Outsourcing Multiple Parts:
An Application to the Automotive Industry

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Global Value Chains in the Automotive Industry: Prospects for Canada

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Offshore Outsourcing: Capitalizing on Lessons Learned

Overview

- Why does "Many" matter?
- Main findings for the automobile industry
- Importance for Canadian firms

Why does "Many" matter?

1. One can make a chain
2. As prices fall and quantity increases, high FC/low MC options become more attractive
3. There might be complementarities
4. Institutions can develop
5. Relational contracts become feasible
6. The whole is more than the sum of its parts: cars are integral design

1. Global Value Chains

- http://www.globalvaluechains.org/
- In principle, useful to
  - exploit comparative advantage across countries
  - exchange information efficiently
  - conduct innovation
- Division of sales (in trade data) likely to differ from division of value added
  - Electronics: intermediate parts often embody most of the technology

1. Global Value Chains

- Question: who off-shores first?
  - Automobiles: OEMs
  - Apparel: further upstream low-tech intermediates
  - Electronics (modular): contract manufacturing

2. P↓ Q↑: high FC / low MC is better

- Antrás (2004) – life cycle model
  - Cut-offs between organizational form are a function of quantity, which is linked to cost/price through final good demand
- Melitz (2004) – heterogeneous firms
  - Ranked by firm productivity:

    FDI > exporting > only domestic sales

2. P↓ Q↑: high FC / low MC is better

- Prediction on firm productivity ↔ offshoring is exactly the opposite:
  - Serving domestic market (Antras): low productivity go first
  - Serving foreign market (Melitz): high productivity go first
  - In reality: firms do both

3. Complementarities are likely

- Novak & Stern (2003): when you outsource one, you might as well outsource more – reflect strategic differences
  - IP protection
  - Product: low cost or quick to market
  - Coordination efforts are interdependent
- Van Biesebroeck (200X):
  - Outsourcing is complementary to other production decision (greater product variety)

4. Institutions develop (slowly)

- Modeled as complementarities in Van Biesebroeck-Zhang (2006)
  - δ = f(# of components outsourced)
  - Alternative: RTS in FC of outsourcing
  - Empirical finding: past outsourcing predicts price (↑) time to off-shore (↓)

4. Institutions develop (slowly)

- Nunn (2007)
  - good contracting environment leads to specialization in industries with high relationship-specific investments
  - a form of comparative advantage

5. Relational Contracts expand feasible set

- Baker-Gibbons-Murphy (2002) & Levin (2003)
  - Many goods over time rather than in the cross-section (similar idea though)
  - Long tradition in economics that in a repeated game more equilibria can be supported
  - E.g. Toyota outsourcing: recover FC in price → when volumes (unexpectedly) decline, suppliers are compensated over time

6. Cars are the prototype of "integral design"

- Clark-Fujimoto (1991) "Product Development Performance: Strategy, Organization, and Management in the World Auto Industry"
  - All (many) components interact in myriad ways
  - Difficult to separate design from manufacturing
  - Car components trade in Asia lags other sectors (relative to the West)
  - When it does take off, it might take engineering jobs with it

6. Cars are the prototype of "integral design"

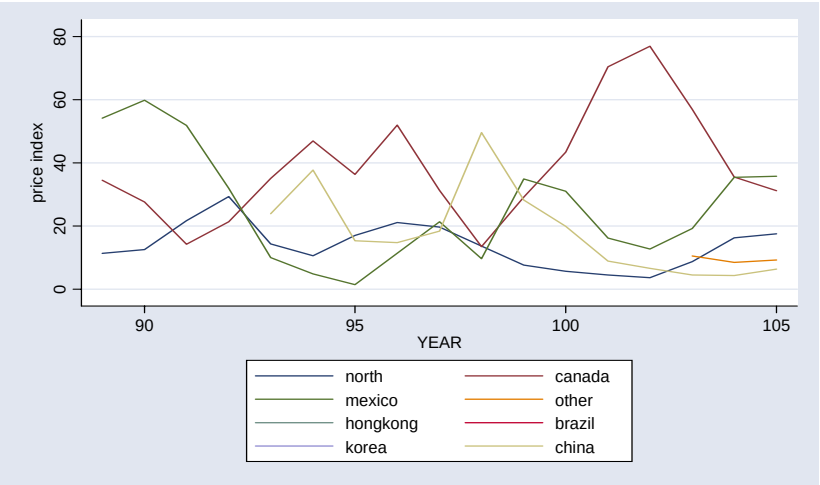
- Why are so few finished cars traded?
  - Industry developed in high-wage countries (skill involved in design!)
  - Poor countries served by exports of second hand cars and second hand designs (for local mfg)
  - Once low-wage countries acquire design capabilities, why wouldn't we see exports to NA? (p – MC margins are huge >50%)

Why does "Many" matter?

Findings for the automotive industry

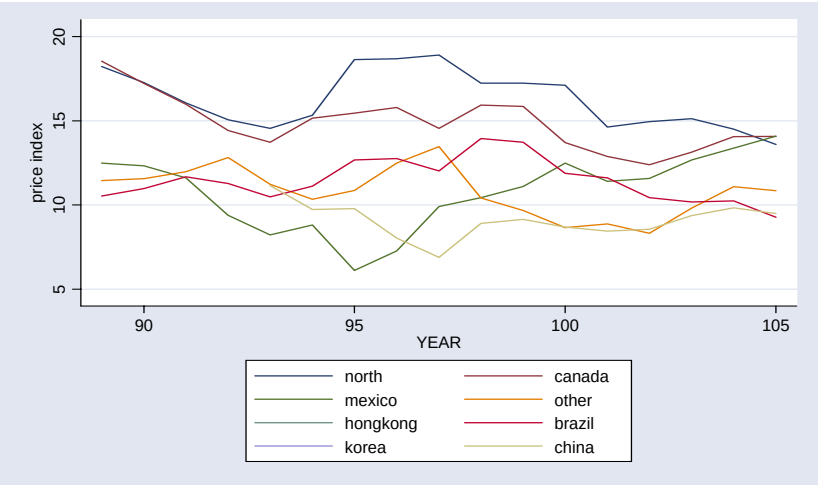
1. Within-component price heterogeneity is important (quality?)
2. Very distinct trade patterns
3. Sourcing pattern generates a (somewhat) intuitive ordering of parts and countries
4. Some evidence of contracting comple-mentarities / institutions developing

1. Price heterogeneity



Seats

1. Price heterogeneity



Tires

2. Trade patterns

- Very large regional trade flows
  - NAFTA
  - EU
  - South-East Asia (Japan, Korea, Thailand, China)
- MNEs supply their overseas assembly locations from their home base
  - Customized components follow the product-cycle
  - Domestic content requirements abound
- Oursourcing to low-wage countries is rising

3. Ordering of parts and countries

Average year exports to the U.S. start (post 1989)

Rank	Country	Year	Rank	Country	Year
1	North	1990.3	6	Mexico	1991.8
2	Canada	1990.9	7	Other	1992.5
3	Hong Kong	1991.2	8	South Korea	1993.9
4	Brazil	1991.7	9	China	1995.4
5	Taiwan	1991.8	10	India	1998.0

* North is Japan and Western Europe

3. Ordering of parts and countries

Average year exports to the U.S. start (post 1989)

Rank	Part	Year	Rank	Part	Year
1	Lock	1989.0	15	Radiator	1991.9
2	Engine	1989.1			
3	Radio	1989.1	21	Suspension	1995.6
4	Tire	1989.4	22	Clutch	1996.1
8	Battery	1990.6	26	A/C	1996.8
			27	Exhaust sys	1997.1
11	Brakes	1991.1	28	Steering sys	1997.3

4. Complementarities - institutions?

	Price when country-part imports into the U.S. start	
Country index	-1.360 (.331)*	-1.511 (.474)*
Part index	-0.240 (.101)*	-0.232 (.103)*
Extent of outsourcing in industry		-0.014 (.011)
# recently outsourced parts to country		0.151 (.354)

Importance for Canadian firms

Revisit the four findings

1. Price
2. Trade
3. Sourcing
4. Complementarities

1. Price

- For many parts, Canadian prices are at the low end, i.e. very competitive
- Within each part, there is demand for high quality – high price varieties

2. Trade

- Regional: given that production volumes in NA won't increase, the almost total reliance on U.S. is precarious
- Low cost: Especially since NAFTA, this is not going to be Canada's comparative advantage
- Supply overseas plants:
  - customized inputs – Head-Reis-Spencer (2004)
  - Through exports or FDI – APMA survey (2005)

3. Sourcing

- In a model of incomplete contracting, attractiveness is a combination of "production costs" and "quality of institutions"
- Off-shoring is not all or nothing, new parts and technologies are introduced continuously

4. Complementarities

- Generates feedback effects
  - Changes that strengthen Canada's position for one part, will increase marginal productivity of investments for other parts
  - Also works in reverse: "failure to …"
- Coordination will help
  - One of the strengths of the industry in Canada