\pi_{O,Fin} = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma_{Fin} \varphi^{\sigma-1} - w_N f_O \qquad (6)$$

where

$$\Gamma_{Fin} = (\sigma + \phi - (\sigma - 1)(1 - \phi)\eta) \left(\frac{1}{2} \right)^{\sigma} < \Gamma < 1$$

- It is clear that, holding B constant, these profits are lower than in the case with ex-ante transfers provided that $\phi < 1$
- Intuitively, offshoring now not only entails distorted investments, but it is also associated with a loss of rents on the part of F
- But same comparative statics apply since Γ_{Fin} decreases in η
- **New prediction:** the higher is ϕ (the better financial contracting), the more appealing is offshoring, other things equal
  - note: positive effect of ϕ is increasing in headquarter intensity η

Partial Contractibility

- It is unrealistic to assume that contracts in international transactions are 'totally incomplete'
  - surely some aspects of production are contractible and enforceable
- It is also unrealistic to assume that contracts in domestic transactions are complete
  - surely some aspects of production are nonverifiable to (domestic) outsiders
- I next incorporate partial contractibility into the model following the approach in Antràs and Helpman (2008)

Modelling Partial Contractibility

- The main idea is that the production processes h and m now entail a continuum of relationship-specific *activities* or parts
- A fraction of these activities is ex-ante contractible while the rest cannot be verified by a court of law and therefore are noncontractible
- This fraction is allowed to vary across production processes reflecting technological aspects that make some inputs more contractible than others
- But fraction is also allowed to vary across countries reflecting variation in contracting institutions
    - certain types of contracts are perceived to be enforceable in some environments but not in others

Partial Contractibility: Specific Assumptions

- Same assumptions as before, but now let

$$h = \exp\left[\int_0^1 \log x_h(i)\, di\right]$$

and

$$m = \exp\left[\int_0^1 \log x_m(i)\, di\right]$$

- Only activities related to input $k = h, m$ in the range $\left[0, \mu_{kj}\right]$ (with $0 \leq \mu_{kj} \leq 1$) are contractible in country $j = N, S$
  - in the sense that the characteristics of these activities can be fully specified in advance in an *enforceable* ex-ante contract
- Initial contracts now stipulates a lump-sum transfer between F and M and the level of contractible activities (which are still carried out at t_1)
- Still, parties will bargain at t_2 about the division of the surplus generated from incorporating the noncontractible into production

Partial Contractibility: Equilibrium

- Solving for the subgame perfect equilibrium of the game, we have that F's profits under offshoring are given by

$$\pi_{O,Partial} = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma_{O,Partial} \varphi^{\sigma-1} - w_N f_O$$

where

$$\Gamma_{O,Partial} = \left(\frac{\sigma}{\sigma - (\sigma-1)\gamma_O} + 1 \right)^{\sigma-(\sigma-1)\gamma_O} \left(\frac{1}{2} \right)^{\sigma}$$

and

$$\gamma_O \equiv \eta (1 - \mu_{hS}) + (1-\eta)(1 - \mu_{mS})$$

- $\Gamma_{O,Partial}$ is increasing in μ_{hS} and μ_{mS} and thus in the quality of contracting in South (interacts with η)

Choice of Location

- The expression for domestic sourcing is analogous (with w_N and μ_{mN} replacing w_S and μ_{mS}, respectively) so we can write:

$$\pi_\ell(\varphi) = \psi_\ell B \varphi^{\sigma-1} - w_N f_\ell \quad \text{for } \ell = D, O$$

with

$$\frac{\psi_D}{\psi_O} = \frac{\Gamma_{D,Partial}}{\Gamma_{O,Partial}} \left(\frac{w_N}{\tau w_S} \right)^{-(1-\eta)(\sigma-1)}$$

- Note that contracting institutions only matter when they differ across location decisions
- Improvements in enforcement of contracts in Southern transactions will increase the prevalence of foreign sourcing

Partial Relationship Specificity

- Although relationship-specific investments are pervasive, the assumption of full relationship-specificity is extreme
- Even when particular transactions end up not occuring, suppliers can generally recoup part of the cost of their investment, perhaps by reselling their goods to alternative buyers
- Similarly, contractual breaches by suppliers may reduce the overall profitability of headquarter services, but will generally not render these useless
- Proper modeling of partial-relationship-specificity is tricky (secondary markets, multiple rounds of negotiation,...)
- But mechanics are similar to partial contractibility
  - parties feel 'secure' or do not anticipate hold up when undertaking certain investments
- We expect foreign sourcing in weak contracting environments to feature relatively low levels of specificity (related to Nunn, 2007)

Many Suppliers

- In modern manufacturing processes final-good producers combine intermediate inputs provided by various suppliers
- Furthermore inputs provided by different suppliers are generally partially substitutable
  - think of (quality-adjusted) services from those inputs rather than physical units
- Implications for the (ex-post) negotiations between F and its suppliers and for the overall efficiency of production
- I next briefly outline a multiple-supplier extension of the global sourcing model above, following the approach in Acemoglu, Antràs and Helpman (2007)
- Degree of complementarity between inputs in production plays a crucial role in determining the profitability of production

Modelling Multiple Suppliers

- Production now combine headquarter services h and a large number (formally, a continuum) of inputs, each provided by a different supplier
- Some of these characteristics or parts of these inputs are contractible, but others are not, so again some aspects of production will need to be (re-) negotiated
- Ex-post bargaining is now multilateral, rather than bilateral, so adopt the Shapley value as the solution concept for multilateral bargaining (as in Hart and Moore, 1990)
    - technically, one needs to consider the limit of a finite-player game to obtain a well-defined expression for the Shapley value

Multiple Suppliers: Specific Assumptions

- Production combines headquarter services and a measure 1 of intermediate inputs:

$$q = \varphi \left(\frac{h}{\eta} \right)^{\eta} \left(\frac{\left[\int_0^1 m(j)^{\rho} dj \right]^{1/\rho}}{1-\eta} \right)^{1-\eta}$$

  where $m(j)$ is an input of type j
  - $\rho \in [0,1]$ governs the degree of substitutability between inputs
- Each input is performed by a different supplier, with whom the firm needs to contract
- For simplicity, assume for now that contracting is 'totally incomplete' under offshoring and complete under domestic sourcing

Benchmark: Complete Contracts

- With complete contracts, the firm makes offer $\{x(i,j)\}_{i\in[0,1],j\in[0,1]}, \{s(j)\}_{j\in[0,1]}$ to suppliers
- This ends up delivering the exact same profit levels as in the bilateral case
  - given the unit measure of identical suppliers
- Degree of substitutability ρ is irrelevant for efficiency and profitability

Equilibrium with Incomplete Contracting

- With incomplete contracting and bargaining, F ends with share

$$\beta \equiv \frac{\rho\sigma}{\rho\sigma + (\sigma - 1)(1 - \eta)}$$

of revenue, while suppliers jointly capture a share $1 - \beta$

  - The larger is input substitutability (ρ), the more surplus the firm captures

- F profits under offshoring are given by

$$\pi_{O,Multi} = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma_{Multi} \varphi^{\sigma-1} - w_N f_O$$

where

$$\Gamma_{O,Multi} = \left(\frac{(\sigma - 1)(1 - \eta) + \rho}{\rho} \right) \left(\frac{\rho\sigma}{\rho\sigma + (\sigma - 1)(1 - \eta)} \right)^{\sigma}$$

Equilibrium with Incomplete Contracting

- It can be shown that $\Gamma_{O,Multi}$ is increasing in ρ and thus the contractual frictions associated with offshoring are lower, the more substitutable the inputs
- As a consequence, the relative prevalence of offshoring is expected to increase in ρ

Intuition

- A higher ρ is associated with a lower remuneration to suppliers...
- ... but also with a higher sensitivity of their payoff to their own investments
- Also, a high ρ enhances investments in headquarter services by F
- Given functional forms, these last two effects dominate and underinvestment inefficiencies are lower in environments with higher substitutability

Reintroducing Partial Contractibility

- One can also incorporate partial contractibility in the same manner as above
- **New prediction:** the inefficiencies associated with operating in a weak contractual environment are more severe whenever inputs feature greater complementarities
- Comparative advantage result: other things equal, foreign sourcing to countries with worse contracting institutions should be more prevalent in sectors with higher substitutability between inputs (less hold-up)

EMPIRICAL EVIDENCE

Evidence Based on U.S. Imports: Specification

- Share of offshored intermediate inputs is given by

$$\Upsilon_O = \frac{\frac{\Gamma_O}{\Gamma_D}\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)}}{\left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_D}\right)^{\kappa-(\sigma-1)} - 1 + \frac{\Gamma_O}{\Gamma_D}\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)}},$$

  where

$$\frac{\tilde{\varphi}_O}{\tilde{\varphi}_D} = \left[\frac{f_O/f_D - 1}{\frac{\Gamma_O}{\Gamma_D}\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)} - 1}\right]^{1/(\sigma-1)}.$$

- We also have

$$\Upsilon_O = \Upsilon_O\left(\underset{+}{w_N/w_S}, \underset{-}{\tau}, \underset{-}{f_O/f_D}, \underset{-}{\kappa}, \underset{+}{\sigma}, \underset{-}{\eta}, \underset{+}{\Gamma_O/\Gamma_D}\right),$$

$$\frac{\Gamma_O}{\Gamma_D} = \frac{\Gamma_O}{\Gamma_D}\left(\underset{+}{\sigma}, \underset{?}{\eta}, \underset{+}{\phi}, \underset{+}{\mu_S}, \underset{-}{\epsilon}, \underset{+}{\rho}\right).$$

Offshoring Shares

Table 5.1. The Ten Industries with the Least and Most Offshoring Intensity

10 Least offshoring intensive: lowest Υ_O		10 Most offshoring intensive: highest Υ_O	
.000	Ready-Mix Concrete Manufacturing	.899	Luggage Manufacturing
.001	Fluid Milk Manufacturing	.905	Men's & Boys' Cut and Sew Shirt
.002	Manifold Business Forms Printing	.919	Men's & Boys' Cut and Sew Shirt
.002	Rolled Steel Shape Manufacturing	.924	Plastics, Foil, & Coated Paper Bag
.002	Manufactured Mobile Home Manuf	.926	Infants' Cut and Sew Apparel Ma
.003	Sheet Metal Work Manufacturing	.936	Fur and Leather Apparel Manuf
.003	Guided Missile & Space Vehicle Ma	.952	All Other General Purpose Mach
.004	Poultry Processing	.959	Jewelers' Material and Lapidary
.005	Ice Cream and Frozen Dessert Ma	.966	Women's Footwear (exc. Athletic)
.005	Soybean Processing	.996	Other Footwear Manufacturing

Sources: U.S. Census, NBER-CES Manuf. database and Annual Survey of Manufactures

Independent Variables: Cross-Industry Regressions

- τ: freight costs and tariffs
- η: capital, skill and R&D intensity
- σ: Broda-Weinstein elasticity
- κ: Nunn-Trefler measure of export dispersion
- μ_S: Nunn, Levchenko, Costinot, BJRS
- ϵ: Nunn (at good, not input level)
- ρ: Broda-Weinstein (at more aggregated level)

Limitations

1. Imports recorded at level of imported product: For some variables it does not make sense to proxy for 'seller' characteristics (certainly σ, and perhaps also η or κ)
   - one can use I/O tables to partly address this
2. Imports include final goods and intermediate inputs
   - one can use Wright (2014) methodology (End Use product concordance) to partly address this
3. Imports include inputs exported by foreign firms to their U.S. affiliated or unaffiliated partners
   - one can use sample restriction of Nunn-Trefler (2013) to partly deal with this
4. Global Sourcing decision of U.S. firms might not always lead to U.S. imports with complex networks (e.g., Apple)
   - I am not sure how to deal with this. Biases?

Benchmark Results for Complete-Contracting Model

Table 5.3. Refined Determinants of U.S. Offshoring Shares

Dep. Var. $\frac{Imp}{Imp+Ship-Exp}$	(1)	(2)	(3)	(4)	(5)	(6)
Seller Freight Costs	-0.315**	-0.295**	-0.235**	-0.239**	-0.023**	-0.054**
	(0.058)	(0.056)	(0.056)	(0.052)	(0.005)	(0.012)
Seller Tariffs	-0.025	-0.013	-0.069*	-0.074**	-0.006**	-0.012
	(0.068)	(0.068)	(0.027)	(0.026)	(0.002)	(0.009)
Log(R&D/Sales)	0.088^{+}	0.095	0.054	0.055	0.008	0.008
	(0.053)	(0.072)	(0.085)	(0.083)	(0.007)	(0.016)
Log(Skilled/Unskilled)	-0.021	-0.036	0.081	0.066	0.006	-0.009
	(0.062)	(0.073)	(0.072)	(0.071)	(0.007)	(0.015)
Log(Capital Equip/Labor)	-0.293^{+}	-0.221	0.027	-0.000	0.005	-0.050
	(0.161)	(0.163)	(0.143)	(0.149)	(0.013)	(0.031)
Log(Capital Struct/Labor)	0.261^{+}	0.108	-0.073	-0.046	-0.008	0.041
	(0.151)	(0.150)	(0.143)	(0.145)	(0.013)	(0.029)
Seller Prod. Dispersion	0.016	0.048	0.101	0.127^{+}	0.017*	0.031*
	(0.071)	(0.064)	(0.068)	(0.070)	(0.007)	(0.015)
Elasticity of Demand	-0.023	-0.042	0.007	-0.006	-0.002	-0.004
	(0.072)	(0.082)	(0.079)	(0.08)	(0.005)	(0.018)
Sample Restrictions	$\Upsilon_O \in [0,1]$	$\Upsilon_O \in [0,1]$	W	W+NT	W+NT	W+NT
Fixed Effects	Year	Year	Year	Year	Ctr/Year	Ctr/Year
Buyer vs. Seller Controls	Seller	Buyer	Buyer	Buyer	Buyer	Buyer
Observations	2,986	2,986	2,626	2,629	612,703	148,890
R^2	0.149	0.148	0.141	0.147	0.190	0.197

W and NT stand for the Wright (2014) and Nunn and Trefler (2013) sample corrections.
Standard errors clustered at the industry level. $^{+}$, *, ** denote 10, 5, 1% significance.

Results with Contractual Determinants: A Disaster

Table 5.5. Contractual Determinants of U.S. Offshoring Shares

Dep. Var. $\frac{Imp}{Imp+Ship-Exp}$	(1)	(2)	(3)	(4)	(5)	(6)
Financial Dependence	-0.022	-0.005	-0.004	-0.018	-0.006	-0.008
	(0.071)	(0.009)	(0.018)	(0.075)	(0.009)	(0.019)
Asset Tangibility	-0.176*	-0.009	-0.020			
	(0.068)	(0.008)	(0.017)			
Nunn Contractibility	-0.099^{+}	-0.005	-0.011	-0.051	-0.002	0.002
	(0.059)	(0.007)	(0.015)	(0.083)	(0.008)	(0.017)
Levchenko Contractibity	-0.117*	-0.001	0.004			
	(0.045)	(0.009)	(0.021)			
Costinot Contracibility	0.115^{+}	0.008	0.018			
	(0.067)	(0.006)	(0.013)			
BJRS Contractibility	0.019	0.002	0.021			
	(0.071)	(0.006)	(0.013)			
Specificity	0.121*	0.007	0.012	0.094	0.004	0.002
	(0.055)	(0.006)	(0.013)	(0.081)	(0.008)	(0.016)
Input Substitutability	-0.035	-0.004	-0.012	0.000	-0.002	-0.011
	(0.052)	(0.004)	(0.011)	(0.055)	(0.005)	(0.013)
Downstreamness	0.044	0.005	0.028^{+}	-0.002	0.004	0.029^{+}
	(0.081)	(0.007)	(0.016)	(0.090)	(0.008)	(0.017)
Sample Restrictions	W+NT	W+NT	W+NT^{+}	W+NT	W+NT	W+NT^{+}
Fixed Effects	Year	Ctr/Year	Ctr/Year	Year	Ctr/Year	Ctr/Year
Observations	2,629	612,703	148,890	2,629	612,703	148,890
R^2	$\simeq$0.15	$\simeq$ 0.19	$\simeq$0.20	0.160	0.191	0.198

Standard errors clustered at the industry level. $^{+}, ^{*}, ^{**}$ denote $10, 5, 1\%$ significance.

Towards Better Identification

- Give up on cross-industry identification and exploit cross-country / cross-industry variation
- Analogous to Romalis, Nunn, Levchenko, Manova, and others
- Think of μ_S and ϕ as country characteristics (although you can think of them as interactions of country and product contractibility or financial constraints)
- Industry variables analogous to above ones
- Country level variables added are 'Rule of Law', Private Credit over GDP, GDP per capita

Structural Derivation

- In the book manuscript I develop a variant of Antràs, Fort and Tintelnot (2014) to generate cross-country and cross-industry predictions for offshoring shares
- Severe limitations: one input per firm, all firms have all countries in their sourcing strategy
- Model generates offshoring shares that depend on neoclassical determinants (wages, technology, trade costs) as well as institutional determinants, as given by the terms Γ derived in the theory
- Because the denominator in the shares is common for all firms, one can run log-linear specifications of U.S. imports, analogously to Nunn (2007)

Benchmark Results: Similar to Chor (2010)

Table 5.6. Contractual Determinants of U.S. Offshoring Shares

Dep. Var.: log(Imports)	(1)	(2)	(3)	(4)	(5)
Nunn × Rule	-0.139**	-0.175**	-0.051**	-0.152**	-0.134**
	(0.012)	(0.014)	(0.019)	(0.033)	(0.033)
Levchenko × Rule	-0.165**	-0.166**	-0.123**	-0.076**	-0.087**
	(0.009)	(0.010)	(0.013)	(0.026)	(0.026)
Costinot × Rule	-0.242**	-0.178**	-0.038^{+}	-0.015	-0.019
	(0.014)	(0.018)	(0.021)	(0.031)	(0.032)
BJRS × Rule	-0.270**	-0.178**	-0.118**	-0.053	-0.048
	(0.016)	(0.022)	(0.025)	(0.045)	(0.045)
Rajan-Zingales × Credit/GDP	0.309**	0.272**	0.059	-0.200*	0.041
	(0.025)	(0.029)	(0.037)	(0.096)	(0.044)
Braun × Credit/GDP	-0.392**	-0.400**	-0.185**	-0.187**	-0.169**
	(0.030)	(0.035)	(0.047)	(0.054)	(0.053)
Firm Volatility × Labor Flexibility	0.123**	0.119**	0.076**	0.100**	0.101**
	(0.025)	(0.028)	(0.029)	(0.029)	(0.029)
Sample Restrictions	$\Upsilon_O > 0$	W+NT^{+}	W+NT^{+}	W+NT^{+}	W+NT^{+}
Ctr/Year & Ind Fixed Effects	Yes	Yes	Yes	Yes	Yes
Interactions with GDP pc	No	No	No	Yes	No
Industry Effects × GDP pc	No	No	No	No	Yes
Observations	≃190,000	≃125,000	120,044	120,044	120,044
R^2	≃0.610	≃ 0.607	0.622	0.623	0.637

Standard errors clustered at the country/ind. level. $^{+}, ^{*}, ^{**}$ denote 10, 5, 1% significance.

Tests of the Global Sourcing Model

Table 5.7. Testing the Global Sourcing Model

Dep. Var.: log(Imports)	(1)	(2)	(3)	(4)	(5)	(6)
Capital Inten. × Cap. Abund	0.120*	0.151*		0.380**	0.357**	0.469
	(0.058)	(0.069)		(0.078)	(0.081)	(0.294)
Skill Inten. × Skill Abund	0.435**	0.466**		0.252**	0.251**	0.118*
	(0.028)	(0.031)		(0.034)	(0.038)	(0.046)
Freight Costs	-0.102**	-0.085**		-0.089**	-0.089**	-0.089**
	(0.018)	(0.010)		(0.010)	(0.010)	(0.010)
Tariffs	-0.015^{+}	-0.023*		-0.018^{+}	-0.018^{+}	-0.015^{+}
	(0.008)	(0.011)		(0.010)	(0.011)	(0.009)
Input Substit. × Rule			-0.037**	-0.009	-0.026^{+}	-0.012
			(0.009)	(0.009)	(0.016)	(0.016)
Demand Elasticity × Rule			0.026**	0.027**	0.001	-0.002
			(0.008)	(0.008)	(0.012)	(0.016)
Nunn Specificity × Rule			0.189**	0.164**	0.255	0.224**
			(0.015)	(0.016)	(0.161)	(0.030)
Headq. Inten. × Credit/GDP			0.074**	0.045**	0.044**	0.045**
			(0.007)	(0.009)	(0.012)	(0.012)
Headq. Inten. × Rule			0.093**	0.049**	0.050**	0.047**
			(0.010)	(0.012)	(0.013)	(0.012)
Sample Restrictions	$\Upsilon_O > 0$	W+NT^{+}	W+NT^{+}	W+NT^{+}	W+NT^{+}	W+NT^{+}
Ctr/Year & Ind Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes
Interactions with GDP	No	No	No	No	Yes	No
Industry Effects × GDP	No	No	No	No	No	Yes
Observations	188,187	128,492	$\simeq$ 128,009	126,078	126,078	126,078
R^2	0.601	0.619	$\simeq$ 0.621	0.624	0.624	0.641

Standard errors clustered at the country/ind. level. $^{+}, ^{*}, ^{**}$ denote $10, 5, 1\%$ significance.

MULTINATIONAL FIRM BOUNDARIES

Overview of the Theory of the Firm

- In developing their global sourcing strategies, firms not only decide on where to locate the different stages of the value chain, but also on the extent of **control** to exert over them
  - **foreign outsourcing** versus foreign integration or (**vertical FDI**)
- In this final part of these lectures, I will develop simple frameworks to study the control decision of firms
- I will begin with a very brief overview of some leading theories of firm boundaries
- I will then develop simple models of the internalization decision
  - today: two transaction-cost models
  - probably next time: a property-rights model
- Next time, I will also discuss empirical evidence suggestive of the relevance of these theoretical frameworks

Overview of the Theory on the Boundaries of the Firm

- Neoclassical Approach: the size of the firm is determined by firms' cost-minimization
  - increasing marginal costs eventually "kick in"
- Caveats:
  1. it ignores incentive problems inside the firm
  2. it has nothing to say about the internal organization of firms (hierarchical structure, extent of authority and delegation...)
  3. theory does *not* pin down firm boundaries (replication – it is better thought of as a theory of plant size)
- Coase-Williamson View: firms emerge when certain transactions can be undertaken with less transaction costs inside the firm than through the market mechanism.
  - what are transaction costs? what is their source? Coase was vague
- Williamson provides better answers:
  - theory is based on three concepts: (1) bounded rationality, (2) opportunism and (3) asset specificity.

Williamson

1. Following Herbert Simon, Williamson assumes that economic actors are "*intendedly* rational, but only *limitedly* so".
   - **bounded rationality** provides a foundation for the incompleteness of contracts (unable to plan ahead for all contingencies; describability, verifiability).
   - hence, ex-ante contracts will tend to be incomplete and will tend to be renewed or renegotiated as the future unfolds.
2. By **opportunism**, Williamson means that economic actors are self-interested $\longrightarrow$ renegotiation may not always occur in a joint profit maximizing manner.
3. Finally, Williamson points out that certain assets or investments are **relationship-specific**, in the sense that the value of these assets or investments is higher inside a particular relationship than outside of it.
   - at the renegotiation stage, parties cannot costlessly switch to alternative trading partners and are partially locked in a bilateral relationship ("*fundamental transformation*").

Williamson (cted.): The Hold Up Problem

- What determines the terms of exchange ex-post? Standard bilateral bargaining problem.
- Agents do not capture full marginal return from their investments $\longrightarrow$ rent-sharing.
- Example: renegotiating down the price of an input ("holding up")
- Foreseeing this hold-up problem, parties will underinvest and this will reduce efficiency.
- Williamson showed that these transaction costs tended to be larger the harder the contracting and the larger the relationship-specificity.
- Source of costs of integration is less clear

A Transaction-Cost Model of Vertical FDI

- Let us go back to the global sourcing model we have been working with earlier in these lectures
- h is controlled by a final-good producer (agent F), m is controlled by an operator of the production facility (agent M)
- The manager F has now four alternatives to obtain the intermediate input m
  1. **Domestic Outsourcing:** transact with an independent, domestic supplier in North
  2. **Domestic Integration:** transact with an integrated, domestic supplier in North
  3. **Domestic Outsourcing:** transact with an independent, foreign supplier in South
  4. **Foreign Integration:** transact with an integrated, foreign supplier in South
- Note that only the last option entails FDI or multinational activity

Domestic Outsourcing and Integration

- For simplicity, assume that contracting within the North is perfect (this is easily relaxable)
- This implies that options 1 and 2 are identical from the point of view of F
- And they both deliver a profit flow equal to

$$\pi_D(\varphi) = (w_N)^{1-\sigma} B \varphi^{\sigma-1} - w_N f_D \tag{7}$$

with

$$B = \frac{1}{\sigma}\left(\frac{\sigma}{(\sigma-1)P}\right)^{1-\sigma} \beta\left(w_N L_N + w_S L_S\right)$$

where P is the common price index in each country, given costless final-good trade

Foreign Outsourcing

- Assume that when transacting in the South via the market (i.e., via outsourcing) only 'totally incomplete' contracts are available
- For simplicity, assume for now symmetric bargaining, no credit constraints, full relationship-specificity and a single supplier
- This delivers profits from foreign outsourcing equal to (see earlier in these lectures)

$$\pi_O = \left((w_N)^{\eta} (\tau w_S)^{1-\eta} \right)^{1-\sigma} B \Gamma_O \varphi^{\sigma-1} - w_N f_O \tag{8}$$

where

$$\Gamma_O = (\sigma + 1) \left(\frac{1}{2} \right)^{\sigma} < 1$$

Foreign Integration or Vertical FDI

- Assume, following the transaction-cost approach, that hold-up inefficiencies disappear when transacting with an integrated foreign agent
- To have a trade off, assume that foreign integration entails extra supervision or other '**governance costs**' that:
  1. magnify marginal costs by a factor $\lambda > 1$ (effective productivity is φ/λ)
  2. also increase fixed costs of fragmentation, so $f_V > f_O$
- Under foreign integration F will then obtain

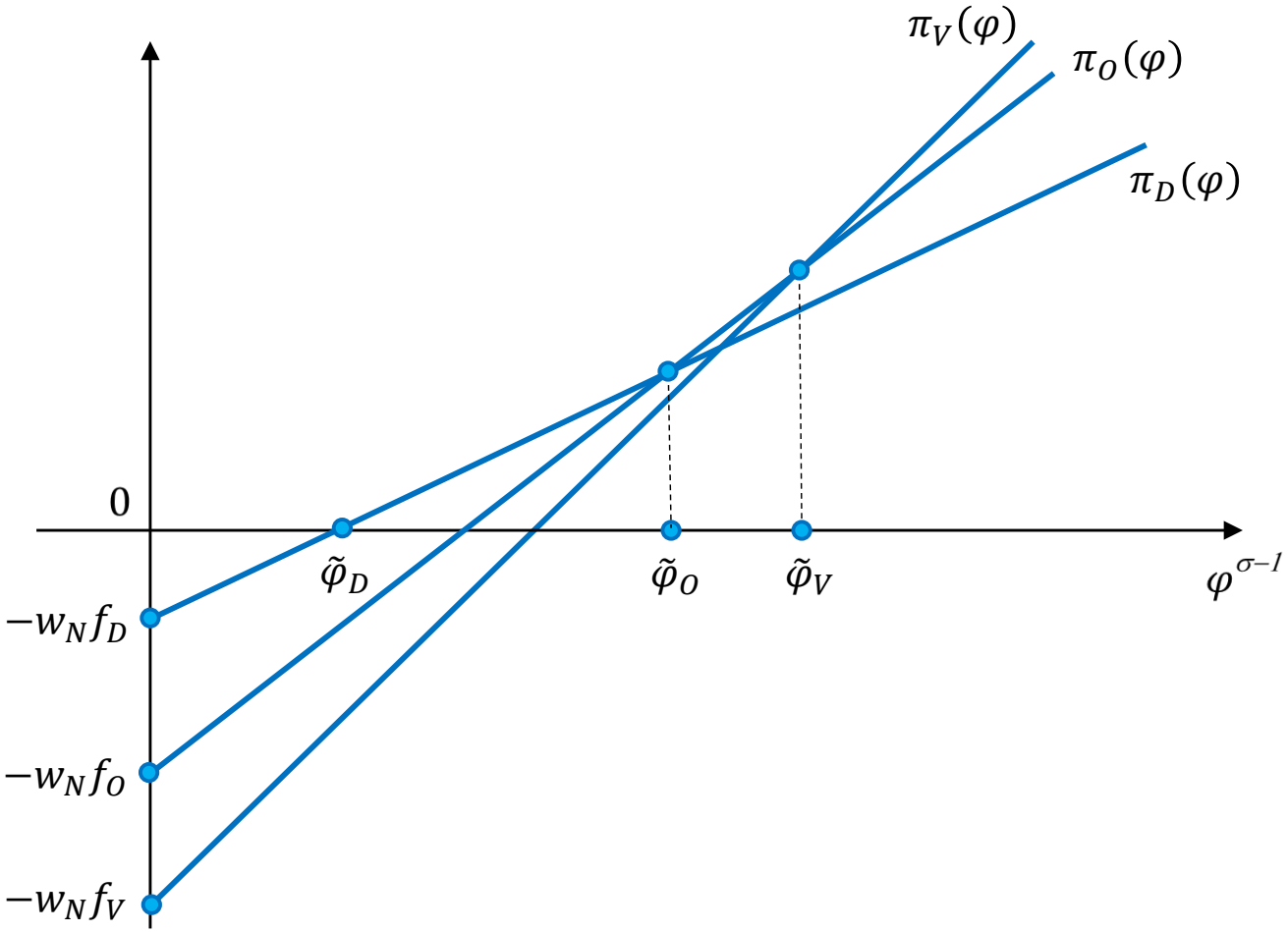
$$\pi_V(\varphi) = \left((w_N)^{\eta}(\tau w_S)^{1-\eta}\right)^{1-\sigma} B\Gamma_V \varphi^{\sigma-1} - w_N f_V \tag{9}$$

where

$$\Gamma_V = \lambda^{1-\sigma} < 1$$

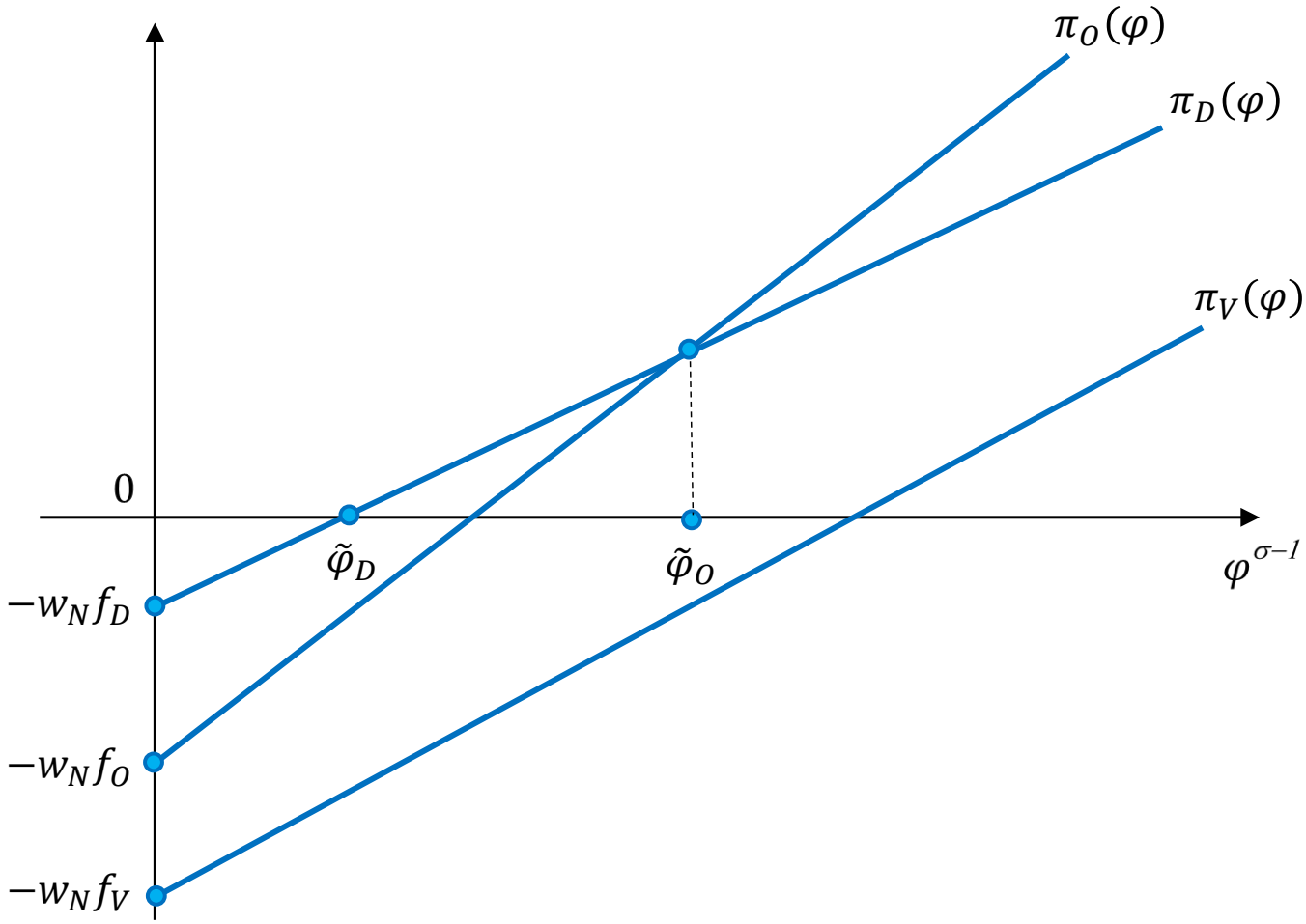
Equilibrium Sorting I

- The following sorting pattern will result whenever wage differences are large enough and λ is sufficiently small



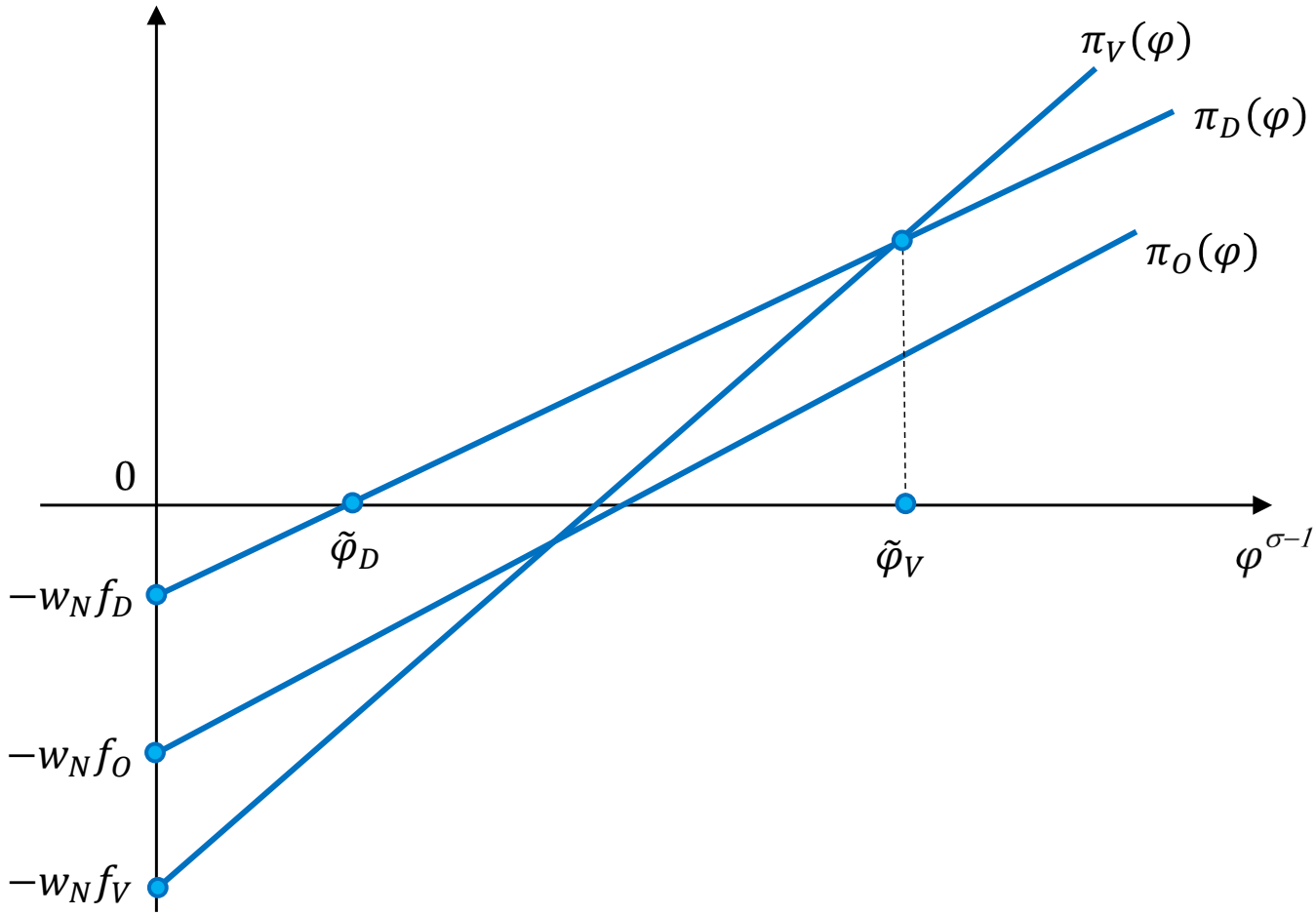
Equilibrium Sorting II

- If wage differences are large but λ is large too, FDI is never chosen



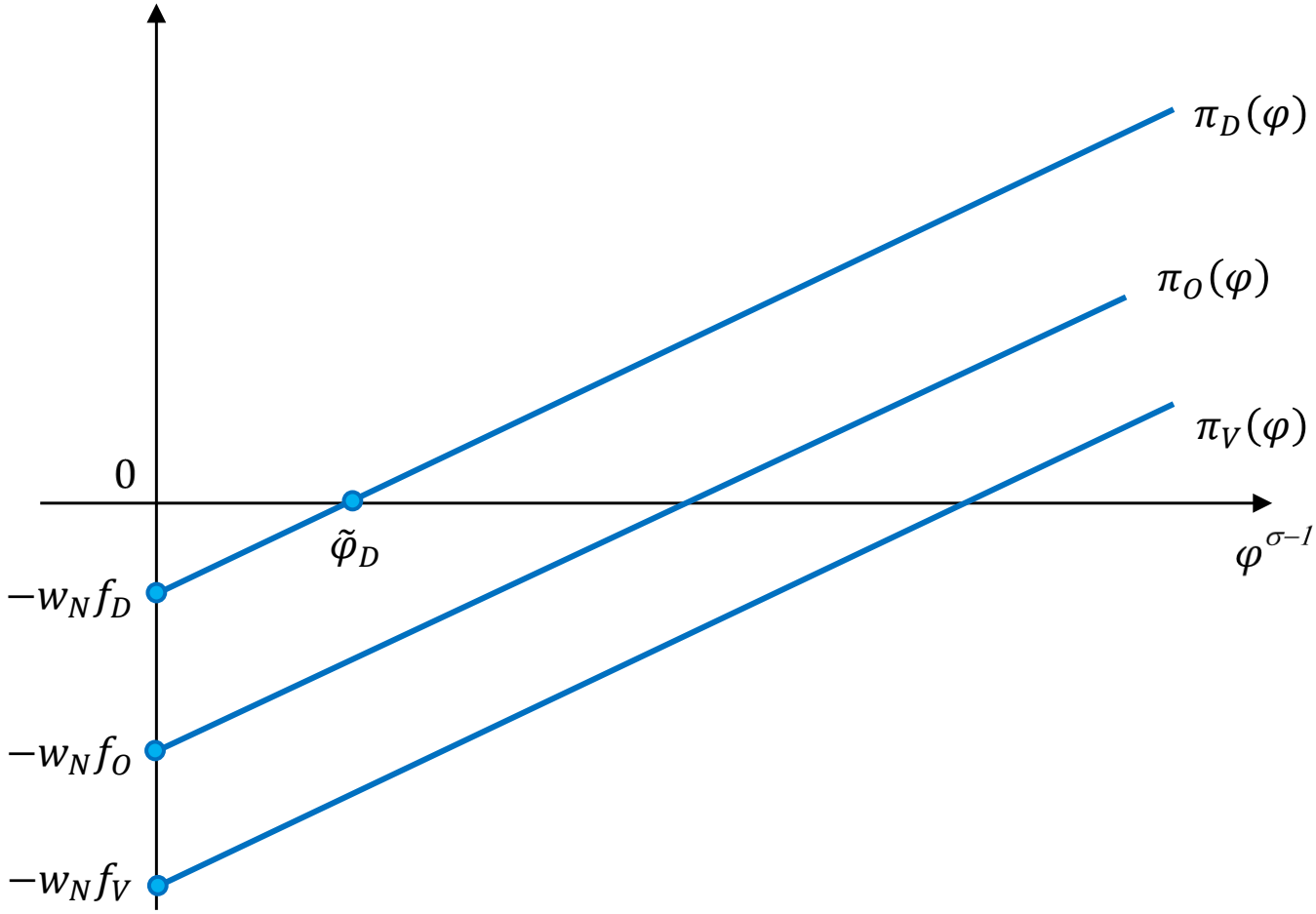
Equilibrium Sorting III

- If wage differences are moderate and $\lambda \longrightarrow 1$, foreign outsourcing is never chosen



Equilibrium Sorting IV

- Finally, if wage differences are very small no form of offshoring is used



Anything Goes?

- It may seem that there are too many cases to consider
- But notice a **robust prediction**: when foreign outsourcing and foreign integration coexist within an industry (i.e., the intrafirm trade share is between 0 and 1)...
- ... integrating firms are more productive than outsourcing firms
- I will focus on Equilibrium Sorting I for the most part, but note that the model provides tools for dealing with 0, 1 and undefined (0/0) intrafirm trade shares

Some Implications

- As in the previous lecture, the share of offshoring firms (inside or outside the firm boundary) will tend to be higher...
  - the lower are headquarter intensity η and trade costs τ
  - the higher are wage differences w_N / w_S and productivity dispersion $(1/k)$
- This is true regardless of whether outsourcing and FDI coexist or not

Some Implications

- We can now also study the relative prevalence of foreign outsourcing and vertical FDI
- The share **of offshoring firms** doing FDI is then

$$\frac{\int_{\tilde{\varphi}_V}^{\infty} dG(\varphi)}{\int_{\tilde{\varphi}_O}^{\infty} dG(\varphi)} = \frac{1 - G(\tilde{\varphi}_V)}{1 - G(\tilde{\varphi}_O)} = \left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_V}\right)^k \tag{10}$$

where

$$\left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_V}\right)^{\sigma-1} = \frac{f_O - f_D}{f_V - f_O} \times \frac{(\Gamma_V - \Gamma_O)\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)}}{\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)} \Gamma_O - 1} \tag{11}$$

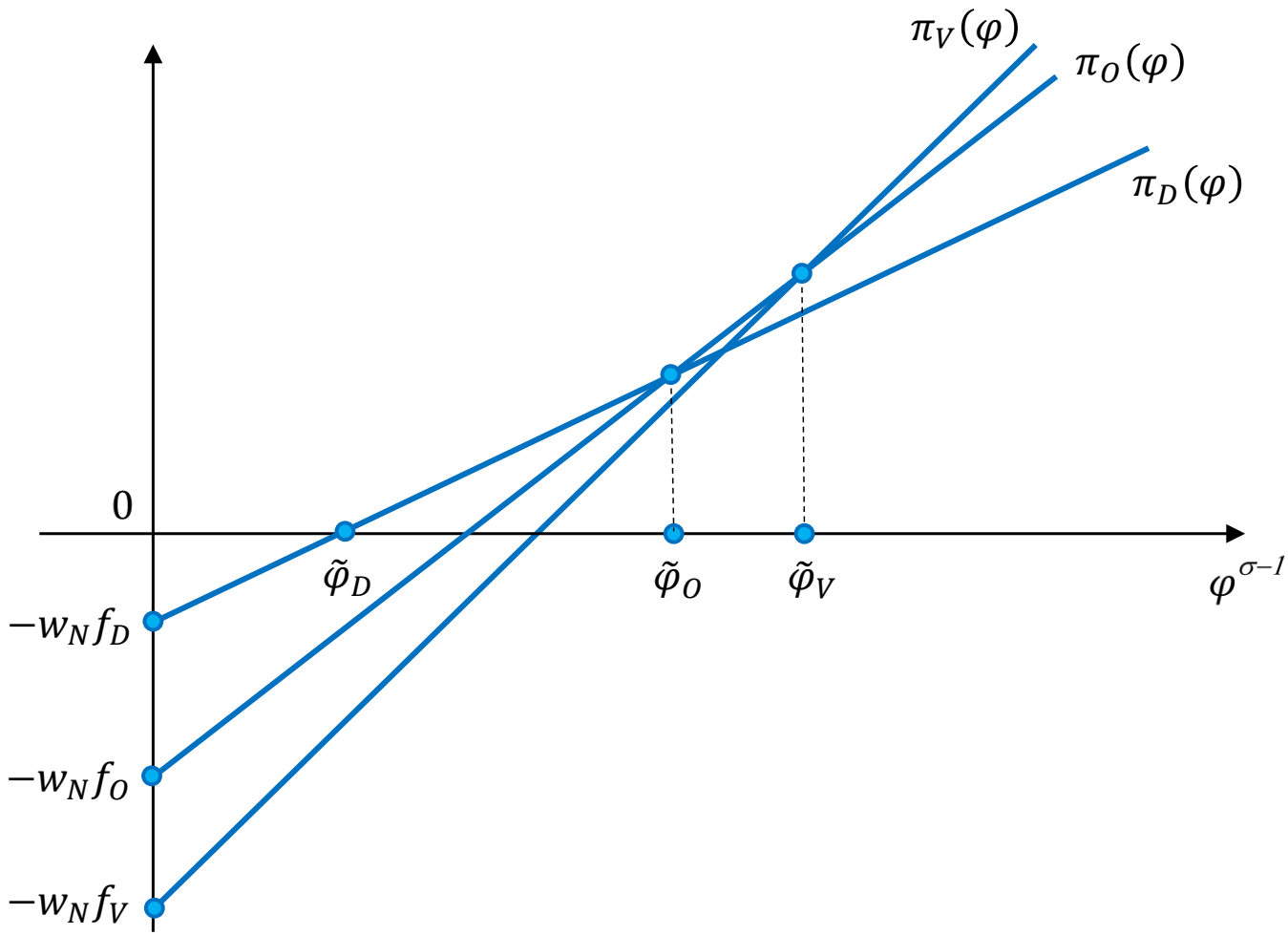
- Remember that $\Gamma_V = \lambda^{1-\sigma}$, so quite trivially, this share is decreasing in 'governance costs' λ

Some Implications: Comparative Statics

- Note also that the share of offshoring firms engaged in intrafirm trade is decreasing in $\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)}$
- As a result, the relative prevalence of intrafirm trade will be higher...
  - the higher are headquarter intensity η and trade costs τ
  - the lower are wage differences w_N / w_S
- The extensive margin of trade is key for these predictions (back to graph in next slide)
- Finally, this share is increasing in productivity dispersion (low k)

Comparative Statics and Selection into Importing

- Selection into offshoring is key for the effects of w_N/w_S, η, and τ



Partial Contractibility

- Let us now introduce partial contractibility of the Antràs and Helpman (2008) type
- For simplicity, assume that contracting is complete in the North, so only profits under foreign outsourcing will be affected
- Following the derivations earlier in these lectures, we have

$$\Gamma_{O,Partial} = \left(\frac{\sigma}{\sigma - (\sigma - 1)\gamma_O} + 1 \right)^{\sigma - (\sigma-1)\gamma_O} \left(\frac{1}{2} \right)^{\sigma}$$

with

$$\gamma_O \equiv \eta \left(1 - \mu_{hS}\right) + (1 - \eta)\left(1 - \mu_{mS}\right)$$

Partial Contractibility

- It is then clear from (11) that improvements in contracting with South (an increase in μ_h or μ_m) will reduce the share of offshoring firms that engage in FDI
- This is an intuitive result characteristic of transaction-cost models
- Note that it operates via two channels:
  - the extensive margin of offshoring channel mentioned above
  - and the fact that integration becomes less necessary the easier is contracting (standard Coase-Williamson-type of result)

The Property-Rights Approach

- Williamson identifies transaction costs in market transactions, but why do these frictions disappear inside firms?
- As pointed out by Grossman and Hart (1986), this is not satisfactory
  - noncontractibilities, incentive problems and relationship-specific investments matter inside firms too!
  - what defines then the boundaries of the firm?
- Grossman and Hart suggest that ownership is a **source of power** when contracts are incomplete

Ownership = Power

- What does it mean for ownership to be a source of power?
- From a legal perspective, integration is associated with the acquisition of physical assets
- When contracts are incomplete, parties will often encounter contingencies that were not foreseen in the initial contract
- In those situations, the owner of the asset has the residual rights of control
- These residual rights of control are important because they are likely to affect how the surplus is divided ex-post
- Owner can 'insist' on courses of action that might be good for him/her but less appealing to the integrated party

Power and the Theory of the Firm

- In the presence of relationship-specific investments, these considerations lead to a theory of the boundaries of the firm in which both the benefits **and the costs** of integration are endogenous
- Because residual powers affect the ex-post division of surplus, they will also affect the efficiency of ex-ante relationship-specific investments
  - in particular, integration will tend to reduce incentives to invest of the integrated party
  - but they will increase the incentives to invest of integrating party
- Salient result: Residual rights of control should be assigned to the party whose investment contributes most to the relationship
- I next illustrate this result within the model of global sourcing we have been working with

A Property-Rights Model of Global Sourcing

- Continue to assume that when transacting in the South via the market (i.e., via outsourcing) only 'totally incomplete' contracts are available
- **Key new assumption:** When transacting with an internal division, incentive problems are still relevant and complete contracts are not available either
- For simplicity, assume that contracts are also 'totally incomplete' under integration
  - framework can flexibly incorporate variation in contractibility across organizational forms
  - but following Grossman and Hart (1986) and Hart and Moore (1990) I will not do so here

Power and Bargaining

- The timing of events is exactly as in the transaction-cost model but it now applies to **both** foreign outsourcing and foreign integration
- Ex-post determination of price characterized by symmetric Nash bargaining (could easily accommodate general primitive bargaining power)
- What is then the difference between foreign outsourcing and foreign integration?
- The firm F has more **power** or control under integration than under outsourcing
- Reduced form: outside option of the firm is higher under integration than under outsourcing

Power and Outside Options

- More specifically, the outside options are as follows:
  - under outsourcing, contractual breach leaves both agents with 0 (as in assumed before)
  - under integration, F can selectively fire M and seize input m (at a productivity cost δ)
- Why can F seize input m?
- Perhaps because it holds property rights over the input or perhaps because the input is stored in a factory which it owns
- Why is there a productivity loss? Perhaps agent M contributed to the process of combining h and m
- One can envision alternative ways in which power is exercised (e.g., reduction of production delays in Boeing's case)

Formulation of the Problem

- Remember that potential sales revenue is given by $r(h, m)$
- Given the specification of ex-post bargaining, F obtains a share $\beta_O = 1/2$ of sales revenue under outsourcing and a share $\beta_V = \delta^\alpha + \frac{1}{2}(1 - \delta^\alpha) > \beta_O$ under integration
- The optimal ownership structure k^* is thus the solution to the following program:

$$\begin{aligned} \max_{k \in \{V,O\}} \quad & \pi_k = r(h_k, m_k) - w_N h_k - \tau w_S m_k - w_N f_k \\ s.t. \quad & h_k = \arg\max_h \{\beta_k r(h, m_k) - w_N h_k\} \\ & m_k = \arg\max_m \{(1 - \beta_k) r(h_k, m) - \tau w_S m_k\} \end{aligned} \tag{P1}$$

- First-best level of investments would simply maximize π_k

A Useful Result

- The solution to the constrained program (P1) delivers the following result (see Antràs, 2003 for details):

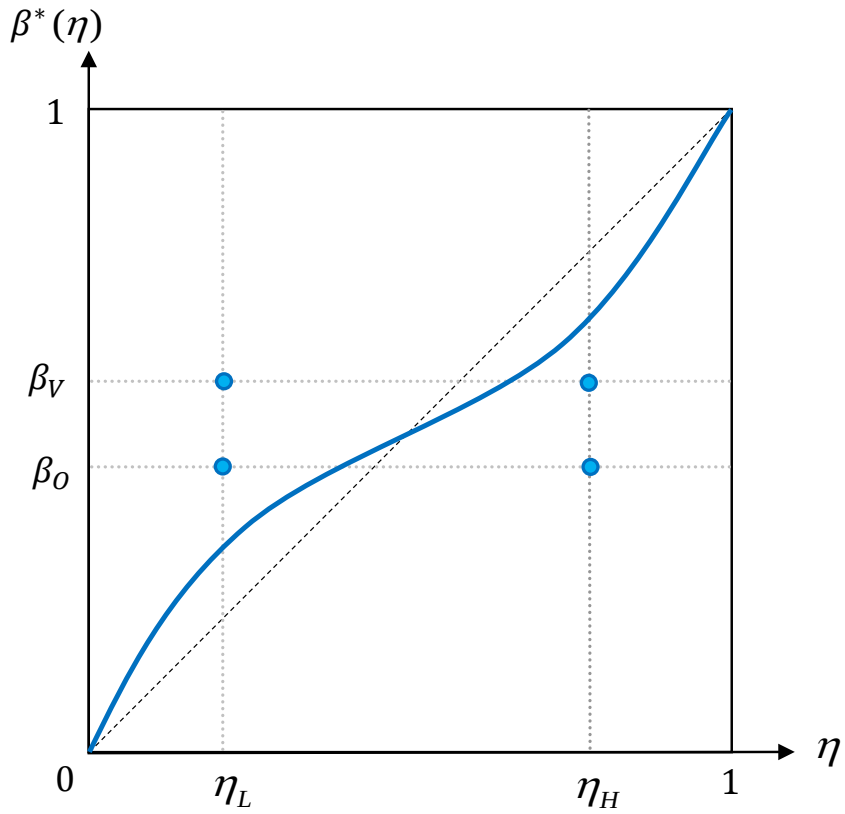
Proposition

There exists a unique threshold $\widehat{\eta} \in (0,1)$ *such that for all* $\eta > \widehat{\eta}$, *integration dominates outsourcing* ($k^* = V$), *while for all* $\eta < \widehat{\eta}$, *outsourcing dominates integration* ($k^* = O$).

- So, ex-ante efficiency dictates that residual rights should be controlled by the party undertaking a relatively more important investment:
  - if production is intensive in the m input, then choose **outsourcing**
  - if production is intensive in the h input, then choose **vertical integration**
- Convenient Feature: threshold k^* is independent of factor prices (Cobb-Douglas assumption important)

Another Look at the Result

- Suppose that instead of $k \in \{V, O\}$, F could choose $\beta \in (0, 1)$.



$$\frac{\beta^*}{1-\beta^*} = \sqrt{\frac{\eta}{1-\eta}\frac{\sigma-(\sigma-1)(1-\eta)}{\sigma-(\sigma-1)\eta}}$$

Robustness

- One might worry that the result depends crucially on the Cobb-Douglas assumption on technology
- For a general revenue function (see Antràs, 2011) we have:

$$\frac{\beta^*}{1-\beta^*} = \frac{\eta_{r,h} \cdot \xi_{h,\beta}}{\eta_{r,m} \cdot \left(-\xi_{m,\beta}\right)}$$

where $\eta_{r,j} \equiv jr_j / r$ and $\xi_{j,\beta} \equiv \frac{dj}{d\beta}\frac{\beta}{j}$

- When the revenue function is homogenous of degree $\alpha \in (0,1)$:

$$\frac{\beta^*}{1-\beta^*} = \sqrt{\frac{\eta_{r,h}}{\eta_{r,m}} \frac{(\sigma-1)\left(1-\eta_{r,m}\right)+(\epsilon_{h,m}-1)\eta_{r,m}}{(\sigma-1)\left(1-\eta_{r,h}\right)+(\epsilon_{h,m}-1)\eta_{r,h}}},$$

where $\epsilon_{h,m}$ is the elasticity of substitution between h and m in r

- For any $\epsilon_{h,m}$, β^* increases in $\eta_{R,h}$ and decreases in $\eta_{R,m}$

Profit Functions

- As in the previous models, we can write the profit functions associated with the different forms of offshoring as

$$\pi_k(\varphi) = \left((w_N)^{\eta}(\tau w_S)^{1-\eta}\right)^{1-\sigma} B\Gamma_k \varphi^{\sigma-1} - w_N f_k$$

- And, in the case of foreign outsourcing

$$\Gamma_O = (\sigma+1)\left(\frac{1}{2}\right)^{\sigma} < 1$$

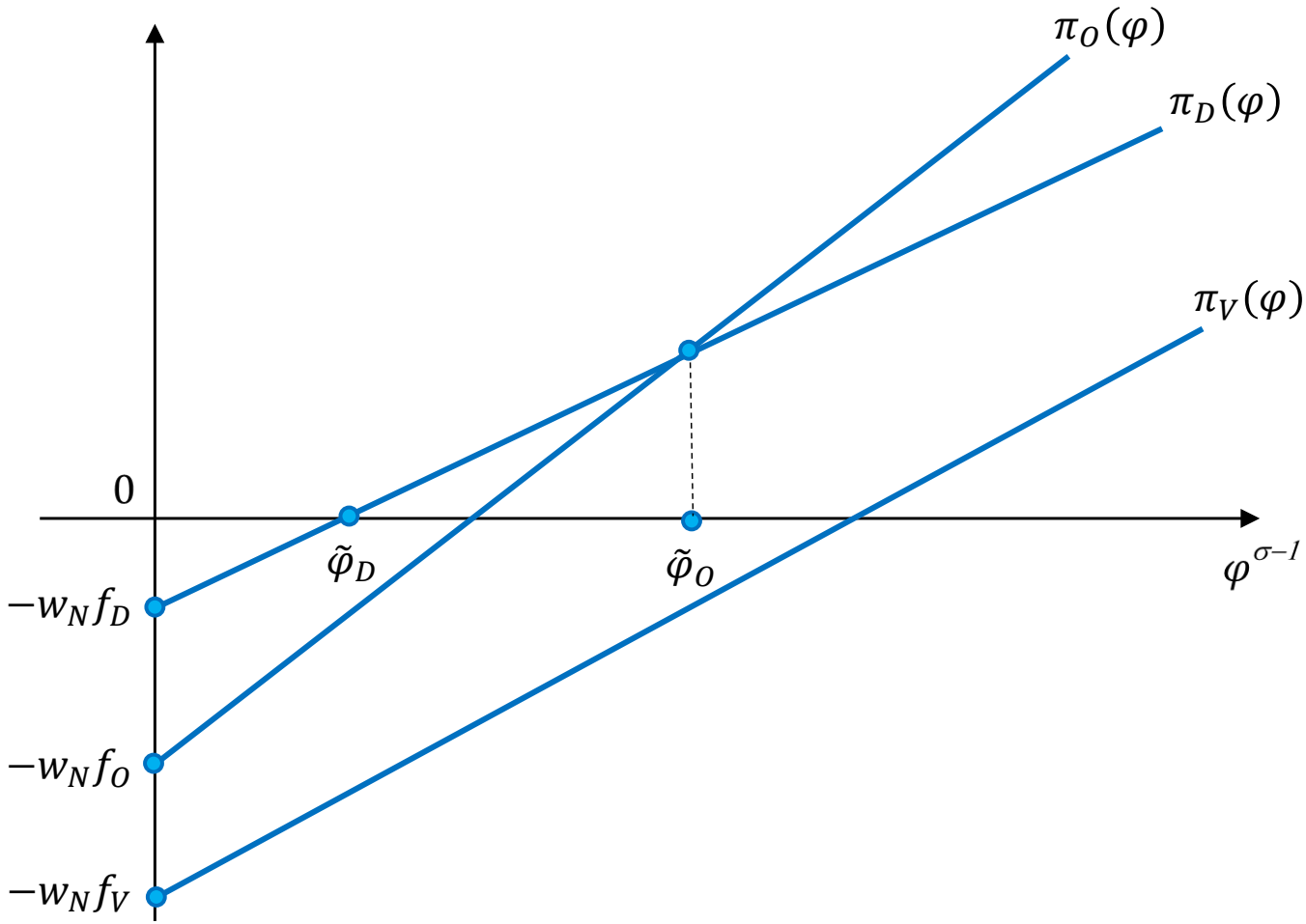
- In the case of foreign integration (or FDI), we can invoke the result in slide 83:

$$\Gamma_V = (\sigma - (\sigma-1)(\beta_V\eta + (1-\beta_V)(1-\eta)))\left(\beta_V^{\eta}(1-\beta_V)^{1-\eta}\right)^{\sigma-1}$$

- Whether $\Gamma_V > \Gamma_O$ or $\Gamma_V < \Gamma_O$ depends crucially on how large η is

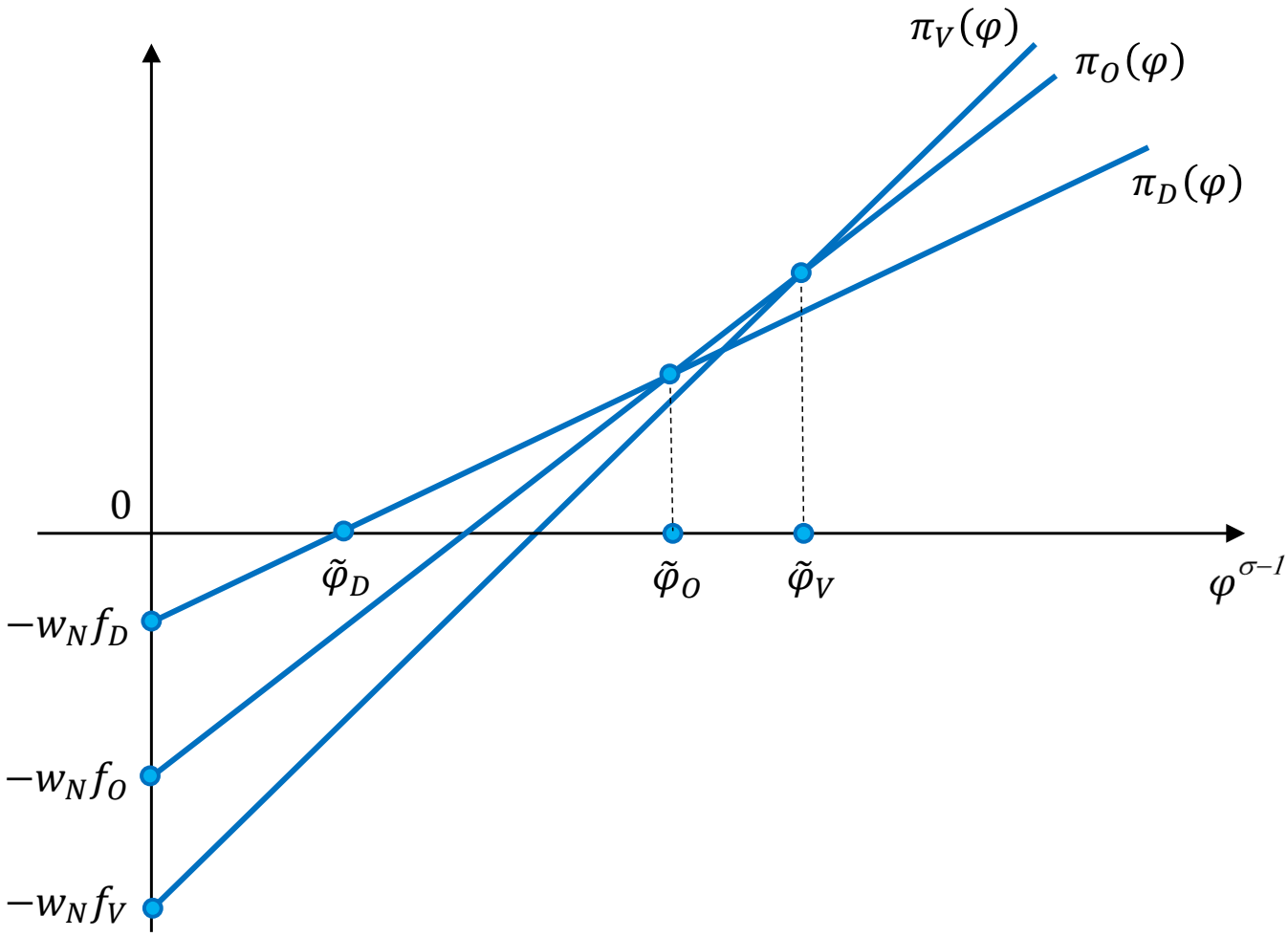
Sorting in a Low Headquarter Intensity Sector

- In such a case, $\Gamma_V < \Gamma_O$ and there is no intrafirm trade in the sector



Sorting in a High Headquarter Intensity Sector

- In such a case, $\Gamma_V > \Gamma_O$ and foreign outsourcing and FDI coexist



Comparative Statics

- Let us focus on a sector in which outsourcing and FDI coexist
- As in the transaction-cost model, the share **of offshoring firms** choosing FDI is given by

$$\frac{\int_{\tilde{\varphi}_O}^{\infty} \varphi^{\sigma-1} dG(\varphi)}{\int_{\tilde{\varphi}_D}^{\tilde{\varphi}_O} \varphi^{\sigma-1} d\varphi} = \frac{1 - G(\tilde{\varphi}_V)}{1 - G(\tilde{\varphi}_O)} = \left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_V}\right)^k \tag{12}$$

where

$$\left(\frac{\tilde{\varphi}_O}{\tilde{\varphi}_V}\right)^{\sigma-1} = \frac{f_O - f_D}{f_V - f_O} \times \frac{(\Gamma_V - \Gamma_O)\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)}}{\left(\frac{w_N}{\tau w_S}\right)^{(1-\eta)(\sigma-1)} \Gamma_O - 1} \tag{13}$$

Comparative Statics

- Note that Γ_V / Γ_O is an increasing function of η, and thus the share of offshoring firms that integrate is positively correlated with η for a reason **distinct** from that in the transaction-cost model
  - it's selection into FDI rather than just selection into importing/sourcing
- On the other hand, it continues to be the case (and for the same reason) that the share of offshoring firms integrating is:
  - increasing in productivity dispersion (lower k)
  - increasing in transport costs (τ)
  - decreasing in relative factor price differences (w_N / w_S)

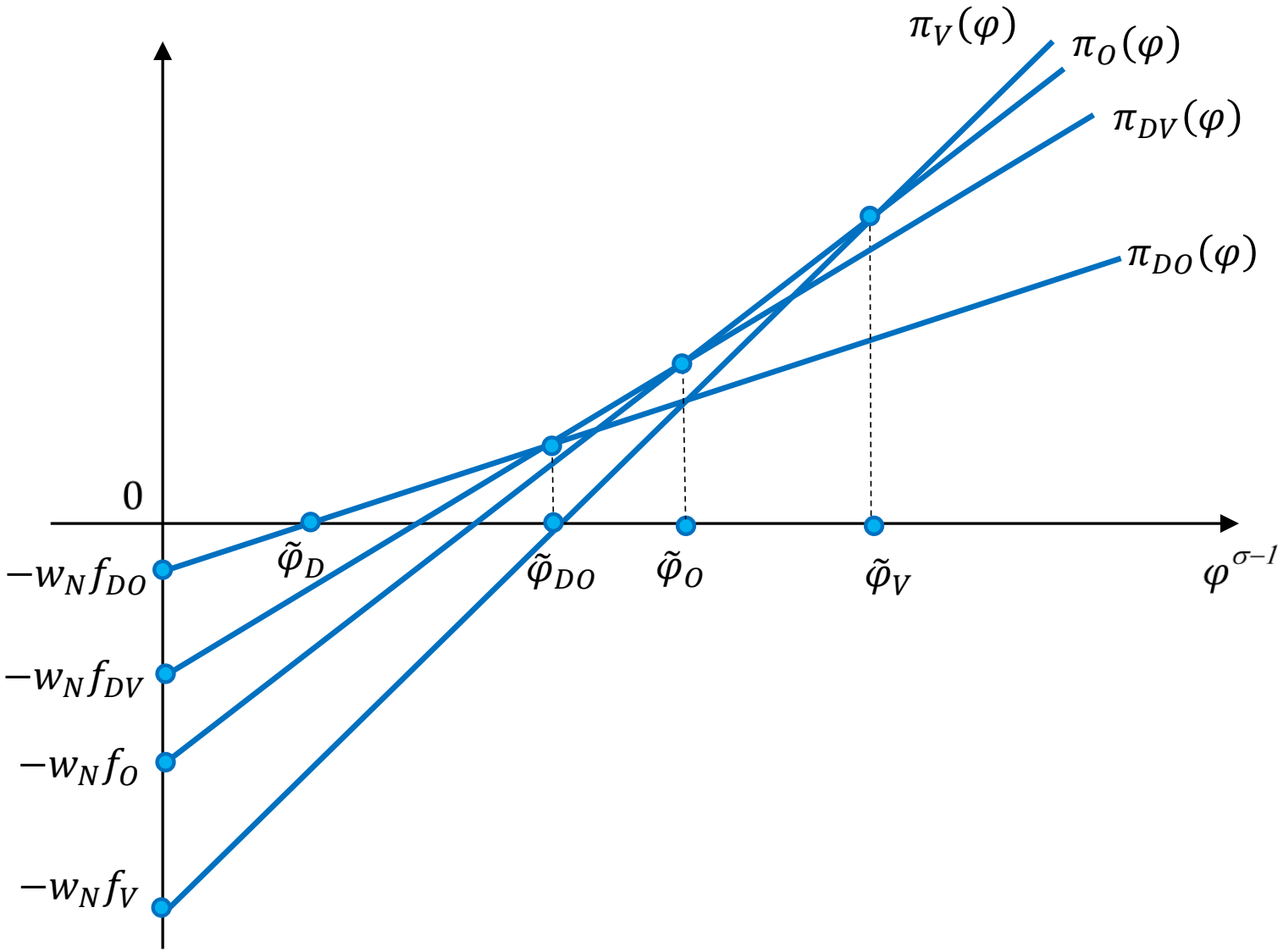
A Two-Factor Model: Antràs (2003)

- In Antràs (2003), I assumed that F's investment in h is capital intensive relative to M's investment
- The model generates a positive correlation between a propensity to integrate suppliers and capital intensity (i.e., η)
  - even true in a model without heterogeneity (or an extensive margin)
- I then embedded the model in a a Helpman-Krugman model, in which the interaction of relative capital abundance and relative capital intensity shapes comparative advantage
- I showed how these two results had implications for how the share of intrafirm imports should correlate positively with capital intensity across industries and relative capital abundance across countries
- The model developed above can also generate the latter result under the plausible scenario that relative wage differences w_N/w_S are increasing in aggregate capital-labor ratio differences
  - obviously, need to close model differently

Domestic Sourcing: Antràs and Helpman (2004)

- By assuming that contracting is complete in the North, the choice between domestic integration and outsourcing is both indeterminate and immaterial
- In Antràs and Helpman (2004), we assume that contracts are also 'totally incomplete' when transacting with M agents in the North
- Many possibilities can arise, but provided that the fixed costs of domestic integration are higher than those of domestic outsourcing the only equilibrium featuring all four organizational modes in equilibrium is as depicted in the next slide

Domestic Sourcing: Antràs and Helpman (2004)



Partial Contractibility: Antràs and Helpman (2008)

- Consider now the variant of the model with partial contractibility in international transactions, and let the degree of contractibility vary across inputs and countries
- New interesting feature: relative degree of contractibility of different inputs plays a central role in the integration decision
  - This has interesting implications for the choice between domestic and foreign sourcing
  - Also for the choice between foreign outsourcing and FDI

Equilibrium with Partial Contractibility

- In slide 89, we derived

$$\Gamma_{O,Partial} = \left(\frac{\sigma}{\sigma - (\sigma - 1)\gamma_O} + 1 \right)^{\sigma - (\sigma-1)\gamma_O} \left(\frac{1}{2} \right)^{\sigma}$$

with

$$\gamma_O \equiv \eta \left(1 - \mu_{hS}\right) + (1 - \eta)\left(1 - \mu_{mS}\right)$$

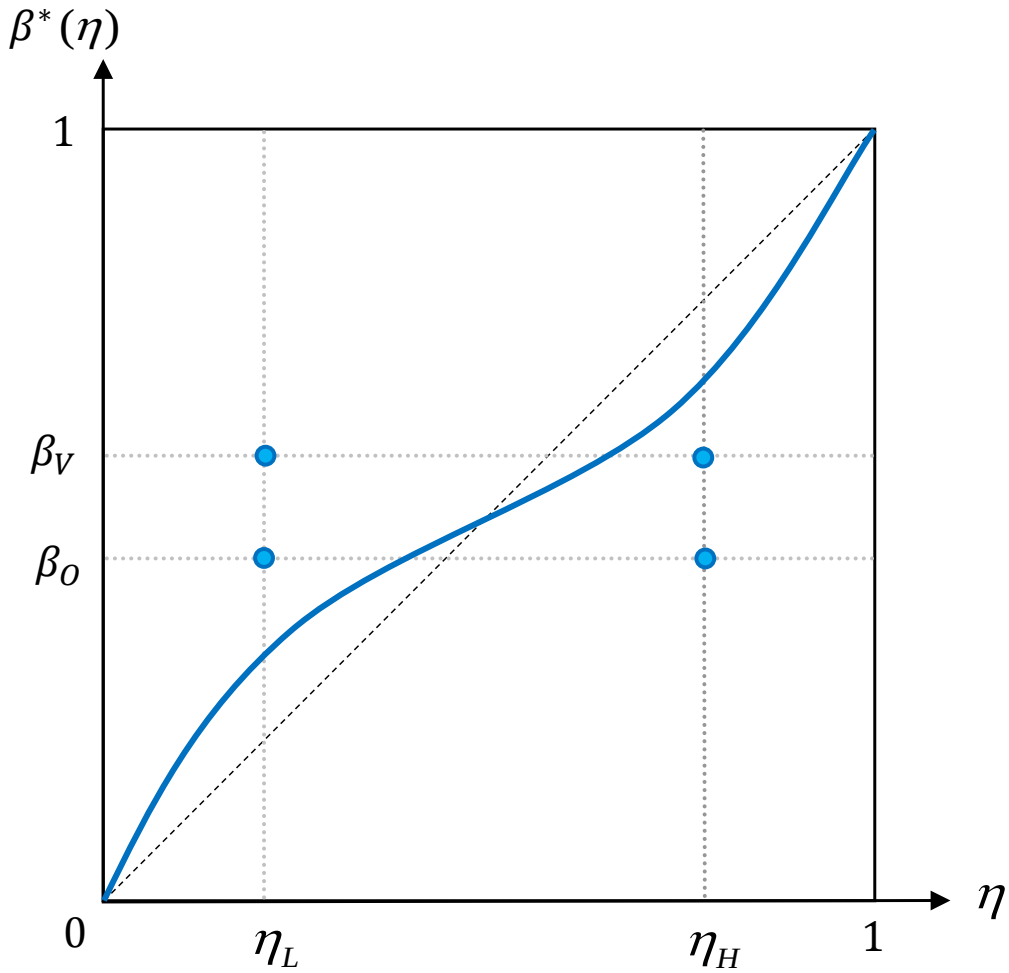
- For a general β, say $\beta_V > 1/2$, Antràs and Helpman (2008) derive

$$\Gamma_{V,Partial} = \left(\frac{\sigma - (\sigma-1)(\beta_V \eta(1-\mu_{hS}) + (1-\beta_V)(1-\eta)(1-\mu_{mS}))}{\sigma - (\sigma-1)\gamma_O} \right)^{\sigma - (\sigma-1)\gamma_O} \times \left(\beta_V^{\eta(1-\mu_{hS})} \left(1 - \beta_V\right)^{(1-\eta)(1-\mu_{mS})} \right)^{\sigma-1}$$

- $\Gamma_{V,Partial}/\Gamma_{O,Partial}$ is monotonically increasing in μ_m and monotonically decreasing in μ_h

Towards an Intuition

- As in Antràs and Helpman (2004), there exists an optimal β_h



Effect of Higher Contractibility

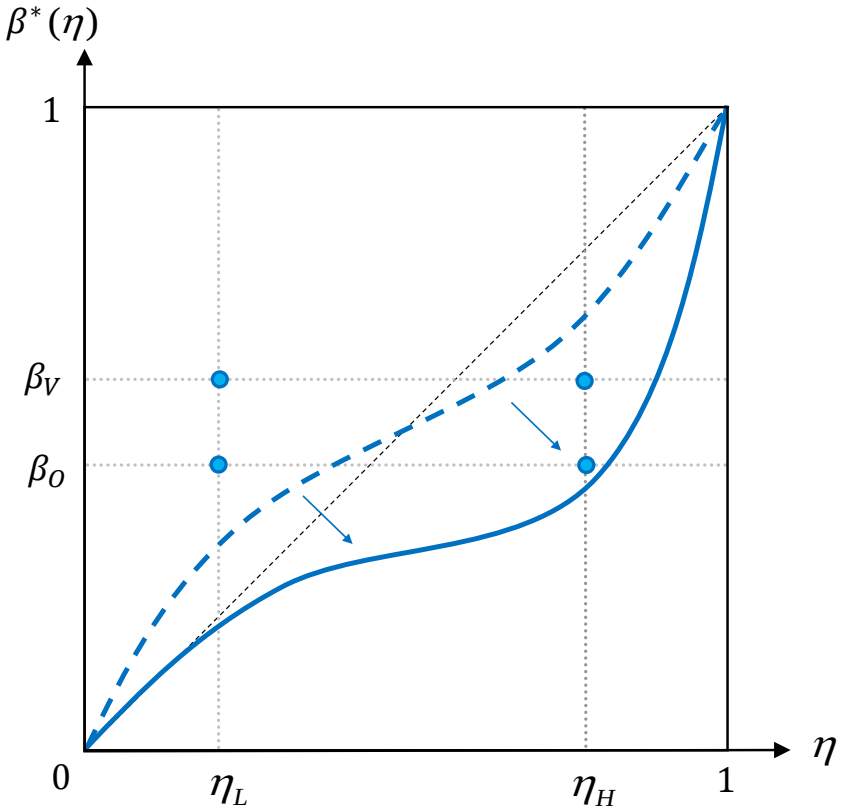


Figure: Headquarter Contractibility

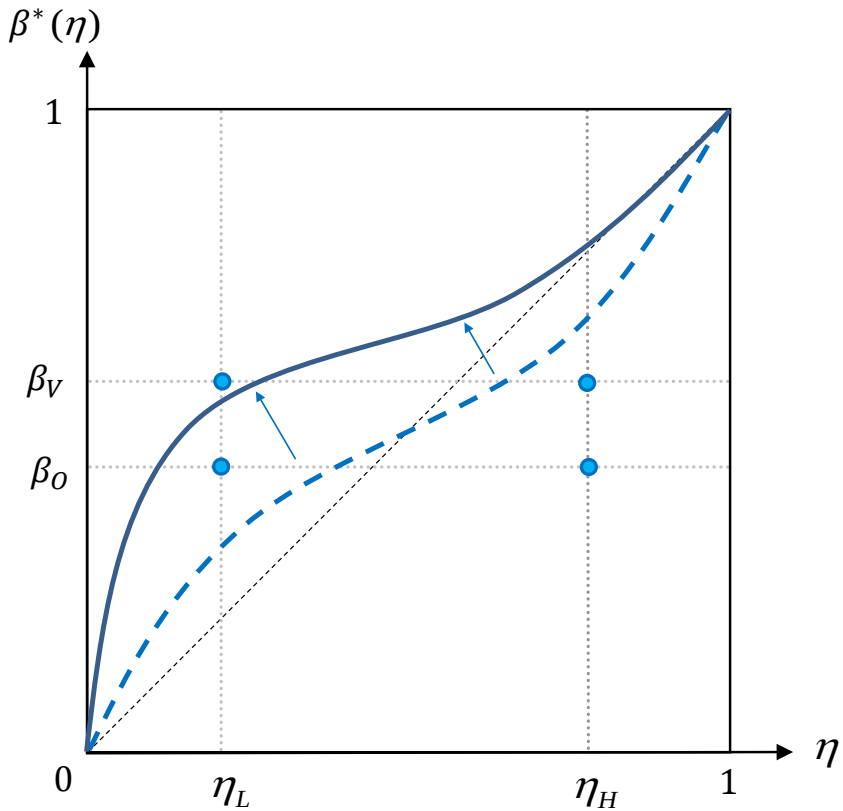


Figure: Manufacturing Contractibility

Implications for Global Sourcing

- Improvements in the contractibility of headquarter services in international transactions always increase offshoring and the relative prevalence of outsourcing within offshorers
  - consistent with transaction-cost approaches
- The effects of improvements on the contractibility of input manufacturing or assembly are more subtle:
  - the share of firms offshoring again increases...
  - but the effect might be disproportionate for integrating firms, so that the share of integrating offshorers might well increase!
- Hence, certain improvements in contracting might be associated with **more** integration, not less
  - more likely the less important is the selection into offshoring effect identified above

Multiple Suppliers

- Antràs (2011) develops variant of the model above with headquarter intensity and multiple suppliers
- The degree of input substitutability shapes the size of contractual inefficiencies, and also affects the integration decision
- He shows that the incentives **to integrate** are higher the **more complementary** are inputs in production
- Coupled with our earlier result that foreign sourcing is more likely the more substitutable are the inputs, we thus get that the share of integrating offshorers will be unambiguously increasing in input complementarity:
  - again both the 'selection into sourcing' and 'selection into FDI' effects work in the same direction, as in the case of η and μ_h above

Sequential Production

- Antràs and Chor (2012) consider how the incentive to integrate a supplier depends on the position of the supplier in the value chain (upstream vs. downstream)
- Production is sequential so this generates asymmetric bargaining at different stages of the value chain
- We show that the pattern of integration along the value chain depends crucially on the relative size of input complementarity ρ and the elasticity of demand σ faced by the final-good producer
  - outsource upstream / integrate downstream when inputs are relatively complementary or demand is relatively elastic
  - integrate upstream / outsource downstream when inputs are relatively substitutable or demand is relatively inelastic

EMPIRICAL EVIDENCE

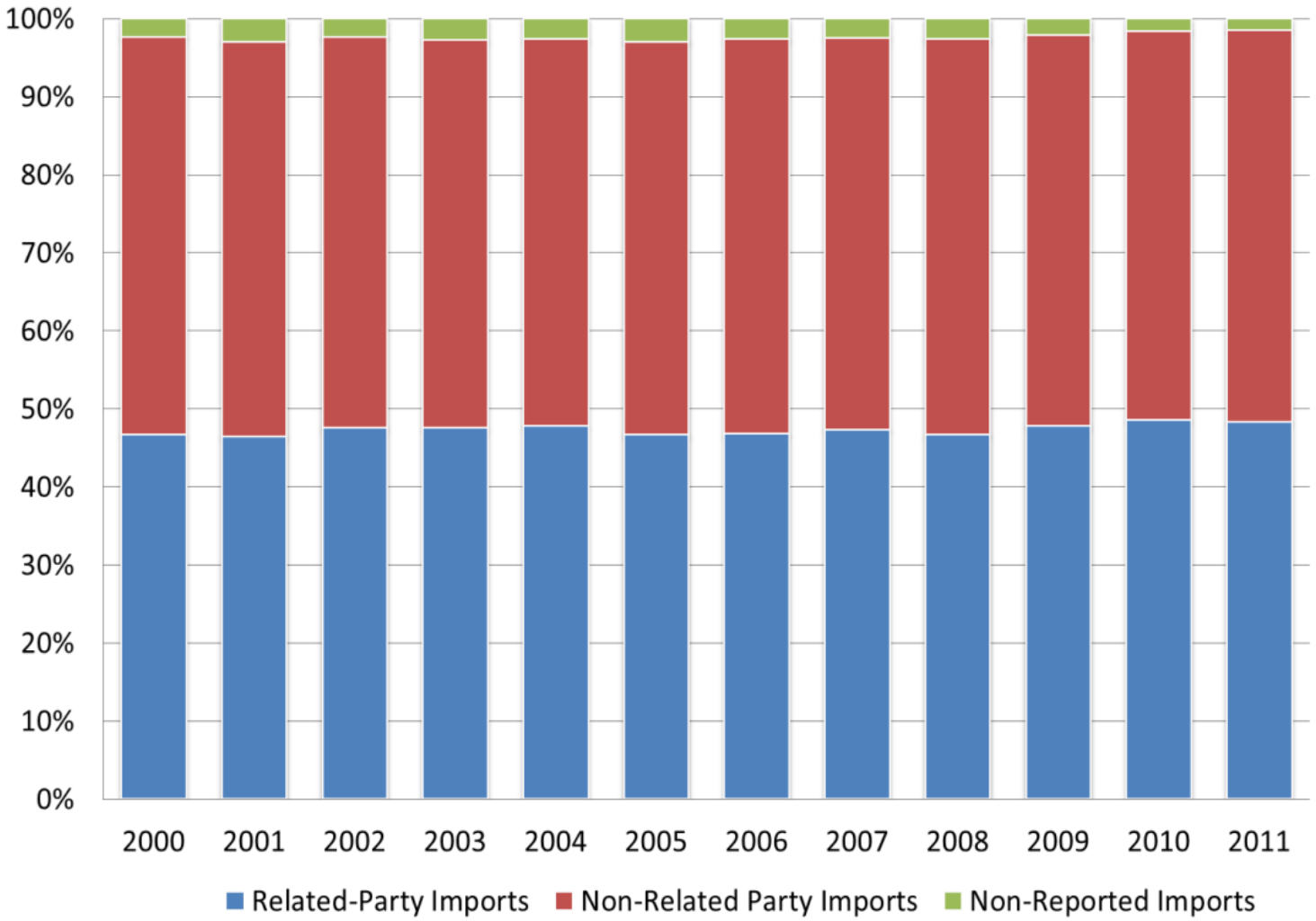
Overview of Empirical Work on MNE Boundaries

- I will next briefly review a few contributions that have attempted to bring the property-rights approach to the theory of the multinational firm to the data
- Empirically validating the property-rights theory poses at least two important challenges
  1. Predictions are associated with marginal returns to investments that are generally unobservable in the data
  2. Data on integration decisions are not readily available
- Two main types of studies:
  - Empirical tests using country- and product-level data (mostly U.S. data)
  - Empirical tests using firm-level data (data from Japan, France, and Spain, and Orbis database)

Pros and Cons of Using Related-Party Trade Data

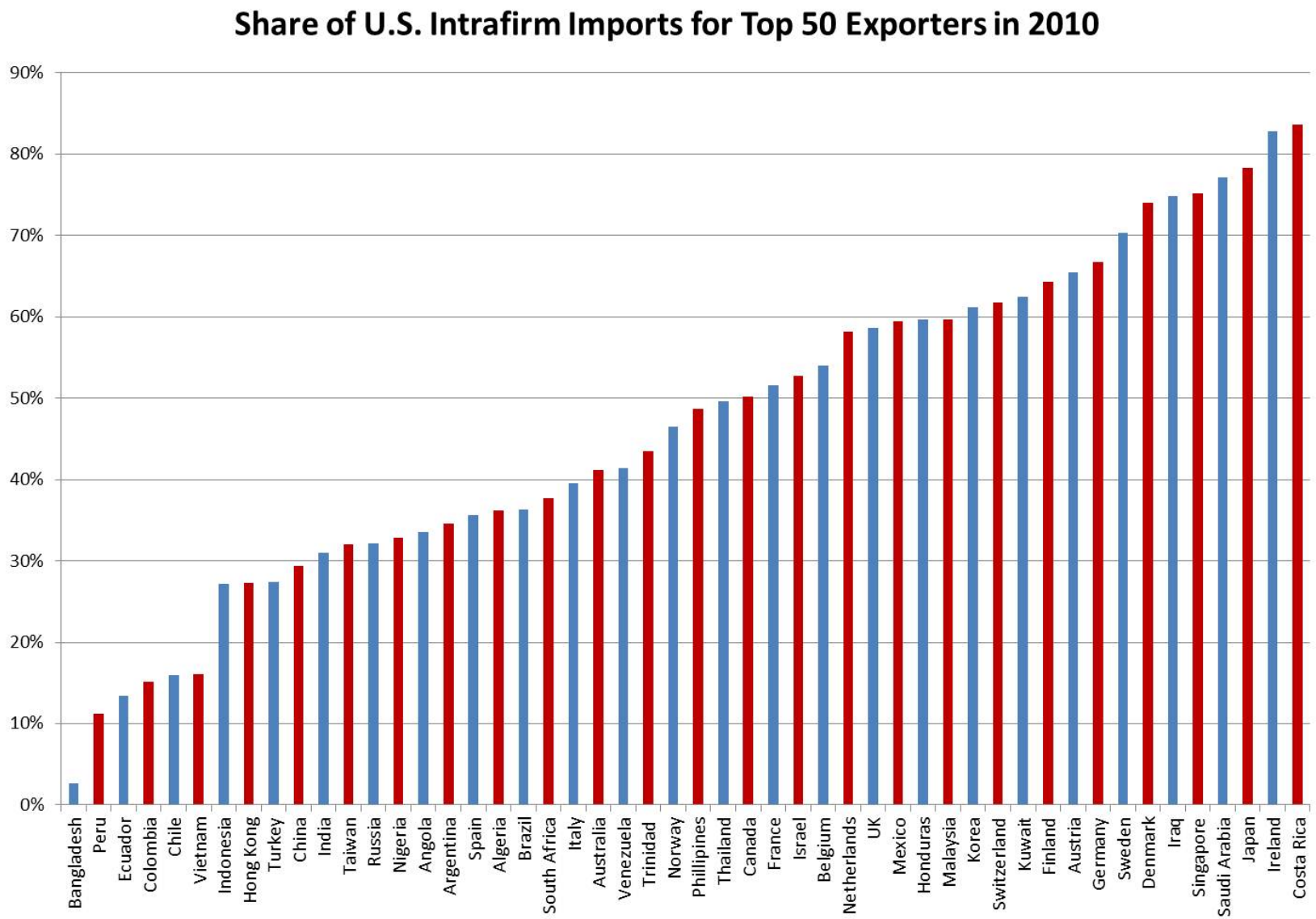
- Some pros:
  - Compiled from administrative records of official import and export merchandise trade statistics
  - There is plenty of variation in the data
  - Easier to spot "fundamental" forces that appear to shape whether international transactions are internalized or not
  - Potential to exploit 'exogenous' changes in sector characteristics or in institutional features of importing/exporting countries
- Some cons:
  - Aggregates firm decisions; can't control for firm-level determinants
  - Information only on the sector of the good being transacted
  - Not always clear which sector is buying on the import or export side
  - Not always clear whether inputs or final goods are traded
  - Not always clear who is integrating whom (backward vs. forward integration) and how large is the ownership stake
  - U.S. firm level sourcing decisions might not be reflected in U.S. trade data (remember the iPad 2 example) – affiliates as intermediaries

Intrafirm Trade: Magnitudes

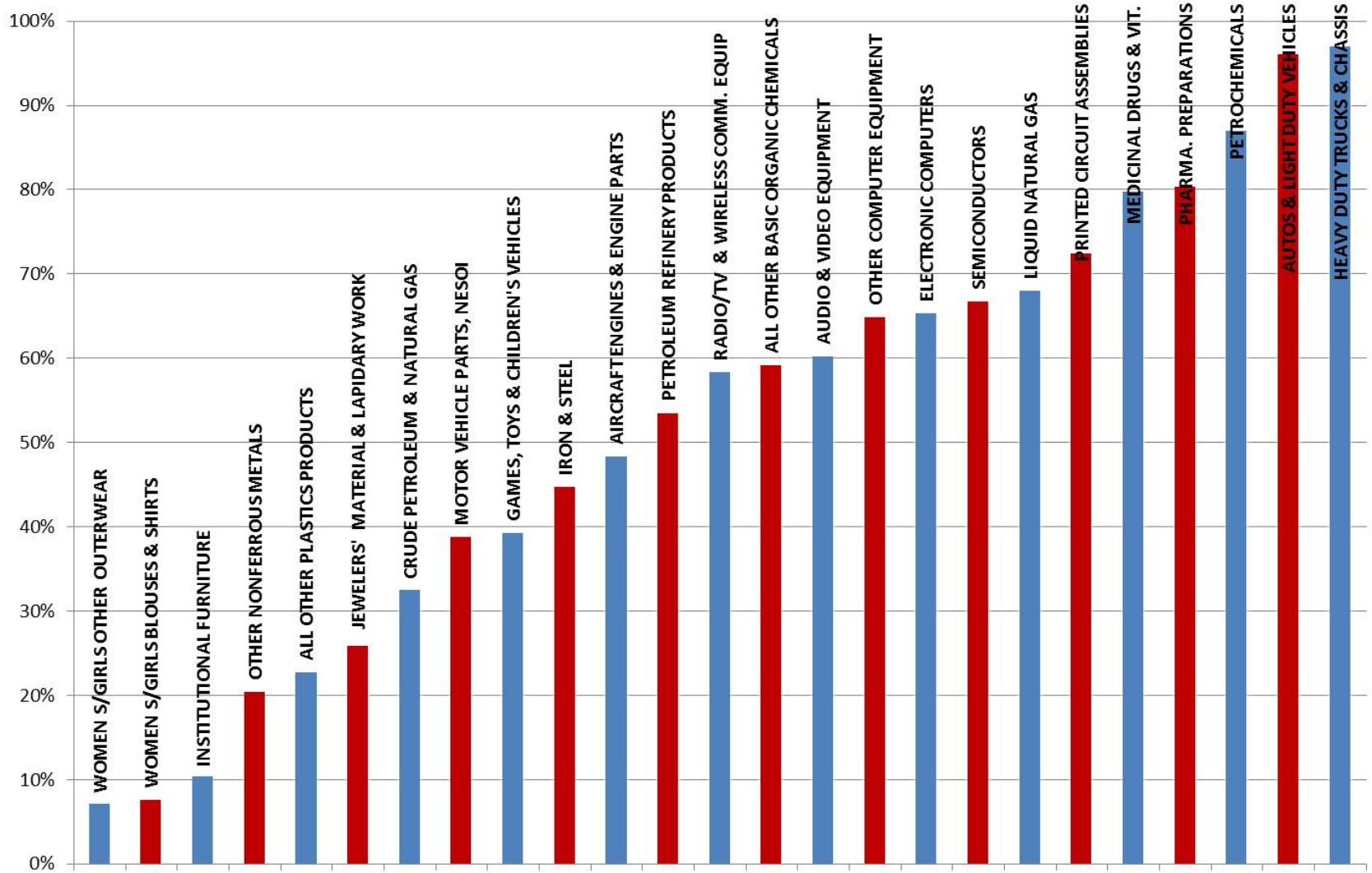


Source: U.S. Census Related-Party Trade Database

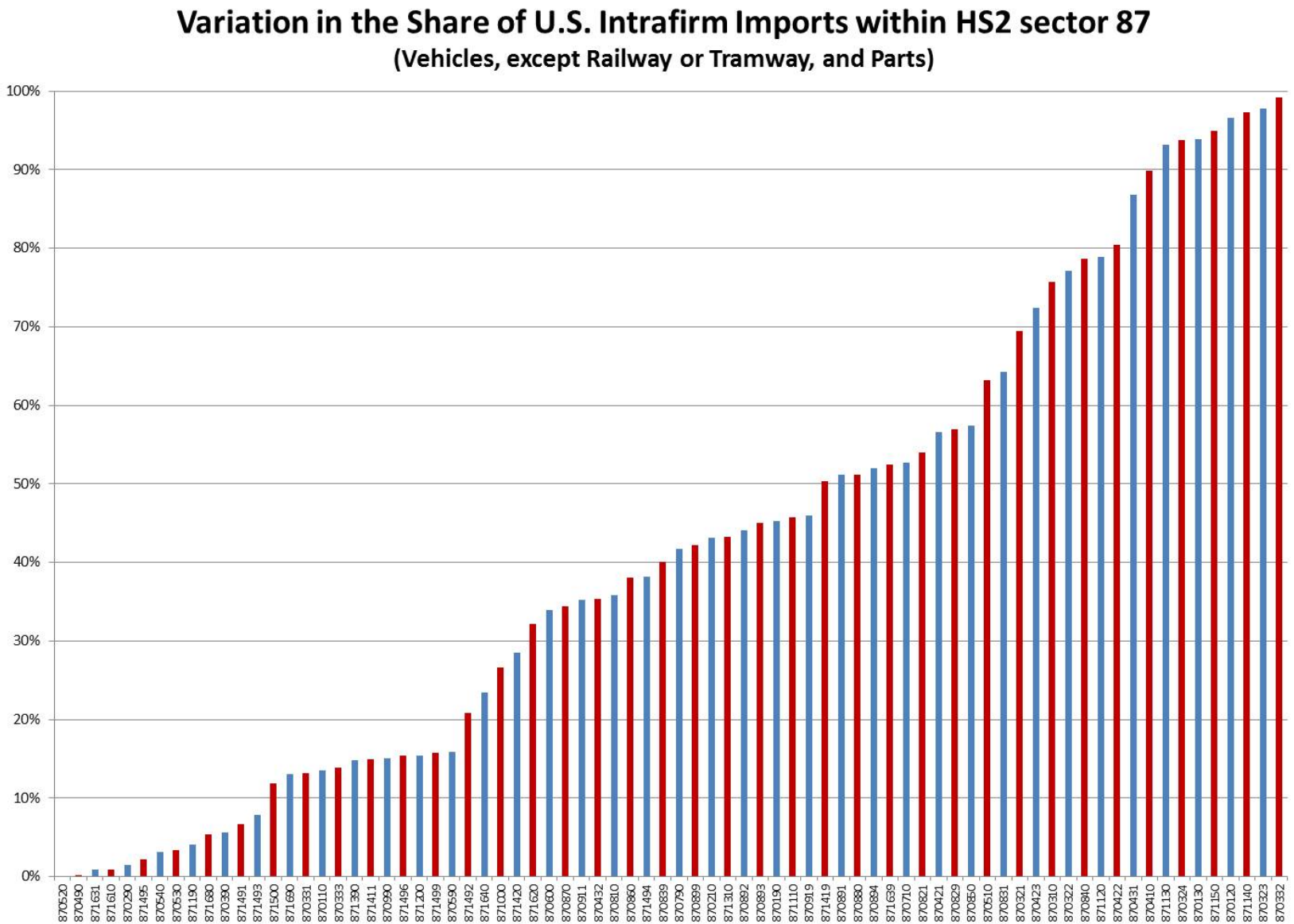
Variation in the Share of Intrafirm Trade across Countries



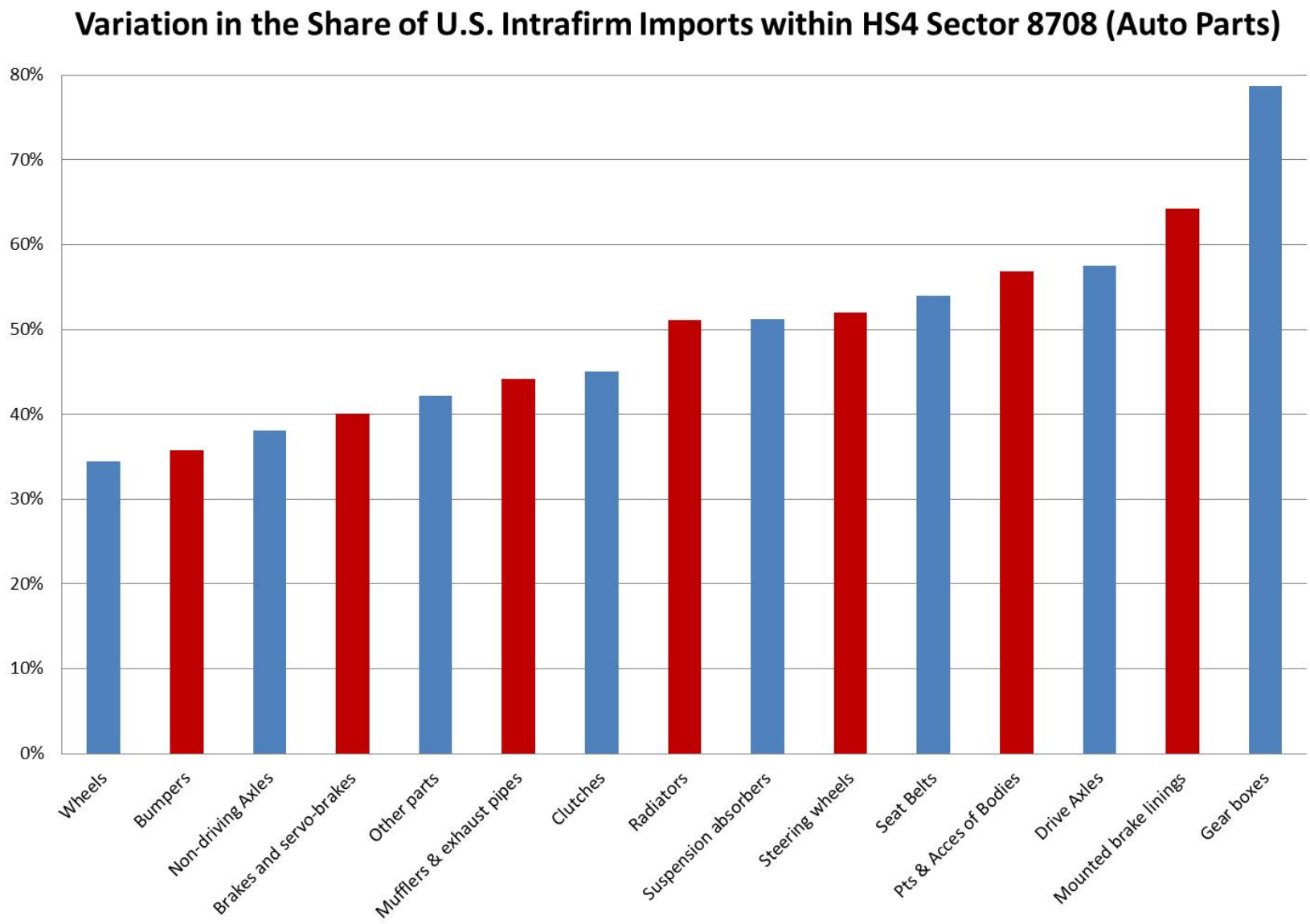
Variation in the Share of Intrafirm Trade across Industries



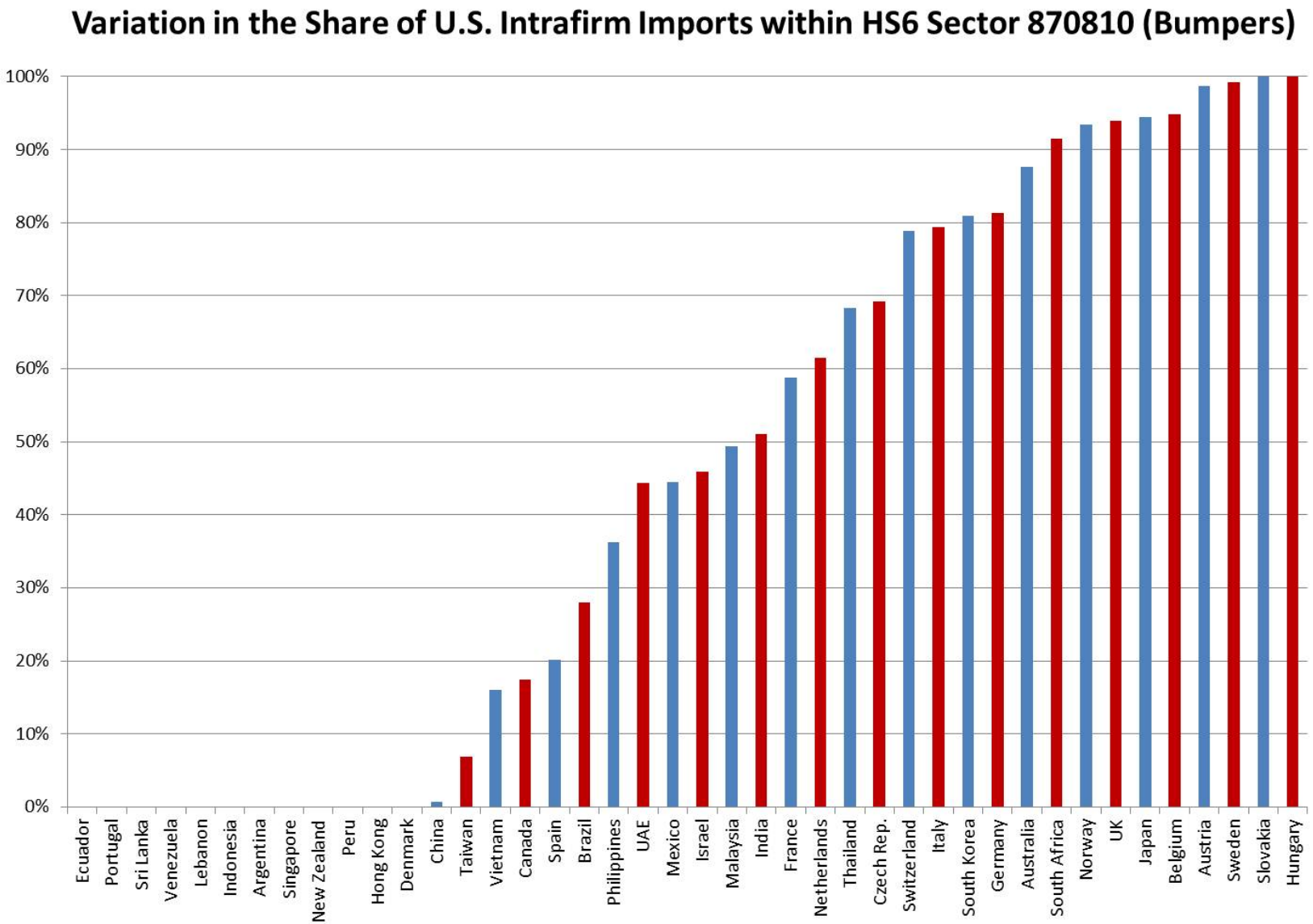
Variation in the Share of Intrafirm Trade within Sectors



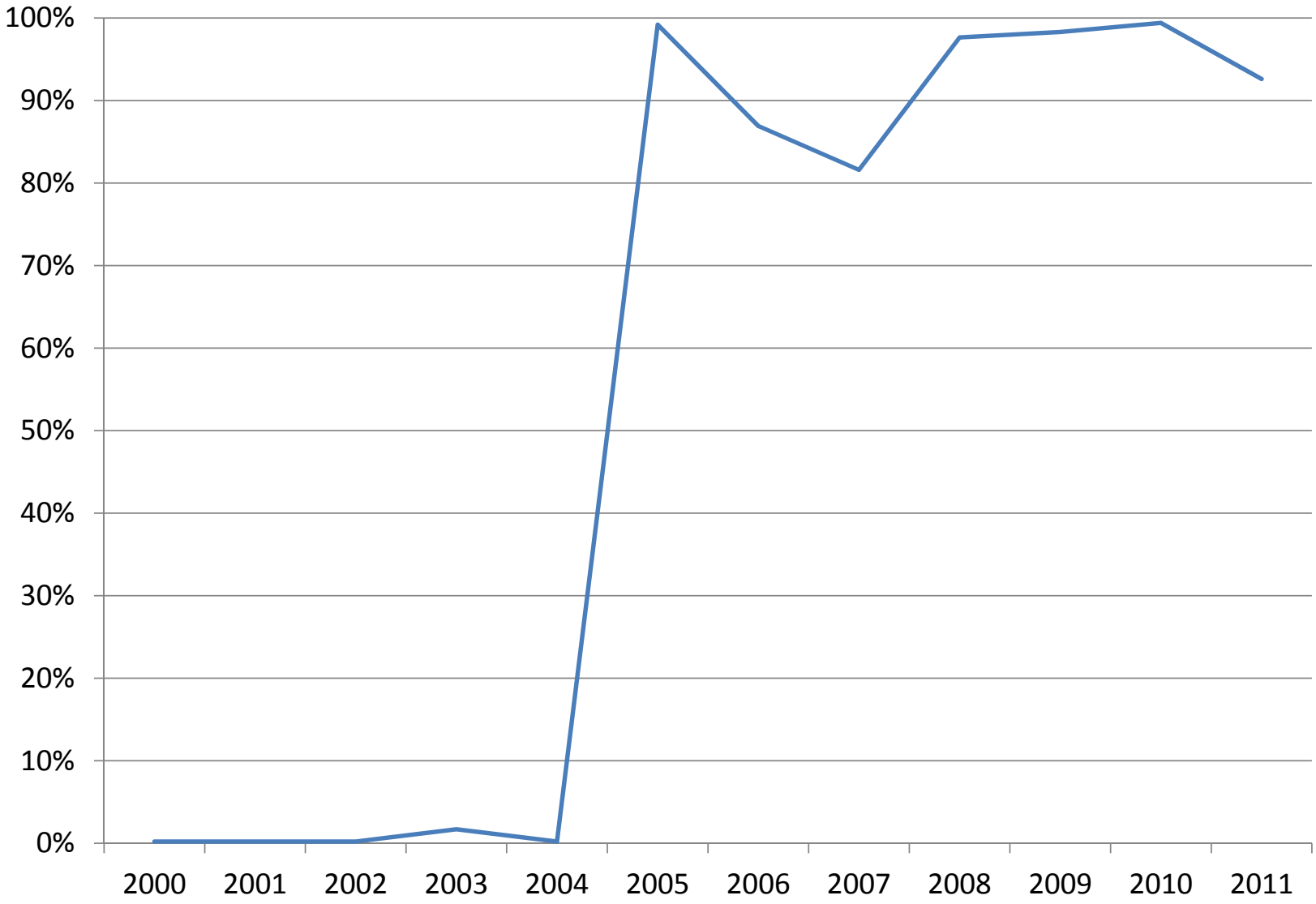
. . . And Also Within More Narrowly Defined Sectors



... And Across Countries Within HS6 Sectors



Gillete's Investment in Poland in 2005

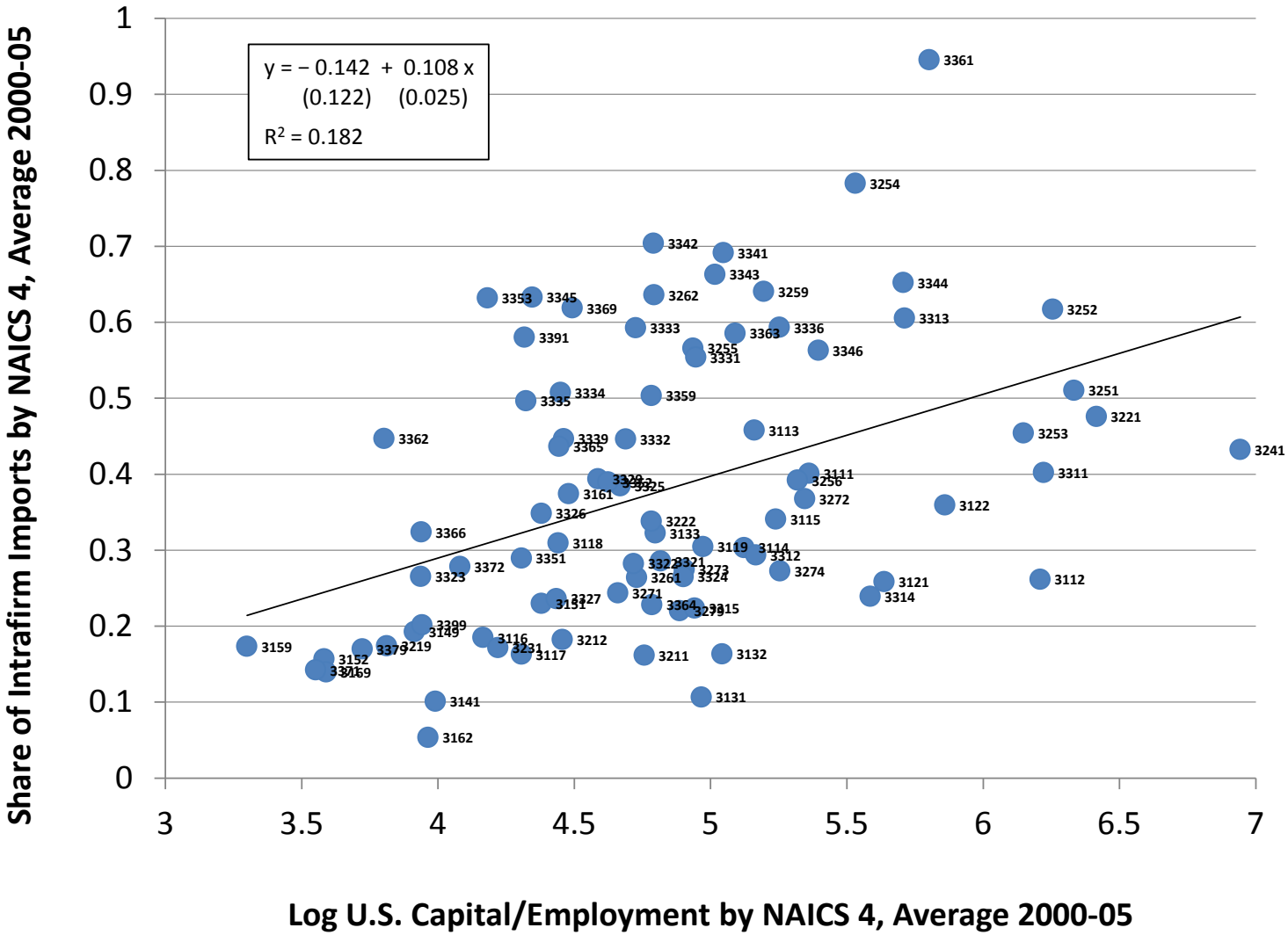


Source: U.S. Census Related-Party Trade Database

The Effect of Headquarter Intensity

- A central result in the property-rights approach is that efficient ownership decision produces a positive correlation between headquarter intensity in production and the vertical integration decision
- But headquarter intensity of what? And how do we measure it?
- Antràs (2003) provides evidence suggestive of a positive correlation between the share of intrafirm trade in U.S. imports and capital intensity (as well as R&D intensity) of the imported good as measured in U.S. data
  - Yeaple (2006) confirms these correlations using more detailed (confidential) BEA dataset for 1994
- Similar results arise when looking at the U.S. census data, which is much more disaggregated (see Nunn and Trefler, 2008)

The Effect of Headquarter Intensity



Sources: U.S. Census Related-Party Trade Database and NBER-CES Manufacturing Industry Database

Alternative Measures of Headquarter Intensity

Table 8.3. Determinants of U.S. Intrafirm Trade Shares

Dep. Var. $\frac{\text{Intrafirm Imp}}{\text{Total Imports}}$	(1)	(2)	(3)	(4)	(5)	(6)
Log(R&D/Sales)	0.385**	0.361**	0.328**	0.301**	0.085**	0.337**
	(0.047)	(0.046)	(0.052)	(0.048)	(0.015)	(0.057)
Log(Skilled/Unskilled)	0.091^{+}	0.097*	0.192**	0.061	0.006	-0.146*
	(0.051)	(0.049)	(0.064)	(0.055)	(0.015)	(0.074)
Log(Capital/Labor)	0.274**					
	(0.042)					
Log(Capital Struct/Labor)		-0.256**	0.007	-0.253**	-0.060**	-0.126^{+}
		(0.076)	(0.069)	(0.078)	(0.023)	(0.074)
Log(Capital Equip/Labor)		0.529**		0.554**	0.106**	0.303**
		(0.073)		(0.076)	(0.022)	(0.082)
Log(Autos/Labor)			-0.250**			
			(0.050)			
Log(Computer/Labor)			-0.012			
			(0.049)			
Log(Other Eq./Labor)			0.290**			
			(0.066)			
Freight Costs				-0.173**	-0.104**	-0.076*
				(0.055)	(0.014)	(0.038)
Tariffs				0.007	-0.010*	-0.049
				(0.028)	(0.004)	(0.041)
Productivity Dispersion				-0.019	-0.013	-0.059
				(0.050)	(0.016)	(0.055)
Elasticity of Demand				0.036	-0.021^{+}	0.136^{+}
				(0.060)	(0.011)	(0.073)
Weighting	None	None	None	None	None	Imports
Fixed Effects	Year	Year	Year	Year	Ctr/Year	Ctr/Year
Observations	4,651	4,651	4,651	4,651	312,884	312,884
R-squared	0.312	0.343	0.344	0.369	0.170	0.585

Standard errors clustered at the industry level. $^{+}, *, **$ denote $10, 5,$ 1% significance.

Some Obvious Caveats

1. Even when we relate headquarter intensity to capital intensity, what should be relevant is the importance of **noncontractible**, relationship-specific capital investments in production
   - Nunn and Trefler (2011) find support for this prediction
   - They break up capital expenditures into (1) expenditures for buildings and other structures, (2) expenditures for machinery and equipment (computers, automobiles, other machinery)
   - The effect is **not coming** from buildings, computers or automobiles
2. The theory tells us that what should matter is the headquarter intensity of the **whole production process**, not just of the imported good
   - how can we know who is buying the goods being imported? Antràs and Chor (2012) use I/O information
3. Our models above suggest that this is a test with little power
   - transaction-cost model has same implication! But for a different reason, so there is hope...

Robustness and Other Results

Table 8.4. Refined Determinants of U.S. Intrafirm Trade Shares

Dep. Var. $\frac{\text{Intrafirm Imp}}{\text{Total Imports}}$	(1)	(2)	(3)	(4)	(5)	(6)
Log(R&D/Sales)	0.164**	0.222**	0.240**	0.251**	0.052**	0.246**
	(0.058)	(0.064)	(0.072)	(0.072)	(0.017)	(0.068)
Log(Skilled/Unskilled)	0.174*	0.009	0.036	0.025	-0.031	-0.182
	(0.072)	(0.081)	(0.082)	(0.082)	(0.023)	(0.113)
Log(Capital Struct/Labor)	0.199**	-0.105	-0.027	-0.031	-0.013	-0.032
	(0.066)	(0.105)	(0.121)	(0.121)	(0.038)	(0.089)
Log(Capital Equip/Labor)	0.144**	0.392**	0.232*	0.235*	0.071*	0.149^{+}
	(0.046)	(0.099)	(0.117)	(0.118)	(0.032)	(0.077)
Seller Freight Costs	-0.231**	-0.221**	-0.254**	-0.240**	-0.131**	-0.081
	(0.069)	(0.075)	(0.089)	(0.087)	(0.020)	(0.068)
Seller Tariffs	-0.076*	-0.070**	-0.104**	-0.102**	-0.022**	-0.079^{+}
	(0.031)	(0.025)	(0.021)	(0.021)	(0.006)	(0.044)
Seller Dispersion	0.039	0.120^{+}	0.043	0.046	0.035^{+}	0.060
	(0.077)	(0.073)	(0.081)	(0.082)	(0.018)	(0.038)
Elasticity of Demand	0.105	0.163*	0.186*	0.184*	-0.011	0.085**
	(0.078)	(0.065)	(0.080)	(0.081)	(0.011)	(0.025)
Sample Restrictions	None	None	W	W+NT	W+NT	W+NT
Weighting	None	None	None	None	None	Imports
Fixed Effects	Year	Year	Year	Year	Ctr/Year	Ctr/Year
Buyer vs. Seller Controls	Seller	Buyer	Buyer	Buyer	Buyer	Buyer
Observations	3,036	3,036	2,480	2,478	148,947	148,947
R-squared	0.348	0.359	0.322	0.313	0.194	0.526

Standard errors clustered at the industry level. $^{+}$, *, ** denote 10, 5, 1% significance.

Robustness and Other Results

Table 8.6. Contractual Determinants of U.S. Intrafirm Trade Shares

Dep. Var. $\frac{IntrafirmImp}{TotalImports}$	(1)	(2)	(3)	(4)	(5)	(6)
Financial Dependence	0.186*	0.028	0.206**	0.182*	0.029	0.196**
	(0.087)	(0.019)	(0.045)	(0.088)	(0.019)	(0.041)
Asset Tangibility	-0.124	-0.015	-0.256**			
	(0.078)	(0.019)	(0.062)			
Nunn Contractibility	-0.084	-0.012	-0.166*	-0.073	0.000	-0.121^{+}
	(0.070)	(0.019)	(0.070)	(0.076)	(0.021)	(0.073)
Levchenko Contractibility	-0.124^{+}	-0.054**	-0.176**			
	(0.073)	(0.019)	(0.055)			
Costinot Contractibility	-0.131^{+}	-0.001	-0.131*			
	(0.071)	(0.018)	(0.063)			
BJRS Contractibility	-0.191*	-0.056**	-0.085^{+}			
	(0.078)	(0.021)	(0.046)			
Specificity	0.044	0.020	0.180*	0.006	0.017	0.055
	(0.070)	(0.019)	(0.074)	(0.074)	(0.021)	(0.067)
Input Substitutability	-0.014	-0.016	-0.078^{+}	-0.000	-0.014	-0.014
	(0.042)	(0.017)	(0.047)	(0.043)	(0.017)	(0.028)
Sample Restrictions	W+NT	W+NT	W+NT	W+NT	W+NT	W+NT
Fixed Effects	Year	Ctr/Year	Ctr/Year	Year	Ctr/Year	Ctr/Year
Weighting	None	None	Imports	None	None	Imports
Observations	2,478	148,947	148,947	2,478	148,947	148,947
R-squared	$\simeq 0.322$	$\simeq 0.194$	$\simeq 0.548$	0.336	0.195	0.582

Standard errors clustered at the industry level. $^{+}, ^{*}, ^{**}$ denote $10, 5, 1\%$ significance.

Robustness and Other Results

Table 8.7. Further Contractual Determinants of U.S. Intrafirm Trade Shares

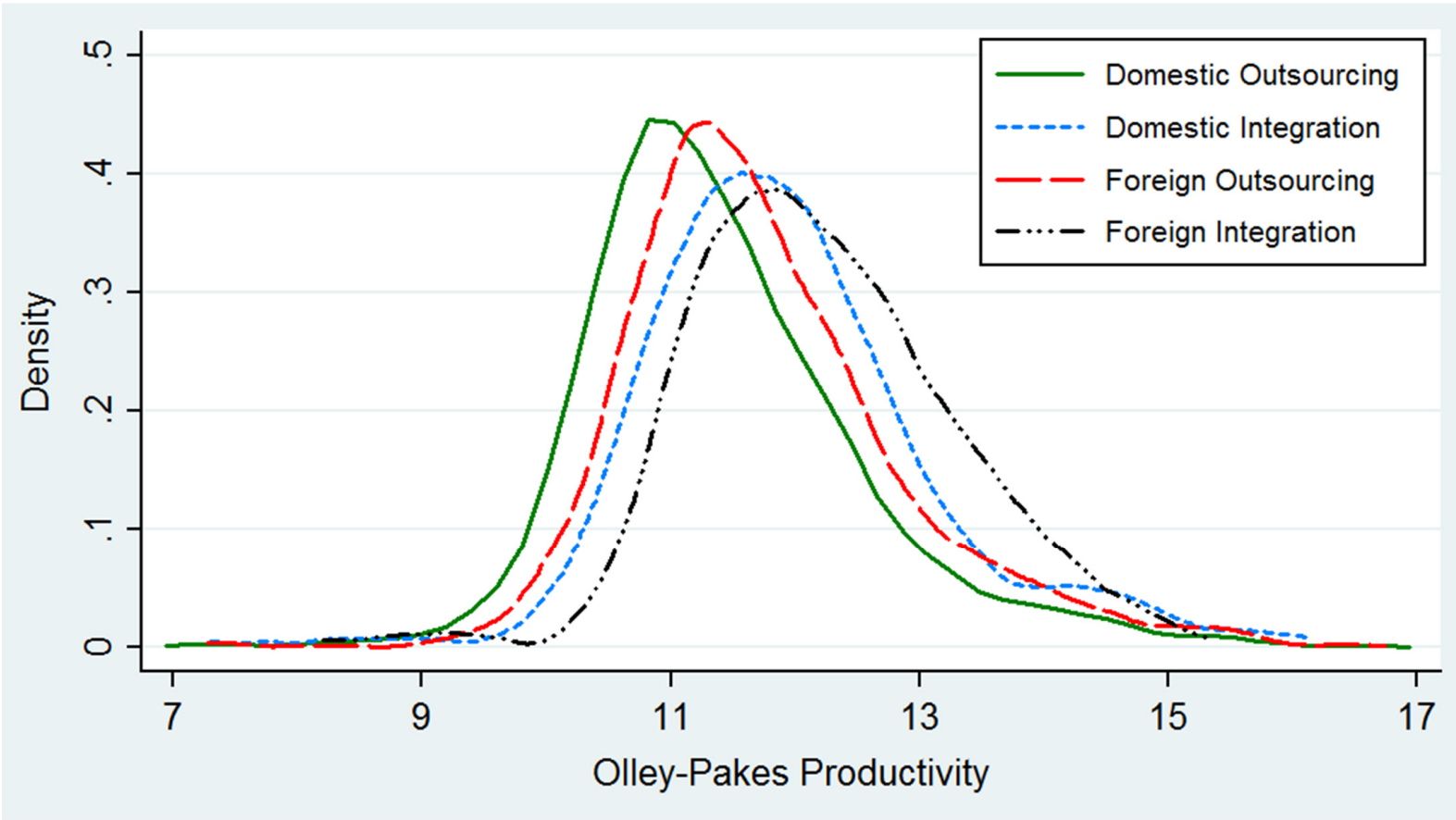
Dep. Var. $\frac{IntrafirmImp}{TotalImports}$	(1)	(2)	(3)	(4)	(5)	(6)
Downstreamness x High σ	0.291^{+}	0.330**	0.296^{+}	0.344**	0.291*	0.321**
	(0.150)	(0.060)	(0.150)	(0.058)	(0.148)	(0.052)
Downstreamness x Low σ	-0.159	0.099	-0.155	0.100	-0.165	0.040
	(0.138)	(0.078)	(0.139)	(0.077)	(0.137)	(0.074)
Seller Nunn Contractibility	-0.059	-0.026	-0.027	0.138	-0.046	0.033
	(0.068)	(0.057)	(0.092)	(0.085)	(0.070)	(0.053)
Buyer Nunn Contractibility			-0.051	-0.185*		
			(0.096)	(0.075)		
Seller Nunn Specificity	-0.015	-0.011	-0.028	-0.038	-0.090	-0.176**
	(0.078)	(0.061)	(0.083)	(0.064)	(0.092)	(0.068)
Buyer Nunn Specificity					0.124	0.284**
					(0.116)	(0.060)
Sample Restrictions	W+NT	W+NT	W+NT	W+NT	W+NT	W+NT
Fixed Effects	Year	Ctr/Year	Year	Ctr/Year	Year	Ctr/Year
Weighting	None	Imports	None	Imports	None	Imports
Observations	2,478	148,947	2,478	148,947	2,478	148,947
R-squared	0.357	0.614	0.358	0.620	0.362	0.632

Standard errors clustered at the industry level. $^{+}$, *, ** denote 10, 5, 1% significance.

Firm-Level Studies

- Firm-level datasets allow to test directly the sorting implied by the frameworks developed above
- Tomiura (2007, JIE) uses a very rich sample of Japanese manufacturing firms to test directly the pattern of sorting of firms into organizational models implied by the models above
  - finds supportive evidence: Japanese firms engaged in offshore outsourcing, are generally less productive than firms engaged in foreign investment
- Defever and Toubal (2009) find more mixed evidence for French firms
- Kohler and Smolka (2009) use data from the Spanish Survey on Business Strategies (ESEE) from the Fundación SEPI
  - they find strong support for the sorting results implied by the theory
- Corcos et al. (2012) have also used French firm-level data and find a positive correlation between headquarter intensity **at the firm level** and the relative importance of intrafirm trade

Sorting Patterns



THE END

THANK YOU VERY MUCH!