The Determinants of Overseas Technology Acquisition and Their Impacts on Firm Performance & Innovation: The Case of Korea

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Catch-up; “from Imitation to Innovation,”
But “How” at the Firm Level?

* The roles of government and market, national level analysis:

* Microeconomic or technology-focused analysis:

* Neo-Schumpeterian concepts of technological regimes and sectoral innovation system:

What are the Conditions for Overseas Technology Acquisition To Lead to Innovation and Performance?
From Case Studies to Econometric Analysis

- Many of the previous studies on catch-up of Korea is based on case studies of success in DRAM, telecommunication (cellular phones), or automobiles.

- Based on the theories generated from the case studies, researchers are trying to verify the determinants and process of catch-up in Korea

  Park & Lee (2006)
  Catch-up index = growth rate of US patents
  Findings: Catch-up is more likely to occur in sectors with shorter technological cycle and easier access to foreign knowledge base

  Jung (2008)
  Catch-up index = the distance of firm level TFP of a Korean firm from average sector TFP in Japan
  Findings: Catch-up is more likely to occur in sectors where knowledge & technology is explicit, where technology is transferred through import of capital goods, and where top firm dominance and export-orientation is significant

Many more meaningful econometric analyses can be performed if interesting data can be obtained
Some Known Concepts

Schumpeter Mark I, Schumpeter Mark II

“Leapfrogging” (Perez 1988)

Technological Regime (Breschi et al., 2000, Dosi 1988):
Technological Opportunities
Appropriability of Innovation
Cumulativeness of technological innovation
Property of the Knowledge Base

Sectoral System of Innovation, SSI (Malerba 2004, 2005)
Knowledge and Technology
Actors and Networks
Institutions
Demand Conditions
Data

- 9,916 Firm Level Technology Acquisition (mostly licensing) Contact Data from 1962~1994

-with specifications on Sector/Industry of the technology and the Nationality of Licensor

Note: * 430 contracts of 1994 have been omitted from the graph as it is not inclusive of the contracts registered at foreign exchange banks (incomplete data)
Data

-The Percentage of Electric/Electronic, and Machinery (including automobiles), Oil Refinery/Petrochemicals, Chemical Fibers, Metal (including Steel) Sectors Consistently High

Note: * 430 contracts of 1994 have been omitted from the bar graph as it is not inclusive of the contracts registered at foreign exchange banks (incomplete data)
Data

- Japanese Firms are Leading in the Number of Contracts, but US Firms have earned much more Royalty

No. of License Contracts Concluded during 1962~1994

Amount of Royalty Paid during 1962~1994, in Miillion USD
Research Questions

1. What are the factors that induce a firm to acquire technological abilities through licensing contract?

(1) Firm characteristics

* Firm size: - or +
  - SIZE: a log value of the average of employees/Sales amount in the year of the contract was concluded (data on the # of employees may not exist)

* R&D intensity: - or +
  - RD_INT: the R&D expenditure/sales ratio for 2/3/5 years preceding the contract

* Existing level of technological abilities (firm level): - or +
  - INNO: accumulated number of patents filed in the years preceding the contract

* Affiliation to business groups: + or –
  - CHAEBOLS5: 1 if a firm belongs to top-5 chaebol firms, or 0 if otherwise (at the point licensing contract is concluded)
  - GROUP: 1 if a firm belongs to a group, or 0 if otherwise (at the point licensing contract is concluded)

* Learning by exporting: - or +
  - EXP_Ratio: the export/sales ratio for 2/3/5 years preceding the contract
(2) Sector characteristics

* Degree of embodied technology transfer: - or +

  - *EMB_Trans*: imported machinery input of the sector for 2/3/5 years preceding the contract/total machinery input of the sector for 2/3/5 years preceding the contract

* Top firm dominance: - or +
  Schumpeter (1949), Breschi et al. (2000), Malerba (2004)

  - *DOM*: largest firm’s sales in each sector for 2/3/5 years preceding the contract / total sales in each sector for 2/3/5 years preceding the contract

* External Discipline (export-orientedness): - or +

  - *Ext_Dis*: total export in each sector for 2/3/5 years preceding the contract / total sales in each sector for 2/3/5 years preceding the contract

* Existing level of technological abilities (Sector level): - or +
  - *S_INÑO*: accumulated number of patents filed in the years preceding the contract

* Capital intensity/Labor intensity: - or +
  - *How can this be measured?*
Hypotheses set 1

**Hypothesis 1.** Overseas technology acquisition through licensing contract is determined by firm-level variables, such as firm size, R &D intensity, existing level of technological abilities, and learning by exporting.

**Hypothesis 2.** Overseas technology acquisition through licensing contract is determined by sector-level variables, such as degree of embodied technology transfer, top firm dominance, export orientation (external discipline), and capital/labor intensity.
2. **Do licensing contracts facilitate innovation at the firm level?**
   (Is it more likely for firms with licensing contracts to obtain more patents in the coming years?)
   (Do licensing contracts have explanatory power on patent application in addition to variables specified in “1.”?)

**Do licensing contracts enhance labor productivity at the firm level?**
(Is it more likely for firms with licensing contracts to have more improvement in labor productivity in the coming years?)
(Do licensing contracts have explanatory power on labor productivity growth in addition to variables specified in “1.”?)

**Do licensing contracts have positive effect on consistency of profit at the firm level?**
(Is it more likely for firms with licensing contracts to show more consistency in profit in terms of ROE or ROA in the coming years?)
(Do licensing contracts have explanatory power on consistency of ROE or ROA in addition to variables specified in “1.”?)

Too many factors other than technology that affect profit….
Accessibility to external knowledge flows is especially important in case of catch-up (Kim 1997, Bell and Pavitt 1993, Laursen and Meliciani 2002, Park & Lee 2006).

Note: * Patents are number of Korean patents filed by Korean individuals and corporations each year

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Hypotheses set 2

**Hypothesis 3.** Overseas technology acquisition have explanatory power on innovation in addition to previously defined firm-level variables, and sector-level variables.

**Hypothesis 4.** Overseas technology acquisition have explanatory power on labor productivity in addition to previously defined firm-level variables, and sector-level variables.

**Hypothesis 5.** Overseas technology acquisition have explanatory power on consistent profit in addition to previously defined firm-level variables, and sector-level variables.
Problems to be solved

How should I solve the problem of endogeneity?

How many lags should I give to each dependent/independent variable?

Should I say anything about profit at all?

In terms of variables, is there anything more important or interesting that I should look at?
Reference