Intellectual property and the regional embeddedness of multinational companies

Martin Heidenreich, Knut Koschatzky and Jannika Mattes

Workshop „Europeanisation of Innovation. Levels, Institutions and Procedures in the Governance of Research and IP Policies“, University of Oldenburg, April 2011

Question:

Both regional embeddedness and intellectual property rights are a strategy of protecting proprietary knowledge. I want to discuss their relationship.

Are property rights an alternative or a complementary strategy to the social embeddedness of corporate innovation processes?

Structure of the presentation

1. Intellectual property rights
2. Regional embeddedness of multinational corporations (MNCs)
3. Limits of distributed R&D projects. Three examples
4. Patent strategies of these companies
5. IPR and external cooperation
6. Conclusion

1. The economic function of intellectual property rights

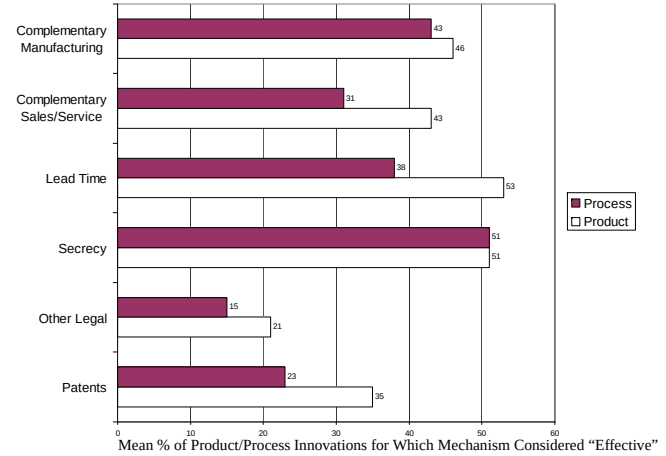
- Innovation create spillover effects => Incentive problems
- “intellectual property … as social structures that *improve the appropriability of returns from innovation* => Legal protection by IPR should increase the incentive to innovate
- Balance between incentives (appropriability) and technological development (disclosure): tightrope walk between the interests of the inventor and the technological community-

Functional alternatives to IP

- **Only one third of innovations are protected by patents**
- **Alternatives**: secrecy, lead time advantages and the use of complementary marketing and manufacturing capabilities (Cohen et al. 2000; Levin et al. 1987): “patent protection is not the most effective means of protecting the profits from innovation in most industries” => no disclosure of critical information (24%) and ease of inventing around (25%) as reasons for not applying
- Relatively more important for medical equipment and drugs
- Advantages of non-patenting: Secrecy ; and the ease of inventing around a patent
- Defensive patenting: Patents not as a means for protecting innovations or eliminating competitors, but as a precondition for becoming “players” in the patent litigation game (patent arms race)

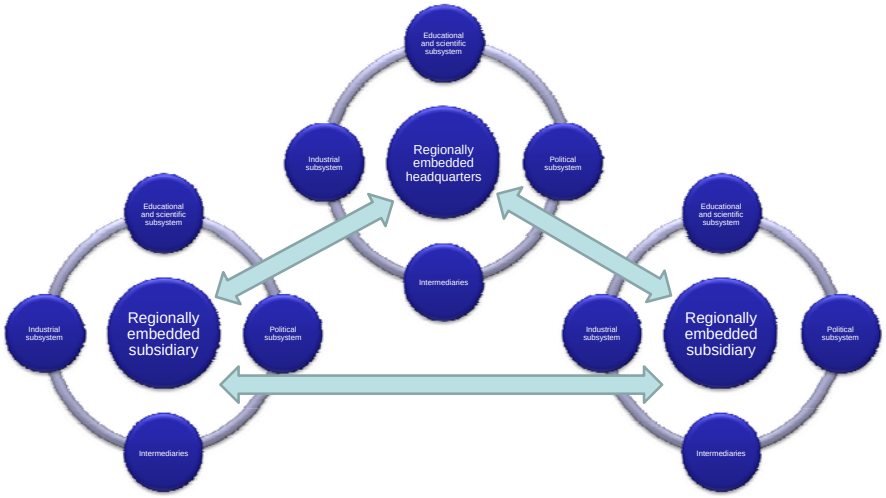
Source: Cohen, Wesley M., Richard R. Nelson and John P. Walsh, 2000: Protecting Their Intellectual Assets. NBER Working Paper #7552.

Effectiveness of Appropriability Mechanisms for Product and Process Innovations



W.M. Cohen, "Patents: Their Effectiveness and Role"

2. The social embeddedness of innovation: Between multinational and regional networks



The advantages of regional embeddedness

1. Companies rely on and exploit the competences, networks, resources, rules and routines in a region
2. Regions provide specific services and benefit from the presence of regional companies

=> Dynamic and (especially in the case of MNCs) often strategic interaction between regional institutions and companies

- MNCs between embedding and disembedding strategies
  - Subsidiaries use localized, often “sticky” knowledge (“buzz”)
  - MNCs as channels for the inner-organisational transfer of knowledge (“pipelines”).
  - How are MNCs able to combine the advantages of local and global patterns of communication and knowledge transfer?

Two hypotheses

1. *IP as an alternative to social embeddedness*: IP as well as social embeddedness provide a (partial) protection of technological knowledge. The ways however are completely different: On the one hand, a legally guaranteed monopoly, on the other hand dense social relations stabilised by social, spatial and cultural proximity and sometimes even mutual trust.
2. *IP as complementary strategy*: MNCs learn and innovate in different arenas: Within a site, within a region, within the company (also in crossborder networks) and with external partners (other companies, universities, R&D institutes …). These innovation processes are shaped by the interests of the dominant players to control the crucial knowledge. IPR are one tool, but not the only or the most important one to master the tightrope walk between control and disclosure of technological knowledge.

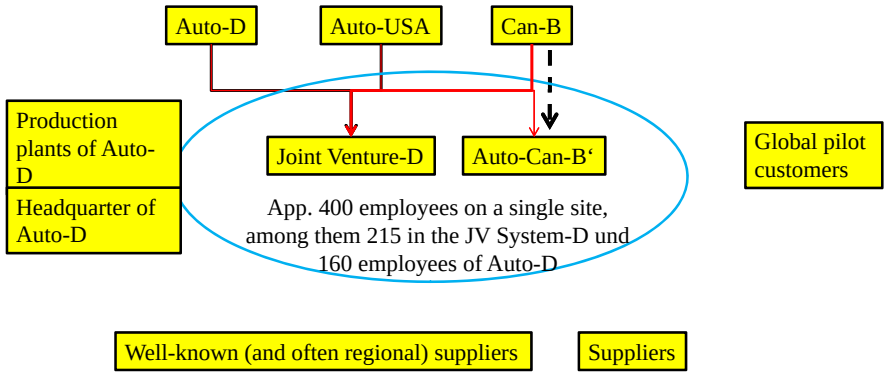
3. Regionally embedded global R&D projects. Three examples

- Three presumably international R&D projects in the automotive, pharmaceutical and IT industry
- My aim: Regional embeddedness of international R&D cooperation

	Pharma-D	Auto-D	IT-US
The innovation project analysed	Developing a new drug	Development of a new engine on the basis of an electrochemical device	Development of a module which accesses relational database systems, from business processes
Organisation of the research phase (actors, spatial concentration, team)	Interdisciplinary core team (4-7 scientists),concentrated at a site close to the HQ	Internal research site, inclusion of external experts for the appropriation of a new type of knowledge	"Creative" initial phase: Interdepartmental core team in a R&D laboratory in Germany
Cooperation with other locations within the company	Limited to the project team	New competence base required (not available within the company)	Support of high-rank US professional necessary for the approval of the project
Cooperation with external partners	Low (normal scientific contacts)	Discussions with competitors and other potential partners on general aspects of the new technology	No
Product-development phase	Bureaucratically structured project organization (for the clinical tests)	Functionally structured project organization (for industrialization of new technology)	Local software development, global tests
Cooperation with other locations within the company	Highly developed division of labour within project organization (100s of employees, up to 19 functions)	Relevant functions are concentrated on one site (400 employees), close cooperation with proximate production plant and headquarter	Implementation of new module in a complex system "owned" by a dozen US laboratories: Approval by global requirement and architecture boards. Tests in US, China
Cooperation with external partners	Foreign investigators, researchers, drug administrations. Licensing and marketing agreement with US partner	Joint venture with an US competitor and a Canadian component developer	No

Case 1: The cooperative development of a source of transportation energy

The divisions of Can-B relevant for the project were bought by Auto-D and Auto-USA in order to control the relevant knowledge



The domestication of an international R&D network

- Distributed research project was transformed in a regionally concentrated development project
- Joint venture between a Canadian, German and American company as core of project (definition of standards, sharing of huge R&D costs, complementary competences)
- Concentration of core skills and technologies in JV and Auto-D
- Coordination of development activities through a high degree of spatial, technical, organizational and cultural homogeneity. Nevertheless: Integration of skills from different places, companies, and professions and places.
- Control of core knowledge even by costly parallel engineering and acquisition of collaborating company

Case 2: The local development of a globally distributed drug

- Company Pharma-D: Global MNC with US R&D labs
- Project: From idea to market 10 years (1998-2008)
- Costs: 800-1.200 million. Expected global sales: Up to 2 bn.
- Research phase: Multidisciplinary cooperation in a small group (7) of experts at the central location of Pharma-D. Utilisation of company infrastructure (laboratories, tests)
- During the clinical tests: Crucial role of company (up to 19 functions involved).
- Clinical tests (phase 3: 12,500 patients): Collaboration with external investigators, scientific experts and regulatory agencies
- Cooperation with US health care company in 3rd phase in order to share the R&D costs and to get access to the US market (FDA, marketing)

=> R&D site close to the HQ crucial for research process and first stages of development

Case 3: A local IT project in a global development context

- IT-US: Big US company with R&D labs all over the world. Case study in German lab
- Project: Development of a new module for a complex system “owned” by a dozen US laboratories
- Core team: 4 software engineer => Development of a prototype. Crucial role of geographical and cultural proximity
- Crucial support of high-rank US professional (“sponsors”): Based on companywide reputation hierarchy of technical experts parallel to the management hierarchy
- Formalisation and documentation of project: Specification, responsibilities ... (global transparency)
- Foreign partners for product tests (US, China)
- Integration in the overarching system after approval by global requirement and architecture boards (global channels of communication)

First results

- Each of the 3 companies observed had huge foreign R&D centres
- Each of the 3 innovation projects analysed had an international dimension
- But: In 2 of the 3 cases the foreign R&D sites were not used – and the foreign infrastructure of the MNCs were used only for simple, downstream activities (e.g. organisation of clinical tests, tests of experimental vehicles). Core activities were concentrated at a German location near the HQ (providing the necessary infrastructure: expertise, money, laboratories, quality control, testing facilities, marketing ...)
- Foreign external partners provided additional money and complementary knowledge. This knowledge was internalised as far as possible.
- Only the IT project was part of global innovation efforts. IT-US has developed highly sophisticated organisational forms for the management of globally distributed innovation projects

=> ***In all the cases strong regional embeddedness (in different forms) of global innovation processes***

4. Patent strategies of the three companies analysed

Patent set for the three case studies

Case study	Technology field	IPC	Period	EP	Inventors (persons)	% country (occ. ina)
Auto-D	Fuel cells in vehicles and system components	H01M0-08 combined with other codes and keywords	until 2004	40	76	99 (77% DE, 22% CA)
Pharma-D	Medicinal preparations containing organic active ingredients	A61K031	2004	23	101	197 (84% DE, 10% JP)
IT-USA	Computing, Calculating, Counting	G06	2000-2002	64	172	200 (37% DE; 53% US)

Regional Distribution of Inventors

ID	OCC	Zip-Code	City
Germany			
1	3	70	Stuttgart
2	3	71	Winnenden, Weinstadt
3	9	72	Kirchheim/Teck
4	47	73	Kirchheim/Teck, Esslingen
5	1	76	Karlsruhe
6	11	88	Uhldingen
7	17	89	Ulm
8	1	94	Aidenbach
total	92		
Foreign			
1	26	CA	Richmond, Vancouver..
2	1	USA	San Diego, California

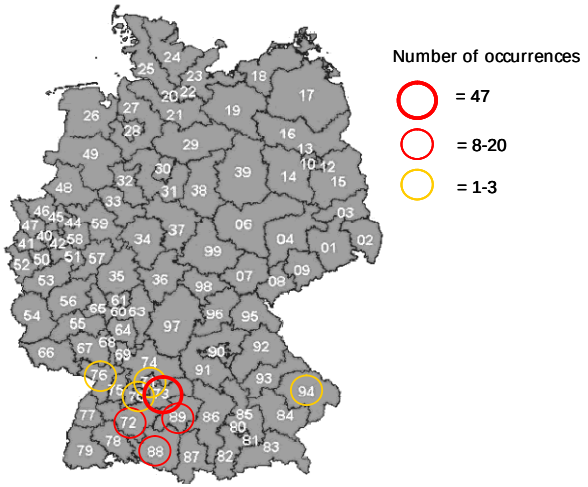
Source: PATDPA, Host STN

40 Patent applications
(10 Auto-D
30 Joint Venture-D,
0 Can-B)
77 Inventors

Occ= occurrence of inventor in patent document
total of 99 occurrences

Strong regional concentration in and around Nabern

Regional distribution of inventors for Auto-D and Joint Venture-D



Regional Distribution of Inventors

ID	Occ	PLZ	Ort
Deutschland			
1	81	42	Wuppertal
2	20	40	Düsseldorf
3	10	51	Leverkusen
4	8	50	Köln
5	2	22	Hamburg
6	2	34	Niedenstein
7	2	45	Essen
8	2	46	Oberhausen
9	1	47	Toenisvorst
10	1	58	Hagen

Ausland

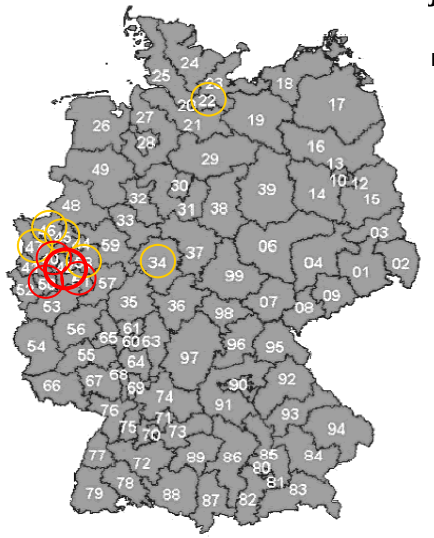
1	16	JP	Kyoto, Nara, Hyogo
2	6	HR	Zagreb u.a.
3	2	FR	Lyon
4	1	ES	Pineda de Mar
5	1	US	Conneticut

23 Patent applications
in technology field 2004
101 Inventors, of whom
76 with German adress
25 with foreign adress

Occ= occurrence of inventor
in patent document
total of 160 occurrences

Strong regional concentration in and around Wuppertal

Regional distribution of inventors for Pharma-D

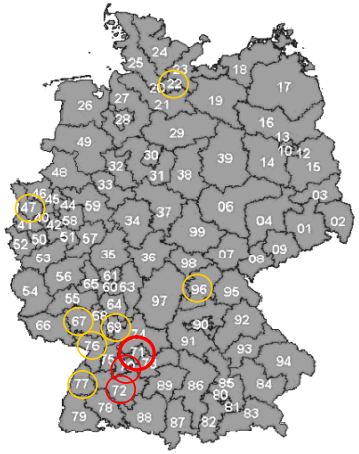


IT-US: International distribution of inventors

ID	Occ	CY	City
1	2	AU	New South Wales
2	6	CA	Ontario
3	3	CH	Zürich
4	1	CN	Hong Kong
5	74	DE	several
6	2	FR	Marseille, Paris
7	1	GB	Portsmouth
8	111	US	several
Total	200		

37 % of all inventors (occ.) have German addresses, while 53 % are located in the US.

Regional distribution of inventors for IT-US



The geographical distribution of inventors shows a strong regional concentration in and around Böblingen. Böblingen is the place of the German subsidiary of IT-US

Further results

- The spatial distribution of inventors in the 3 cases of MNCs shows that inventors are regionally clustered around particular R&D centres => role of spatial and cultural proximity
- There are significant contributions to the selected technology fields from inventors living in other countries => MNCs combine regional and cross-border learning
- Patent strategies as way of securing IP rights **complementary** to the internalisation and corporate control of crucial knowledge

4. Intellectual property and external cooperation

- **Patents as a precondition for external cooperation**: „From our point of view, early discussions with external partner were very problematic. For example, we need at first patents. In 1999, the essential patent was filed. Before this you could not tell nothing about the structures. External discussions are always important for me: What is interesting? Where you have to watch it? What is needed for the clinic? What models could be made? Then there are things that can be discussed externally at conferences, or with colleagues who you know." (Researcher Pharma-D)
- **Patents as bargaining chip for long-term involvement**: "Suppliers is a very difficult subject because there are also significant differences concerning innovations. And most of all innovations that are not implemented in three years, but really take the ten or twenty years. Family businesses are more open to these innovations. The others just do it because we tell them, "You deliver us here, so what, then you must also see that you are doing here with our innovations." The prices are extremely high. That is, we pay the most to develop what the vendors. To the detriment of later times, if the thing flies, from the suppliers, because we will own all patents. You can force them only with money to take part in the innovation." (project leader Auto-D)
- **Asymmetric cooperation with universities**: „Patents belong to the company. So, since there is a general agreement. This is clearly established. We get such a small sum, I think. But this covers only the effort required to arrive there. Otherwise, patents belong to Auto-D2." (Professor at a regional university of applied sciences)

5. Conclusions

1. Protection of intellectual property mostly by the **internalisation** of crucial knowledge. Complementary to this, companies rely on patenting
2. **Foreign R&D sites** of MNCs are often used only for simple, downstream activities. Nevertheless, foreign inventors play an important role in corporate patenting strategies. This may be partially a methodological artefact, partially it may reflect cross-border flows of knowledge (mostly within the company).
3. R&D centres in MNCs rely on **regional competences** (especially in the case of Auto-D). Core activities are often concentrated close to the HQ (providing the necessary infrastructure). Regional concentration of research (proximity) as an important strategy for getting access to complementary, often tacit knowledge. This is also reflected in corporate IP strategies.
4. **External cooperation within or beyond the region is strongly facilitated by patents, because patents reduce the secrecy requirements ("institutionalised trust")**

Further reading

- Cohen, Wesley M., Richard R. Nelson and John P. Walsh, 2000: Protecting Their Intellectual Assets: Appropriability Conditions and Why U.S. Manufacturing Firms Patent (or Not). NBER Working Paper #7552.
- Heidenreich, Martin, Christoph Barmeyer, Knut Koschatzky, Jannika Mattes, Elisabeth Baier, Katharina Krüth, 2011: Multinational Enterprises and Innovation. Regional Learning in Networks. London 2011: Routledge (in print).
- Heidenreich, Martin (ed., 2011): Innovation and Institutional Embeddedness of Multinational Companies. London: Edward Elgar (in print)
- Jappe-Heinze, Arlette, Knut Koschatzky, 2008: The spatial embeddedness of multi-national enterprises' research activity - A bibliometric analysis. Karlsruhe: Fraunhofer ISI (Working Papers Firms and Region, No. R2/2008).
- Levin, R., Klevorick, A., Nelson, R.R., and Winter, S.G. (1987) "Appropriating the returns from industrial R&D", *Brookings Papers on Economic Activity*, 783-820.
- Mattes, Jannika, 2010: Innovation in Multinational Companies. Organisational, International and Regional Dilemmas. Frankfurt et al.: Peter Lang