Patent Protection and the Industrial Composition of Multinational Activity: Evidence from U.S. Multinational Firms

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## Summary

# Research question: Impact of developing countries' patent protection on U.S. internal and arms-length technology licensing

#### Empirical analysis:

- Data coverage: U.S. firm's technology licensing in 44 developing countries for the period 1993-2009, by distinguishing: (i) transfer to related affiliates from transfer to arms-length companies (how they licence) (ii) the complexity of products.
- Variable of interest: Patent rights (index of the strength of patent protection)

#### Main results:

- Technology licensing to affiliates and unaffiliated parties increases with the strength of patent rights
- Product complexity has a significant effect on the licensing decisions of U.S. firms
  - The share of unaffiliate licensing over affiliated licensing increases with the complexity of the product

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This pattern is more pronounced in countries with strong patent rights

## Comments

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Very relevant topic, rich database and interesting results.

1. Are the findings consistent with the internalisation theory of multinational firms?

Main results: Outsourcing with more complex products where the risk of imitation is low and FDI with less complex products where the risk of imitation is high:

- Hold-up problem (Grossman and Helpman, 2002, 2003; Antras, 2004; Antras and Helpman, 2004): With outsourcing, the relationship-specific investment made by the supplier can be expected to increase with the complexity of the product. In turn, this could decrease the outside options of the supplier, leading to a hold-problem with a suboptimal investment.
- Dissipation of knowledge (Ethier and Markusen, 1996; Markusen, 2001): When the intangible consists of superior knowledge, the optimal organisation of the firm (FDI vs outsourcing) depends on the degree of transferability of this knowledge capital. Internalisation is likely if knowledge is too easily transferred and when knowledge is too difficult to transfer.

Dissipation of reputation (Horstmann and Markusen, 1987): The MNE is more likely to license, the lower the cost saving from cheating (gain occurring when a franchisee produces a low quality good, sold at the price of a high quality good) and the more rapid is the detection to cheat. The cost saving and the time of detection can be expected to increase with the complexity of the product, and thus increase the risk of dissipation of reputation.

## Higher technology complicates the relation with the supplier and makes it optimal to internalise the production of the firm.

**Suggestion:** Test for a non-linear relationship between product complexity and the unaffiliated/affiliate ratio.

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#### 2. The special case of developing countries

- Domestic firms in developing countries often have a technological gap with multinational firms, and might lack of absorptive capacities to properly use the foreign technologies.
- Substantial heterogeneity among developing countries and the ability of domestic firms to undertake the production of complex products (Chad, Ghana, Sri Lanka and Zimbabwe versus China, India and Taiwan).

**Suggestion:** Product complexity could be interacted with a measure of human capital (education), to consider the role played by the absorptive capacities of the host country.

#### 3. How to conciliate the results on R&D and complex product?

- The coefficient estimated on parent R&D/sales has a negative effect on the Unaff/Aff ratio (rationale given: since R&D intensive firms invest more in their innovations, they are more prone to keep their knowledge assets within firm boundaries).
- The coefficient estimated on product complexity has a positive effect on the Unaff/Aff ratio (rationale given: risk of imitation is high for simple products)
- What kind of relationship do we have between parent R&D/sales and product complexity?

#### 4. Effect of patent protection:

#### Table: Complexity results

	Unaff./Aff. Ratio	Unaff.	Affil.
log (host's PRs)	-1.069***	0.314***	1.394***
	(0.232)	(0.102)	(0.216)
Product complexity	2.509***	0.891***	-1.558**
	(0.782)	(0.383)	(0.762)
Log (host's PRs) x product complexity	3.512***	-0.638*	-4.165***
	(0.755)	(0.353)	(0.679)

- Why does patent protection (PR) matter more for affiliates?

- Firms with more complex products licence more to unaffiliates and this increases with patent protection: could patent protection be an indicator of technological capacity?

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#### 5. Measure of product complexity:

#### Table: Product complexity data

Complexity	Product category description
0.4221271	Computers and related
0.3798102	Radio, television and communication equipment
0.3790194	Commercial machinery
0.3113132	Machinery and equipment
0.3073564	Electrical machinery and apparatus
0.3033172	Trade, maint. and repair services
0.3031925	Medical, precision and optical instruments
0.2878633	Fabricated metal products
0.2786216	Basic metals
0.2748125	Other transport equipment
0.2596836	Motor vehicles, trailers and semi-trailers
0.2580898	Chemicals
0.2537238	Coke, refined petroleum products, nuclear fuels
0.205822	Rubber and plastic products
0.1839178	Other non-metallic mineral products

- Motor vehicles: odd position in the ranking.

- Outliers: Other non-metallic mineral products; Rubber and plastic products.

- Lack of variation of the index.

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#### 6. IV: Colonial origin used to isolate exogenous variation in PRs

- Why are colonial origin relevant for explaining variation in changes of patent protection over time?

- Why focusing only on British and French colonies?

- IV approach is valid under the assumption that colonial origin does not affect the ratio of unaffiliated to affiliated licensing, but colonial origin can be related to the **quality of institutions**, and to a **common language "English"**, which can influence the decision between internalising or outsourcing production.