

## OPEN INNOVATION – BUYING & SELLING KNOWLEDGE ACROSS SYSTEMS: THE CASE OF CHINA, FINLAND & SPAIN

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## Open Innovation is...

- ...the opening of firm boundaries to share & exchange knowledge (e.g., Chesbrough, 2004, 2006; West & Gallagher, 2006; Gassmann, 2006), including
  - ...“buying” external knowledge to improve, speed, efficiency and effectiveness of focal firm’s innovation process
  - ...“selling” internally generated knowledge, e.g., “research waste” (Chesbrough, 2006), but not just waste (Gambardella & Giarranta, 2008), to increase revenues from internal innovation
    - ↳ The Market(s) for Technology
- As we heard, limited focus on demand side – yet, several papers here... we do both...
- Chesbrough, Vanhaverbeke and West (2006) call for more work on **influence of national, institutional contexts on open innovation practices**

## Some Open Questions

- To what extent do we see Open Innovation practices in different institutional contexts, such as Europe, Japan, Brazil, or China?
- Do we see greater or lesser use of external technologies within firms in these countries?
- Are there more or fewer barriers to the external utilization of spillover technologies within firms?

## How we address them

- Focus: Buying & Selling of knowledge in the tension between national context and firm capabilities
- Concentrate on three ideas:
  - **FEAR** – appropriability regimes
  - **NEED** – **low** firm OR national investments in R&D
  - **AC (& Greed...)** – **high** firm OR national investments in R&D
- Explore these issues across three (rather different) national contexts

## Country level Differences

- Utilize “National System of Innovations” (a framework linking innovation performance to differences in institutional support for innovation – Lundvall, 1992; Nelson, 1993)

	Finland	Spain	China
I. Property rights (Rank) <sup>1</sup>	7	32	76
II. Intellectual property protection (Rank) <sup>1</sup>	2	28	71
III. Public R&D expenditures / GDP, 2004 (=Gross domestic expenditure on R&D / GDP × government share of funding) <sup>2</sup>	3.46% × 26% = 0.90%	1.06% × 41% = 0.44%	1.23% × 41% = 0.30%

<sup>1</sup> Source: The Global Competitiveness Report 2007-2008 (Porter et al., 2007). <sup>2</sup> Source: Eurostat R&D statistics (Göerzfeld, 2007)

- So, both for IPR & Public investments in knowledge:  
**Finland → Spain → China**

## The Sell side – National level

- Selling knowledge may expose focal firm to hazards, especially in weak “appropriability regimes” (Teece, 1986):
  - Characteristics of knowledge vs. enforcement of contracts
  - If “research waste” (Chesbrough, 2006): knowledge may dissipate beyond initial buyer; focal firm loses licensing/selling fees (Fosfuri, 2006)
  - If IP also used by focal firm: Even Worse! Further spread decreases competitive rareness and AC (Barney, 1991; Peteraf, 1993)

→ **FEAR** High TCE that need to be balanced out by effective IPR

H1a: Firms operating under weak appropriability regimes will be less likely to sell or share internally generated knowledge with other firms

## The Sell side – Firm level

- Why engage in MFT if you have nothing to offer...
- The higher firm R&D, the more likely valuable knowledge arises
- The more R&D, the more likely “surplus innovations” or “research waste” exists (Chesbrough 2006a, Torkkeli 2007).

→ **GREED** Incentives for selling should scale with R&D intensity

H2: Firms with high levels of R&D expenses will be more prone to sell or share their own technologies with other firms.

## The Buy side – Version 1.0

- Low **firm** investment in R&D → “Dearth” of knowledge
- Low **national** investment in R&D → negative effects on “National Diamond” (Porter, 1991)
  - Low worker skill base / lousy infrastructure
  - Lousy suppliers (inputs not knowledge intensive, etc.)
  - No help for focal firm’s knowledge development (interaction?)

→ **NEED** to source good ideas externally (from other country...)

H3: Firms with **low** levels of R&D (3a), or operating in countries with **low** levels of investments in knowledge (3b) will be **more** prone to acquire external knowledge.

## The Buy side – Version 2.0

- High **firm** investment in R&D → high “absorptive capacity” (Cohen & Levinthal, 1990)
  - Easier to find & integrate valuable external knowledge
- High **national** investment in R&D → negative effects on “National Diamond” (Porter, 1991)
  - Highly skilled workers, good universities, great suppliers
  - Aid focal firm in scanning, sensemaking, integration

→ **AC** External knowledge more valuable to these firms because they CAN

H4: Firms with **high** levels of R&D (4a), or operating in countries with **high** levels of investments in knowledge (4b) will be **more** prone to acquire external knowledge.

## Public Funding

- Weak “appropriability regime”
  - Danger of exposing knowledge in collaborative projects
  - Rather, don’t accept public funding...

→ **FEAR** of losing proprietary knowledge without pay

H1 b: Firms operating under weak appropriability regimes will be less likely to engage in collaborative, publicly funded research projects.

## Barriers to Selling

- FEAR...
  - Loose out on value of technology
    - Research waste – it could pay off...
    - Core technologies – own products have less rarity in product market
  - **Not Sold Here**
- Effort/Technical Problems
  - Lack of Market
  - Difficult to find buyer willing to pay the right price (the DuPont quote...)

## Barriers to Buying

- FEAR...
  - Loose own innovative ability (functional...)
  - Organizational resistance – **Not Invented Here** (psychological or employee self-interested)
- Effort/Technical Problems
  - Knowledge/active MFT available?
  - Costliness of integration

## Empirics

- Identical surveys in Finland (59), Spain (165) and China (501 responses); 710 with full set of variables
- Dependent variables:
  - **Open BUY Index & Open SELL Index** (combine answers to several questions indicating intention and actual behavior)
  - **Barriers to Selling & Buying** (series of 4 dichotomous variables each)
- Main explanatory variables:
  - **Country Dummies** (proxy for IPR & National R&D)
  - **Firm R&D Intensity** (proxy for IPR & National R&D)
- Controls: Size, R&D Intensity, Industry (10 main categories)
- OLS, Logistics Regression

## Barriers to Selling

	NSH	Complex/fear loose control	Diff. find Buyers	Lack of Market
OI BUY	_^	+^	+**	+**
OI SELL	+***	+***	+***	+***
Spain	+ n.s.	- n.s.	+ n.s.	+***
China	+*	+ n.s.	-***	- n.s.
Firm R&D	- n.s.	- n.s.	+ n.s.	- n.s.

n.s. = not significant; ^<0.1, \*<0.05, \*\*<0.01, \*\*\*<0.001

## Barriers to Buying

	NIH	No techn. available	Too costly	Loose own innov. ability
OI BUY	+***	+***	+***	+***
OI SELL	+ n.s.	- n.s.	- n.s.	+ n.s.
Spain	- n.s.	- n.s.	_^	+ n.s.
China	-***	_^	-**	- n.s.
Firm R&D	+ n.s.	_^	+ n.s.	+***

n.s. = not significant; ^<0.1, \*<0.05, \*\*<0.01, \*\*\*<0.001

## Conclusions

- Country context matters greatly – but effects assymmetric for “buy” & “sell” side of MFT
- Our hypotheses broadly supported
  - FEAR due to low IPR → low selling activity
  - NEED due to low country level investments → more buying
  - GREED due to high R&D → more selling
  - AC due to the same → more buying
- Look at Barriers helps untangle IPR/knowledge issue on state level
  - SELL: Weak approp. – FEAR to loose out, less concern with technicalities
  - BUY:
    - ➔ Sell – low IPR – Fear of loosing knowledge rules, not technicalities
    - ➔ Buy – opposite, Fear of technicalities rather than organizational hurdles