Open innovation: The role of geography and localized social capital

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Open Innovation (ii)

• Recap, Chesbrough (2003):
  • The advantages that firm’s gain from internal R&D expenditure have declined.
  • Accordingly, many innovative firms now spend little on R&D
  • Yet they are able to successfully innovate by drawing in knowledge and expertise from wide range of external sources.
What is new?

• Schumpeter mark I (1912) — probably the only “closed” innovation model!
• Schumpeter mark II (1942)
• Earlier contributions:
  • Nelson (1959);
  • Linder (1961);
  • Rosenberg (1963);
  • Rothwell et al (1974);
  • von Hippel (1976, 1988, 2005);
  • Rosenberg (1982);
  • Lundvall (1984, 1988);
  • Pavitt (1984);
  • Cohen & Levinthal (1990);
  • Baum, J., Calabrese, T., & Silverman, B. S. (2000)
• + literally hundreds of additional contributions in innovation studies, strategic management and in economics.
What is new?

- So the idea of the importance of “distributed” or “open” innovation processes is certainly not new.
- What is new is:
  - That there are drivers (stronger labor mobility, “software movements” & venture capital) that accelerate the process at this point in time.
  - That a firm should think about its degree of openness not only to specific external sources of innovation, but has to manage a portfolio of external sources).
Context and Open Innovation

• The OI literature is now moving towards sorting out the importance of “context” (industry, appropriability conditions, geography etc.).

• A recent literature in this vain in management looks at external knowledge sourcing and geography
The “geography turn” in management research


- **Leiponen, A., Helfat, C.E.** Forthcoming. 'Location, Decentralization, and Knowledge Sources for Innovation', Organization Science.
Geography and open innovation


- Laursen, Masciarelli & Prencipe (2010), Regions matter: how regional characteristics affect innovation and external knowledge use.

- Laursen, K., T. Reichstein and A. Salter (forthcoming), 'Exploring the Effect of Geographical Distance and University Quality on Industry-University Collaboration in the UK', Regional Studies.
Geography and open innovation

- Geography may have a number of effects on knowledge exchange between firms:
  - Knowledge gain ("inward spillover")
  - Knowledge loss ("outward spillover")
- Alcácer and Chung (2007)
  - Finds that geography in the form of location choice matter in this regard.
  - They differentiate between three knowledge sources—industry, academia, and government. They produce technical knowledge and associated innovations that vary in two dimensions—basicness and appropriability.
Geography and open innovation

• Looking at first-time entrants into the United States from 1985 to 1994, Alcácer and Chung find differences in firms’ location strategies:
  • While on average firms are indifferent to governmental and industrial activity, and attracted to locations with academic activity, more nuanced and distinct results emerge when firm heterogeneity is introduced:
  • **Less technically advanced firms** favor locations with any level of academic activity and high levels of industrial innovative activity
  • **Technically advanced** firms are attracted only to locations with high levels of academic activity but avoid economic areas with industrial activity. Given that laggards also like academia, by only choosing locations thick with academic activity, leaders can get the greatest possible gains for themselves. By steering away from industrial activity, leading firms avoid competitors.
  • These differences in strategies suggest that **firms consider net spillovers**—not only gains from inward knowledge spillover but also the potential cost of outward spillovers.
Geography and open innovation

• Unanswered questions:
  • What about location close to suppliers and users?
  • The interaction between geography and appropriability mechanisms, such as patents?
  • Licensing behavior and location choice?
Geography and open innovation

• Most studies infer spillovers but do not address the mechanism by which spillovers occur.
• The recent paper by Laursen, Masciarelli & Prencipe suggests that a key mechanism is social capital—particularly in the form of social interaction.
• Regional social capital is defined as the localized norms and networks that enable people to act collectively within a region (cf., Woolcock and Narayan’s 2000: 226).
Geography and open innovation

• The central argument in the paper is that geographically bound social capital facilitates joint learning for innovation and reduces search and transaction costs of both contractual and non-contractual interaction among the economic actors in a region.

• In other words, geographically bound social capital is the key transmitter of knowledge spillovers within geographically constrained areas and that the resulting existence of localized social capital has implications for firms’ abilities to innovate.
Geography and open innovation

• Insights from the relational view of the firm and social capital theory is used to advance the thesis that social capital is a geographically-constrained phenomenon that enhances firms’ abilities to introduce innovations.

• The distributed or open (Chesbrough 2003) nature of the innovation process derives from its information and knowledge requirements: innovation requires combinations of a variety of new and existing knowledge bases located inside and outside the focal firm.

• We develop the hypothesis that high levels of geographically bounded social capital, in terms of social interaction in the home region.
Geography and open innovation

• Spillovers are context-dependent due to two interrelated factors:
  • An important component of knowledge is tacit, difficult to unbundle from its context (“sticky”), and complex; therefore, its transfer requires information-rich, face-to-face interactions (Nelson and Winter 1982; Szulanski 1996; von Hippel 1994).
  • Personal contacts — the major means of face-to-face interaction — are fostered by proximity and are less likely to be established over larger geographical distances (Rosenthal and Strange 2003; Storper and Venables 2004).

Rosenthal and Strange 2003: “Information spillovers that require frequent contact between workers may dissipate over a short distance as walking to a meeting place becomes difficult or as random encounters become rare”.
Geography and open innovation

• Two assumptions:
  • Personal relationships overlap with work relationships since social capital is dependent upon individual attitudes and behaviors, which impinge on the collective behavior of firms.
  • Social capital is effective irrespective of the level of development in the region (we control for level of development in the empirical analysis).
Hypotheses

- The idea central to social capital theory is that high levels of social interaction provide information benefits in terms of access, i.e. the opportunity to obtain a valuable piece of information; of timing, i.e. the opportunity to be informed early; and of referrals, i.e. having your name prominent at the right time in the right place (Burt 1992)—the *localized connectivity effect*.

- Localized social capital also improves the functioning of knowledge connections by alleviating potential moral hazard problems through the creation of trust—the *localized trust effect*.
  
  - H1: Firms operating in regions with high levels of social capital in terms of social interaction are more likely to introduce product innovations (through the *localized connectivity and trust effects*).
Hypotheses

• “Restricted” internal R&D search has the advantage that in the majority of cases, it is the most efficient mode of search due to its relatively low costs, given that the chances of finding a solution will be higher within a familiar domain (Rosenkopf and Almeida 2003).

• However, there are limitations to familiar sources of knowledge, such as in-house R&D, in that they may not provide sufficient inspiration or variety to enable combinations of knowledge required to produce innovation (Rosenkopf and Almeida 2003; Rosenkopf and Nerkar 2001):

  • H2: The effectiveness of internal R&D spending on the likelihood of introducing product innovation is higher for firms operating in regions associated with high levels of social capital.
Hypotheses

• There are a number of reasons why investments in externally acquired R&D could fail in delivering innovations to the acquiring firm.

• The relational view of the firm posits that social capital may work as an institutional reparation mechanism for the implied market failures, facilitating solutions to ex-ante and ex-post transaction cost problems.

• Social interactions develop over time in dyadic relationships as formal exchange partners become more comfortable with each others’ competences and reliability in economic exchange:
  • H3: The effectiveness of externally acquired R&D on the likelihood of introducing product innovation is higher for firms operating in regions associated with high levels of social capital.
Geography and open innovation

• Data
  • The firm level data on innovation come from Capitalia. 2,410 usable observations
  • Data social capital variables from the Italian National Institute of Statistics (Participation in cultural associations; Participation in voluntary associations; Participation in non-voluntary organizations; Number of voluntary associations per region; Meeting friends regularly; Social meetings; Satisfaction as to relationships with friends).
  • Dependent variable product innovation yes/no
**Geography and open innovation**

**Independent variables**
- Social capital — social interaction (regional)
- R&D intensity (firm)
- External R&D acquisition (firm)
- Size (firm)
- Age (firm)
- % of employees with a degree (firm)
- Customer satisfaction (firm)
- Industry-level R&D intensity (industry)
- Social capital — political participation (region)
- Regional Human Capital (region)
- Regional Expenditure on innovation (% of regional GDP) (region)
- Population (in millions of people) (region)
- Passengers by air (region)
- Firms over the population (region)
- Road Infrastructures (region)
- Port Infrastructures (region)
- Tax paid (region)
## Results

<table>
<thead>
<tr>
<th>Model III</th>
<th>Model IV</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Coeff.</strong></td>
<td><strong>S.E.</strong></td>
</tr>
<tr>
<td>Social capital — social interaction</td>
<td>0.177 *</td>
</tr>
<tr>
<td>R&amp;D intensity</td>
<td>5.554 **</td>
</tr>
<tr>
<td>External R&amp;D acquisition¤</td>
<td>5.210 *</td>
</tr>
<tr>
<td>Social interaction × R&amp;D intensity</td>
<td>2.952 ***</td>
</tr>
<tr>
<td>Social interaction × External R&amp;D acquisition¤</td>
<td>5.839 *</td>
</tr>
<tr>
<td>Size</td>
<td>0.002 ***</td>
</tr>
<tr>
<td>Age</td>
<td>0.001</td>
</tr>
<tr>
<td>% of employees with a degree</td>
<td>0.020 **</td>
</tr>
<tr>
<td>Customer satisfaction</td>
<td>0.223 *</td>
</tr>
<tr>
<td>Supplier dominated</td>
<td>-0.394 ***</td>
</tr>
<tr>
<td>Scale intensive</td>
<td>-0.498 ***</td>
</tr>
<tr>
<td>Science based</td>
<td>-0.555 †</td>
</tr>
<tr>
<td>Specialized suppliers</td>
<td>Benchmark</td>
</tr>
<tr>
<td>Industry-level R&amp;D intensity</td>
<td>0.133 †</td>
</tr>
<tr>
<td>Social capital — political participation</td>
<td>-0.063</td>
</tr>
<tr>
<td>Regional human capital</td>
<td>-0.014</td>
</tr>
<tr>
<td>Regional expenditure on innovation (% of regional GDP)</td>
<td>-0.135</td>
</tr>
<tr>
<td>Population</td>
<td>0.000 *</td>
</tr>
<tr>
<td>Passengers by air</td>
<td>-0.002 †</td>
</tr>
<tr>
<td>Constant</td>
<td>-0.060</td>
</tr>
<tr>
<td>Number of observations</td>
<td>2410</td>
</tr>
<tr>
<td>Log likelihood</td>
<td>-1439.8</td>
</tr>
<tr>
<td>Chi-square</td>
<td>412.71 ***</td>
</tr>
<tr>
<td>Pseudo R2</td>
<td>0.125</td>
</tr>
</tbody>
</table>

Notes: ¤ indicates a predicted variable from the first-step fractional response estimation. Two-tailed tests; † p < .10; * p < .05; ** p < .01; *** p < .001. Standard deviations in parenthesis.
Geography and open innovation

• The three hypotheses are largely confirmed, but significance plots reveals that the effects are not equally distributed across firms:
The significance of the interaction between social interaction and R&D intensity

89.3 percent of cases at the two-sided 10 percent level ~5 percent negative and significant
Significance of the interaction between social interaction and external R&D acquisition

95.2 percent of observations significant
Contribution

The paper’s contribution is threefold:

• Location matters: firms located in regions characterized by a high level of structural social capital in terms of social interaction display a higher propensity to innovate.

• Regional social interaction reduces learning myopia and too strong a focus on exploitation.

• Regions with high levels of structural social capital there is a higher probability that externally acquired R&D will be translated by firms into product innovations, making the buy option more attractive to managers.
The “geography turn” in management research

• Unanswered questions:
  • How does social capital interact with different external knowledge sources?
  • What about the interplay between intra and extra-region knowledge sourcing?
  • Does regional geographically bounded social capital influence internationalization? To what extent will such SC enable and constrain firms?
Research Context: Laursen, Reichstein & Salter (2010), Regional Studies

- Extent of interaction (Mansfield, 1991; Beise and Stahl, 1999; Schmoch and Meyer-Krahmer, 1998)

- Types of knowledge exchanged (Cohen, Nelson and Walsh, 2002)

- Inter-industry differences (Klevorick et al, 1995)

- Impact of policy reform (Mowery, Nelson, Sampat and Ziedonis, 2001)

- Motivation of firms (Mohnen and Hoareau, 2003; Laursen and Salter, 2004; Feldman and Berkovitz, 2006; Perkmann and Walsh, 2007)

- Impact of exchange on firms, universities and researchers’ behavior (Shane, 2004; Mowery et al, 2001, D’Este and Patel, 2007)
The Geography of U-I Interaction

- Impact of geographic proximity on U-I interactions
  - Arundel and Geuna (2004) – domestic vs. foreign sources of university knowledge
  - Fabrizio (2006) – distance to university cited in a patent
  - Abramovsky et al. (2007) – research activities of universities and location of R&D units
  - Mansfield and Lee (1996) – research quality of the university shaping choice of partner
  - ‘Sticky knowledge’ – need for face-to-face communication in U-I knowledge exchange (Pavitt, 1991)
Challenges in Geography of U-I Interaction

- Limited attention to choices of firms and academics
- Sample size
- Incomplete distance measures
- Single sector focus — biotechnology
- The search for the “importance” of geographical proximity
**Geography and open innovation: University-industry interaction**

- In the paper it is argued and substantiated empirically, that the relationship between geographical proximity to a university and a firm’s propensity to collaborate with a local university in the innovation process, is influenced by both physical distance and the research quality of the local university.
Geography and open innovation

Fig. 1. Nested decision tree for university collaboration
Geography and open innovation

• We posit that a firm’s decision to collaborate with its local university is more likely if this is one of the top tier universities.

• Accordingly, is conjectured that geographical distance to the nearest top tier university is positively related to the firm’s propensities to collaborate with a local university, and that there is no or even a negative relationship between geographical distance to the nearest low tier university and the propensity to collaborate locally.

• Based on three ‘classes’ of universities in terms of research quality, this paper provides overall empirical support for these ideas.
Data

UK INNOVATION SURVEY 2005
8724 FIRMS

GRIDLINK POST CODES OF ALL FIRMS AND UNIVERSITIES
2430 POSTAL AREAS

RESEARCH ASSESSMENT EXERCISE 2001
99 UNIVERSITIES

REGIONAL DATA (ONS)
36 NUTS REGIONS
Dependent Variable

Innovation collaboration: ACTIVE PARTICIPATION WITH OTHER ENTERPRISES OR NON-COMMERCIAL INSTITUTIONS ON INNOVATION ACTIVITIES. BOTH PARTNERS DO NOT NEED TO COMMERCIALIZE BENEFIT. EXCLUDE PURE CONTRACTING OUT WORK WITH NON ACTIVE CO-OPERATION (DTI, 2005)
Independent Variables I

• Categorizing universities according to research activities
• Research Assessment Exercise 2001 -> % of FTE Researchers within 5 or 5* departments
• Generating 3 tiers of universities
  • 1st tier: 10 highest ranked
  • 2nd tier: ranked 11th to 50th
  • 3rd tier: ranked 51st to 99th
• Investigated arbitrary splits
Independent Variables II

• Measure: -Log(geographical distance)

• Studying effect of being co-located with a university regardless of ranking

• Investigating the effect of ranked universities—including a distance measure for each of the tier universities
Control Variables

- Firm level:
  - Innovation new to the world (0/1)
  - R&D Intensity (%)
  - Openness (Laursen & Salter, 2004, 2006)
  - Firm size (Log(employees))
  - Public Support (0/1)
  - Market Orientation (0-3)
- Regional variables (NUTS2 - 36 UK regions)
  - GVA of the Region (Log)
  - R&D Intensity of the region
- Industry Dummies (11)
Model

- Nested Logit (McFadden, 1981)
  - Decision to collaborate locally or non-locally is nested in the decision to collaborate at all
- Reshaping of data
- We use interaction effect between distance measures and local/non-local dummies to generate variation between outcomes within individuals (Drucker & Puri, 2005)
- Distance measures drives local collaboration decision
- Control variables drives decision to collaborate
- Split sample (High R&D intensive/Low R&D intensive)
Conclusions

• Yet, while our findings indicate that the first-best choice—from the firms’ point of view—is to collaborate with a local, top-tier university, in the absence of a high-quality local university, the second-best choice would seem to be collaborating with a non-local (presumably high-quality) university rather than cooperating with a local, lower-tier university.

• The study also shows that firm-university relationships are moderated by research and development (R&D) intensity: firms with above-average R&D intensity are less prone to collaborate with (high-quality) local universities compared to firms with below-average R&D intensity.

• In other words, geographical proximity matters more for firms with lower absorptive capacity.

• There is a “scaring away” effect from being located close to a lower-tier university.
The “geography turn” in management research

• Unanswered questions:
  • Will “matching” explain U-I interaction? [high-quality—high-quality and low-quality—low quality].
  • How is the interaction shaped by the movement of individuals between U and I?
  • How is the interaction shaped by the firms’ strategy in terms of exploration/exploitation? (see Salter & Tartari, 2009)
The end of the route...

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