Openness, Global Value Chains, and Productivity

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The emergence of GVCs

Most production processes feature some element of sequentiality: Raw materials → Basic parts → Complex components → Final good.

Advances in information and communication technology and falling trade barriers have led to the emergence of global value chains (GVCs): R&D, design, production of parts, assembly, marketing and branding are increasingly fragmented across firms and countries.

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iPhone's software and product design are done by Apple, most parts are produced by independent suppliers around the world (Xing, 2011).

As a result of the fragmentation of production processes across countries, intermediates account for 2/3 of total trade (Johnson and Noguera, 2012).
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- Recent theoretical work on how the sequential nature of production affects location and organizational decisions of firms.

  Harms, Lorz and Urban 2012; Baldwin and Venables 2013; Costinot, Vogel and Wang 2013; Antràs and Chor 2013; Kikuchi, Nishimura and Stachurski 2014; Fally and Hillberry 2014
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Firm-level tests of these theories are still relatively sparse.
Overview: theory

• We extend the property-rights model of Antrás and Chor (2013) of firm boundaries along value chains.

• Outsourcing provides supplier with better incentives to invest in quality, but integration confers the firm a better bargaining position.

• Organizational decisions have spillovers along the value chain: investments by upstream suppliers affect the incentives of downstream suppliers.

• Core prediction: the role of demand elasticity

• Additional testable predictions concerning the role of
  • Contractibility of the inputs
  • Productivity of final good producers with fixed costs of integration
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Overview: empirics

To assess the validity of the model’s predictions, we use data from Dun & Bradstreet WorldBase to identify ownership linkages and production activities of parents/subsidiaries. We combine this information with U.S. Input-Output Tables to identify firms’ integrated vs non-integrated inputs. Using Input-Output tables, we also construct new measure of upstreamness of each input in the production of final good. Example: Exploiting variation across and within firms, we find strong support for our model’s predictions concerning how integration choices depend on elasticity of demand for the final good, profile of contractibility of the inputs along the value chain, firm productivity. In general, the firm-level patterns that we uncover suggest that contractual frictions critically shape firms’ ownership decisions along their value chains.
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- Using Input-Output tables, we also construct a new measure of upstreamness of each input \( i \) in the production of final good \( j \).
- Exploiting variation across and within firms, we find strong support for our model’s predictions concerning how integration choices depend on:
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  - Profile of contractibility of the inputs along the value chain
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Conconi, García-Santana, Puccio and Venturini (2016)

GVCs are actually regional: trade in intermediates is concentrated within “Factory North America, Factory Europe, and Factory Asia” (Baldwin, 2013)

Recent decades have seen the proliferation of regional trade agreements. 90% are Free Trade Agreements (FTAs)

FTAs can distort sourcing decisions through two channels:

- Lower tariffs when importing from FTA partners
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Some information about RoO

- RoO define the **conditions that products must satisfy to obtain preferential tariff treatment**, to avoid that products from non-FTA members are transhipped from low-tariff to high-tariff FTA partners.

  1. **Value-added requirements**  
     At least X% of the value of the final good must be "domestic" VA
  2. **Change of tariff classification**  
     Some inputs cannot be sourced (at all) from outside the FTA
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- There are two main types of rules:
  1. **Value-added requirements**
     
     At least $X\%$ of the value of the final good must be “domestic” VA
  
  2. **Change of tariff classification**
     
     Some inputs cannot be sourced (at all) from outside the FTA
• A final good producer located in the FTA has two options:

  • Complying with RoO, in which case it enjoys preferential tariff treatment when exporting to the FTA partners, but must source certain inputs within the FTA

  • Not complying with RoO, in which case it can source its inputs from the most efficient producers around the world, but faces MFN tariffs when exporting to the FTA partners

  • Theoretically, it is has long been known that RoO distort sourcing and lead to trade diversion in intermediate goods (e.g. Grossman, 1981).

  • In a large survey by the ITC (2015), RoO emerge as the most problematic non-tariff measure faced by manufacturing firms.
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- Two challenges:
  - Measuring RoO, due to their legal complexity
  - We focus on the case of NAFTA
    - RoO are written at a very disaggregated level
    - RoO are mostly defined in terms of change of tariff classification
  - Endogeneity of the rules
    - We run difference-in-differences regressions, focusing on Mexican imports
      - (NAFTA RoO were to a large extent inherited from CUSFTA)
    - We use CUSFTA RoO as an instrument
  - We run triple-difference regressions exploiting variation in RoO treatment
    - between NAFTA and non-NAFTA countries
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Main results

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• RoO decreased the growth of Mexican imports of restricted intermediates from third countries by between 13 and 117 log points (representing between 5% and 52% of the actual change in imports of treated goods).

• Our results challenge those by Caliendo and Parro (2015): abstracting from RoO, they find that “the rest of the world was hardly affected by NAFTA.”
Policy implications

- RoO shift protection from final goods to inputs (“cascade effect”).
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- Input tariffs are low compared to tariffs on final goods (Miroudot et al., 2009). Because of RoO, the actual level of protection on intermediates is much higher than what implied by input tariffs.
Policy implications

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- Input tariffs are low compared to tariffs on final goods (Miroudot *et al*., 2009). Because of RoO, the **actual level of protection on intermediates** is much higher than what implied by input tariffs.

- Our analysis has important policy implications for

  - **Multilateral trade rules** (in particular GATT Article XXIV)
  - **Brexit negotiations** (in particular in the case of a UK-EU FTA)
Avenue of future research

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  • **Productivity and welfare?**
    
    Include preferential tariffs and RoO in a model of global sourcing à la Antràs et al. (2017) or in a framework that accounts for input-output linkages à la Caliendo and Parro (2015).
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• **Inward FDI?**
  Study whether NAFTA sourcing restrictions led to “RoO-jumping” FDI, using disaggregated data on Mexican inward FDI.
Preliminary projects on other GVC-related questions

• Conconi et al. (2017a): How does the global fragmentation of production affect the political economy of trade policy?
  
  
• Empirical analysis using US firm-level data on lobbying in favor/against all the free trade agreements negotiated since 1995

• Conconi et al. (2017b): What are the implications of joining a multinational production network?
  
Using firm-level datasets from the Belgian National Bank, we plan to study the impact of foreign ownership on
  
• global and domestic sourcing
  
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  - global and domestic sourcing
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  - productivity
Thank you!
Core prediction: the role of demand elasticity

- Complements case \((\rho > \alpha)\): Greater propensity to integrate downstream.
- Substitutes case \((\rho < \alpha)\): Greater propensity to integrate upstream.

Sequential complements: \(\rho > \alpha\)

Sequential substitutes: \(\rho < \alpha\)
The role of contractibility

- A higher level of “upstream contractibility”
  - Complements case: greater propensity to integrate more upstream inputs.
  - Substitutes case: lower propensity to integrate more upstream inputs.

Sequential complements: $\rho > \alpha$

Sequential substitutes: $\rho < \alpha$

- Intuition: firms rely less on the organizational mode to counteract distortions associated with inefficient investments upstream.
The role of productivity

- More productive firms are better able to spread their fixed costs over a greater output, hence they integrate more stages.

Sequential complements: $\rho > \alpha$

Sequential substitutes: $\rho < \alpha$
Measuring upstreamness

Upstreamness of Tires (SIC 3011) in Different Sectors

- Mobile Homes
- Lawn & Garden Equipment
- Industrial Trucks & Tractors
- Transportation Equipment, n.e.c.
- Motorcycles, Bicycles, and Parts

Year:
- 2011: 2.5
- 2035: 3.5
- 2052: 4.5
- 2076: 5.0
- 2095: 4.0
- 2321: 2.0
- 2342: 3.0
- 2391: 2.0
- 2429: 3.0
- 2491: 2.0
- 2531: 3.0
- 2656: 4.0
- 2711: 3.0
- 2789: 4.0
- 2833: 3.0
- 2869: 4.0
- 2951: 2.0
- 3082: 3.0
- 3143: 2.0
- 3231: 3.0
- 3271: 2.0
- 3299: 3.0
- 3334: 2.0
- 3365: 3.0
- 3431: 2.0
- 3452: 3.0
- 3489: 2.0
- 3519: 3.0
- 3555: 2.0
- 3569: 3.0
- 3589: 2.0
- 3629: 3.0
- 3646: 3.0
- 3675: 2.0
- 3713: 3.0
- 3761: 2.0
- 3825: 3.0
- 3873: 2.0
- 3955: 3.0
Figure 1: Number of RTA notifications and RTA in force (source, WTO Secretariat)
NAFTA Rules of Origin

- Example of RoO: **watches** (HS 91.02) can only be traded duty free among members if **watch movements** (HS 91.08), **watch straps** (HS 91.13) **watch cases** (HS 91.12) used to produce them are sourced within NAFTA.
Example of RoO: **watches** (HS 91.02) can only be traded duty free among members if **watch movements** (HS 91.08), **watch straps** (HS 91.13) **watch cases** (HS 91.12) used to produce them are sourced within NAFTA.

We construct a new dataset on **NAFTA RoO**: for every final good, we can trace all the inputs that are subject to RoO requirements; similarly, for every intermediate good, we can link it to all final goods that impose RoO requirements on its sourcing. 

[construction of RoO dataset]
Construction of dataset on NAFTA RoO

- Four steps to codify sourcing restrictions in NAFTA RoO:

  1. NAFTA RoO in Annex 401
  2. Coding Annex 401
  3. Mapping input-output linkages in NAFTA RoO
  4. Construction of RoO variables
Step 1: Annex 401

- NAFTA RoO on textile fabric HS 6203.42 (men’s or boys’ trousers):
  
  “change[s] to subheadings 6203.41 through 6203.49 from any other chapter, except from headings 5106 through 5113, 5204 through 5212, 5307 through 5308 or 5310 through 5311, chapter 54, or heading 5508 through 5516, 5801 through 5802 or 6001 through 6002.”
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- **Main rule** (“change[s] to subheadings 6203.41 through 6203.49 from any other chapter”): any input that falls within chapter 62 must be sourced within NAFTA for the textile fabric to obtain origin status.
Step 1: Annex 401

- **NAFTA RoO on textile fabric HS 6203.42 (men’s or boys’ trousers):**
  
  "change[s] to subheadings 6203.41 through 6203.49 from any other chapter, except from headings 5106 through 5113, 5204 through 5212, 5307 through 5308 or 5310 through 5311, chapter 54, or heading 5508 through 5516, 5801 through 5802 or 6001 through 6002."

- **Main rule** ("change[s] to subheadings 6203.41 through 6203.49 from any other chapter"): any input that falls within chapter 62 must be sourced within NAFTA for the textile fabric to obtain origin status.

- **Additional requirements** (from “except from headings 5106” to the end): any input falling into the listed tariff items must be sourced within NAFTA (e.g. 5106 through 5113: yarn or fabrics of wool).
Step 1: Annex 401

- **NAFTA RoO on textile fabric HS 6203.42 (men’s or boys’ trousers):**
  “change[s] to subheadings 6203.41 through 6203.49 from any other chapter, except from headings 5106 through 5113, 5204 through 5212, 5307 through 5308 or 5310 through 5311, chapter 54, or heading 5508 through 5516, 5801 through 5802 or 6001 through 6002.”

- **Main rule** (“change[s] to subheadings 6203.41 through 6203.49 from any other chapter”): any input that falls within chapter 62 must be sourced within NAFTA for the textile fabric to obtain origin status.

- **Additional requirements** (from “except from headings 5106” to the end): any input falling into the listed tariff items must be sourced within NAFTA (e.g. 5106 through 5113: yarn or fabrics of wool).

- In some cases, alternative or complementary value added rules are used, but only in combination with change of classification rules.
Step 2: Coding Annex 401

“change[s] to subheadings 6203.41 through 6203.49 from any other chapter, except from headings 5106 through 5113, 5204 through 5212, 5307 through 5308 or 5310 through 5311, chapter 54, or heading 5508 through 5516, 5801 through 5802 or 6001 through 6002.”

Figure 2: RoO on HS 6203.42
Step 3: Mapping output-input linkages in NAFTA RoO

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Step 4: Constructing RoO variables

- \( \text{RoO}_{ij} \): dummy equal to 1 is RoO on final good \( i \) restricts sourcing of \( j \).
Figure 1: NAFTA Rules of Origin ($RoO_{ij}$)

This figure provides a graphical representation of NAFTA rules of origin. Outputs $i$ are on the horizontal axis and inputs $j$ are on the vertical axis. Each dot corresponds to $RoO_{ij} = 1$, i.e. a rule on final good $i$ that imposes sourcing restrictions on intermediate good $j$. 

![Graph showing NAFTA Rules of Origin](image)
RoO variables

- Main treatment variables for a given intermediate good $j$:

$$RoO_j^x = \sum_i RoO_{ij}^x$$
RoO variables

• Main treatment variables for a given intermediate good $j$:

$$RoO^x_j = \sum_i RoO^x_{ij}$$

• $x = 1$: all final goods $i$ with sourcing restrictions on $j$
RoO variables

- Main treatment variables for a given intermediate good \( j \):

\[
RoO^x_j = \sum_i RoO^x_{ij}
\]

- \( x = 1 \): all final goods \( i \) with sourcing restrictions on \( j \)

- \( x = 2 \) excludes final goods \( i \) with zero preference margin
RoO variables

- Main treatment variables for a given intermediate good \( j \):
  
  \[
  RoO_j^x = \sum_i RoO_{ij}^x
  \]

- \( x = 1 \): all final goods \( i \) with sourcing restrictions on \( j \)
- \( x = 2 \) excludes final goods \( i \) with zero preference margin
- \( x = 3 \) further excludes final goods \( i \) with alternative VA rules