The Boundaries of the Multinational Firm

Lecture Slides, PhD level class

Giuseppe Berlingieri, Frank Pisch, and Claudia Steinwender

The Organization of Multinationals

- **Today's economies feature complex, global production networks**
  - Multinationals are important players in the world's manufacturing supply chains (Bernard et al., 2009)
  - Multinationals own some, but not all parts of their supply chain (1/3 of world trade is intrafirm)
- **Which inputs are sourced from affiliated suppliers ("made"), and which from unaffiliated suppliers ("bought")?**
  - Affects gains from international sourcing characterized by contractual frictions
  - Implications on international shock transmission

MNCs Provide Intriguing Research Setting

- **Multinationals provide an intriguing setting for studying the organization of the firm**

1. Substantial contracting frictions in the international context

2. Availability of great micro data at the transaction or firm level

1: Contracting Frictions in International Setting

- **Which country's laws apply?**
  - Sometimes specified in *choice of law clause*; could even vary by contract item
  - But often not specified in advance
  - Even if specified, courts may disregard choice
- **Are courts willing to enforce law?**
  - Courts may be unwilling to enforce a contract if unfavorable outcome for local residents
  - Political considerations may matter
- **Are there practical impediments to enforce law?**
  - Defendant may not have any assets in the court's country that can be seized
  - A new law suit to seek enforcement needs to be filed in the country where defendants' assets are

Source: Antras (2015)

1: Attempts to Reduce Contracting Frictions

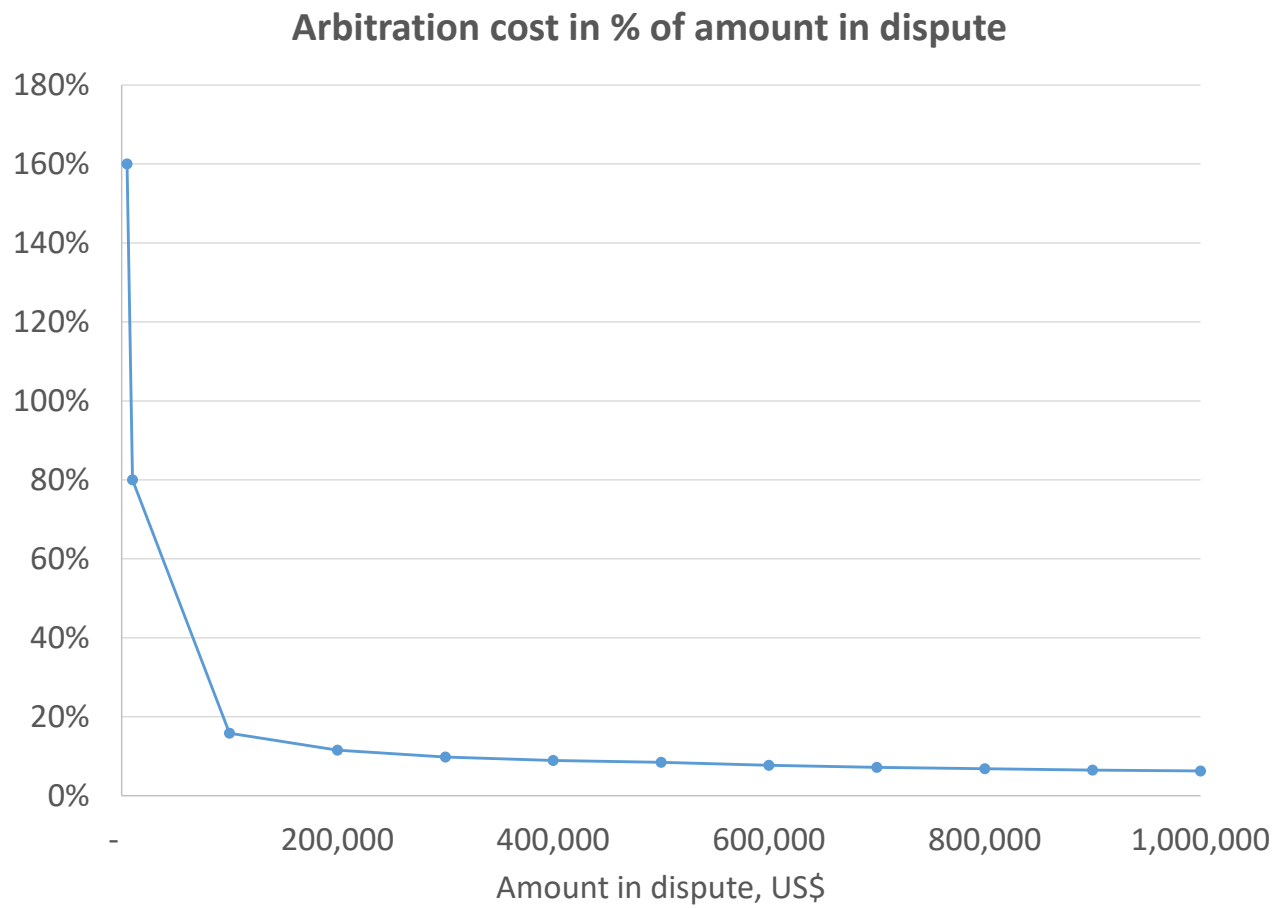
- **"Vienna Convention"**
  - United Nations Convention on Contracts for the International Sale of Goods (CISG)
  - Ratified by 93 countries, but not e.g., United Kingdom, India (unclear status of Hong Kong, Taiwan)
  - Uniform rules to govern contracts for international sale of goods, but not services or intangibles (e.g., unclear about software)
  - Criticism: still inconsistent decisions by courts in different countries (precedents from other countries at the moment not accepted); vague language

- **International Arbitration**
  - Different systems, e.g., UNCITRAL Arbitration Rules, *New York Convention*
  - New York Convention ratified by 150 countries

- **Implicit contracting**
  - Limited repeated interactions (e.g. due to international shocks)
  - Cultural differences, long distance impedes collective or community enforcement

Source: Antras (2015)

1: International Arbitration Cost



Source: International Chamber of Commerce; Arbitration Cost Calculator

2: Availability of great micro data

- Customs offices around the world have been routinely collecting data on international transactions
  - Accessible, widely used, detailed (e.g., detailed product description, value)
  - May contain information about whether transaction is with foreign affiliate or not
  - Even if not, can sometimes be complemented with data on corporate ownership to create proxy for intrafirm versus at arms length transactions
- Can sometimes be matched to other firm level (or even employer-employee matched) data sets
- Some countries provide identity of buyer *and* seller (e.g., US, Latin America, China); could possibly be matched to other datasets — work in progress by some researchers

2: Example datasets for research in this area

Examples of mostly firm level datasets that have information on intrafirm trade:

- U.S. Bureau of Customs and Border Protection: firm level, but access is time consuming (need security clearance and then project approved by the U.S. Census data administrators)
- U.S. Related Party Trade database: data as above aggregated at the product level, available online: https://relatedparty.ftd.census.gov/
- U.S. Bureau of Economic Analysis: intra-firm sales and affiliate data for U.S. based multinationals (e.g., Ramondo et al. (2015))
- France: EIIG; e.g., Berlingieri et al. (forthcoming); Corcos et al. (2013), Defever and Toubal (2013), Carluccio and Fally (2012)
- Spain: ESEE; e.g., Kohler and Smolka (2009), Kohler and Smolka (2014)
- Japan: Basic Survey of Commercial and Manufacturing Structure and Activity (Tomiura, 2007)
- Italy: Survey on Italian Manufacturing Firms conducted by Mediocredito Capitalia (Federico, 2010)
- Bureau van Dijk's Orbis: worldwide firm level dataset, but only ownership data and not trade data; e.g., Eppinger and Kukharskyy (2019), Nunn and Trefler (2013)
- Dun & Bradstreet's WorldBase: worldwide firm level dataset, but only ownership data and not trade data; e.g., Alfaro and Chen (2014)

Overview: Theoretical Approaches

- **Seminal paper by Antràs (2003)**
  - Roughly one third of world trade is intra-firm, yet trade theory generally has little to say about whether international transactions occur within or outside the firm
  - Embeds property rights theory approach à la Grossman-Hart-Moore in a model of international trade based on Helpman and Krugman (1985)

- **Selected subsequent research**
  - Antràs and Helpman (2004): Incorporates firm heterogeneity by combining Antràs (2003) and Melitz (2003); for generalization to partial contractibility see Antràs et al. (2008)
  - Acemoglu et al. (2007): Incorporates technological choice
  - Antràs (2005): Develops a model of the product cycle based on contractual incompleteness
  - Costinot (2009): Develops a model of the division of labor and contractual incompleteness
  - Antràs and Chor (2013): Sequential production process
  - Financial constraints: Carluccio and Fally (2012), Basco (2013), Antràs (2014), Conconi et al. (2012).

Example for Empirical Approach: Berlingieri et al. (forthcoming)

- Previous literature focused on *firm level* determinants of intrafirm trade
  - E.g., headquarter intensity, capital intensity, R&D intensity
- But even within firms, large variation in sourcing mode across inputs
- This paper proposes a novel determinant of intrafirm trade: **technological importance of an input**

To fix ideas ...

Figure: A 1 series BMW

Overview

Do multinationals make or buy technologically important inputs?

Our approach:

- Compare sourcing strategies for detailed products sourced by the *same* firm
- Unique firm-level trade data from France
  - Distinguish imports from affiliated versus unaffiliated parties
  - Very detailed product level
  - Can be linked to industry of buyer
- Measuring technological importance
  - Is reflected in its cost share, among other things
  - Use variation from detailed, self-constructed input-output tables to isolate fundamental technological relationship

French Firm Level Data

- **Enquête Échanges Internationaux Intragroupe (EIIG)**
  - Imports from affiliated versus unaffiliated firms at the product-country level
    - ⋆ 1,100 HS4 inputs
    - ⋆ 170 countries
  - 3,151 multinationals in manufacturing
    - ⋆ Imports at least 1 million EUR
    - ⋆ Covers 80% of French imports by multinationals
    - ⋆ Part of a group that controls at least 50% of a foreign firm
  - Cross section for 1999

- **Enquête annuelle d'Entreprise (EAE)**
  - Other balance sheet data: Total expenditure on intermediate inputs; capital, employment, sales, wage bill, etc.
  - Identify industry of multinational

Summary statistics

Table: Summary Statistics

	mean	median	sd	count
Employment	468	198	1,187	3,101
Sales	160.4k	38.8k	1,137.8k	3,149
Average Input Cost Share	0.0068	0.0012	0.0166	3,101
Average Intrafirm Trade Share	0.27	0.09	0.34	3,151
Average Number of Products	10	7	12	3,151
Capital Intensity	900	445	7103	3,097
Intangible Cap. Int.	106	17	1022	2,965
Skill Intensity	185	172	71	3,097
TFP Wooldridge (ln)	1.53	1.24	1.16	2,997
VA per worker	1,262	650	7,788	3,090

Do multinationals make or buy technologically important inputs?

$$intrashare_{ipc} = \beta_1 costshare_{ip} + \alpha_i + \phi_{cp} + \gamma_{cj} + \varepsilon_{ijpc}$$

- Firm i (in industry j) sourcing input p from origin country c
- **Regressor:** Technological importance
  - Reflected in $costshare_{ip} = \frac{imports_{ip}}{totexp_i}$
  - $totexp_i$ is total expenditure on intermediate goods
  - Robustness: normalized by total imports; ln(import values)
- **Dependent variable:**
  - $intrashare_{ipc}$: share of imports from related parties in overall imports
  - Robustness: different dummy variables for integration; aggregate across countries
- Standard errors: two way clustered at downstream industry j and broad input p-industry

Regressor: Variation in technological importance

- Average number of imported products: 10 (median: 7; SD: 12)
- Average cost share of inputs: 0.007 (median: 0.001; SD: 0.02)

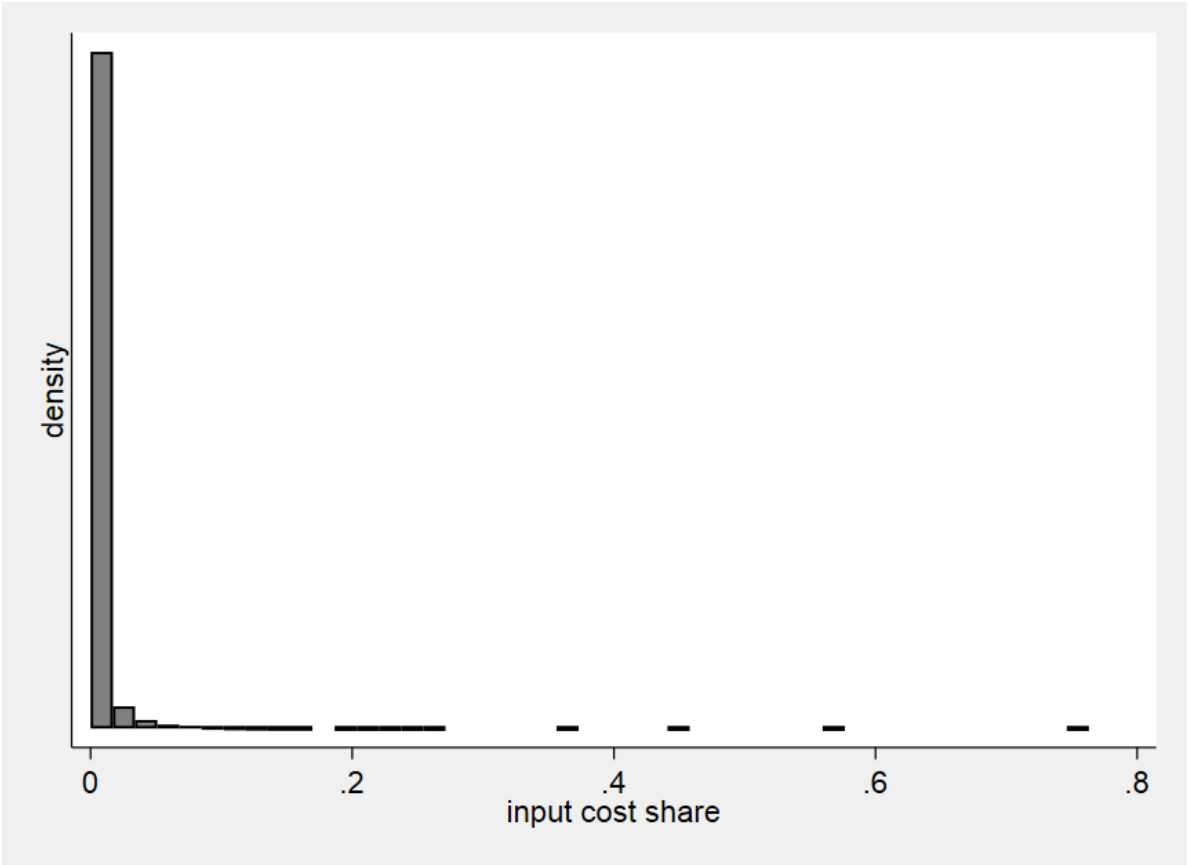


Figure: Distribution of Input Cost Share

High cost share inputs are more likely to be integrated

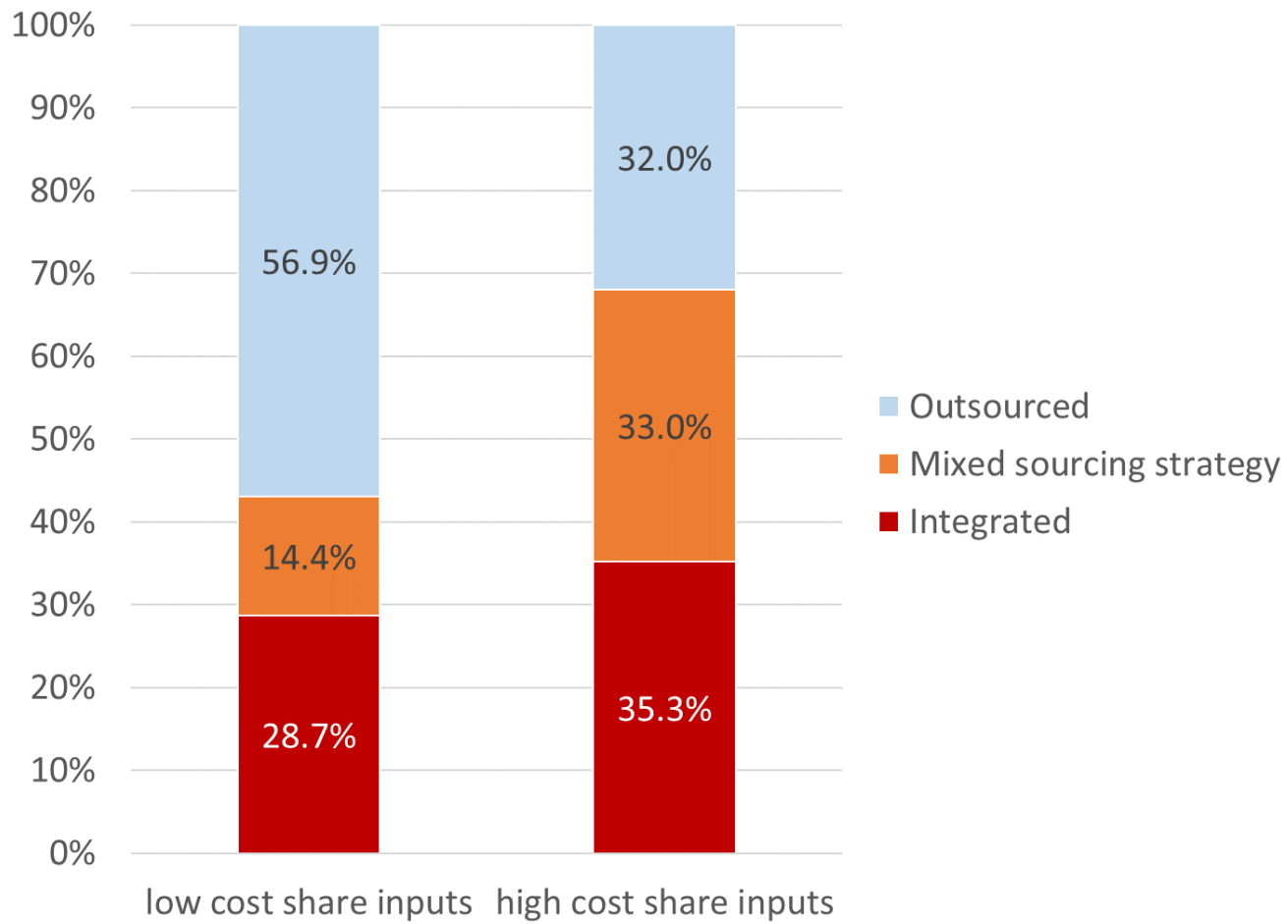


Figure: Raw Data, French intra-firm trade survey EIIG (1999)

Isolate variation driven by technological importance

- Cost shares reflect **technological importance**, but also other determinants which may also be related to offshoring
- Some of it absorbed by **rich fixed effects**
  - Product specific characteristics: input prices; complexity; relationship-specificity; codifiability of tasks
  - Country specific characteristics: gravity factors that influence FDI and trade
  - Country-product specific characteristics: input prices, trade cost
  - Country-industry specific characteristics: financial constraints in an industry and financial frictions in a sourcing country; differences in comparative advantage of countries in intermediate inputs that vary by industry
- **Endogenous firm responses** to substitute towards inputs produced by affiliates
  - Trigger increasing returns in production at affiliate
  - Avoid double marginalization
  - Exploit transfer pricing (to avoid taxes or tariffs)

$\Rightarrow$ **Our approach: Use variation from input-output coefficients at the industry level as IV for firm level cost shares**

Instrumental variable based on IO tables

- **Assumption**
  - Industry-level IO relationships reflects fundamental features of production technology
- **Instrumental variable**
  - Self constructed IO tables based on transaction level import data for all of France
  - Detailed, asymmetric: HS 4 digit product $\times$ 4-digit NAF industry
    - ⋆ 1,100 products $\times$ 285 manufacturing industries
    - ⋆ Official French IO table is at the 2-digit ISIC level (23 manufacturing industries)
  - Exogeneity
    - ⋆ Exclude firm's own trade flows (robustness: remove all EIIG firms)
    - ⋆ Pre-determined (1996, any year possible)
    - ⋆ Use categorical variable (quintiles) because distribution is skewed, more robust to measurement error

Official versus detailed IO tables

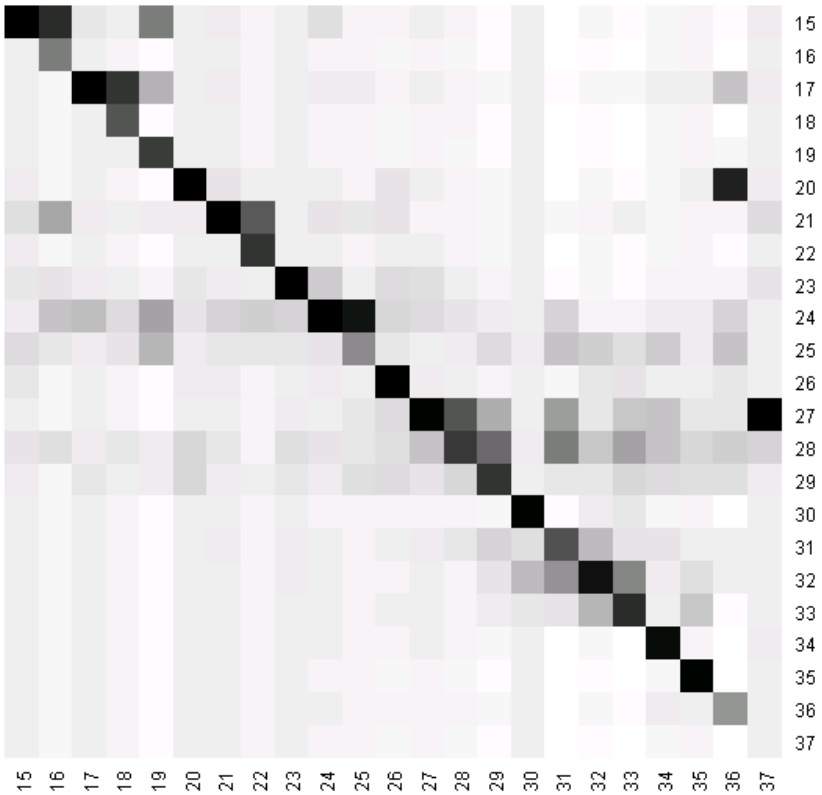
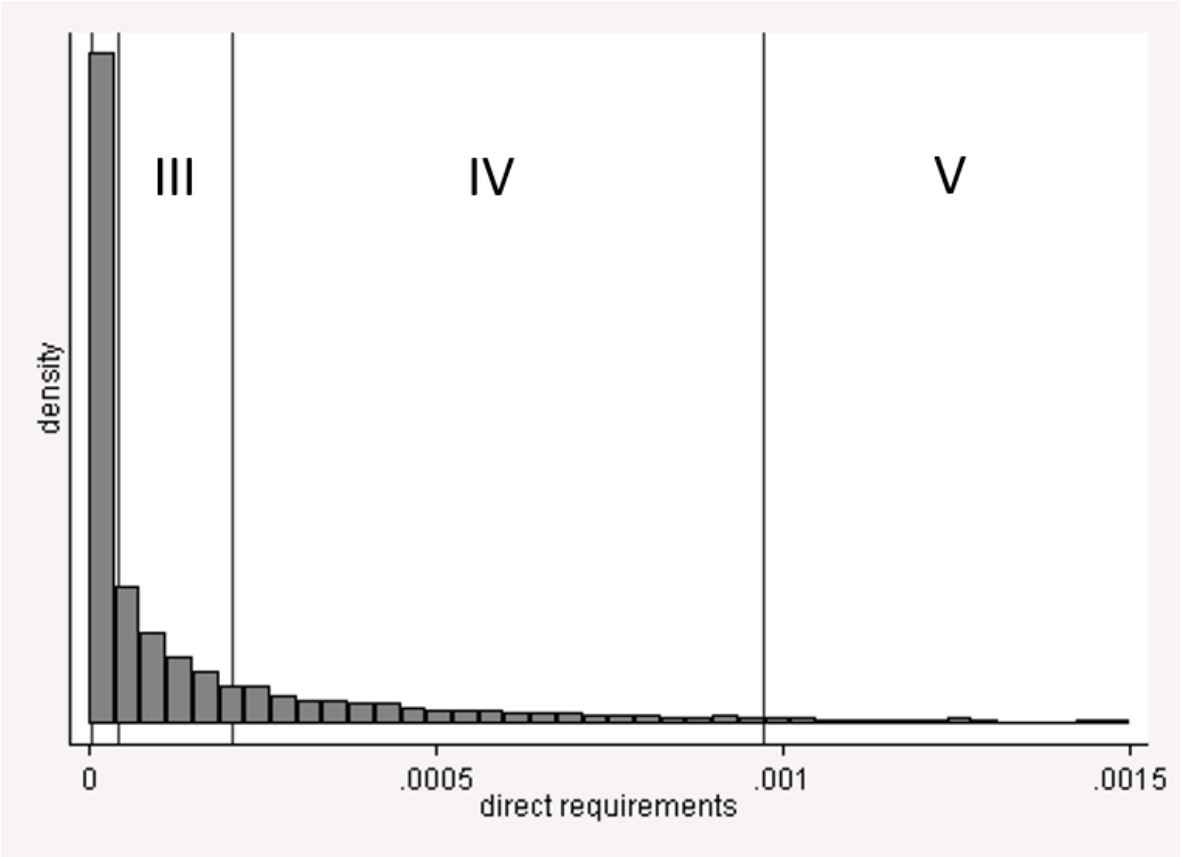


Figure: Official 2 digit

Figure: Self-constr asymmetric

Variation in instrument

Figure: Empirical Density of Direct Requirements



Baseline Results

- **Magnitude:** 75th perc input is 6pp more likely to be sourced in-house than 25th perc input = 1/5 of average integration share of 27%

VARIABLES	(1) intra-firm share	(2) intra-firm share	(3) intra-firm share
cost share	3.222***	2.479***	11.586***
	(0.550)	(0.320)	(1.400)
Country*HS4 product FE		YES	YES
Country*NAF 4dig FE		YES	YES
Firm		YES	YES
Observations	76,897	70,016	70,016
R-squared	0.015	0.686	0.638
Instrument			Micro 1996 excl own firm
KP-stat 1st stage			241.8

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries
- **IO tables from other countries**
  - Detailed based on transaction level micro data for China in 2006
  - More aggregated for US in 2002

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries
- **IO tables from other countries**
  - Detailed based on transaction level micro data for China in 2006
  - More aggregated for US in 2002
- **Horizontal (reselling) versus vertical offshoring**
  - Dropping the "diagonal"

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries
- **IO tables from other countries**
  - Detailed based on transaction level micro data for China in 2006
  - More aggregated for US in 2002
- **Horizontal (reselling) versus vertical offshoring**
  - Dropping the "diagonal"
- **Technical similarity to output (upstreamness) vs. technological importance**
  - Upstream product $\times$ downstream broader industry FE; downstream firm $\times$ upstream broader product FE

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries
- **IO tables from other countries**
  - Detailed based on transaction level micro data for China in 2006
  - More aggregated for US in 2002
- **Horizontal (reselling) versus vertical offshoring**
  - Dropping the "diagonal"
- **Technical similarity to output (upstreamness) vs. technological importance**
  - Upstream product $\times$ downstream broader industry FE; downstream firm $\times$ upstream broader product FE
- **Distorted intrafirm prices**
  - Controlling for country $\times$ firm FEs; dropping 21 tax heaven countries; no significant effects of tariffs

Robustness checks

- **Exogeneity of industry level IO relationship**
  - Only firms in highly competitive industries
- **IO tables from other countries**
  - Detailed based on transaction level micro data for China in 2006
  - More aggregated for US in 2002
- **Horizontal (reselling) versus vertical offshoring**
  - Dropping the "diagonal"
- **Technical similarity to output (upstreamness) vs. technological importance**
  - Upstream product $\times$ downstream broader industry FE; downstream firm $\times$ upstream broader product FE
- **Distorted intrafirm prices**
  - Controlling for country $\times$ firm FEs; dropping 21 tax heaven countries; no significant effects of tariffs
- **International versus domestic sourcing**
  - No heterogeneous effects across industries that depend more or less on imported inputs
  - Only import flows from EU; no heterogeneity w.r.t. distance within the EU

Robustness: IO tables from other countries

VARIABLES	(1) intra-firm share	(2) intra-firm share	(3) intra-firm share	(4) intra-firm share	(5) intra-firm share
cost share	3.222***	2.479***	11.586***	11.281***	10.246***
	(0.550)	(0.320)	(1.400)	(1.615)	(2.108)
Country*HS4 product FE		YES	YES	YES	YES
Country*NAF 4dig FE		YES	YES	YES	YES
Firm		YES	YES	YES	YES
Observations	76,897	70,016	70,016	70,016	70,016
R-squared	0.015	0.686	0.638	0.641	0.651
Instrument			Micro 1996 excl own firm	Micro China 2006 excl France	Official US 2002 4 digit
KP-stat 1st stage			241.8	103.4	98.66

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness — diagonal dropped

VARIABLES	(1) intra-firm share	(2) intra-firm share	(3) intra-firm share	(4) intra-firm share	(5) intra-firm share
cost share	2.373***	1.878**	10.196***	11.741***	18.446**
	(0.706)	(0.756)	(2.191)	(3.092)	(7.495)
Country*HS4 product FE		YES	YES	YES	YES
Country*NAF 4dig FE		YES	YES	YES	YES
Firm		YES	YES	YES	YES
Observations	56,253	50,654	50,654	50,654	50,654
R-squared	0.004	0.718	0.699	0.692	0.643
Instrument			Micro	Micro China	Official US
			1996	2006	2002
			excl own firm	excl France	4 digit
KP-stat 1st stage			102.7	73.75	16.74

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness checks

VARIABLES	(1) intra-firm share	(2) intra-firm share	(3) intra-firm share	(4) intra-firm share	(5) intra-firm share	(6) intra-firm share	(7) intra-firm share	(8) intra-firm share
cost share	11.577***	10.706***	8.533**	6.229**	10.354***	12.301***	8.941***	12.319***
	(1.392)	(2.164)	(4.111)	(2.979)	(1.517)	(1.284)	(1.841)	(1.847)
Country*HS4 product FE	YES	YES	YES	YES	YES	YES	YES	YES
Country*NAF 4dig FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES		YES		YES	YES
ISIC 4dig FE*HS4 product			YES					
Up ISIC 4dig*Firm				YES				
Country*Firm						YES		
Observations	75,549	55,201	72,024	68,856	42,848	66,385	42,645	36,807
Sample	all	(1)	all	all	(2)	all	(3)	(4)
R-squared	0.638	0.697	0.736	0.825	0.653	0.754	0.674	0.619
Instrument				Micro 1996 excl own firm				
KP-stat	231.3	98.2	19.9	40.5	118.5	274.2	108.7	339.3

Sample (1): We drop all observations in which the downstream importer i is mainly active in the industry j that also produces the good sourced (p). Sample (2): Firms in highly competitive industries. Sample (3): Only firms *in industries* with above median import shares in total spending on intermediates. Sample (4): Only affiliates of foreign multinationals. Standard errors in parentheses are two-way clustered at the 3 digit downstream ISIC Rev. 3 industry and at the 3 digit upstream ISIC Rev. 3 level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Robustness checks II

VARIABLES	(1) intra-firm indicator 1	(2) intra-firm indicator 2	(3) intra-firm indicator 3	(4) intra-firm share	(5) intra-firm share	(6) intra-firm share	(7) intra-firm share	(8) intra-firm share
cost share	11.978***	11.224***	9.768***				4.954***	11.299***
	(1.395)	(1.419)	(1.472)				(0.885)	(1.344)
cost share in imports				0.611***				
				(0.073)				
(log) import value					0.032***			
					(0.004)			
cost share (winsorized)						14.355***		
						(1.703)		
Country*HS4 product FE	YES	YES	YES	YES	YES	YES	YES	YES
Country*NAF 4dig FE	YES	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES	YES
Observations	75,549	70,670	64,645	76,154	76,154	76,154	75,549	75,549
R-squared	0.622	0.651	0.694	0.670	0.683	0.669	0.682	0.641
Instrument origin				Micro 1996 excl own firm				
Instrument type				quintile variable			direct requirement	quintile dummies
KP-stat 1st stage	231.3	221.2	259.2	273.1	244.1	265.0	140.1	52.7

The variable *intra-firm indicator 1* is a dummy that equals one whenever the intra-firm share of a firm×country×product trade flow is weakly greater than 50%; *intra-firm indicator 2* is equal to one if the share is at least 80% and equal to zero if it is weakly smaller than 20%; *intra-firm indicator 3* is equal to one if the share is 100% and equal to zero if it is 0. The regressors are the firm by input level cost share in total expenditure on intermediates; the value share of a firm×country×product flow in a firm's total import value; the cost share in intermediates winsorized at 5 and 95%. Standard errors in parentheses are two-way clustered at the 3 digit downstream ISIC Rev. 3 industry and at the 3 digit upstream ISIC Rev. 3 level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Horse Race with Integration Determinants at Firm Level

VARIABLES	(1) intra-firm share	(2) intra-firm share	(3) intra-firm share	(4) intra-firm share	(5) intra-firm share	(6) intra-firm share	(7) intra-firm share	(8) intra-firm share
cost share	0.226***	0.231***	0.229***	0.221***	0.223***	0.230***	0.231***	0.231***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
(log) capital intensity		0.048***						0.009
		(0.000)						(0.565)
(log) intangible cap. int.			0.038***					0.013
			(0.000)					(0.140)
(log) skill intensity				0.120***				0.121***
				(0.000)				(0.000)
(log) VA per worker					0.069***			
					(0.000)			
(log) TFP						0.070***		0.023
						(0.003)		(0.253)
rel. spec. (Defever/Toubal)							-0.059***	-0.075***
							(0.000)	(0.000)
IM	0.281***	0.270***	0.276***	0.264***	0.272***	0.278***	0.279***	0.258***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Country*HS4 product FE	YES	YES	YES	YES	YES	YES	YES	YES
Country*NAF 4dig FE	YES	YES	YES	YES	YES	YES	YES	YES
Observations	119,258	119,258	119,258	119,258	119,258	119,258	119,258	119,258
R-squared	0.366	0.366	0.366	0.374	0.369	0.365	0.366	0.375
Instrument				Micro 1996 excl own firm				
KP-stat 1st stage	247.2	253.3	245	246.2	248.7	238	246.2	242.0

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Empirical Findings

- More important inputs are *more* likely to be sourced intra-firm

- Technological importance is at least as important as previously identified drivers of the make-or-buy decision

Empirical results are surprising to trade economists

How can we rationalize the previous results?

- Workhorse model for MNEs is property rights theory (PRT; ex ante inefficiencies)
  - Inconsistent with our empirical findings!
- Organizational Economics literature also emphasizes transaction cost economics (TCE; ex post inefficiencies)
  - Haggling, coordination/adaptation

Construct a model with both ex ante and ex post contract incompleteness

- Interpret our main result through this lens
- Are PRT-type forces weak or absent? Derive further predictions and test empirically

General setup

- Incomplete contracts: only property rights can be contractually specified
- Dynamic game
  0. Integration decision (property rights allocated)
     - ⋆ Downstream firm chooses ownership share of supplier
  1. Supplier makes investment at marginal cost
     - ⋆ *ex ante inefficiencies; focus of PRT*
     - ⋆ Total surplus depends positively on investment, and more so for technologically important inputs
  2. Haggling, bargaining, distribution of surplus
     - ⋆ *ex post inefficiencies; focus of TCE*
     - ⋆ Share of total surplus increases in ownership
     - ⋆ Buyer pays haggling cost, decreasing in ownership
     - ⋆ Inefficiencies are more costly for more important inputs
- Solve via backward induction

Are PRT extensions consistent with empirical findings?

- **Important downstream investment (e.g., HQ services)**
  - If firm-specific, absorbed by our firm FE
  - Needs to be input-specific downstream firm investment (e.g., R&D)
  - But our results hold even for homogeneous products; and with upstream-product narrow-downstream-industry FE
- **Fixed cost of integration versus outsourcing**
  - Relative fixed cost of outsourcing versus integration higher for technologically more important inputs; hard to believe
  - Usually fixed cost of integration is assumed to be higher
- **Strategic interactions between suppliers**
  - E.g., technological complementarity between important and less important inputs
  - Incentivize the less important input via outsourcing, spillover to more important supplier will reduce underinvestment even if owned
  - Empirical findings hold even for non-complementary inputs

Solution of model and additional predictions

- **Optimal ownership share**
  - PRT force pushes for outsourcing of more important inputs
  - TCE force pushes for integration of more important inputs

  $\Rightarrow$ Empirical finding suggests that TCE force present, and more powerful than PRT force for more important inputs

- **Are PRT forces present at all?**

  $\Rightarrow$ Derive additional predictions that are only true if PRT present

Are PRT forces present at all?

- **Additional predictions:**

  1. Better contracting environment ex ante reduces ex ante inefficiencies (PRT force)

  2. More headquarters intensity reduces ex ante inefficiencies (PRT force)

  $\Rightarrow$ Both suggest *stronger relationship* between technological importance and intrafirm trade

- Test by allowing for interaction of input cost share with dummy when contractability or HQ intensity is above median

- Instrument both main effect and interactions as before

Additional Results: Contracting Environment

CONTRACTIBILITY PROXY	(1) PR Protect.	(2) Rule of Law	(3) IPR Protect.	(4) Contractibility Product	(5) Contractibility Firms	(6) Contractibility Industry	(7) Upstream Routineness
cost share	10.048***	9.507***	2.507	12.106***	11.430***	9.735***	13.526***
	(1.623)	(1.796)	(2.269)	(1.363)	(1.315)	(1.784)	(1.515)
× 1(proxy)	3.564***	3.100**	9.827***	0.297	1.559	6.076**	-4.478*
	(1.039)	(1.483)	(2.323)	(2.448)	(1.337)	(2.308)	(2.478)
Country*HS4 product FE	YES	YES	YES	YES	YES	YES	YES
Country*NAF 4dig FE	YES	YES	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES	YES	YES
Observations	72,307	72,307	72,307	72,307	72,307	72,307	72,307
R-squared	0.637	0.638	0.640	0.638	0.636	0.627	0.634
Instrument			Micro 1996 excl own firm				
KP-stat 1st stage	108	86.56	23	42.09	111.2	81.93	62.47

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Additional Results: Headquarters Intensity

HQ Intensity Proxy	(1) RnD Intensity	(2) Capital Intensity	(3) Intangible Cap. Intensity	(4) Skill Intensity	(5) Service Intensity
cost share	9.872***	8.515***	9.026***	8.389***	8.251***
	(1.770)	(1.350)	(1.411)	(1.590)	(1.766)
× 1(proxy)	2.610	6.394***	5.086**	5.326**	5.654**
	(2.210)	(2.099)	(2.454)	(2.472)	(2.375)
Country*HS4 product FE	YES	YES	YES	YES	YES
Country*NAF 4dig FE	YES	YES	YES	YES	YES
Firm	YES	YES	YES	YES	YES
Observations	75,549	75,549	75,549	75,549	75,549
R-squared	0.636	0.633	0.633	0.630	0.633
Instrument			Micro 1996 excl own firm		
KP-stat 1st stage	63.67	70.88	61.47	59.75	86.18

The dependent variable is the share of intra-firm import value in total import value. Standard errors in parentheses are clustered at the industry and input level. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$.

Conclusion

- Novel determinant of the make-or-buy decision: technological importance of an input
- Mechanism
  - Consistent with an incomplete contracting model in which ex post inefficiencies (TCE forces) stronger than ex ante inefficiencies (PRT forces) for more important inputs
  - Additional empirical evidence suggest a role for both
- Important implication for researchers
  - So far, trade economists have predominantly viewed multinational activity through the lens of the PRT model
  - Our results suggest that it is necessary and important to incorporate TCE into trade models and explore their implications

    $\rightarrow$ Integrative approach promising (Gibbons 2005)!

References I

Acemoglu, Daron, Pol Antràs, and Elhanan Helpman, "Contracts and technology adoption," *American Economic Review*, 2007, *97* (3), 916–943.

Alfaro, Laura and Maggie Xiaoyang Chen, "The global agglomeration of multinational firms," *Journal of International Economics*, 2014, *94* (2), 263–276.

Antràs, Pol, "Firms, contracts, and trade structure," *The Quarterly Journal of Economics*, 2003, *118* (4), 1375–1418.

_ , "Incomplete contracts and the product cycle," *American Economic Review*, 2005, *95* (4), 1054–1073.

_ , "Grossman–Hart (1986) goes global: Incomplete contracts, property rights, and the international organization of production," *The Journal of Law, Economics, & Organization*, 2014, *30* (suppl_1), i118–i175.

Antras, Pol, *Global production: Firms, contracts, and trade structure*, Princeton University Press, 2015.

Antràs, Pol and Davin Chor, "Organizing the global value chain," *Econometrica*, 2013, *81* (6), 2127–2204.

_ **and Elhanan Helpman**, "Global sourcing," *Journal of Political Economy*, 2004, *112* (3), 552–580.

References II

_ , _ , Nathan Nunn, Daniel Trefler, Gianmarco IP Ottaviano, James A Costantini, Marc J Melitz, Dalia Marin, Thierry Verdier, Robert C Feenstra et al., "The Organization of Firms in a Global Economy," 2008.

Basco, Sergi, "Financial development and the product cycle," *Journal of Economic Behavior & Organization*, 2013, *94*, 295–313.

Berlingieri, Giuseppe, Frank Pisch, and Claudia Steinwender, "Organizing Global Supply Chains: Input-Output Linkages and Vertical Integration," *Journal of the European Economic Association*, forthcoming.

Bernard, Andrew B., J. Bradford Jensen, and Peter K. Schott, "Importers, Exporters and Multinationals: A Portrait of Firms in the U.S. that Trade Goods," in "Producer Dynamics: New Evidence from Micro Data" NBER Chapters, National Bureau of Economic Research, Inc, 2009, pp. 513–552.

Carluccio, Juan and Thibault Fally, "Global sourcing under imperfect capital markets," *Review of Economics and Statistics*, 2012, *94* (3), 740–763.

Conconi, Paola, Patrick Legros, and Andrew F Newman, "Trade liberalization and organizational change," *Journal of International Economics*, 2012, *86* (2), 197–208.

References III

Corcos, Gregory, Delphine M Irac, Giordano Mion, and Thierry Verdier, "The determinants of intrafirm trade: Evidence from French firms," *Review of Economics and Statistics*, 2013, *95* (3), 825–838.

Costinot, Arnaud, "On the origins of comparative advantage," *Journal of International Economics*, 2009, *77* (2), 255–264.

Defever, Fabrice and Farid Toubal, "Productivity, Relationship-specific Inputs and the Sourcing Modes of Multinationals," *Journal of Economic Behavior and Organization*, 2013, *94*, 345–357.

Eppinger, Peter S and Bohdan Kukharskyy, "Contracting institutions and firm boundaries," Technical Report, University of Tübingen Working Papers in Economics and Finance 2019.

Federico, Stefano, "Outsourcing versus integration at home or abroad and firm heterogeneity," *Empirica*, 2010, *37* (1), 47–63.

Gibbons, Robert, "Four formal (izable) theories of the firm?," *Journal of Economic Behavior & Organization*, 2005, *58* (2), 200–245.

References IV

Helpman, Elhanan and Paul R Krugman, *Market structure and foreign trade: Increasing returns, imperfect competition, and the international economy*, MIT press, 1985.

Kohler, Wilhelm and Marcel Smolka, "Global sourcing decisions and firm productivity: Evidence from Spain," 2009.

_ **and** _ , "Global sourcing and firm selection," *Economics Letters*, 2014, *124* (3), 411–415.

Melitz, Marc J, "The impact of trade on intra-industry reallocations and aggregate industry productivity," *Econometrica*, 2003, *71* (6), 1695–1725.

Nunn, Nathan and Daniel Trefler, "Incomplete Contracts and the Boundaries of the Multinational Firm," *Journal of Economic Behavior and Organization*, 2013, *94*, 330–344.

Ramondo, Natalia, Veronica Rappoport, and Kim J Ruhl, "Intrafirm trade and vertical fragmentation in US multinational corporations," *Journal of International Economics*, 2015, *98*, 51–59.

Tomiura, Eiichi, "Foreign outsourcing, exporting, and FDI: A productivity comparison at the firm level," *Journal of International Economics*, 2007, *72* (1), 113–127.