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”**
  - 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

- **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
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
### Table: Summary Statistics

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

\[ \text{intrashare}_{ipc} = \beta_1 \text{costshare}_{ip} + \alpha_i + \phi_{cp} + \gamma_{cj} + \varepsilon_{ijpc} \]

- **Firm** \( i \) (in industry \( j \)) sourcing input \( p \) from origin country \( c \)

- **Regressor**: Technological importance
  - Reflected in \( \text{costshare}_{ip} = \frac{\text{import}_{ip}}{\text{totexp}_i} \)
  - \( \text{totexp}_i \) is total expenditure on intermediate goods
  - Robustness: normalized by total imports; \( \ln(\text{import values}) \)

- **Dependent variable**:
  - \( \text{intrashare}_{ipc} \): 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)

⇒ 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 × 4-digit NAF industry
    - 1,100 products × 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%

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

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.

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Berlingieri, Pisch, Steinwender
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

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 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 × downstream broader industry FE; downstream firm × upstream broader product FE

- **Distorted intrafirm prices**
  - Controlling for country × firm FE; 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

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) intra-firm share</th>
<th>(2) intra-firm share</th>
<th>(3) intra-firm share</th>
<th>(4) intra-firm share</th>
<th>(5) intra-firm share</th>
</tr>
</thead>
<tbody>
<tr>
<td>cost share</td>
<td>3.222*** (0.550)</td>
<td>2.479*** (0.320)</td>
<td>11.586*** (1.400)</td>
<td>11.281*** (1.615)</td>
<td>10.246*** (2.108)</td>
</tr>
<tr>
<td>Country*HS4 product FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Country*NAF 4dig FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Firm</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>76,897</td>
<td>70,016</td>
<td>70,016</td>
<td>70,016</td>
<td>70,016</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.015</td>
<td>0.686</td>
<td>0.638</td>
<td>0.641</td>
<td>0.651</td>
</tr>
<tr>
<td>KP-stat 1st stage</td>
<td>241.8</td>
<td>103.4</td>
<td>98.66</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Berlingieri, Pisch, Steinwender
Robustness — diagonal dropped

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

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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Berlingieri, Pisch, Steinwender

MNCs

25 / 37
## Robustness checks

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>(1) intra-firm share</th>
<th>(2) intra-firm share</th>
<th>(3) intra-firm share</th>
<th>(4) intra-firm share</th>
<th>(5) intra-firm share</th>
<th>(6) intra-firm share</th>
<th>(7) intra-firm share</th>
<th>(8) intra-firm share</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1.392)</td>
<td>(2.164)</td>
<td>(4.111)</td>
<td>(2.979)</td>
<td>(1.517)</td>
<td>(1.284)</td>
<td>(1.841)</td>
<td>(1.847)</td>
</tr>
<tr>
<td>Country*HS4 product FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Country*NAF 4dig FE</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Firm</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>ISIC 4dig FE*HS4 product</td>
<td>YES</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Up ISIC 4dig*Firm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Country*Firm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>YES</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>75,549</td>
<td>55,201</td>
<td>72,024</td>
<td>68,856</td>
<td>42,848</td>
<td>66,385</td>
<td>42,645</td>
<td>36,807</td>
</tr>
<tr>
<td>Sample</td>
<td>all</td>
<td>(1)</td>
<td>all</td>
<td>(2)</td>
<td>all</td>
<td>(3)</td>
<td>(4)</td>
<td></td>
</tr>
<tr>
<td>R-squared</td>
<td>0.638</td>
<td>0.697</td>
<td>0.736</td>
<td>0.825</td>
<td>0.653</td>
<td>0.754</td>
<td>0.674</td>
<td>0.619</td>
</tr>
<tr>
<td>KP-stat</td>
<td>231.3</td>
<td>98.2</td>
<td>19.9</td>
<td>40.5</td>
<td>118.5</td>
<td>274.2</td>
<td>108.7</td>
<td>339.3</td>
</tr>
</tbody>
</table>

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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Berlingieri, Pisch, Steinwender  
MNCs  
26 / 37
Robustness checks II

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

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

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

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

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

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

  ⇒ 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)

  ⇒ 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

<table>
<thead>
<tr>
<th>CONTRACTIBILITY PROXY</th>
<th>(1) PR Protect.</th>
<th>(2) Rule of Law</th>
<th>(3) IPR Protect.</th>
<th>(4) Contractibility Product</th>
<th>(5) Contractibility Firms</th>
<th>(6) Contractibility Industry</th>
<th>(7) Upstream Routineness</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>(1.623)</td>
<td>(1.796)</td>
<td>(2.269)</td>
<td>(1.363)</td>
<td>(1.315)</td>
<td>(1.784)</td>
<td>(1.515)</td>
</tr>
<tr>
<td>× 1(proxy)</td>
<td>3.564***</td>
<td>3.100**</td>
<td>9.827***</td>
<td>0.297</td>
<td>1.559</td>
<td>6.076**</td>
<td>-4.478*</td>
</tr>
<tr>
<td></td>
<td>(1.039)</td>
<td>(1.483)</td>
<td>(2.323)</td>
<td>(2.448)</td>
<td>(1.337)</td>
<td>(2.308)</td>
<td>(2.478)</td>
</tr>
<tr>
<td>Country*HS4 product</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Firm</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
<td>YES</td>
</tr>
<tr>
<td>Observations</td>
<td>72,307</td>
<td>72,307</td>
<td>72,307</td>
<td>72,307</td>
<td>72,307</td>
<td>72,307</td>
<td>72,307</td>
</tr>
<tr>
<td>R-squared</td>
<td>0.637</td>
<td>0.638</td>
<td>0.640</td>
<td>0.638</td>
<td>0.636</td>
<td>0.627</td>
<td>0.634</td>
</tr>
<tr>
<td>Instrument</td>
<td>Micro 1996 excl own firm</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>KP-stat 1st stage</td>
<td>108</td>
<td>86.56</td>
<td>23</td>
<td>42.09</td>
<td>111.2</td>
<td>81.93</td>
<td>62.47</td>
</tr>
</tbody>
</table>

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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

Berlingieri, Pisch, Steinwender
### Additional Results: Headquarters Intensity

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

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. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. 

---

Berlingieri, Pisch, Steinwender
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
    → Integrative approach promising (Gibbons 2005)!
References


References II


References III


References IV


