FROM INNOVATION TO COMMERCIALIZATION THROUGH NETWORKS AND AGGLOMERATIONS

ANALYSIS OF SOURCES OF INNOVATION, INNOVATION CAPABILITIES AND PERFORMANCE OF DUTCH SMES

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Background

- Today's social and economic dynamic societies require experimentally-organized economies based on notion of open systems and creative destruction (Eliasson, 2000)

- In particular frameworks of NIS and RIS evaluate innovation processes that rely on communication and interaction with critical actors outside the firm (OECD, 1997)

- Yet little examination of how firm can interact with RIS to enhance its capacity to innovate and achieve global competitiveness

- Also little examination of embeddedness of innovation in SMEs (Shaw, 1998), often related to material and resources factor disadvantages of SMEs

Growing policy attention for role SMEs in innovation prompts questions *how innovation in SMEs can be facilitated* and *which factors contribute to succes of innovation efforts* (Lee et al., 2010)

Aim of paper

- NIS and RIS focus on exploration, while cluster literature (Porter, 1990) highlights exploitation or commercialization phase

Why is this?

- Exploration of new opportunities and exploitation of old certainties, as well as inherent conflict between two lie at heart of organizational change and learning (Schumpeter, 1934)

- Exploration needed to renew system, but only through exploitation benefits of renewal are reaped (March 1991)

So, we wonder:

- Do change processes exploration and exploitation complement each other or not?

PASTEUR'S QUADRANT CATEGORIES OF RESEARCH

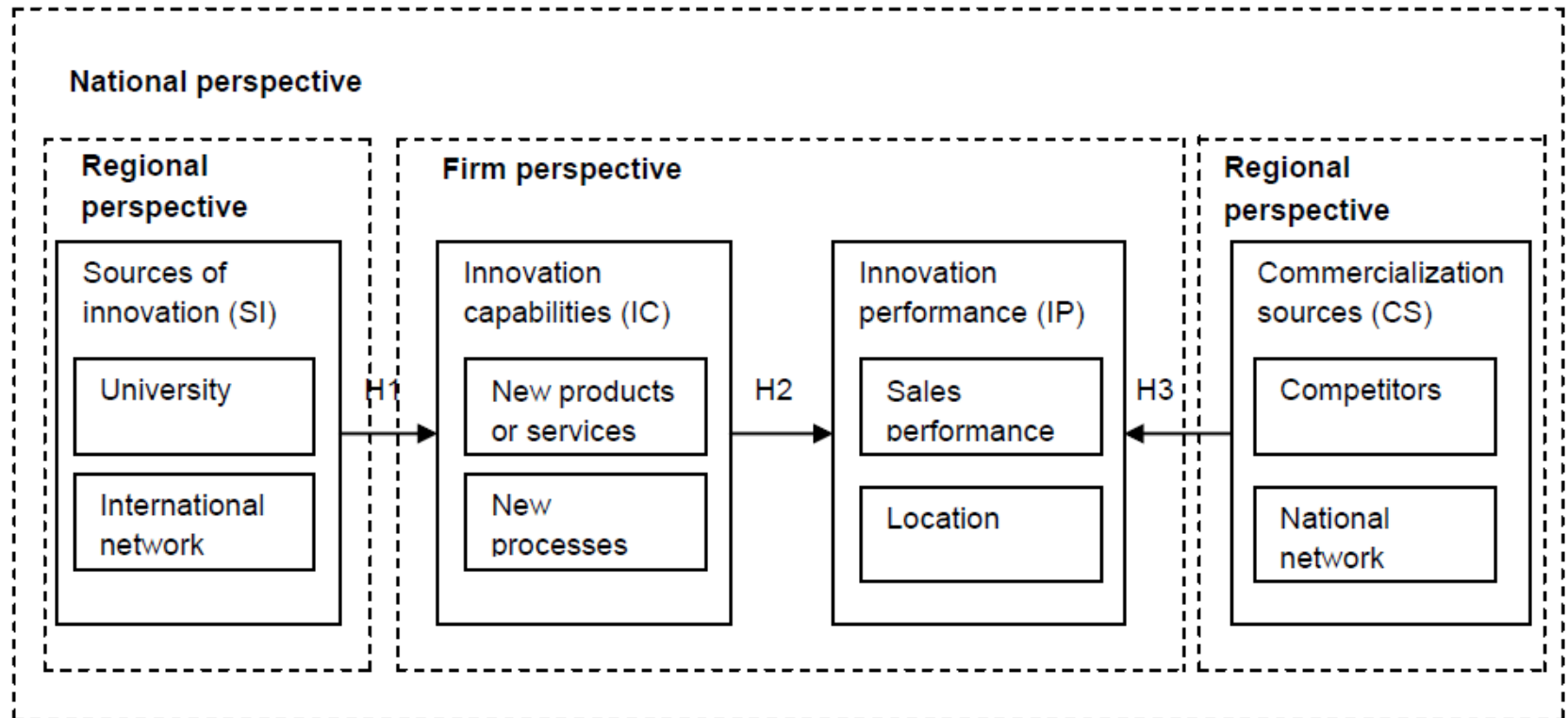Innovation

The innovation process in SMEs

- **Sources of Innovation (SI)**
  - Generalization and utilization of knowledge depends on frequency and density of firm's interactions with external sources of innovation and openness to external knowledge
  - External knowledge from universities plays particularly important role, while others emphasize importance research links with geographically distant partners for access to global knowledge

- **Innovation Capabilities (IC)**
  - Technological interrelatedness between various sub-systems or sub-processes in firms including concept generation and technology acquisition
  - Capabilities reside in know-how, experiences and skills of employees and managers, and their ability to develop new products, services or processes

- **Innovation Performance (IP)**
  - IP can be measured by proportion of sales as a result of technologically new or improved products (Oslo Manual, 1997)
  - Location close to a university may further indicate that firm is located in knowledge cluster, which indicated the availability to a larger variety of innovation sources

- **Commercialization Sources (CS)**
  - a complete picture of external knowledge exploitation requires comprehensive picture of activities and capabilities needed for commercialization
  - strategic objectives such as realizing learning effects are considered increasingly important in this stage (Davis and Harrison, 2001; Rivette and Kline, 2000)
  - Open innovation has not been considered seriously in existing literature in this stage!

Sample

- Until 2000 Netherlands did not have clear global competitiveness strategy

- Innovation Platform (2004-2010) was basis of strategy, whereby focus was on stimulation of cooperation between private, academic and public sector

- Initiatives mostly in hands of large companies and research groups

- Innovation voucher programme launched especially for SMEs to stimulate contact with knowledge institutions

- Our questionnaire focused on Dutch SMEs that applied for innovation voucher in period 2006-2009

- 1153 SMEs addressed in summer 2010 – 416 questionnaires returned by end 2010

- 243 questionnaires used for SEM analysis (after data cleaning and elimination of SMEs that applied for but did not use voucher)

Conceptual research framework

Results of confirmatory factor analysis

Construct and items	Standardized loading	Error term
Sources of Innovation (SI)		
• University contact	0.33	0.22
• International network	0.54	
Innovation Capabilities (IC)		
• New products or services	0.63	
• New production or service processes	0.49	0.27
Innovation Performance (IP)		
• Sales performance	0.75	
• Location	0.11	0.04
Commercialization Process (CP)		
• Competitors	0.38	
• National network	0.23	0.40

Sub-hypothesis testing
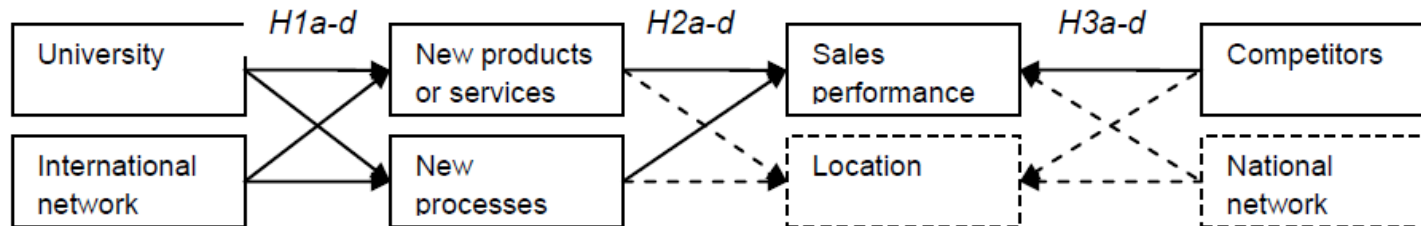
| Hypothesis testing	r	result
H1a: University contact has a positive relationship with the development of new products or services	0.126	Accepted
H1b: University contact has a positive relationship with the development of new production or service processes	0.095	Accepted
H1c: Contact with an international network has a positive relationship with the development of new products or services	0.194	Accepted
H1d: Contact with an international network has a positive relationship with the development of new production or service processes	0.140	Accepted
H2a: Development of new products or services has a positive relationship with sales performance	0.202	Accepted
H2b: Development of new products or services has a positive relationship with location	n.s.	Rejected
H2c: Development of new production or service processes has a positive relationship with sales performance	0.177	Accepted
H2d: Development of new production or service processes has a positive relationship with location	n.s.	Rejected
H3a: Contact with competitors has a positive relationship with sales performance	0.145	Accepted
H3b: Contact with competitors has a positive relationship with location	n.s.	Rejected
H3c: Contact with a national network has a positive relationship with sales performance	n.s.	Rejected
H3d: Contact with a national network has positive relationship with location	n.s.	Rejected

Note: n.s. = the hypothesis is insignificant, and is deleted in the model specification of the structural equation model.

Descriptive statistics and correlations

	Mean	SD	1	2	3	4	5	6
1. New products or services	2.8012	0.46102	1					
2. New production or service processes	2.5409	0.59550	0.307**	1				
3. Sales performance	4.9942	1.97342	0.202**	0.177**	1			
4. Competitors	1.3480	0.47702	0.075	0.037	0.145**	1		
5. University	1.2778	0.44856	0.126*	0.095	0.131*	-0.014	1	
6. International network	1.2924	0.45553	0.194**	0.140**	0.139*	-0.024	0.175**	1

Note: * p-value < 0.05; ** p-value < 0.01.

Structural equation modelling results
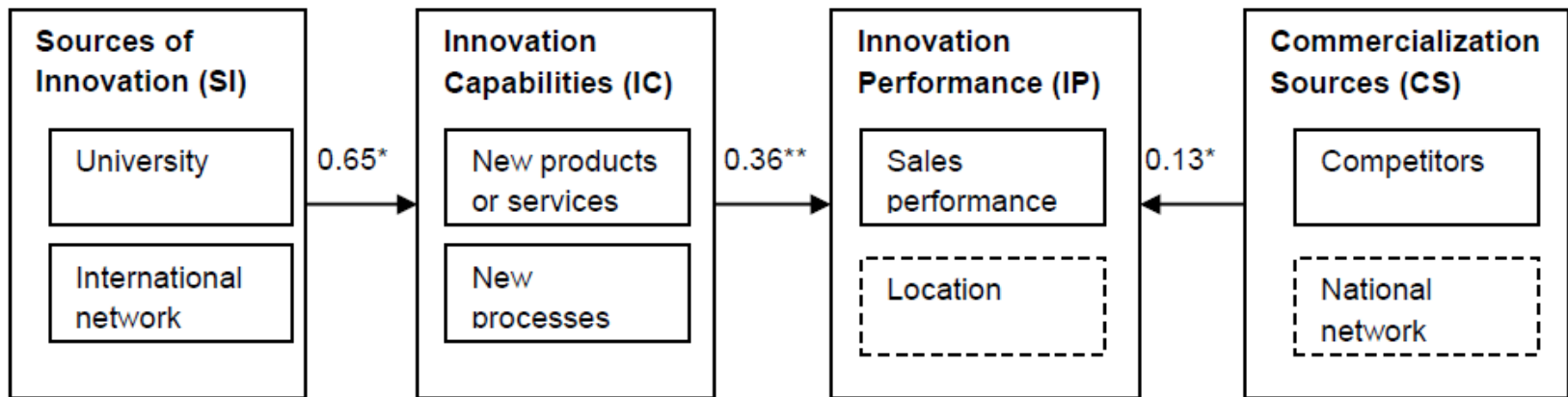
Notes: χ^2 = 4.818; df = 8; p = 0.777; cmin/df = 0.602; GFI = 0.995; AGFI = 0.988; NFI = 0.951; CFI = 1.000; RSMEA = 0.000

* p-value < 0.05.
** p-value < 0.01.

Impact of utilizing SI on IC

- Hypothesis 1 (*higher use of sources of innovation leads to higher innovation capabilities of SMEs*) is supported by the sample, and thus also supports that:
  - Small innovative firms actively seek diverse partnerships
  - Effectively learn from different types of collaborators
  - For radical innovations specifically learn from universities
  - High-growth firms are more likely to research and enter new markets
  - Younger firms are more likely to expand geographically, using their product line to serve new regional and international markets
  - Universities may have more global connections, which may improve international network of SMES
  - Broad scanning and timely absorption of new information cues from the external environment provides innovative insights

Effect of IC on IP

- Hypothesis 2 (*higher innovation capabilities lead to higher innovation performance of SMEs*) is supported, and thus supports:
  - Firms need strong organizational, resource allocation and manufacturing capabilities to achieve high sales performance
  - Creative cross-pollination of relevant skills and resources across different areas of expertise depends on quality and energy of firms' professional personnel
  - High-growth firms engage in more comprehensive activities that slow-growth firms
  - High-growth firms pay more attention to periodically updating prior operating routines, upgrading technology, and retain production workforce
- While:
  - Locational disadvantages may not exist in small countries with well-developed transportation and communication systems, or could easily be overcome by rcruitment of personnel, etc.

Effect of CS on IP

- Finally, we find support for hypothesis 3 (*higher use of commercialization sources leads to higher innovation performance*), and this may mean that:
  - Greater emphasis on market development allows firms to better analyse, interpret and incorporate novel inputs and ideas into existing operations and offer new solutions
  - Effective commercialization depends on firms' abilities to delink existing competencies from established product-market combinations and relink them to new product lines
  - Close contact with competitors allows SMEs to be at forefront of market developments
  - Succesful companies use alliances with competitors not only to avoid investment but to build skills in areas outside the formal argeement
  - Success in innovation implies successful commercialization; openness of open innovation model also applies to commercialization phase

Effect of RIS on NIS

☐ Our model supports link described in NIS literature between innovation and competitive and economic outcomes at national level.

☐ Our model supports RIS literature that generation and diffusion of knowledge takes place outside boundary of firm.

☐ Current RIS literature lacks discussion on how a firm can interact with RIS to enhance capacity to innovate and achieve global competitiveness (Yam et al, 2011).

☐ Our model **adds** to RIS literature in two ways:

1) A combination of local university knowledge and international contacts strenthen SMEs' innovation capabilities, so sources of innovation are not necessarily region bounded

2) For successful commercialization market sources are required to optimize innovation performance in SMEs

Conclusions

For SMEs openness of open innovation also applies to commercialization phase!

- Importance of SMEs' flexibility and specificity for RIS and NIS has turned SMEs in useful policy tools

- Open innovation model stimulates SMEs to develop exploration skills for exploring opportunity

- Open innovation is studied primarily in large firms where open innovation is used for R&D

- SMEs' innovation can also benefit greatly from external support at commercialization stage

- Policy makers and researchers not sufficiently aware of importance of maintaining appropriate balance between exploration and exploitation for SMEs