

Multinational Enterprises in Regional Innovation Processes

Empirical Insights into Intangible Assets, Open Innovation and Firm Embeddedness in Regional Innovation Systems in Europe

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1 Introduction

1.1 Research Context

In an increasingly globalized world, knowledge creation and, even more so, innovation have become key ingredients for sustainable economic growth and a high level of employment, particularly in developed economies but also in emerging markets and developing countries. Over the past decades, the comparative advantage of the advanced economies with high labor costs has continuously shifted towards knowledge-based activities and innovation. At the same time, firms, especially globally operating multinational enterprises (MNEs), amplify their global research and development (R&D) activities in an attempt to access creative talent around the world, while policymakers on supra-national (e.g., the European Commission), national, and regional levels (e.g., the German federal states) increase their efforts to promote innovative capacities and human capital within their territories.

Thus, although firms and regions indeed compete globally, and global access to factor inputs such as raw materials, financial resources, and scientific knowledge has significantly increased over the last few decades, strong empirical evidence shows that *location* continues to play a significant role in competitive advantage (SCOTT, 1998; ENRIGHT, 2000; REVILLA DIEZ, 2002; SCHIELE, 2003; SCHIELE, 2008). As Harvard Business School Professor Michael PORTER (2008, p. 252 f.) notes, “*economic geography in an era of global competition [...] involves a paradox. In an economy with rapid transportation and communication and accessible global markets, location remains fundamental to competition*”. Furthermore, he argues that “*the enduring competitive advantages in a global economy are often heavily local, arising from concentrations of highly specialized skills and knowledge, institutions, rivals, related businesses, and sophisticated customers in a particular nation or region*”. In other words, as competition globalizes, the location- or place-specific sources of competitive advantage will tend to become more and not less important. Within this briefly outlined research context, this dissertation will explore the following topics as illustrated by figure 1:

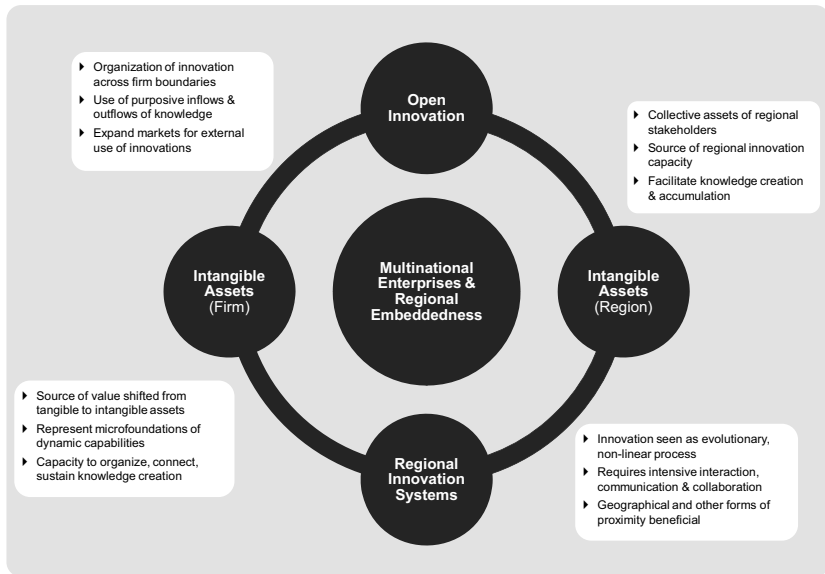


Figure 1: Research Context
Source: Figure provided by author.

1.1.1 Intangible Assets

In contrast to the first industrial revolution in the late eighteenth and early nineteenth centuries in Western Europe and the United States, which heavily relied on wealth creation through “*direct application of human labor to tangible assets like machinery and industrial plants*” (MUDAMBI, 2008, p. 699), the knowledge-based revolution has led to a considerable shift in the nature of value creation, and with it, an increasing role of intangible assets (IAs). Key industries that emerged or were radically transformed in the late twentieth century, such as microelectronics, telecommunications, and computer software, as well as twenty-first century growth sectors, such as biotechnology and green technologies, all rely heavily on the capacity to create new knowledge and ideas and transfer these into economic value (HUGGINS and IZUSHI, 2007).

The competitiveness of firms in today’s global economy is determined by their ability to constantly innovate on the product, process, and organizational level — innovation activities in which intangible assets, such as human capital, knowledge from R&D, organizational structures, and inter-organizational relationships play a crucial role (DE HAAN and VAN ROOIJEN-HORSTEN, 2007; MUDAMBI, 2008). As figure 2 illustrates, IAs are increasingly seen as critical drivers for knowledge creation, innovation, and consequently economic growth

in advanced economies, re-shaping the way economic processes are comprehended, measured and governed at the micro, meso, and macro levels.

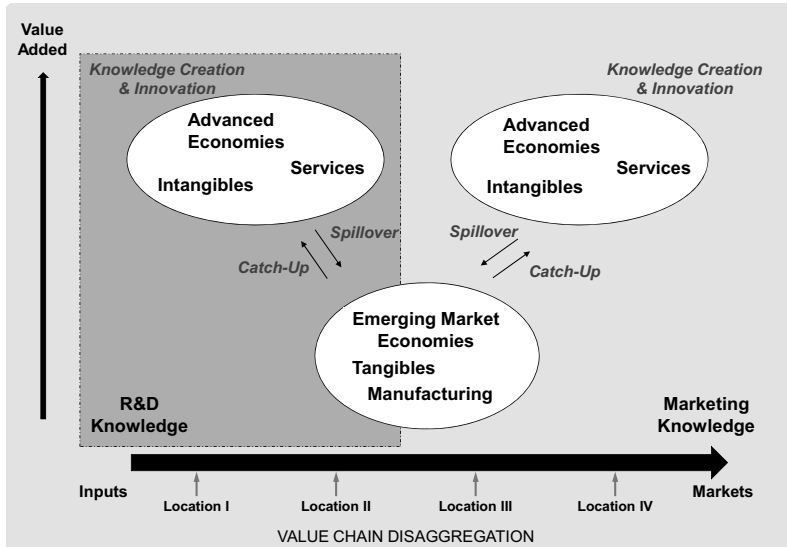


Figure 2: Value Creation Dynamics and the Role of Advanced Economies
Source: Figure provided by author. Modification of MUDAMBI (2008, p. 709).

Value creation dynamics, especially in advanced economies, strongly rely on the *rising share of intangibles* and are driven by knowledge-intensive and creative industries. The increasing overall economic importance of intangible assets is very nicely summarized by MUDAMBI (2008, p. 699), who states that the

“[...] source of value has been shifting from tangible to intangible assets at an accelerating pace. For all the G-7 economies put together, intangible assets have been estimated to constitute about 30% of the stock of all long-term assets (IMF, 2006). Intangible assets are the lifeblood of creative and knowledge-intensive industries, which may be defined as those where value creation is disproportionately based on specialized, nonrepetitious activities.”¹

1 As shown by BLAIR and WALLMAN (2001), NAKAMURA (2003), and HOFMANN (2005), the percentage of market valuation of the Standard & Poor 500 US firms related to intangible assets increased from 38% in 1982 to 62% in 1991 and to about 85% in 2001. By 2004, annual investments in intangibles in the US economy were conservatively estimated at over 8% of GDP or about USD 1 trillion (MUDAMBI, 2008).

However, as TEECE (2007) confirms, while the role of intangible assets is increasingly recognized as central to the sustained competitiveness of firms and advanced economies, it is still not clearly understood *why* and *how* IAs are now so critical and this issue is not addressed in orthodox frameworks.

1.1.2 Multinational Enterprises

Large MNEs are key actors in this respect, as they are widely considered as innovation architects, system integrators, and platform leaders important to the creation of new knowledge, even in an increasingly vertically disintegrated innovation set-up (CANTWELL and IAMMARINO, 2003; NARULA and ZANFEI, 2005; CHRISTENSEN, 2006). Figure 3 shows, based on data from UNCTAD (2007) and the WORLD BANK (2007), that the 78,000 MNEs operating in the global economy account for approximately USD 4.8 trillion or 10.7% of global value added and USD 4.7 trillion worth of exports (approximately 1/3 of global exports).

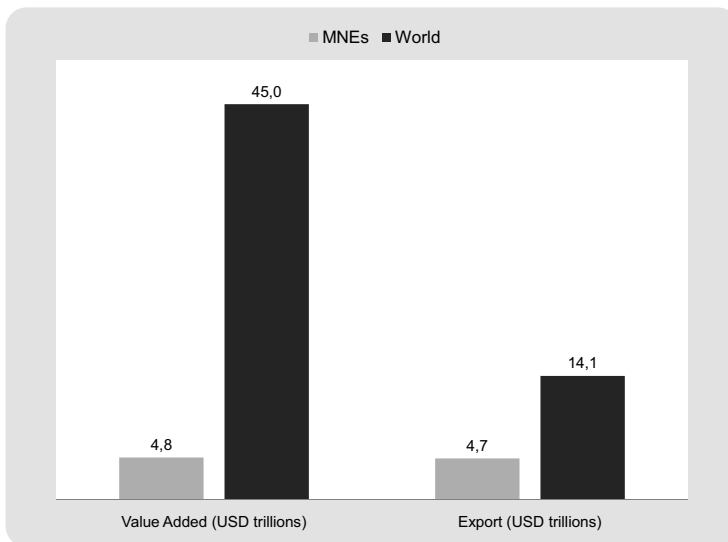


Figure 3: Contribution of MNEs to the World Economy 2006

Source: Figure provided by author, based on data in McCANN and ACS (2011). Data sources: UNCTAD 2007, WORLD BANK 2007.

Moreover, as shown in figure 4, the 700 largest MNEs account for roughly 46% of all global R&D expenditure or USD 310 billion of the overall USD 677 billion spent in 2002 (of which some USD 450 billion is for global private R&D). Over 50% of these 700 MNEs belong to the automotive, pharmaceuti-

cal/biotechnology, and IT hardware industries, with over 80% of these firms having their headquarters in the U.S., Germany, Japan, the UK, or France (McCANN and ACS, 2011).

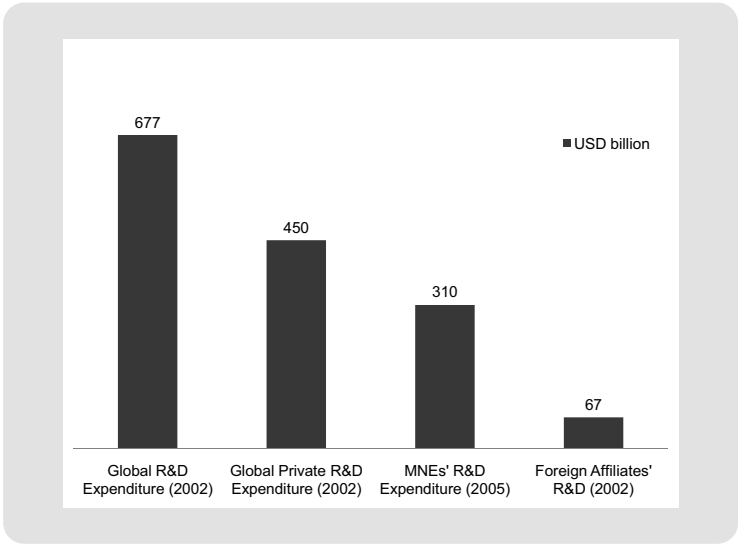


Figure 4: Contribution of MNEs to Global R&D Expenditures

Source: Figure provided by author, based on data in McCANN and ACS (2011). Data sources: UNCTAD 2005.

International business scholars have developed a prolific literature emphasizing the increasing internationalization of R&D and innovation activities, including influential works by DUNNING (1977) and KUEMMERLE (1999a). The eclectic or OLI paradigm proposed by DUNNING was an attempt to offer a unified framework for determining the extent and the pattern of foreign-owned activities, assuming that multinational activities are driven by three distinctive advantages: (1) firm-specific advantages related to resources owned by the firm (Ownership; O), which are mostly associated with the size of the firm (e.g., economies of scale, product diversification, financial resources); (2) location-specific advantages (Location; L), displayed by the factor endowments of a nation (e.g., size of the market, labor productivity, input cost advantages, and competitive environment), and (3) internationalization advantages (I), replacing (potentially) imperfect external markets by internal markets within the MNE. KUMMERLE (1999a), on the other hand, has presented a taxonomy for analyzing the foreign direct investment (FDI) strategies of MNEs in regard to innovation activities and distinguished between home base-exploiting (HBE) and home

base-augmenting (HBA) FDI strategies. While HBE FDI strategies involve a rather modest form of R&D internationalization, concentrating on the adaptation of existing products to the needs of the local market and of technical support to foreign manufacturing plants, HBA FDI strategies strive to extend the core competencies of the MNE by broadening its knowledge base through investment in innovative regions.

More recently, there has been a growing awareness in the management and international business literature that MNEs are increasingly using their global network to augment competitive advantages and/or create new advantages by tapping into geographically dispersed sources of knowledge within regional systems of innovation (CANTWELL and IAMMARINO, 2003; REVILLA DIEZ and BERGER, 2005; BOUTELLIER et al., 2008; MUDAMBI, 2008; CANTWELL and PISCITELLO, 2009), thus reflecting the importance for MNE international networks of evolving from closed to more open systems to enable the evolution of the different innovation-related business units into explorative and creative activities.

1.1.3 Open Innovation

The concept of Open Innovation (OI), defined by CHESBROUGH (2006, p. 1) as “[...] *the use of purposive inflows and outflows of knowledge to accelerate internal innovation, and expand the markets for external use of innovation, respectively*”, reflects this greater awareness regarding the organization of innovation across firm boundaries and the increasing need for firms to tap into external sources of knowledge and expand the markets for external use of intellectual property (IP) to accelerate internal innovation.

There are a number of reasons why Open Innovation is becoming more important, which essentially can all be linked back to the discussion on intangible assets and the global knowledge-based economy. These include the globalization of R&D activities as a response to asymmetric knowledge potentials across regions, declining technology life cycles, disruptive innovation landscapes, highly dynamic technology markets and innovation processes calling for interdisciplinary problem-solving, an increasing availability and mobility of knowledge workers, and growing venture capital markets to finance promising inventions from entrepreneurs (KOGUT and ALMEIDA, 1999; CHESBROUGH, 2003; COOKE, 2005a; CANTWELL and PISCITELLO, 2009).

1.1.4 Geography of Innovation

The geography of innovation plays a significant role in this context, being, on the one hand, the outcome of the aforementioned value creation dynamics and, on the other hand, displaying the *“location-specific supply base of technological and knowledge externalities that firms draw upon for their competitiveness”* (AMIN and COHENDET, 2004, p. 88). Despite the fact that most research on MNEs in the Open Innovation context has focused on the firm level, there are compelling arguments as to why *“the regional”* matters for OI approaches, as firms are increasingly depending on external knowledge sources. As argued by PORTER (2008, p. 459), firms today depend more heavily on local partnerships:

“[...] they rely on outsourcing and collaboration with local suppliers and institutions rather than on vertical integration; they work more closely with customers; and they draw more on local universities and research institutes to conduct research and development. [...] As a result of these trends, companies’ success has become more tightly inter-twined with local institutions and other contextual conditions.”

Similarly, the economic geography literature has developed a sound understanding of the economies of agglomeration (see, e.g., KRUGMAN, 1991; MASKELL et al., 1998), Regional Innovation Systems (RIS), and knowledge clusters (COOKE, 1992; REVILLA DIEZ, 2002; SCHIELE, 2008), as well as localized knowledge creation and accumulation (SAXENIAN, 1994; AUDRETSCH and FELDMAN, 2005; MALMBERG and MASKELL, 2006). This helps explain why the effectiveness of the innovation strategies of firms tends to be strongly related to the presence of regional innovation potentials.

At the same time, MNEs are important drivers of knowledge creation within RIS, as through their technological efforts regions in a globalized economy are linked with other locations beyond the national boundaries. This linkage provides access to streams of knowledge developed elsewhere and may generate spillovers (IAMMARINO and McCANN, 2010a). Moreover, a significant contribution of the total regional R&D expenditure in most top-performing regions in Europe comes from the large global players and industry leaders. As KROLL and STAHLCKER (2009) show, the increase in the business enterprise expenditure on R&D (BERD) between 1995 and 2003 in Europe can to a considerable extent be attributed to an increase in R&D expenditure by the top private R&D investors. For instance, the headquarters of Siemens in Munich alone had control of over € 5.5 billion of R&D spending in 2003, which exceeds the regional BERD by approximately 10% (KROLL and STAHLCKER, 2009).

1.2 Objectives and Guiding Research Questions

Despite some convergence in the research interests of economists, international business and strategy scholars, as well as economic geographers, no research field has explicitly integrated thinking that relates a firm's organizational characteristics to its fundamental geographical characteristics, both within and between countries (PORTER, 2008; BEUGELSDIJK et al., 2010). While the literature on multinational enterprises and, to a lesser extent, on Open Innovation, has emphasized that MNEs need to increasingly use their global network to augment competitive advantages, it has left open many questions, particularly as far as locational and regional issues are concerned. In fact, international business and management research must develop a deeper understanding of how a MNE's decision-making behavior is related to the issue of geography and location and how effective innovation strategies incorporate regionally-embedded innovation potentials (see also, PORTER and STERN, 2001; McCANN and MUDAMBI, 2004; STEINLE and SCHIELE, 2008). At the same time, however, the economic geography literature must develop a more sophisticated micro-approach to analyzing the geographical behavior of MNEs (McCANN and MUDAMBI, 2004), for example, by understanding firm approaches to extracting, exploiting, and exploring external knowledge, organizational designs, and architectures in order to tap into regional knowledge pools, and understanding the implications of an important trend in strategic management, Open Innovation, on the spatial organization of innovation. Similarly, despite the large literature on clusters and RIS, *"the MNE's strategy and structure within the context of its spatial embeddedness has not received much attention"* (BEUGELSDIJK et al., 2010, p. 488). In other words, there is still a considerable research gap in the understanding of the link between the increasingly open innovation processes of multinational enterprises, their embeddedness in regions, and discourse on RIS and intangible assets in advanced economies.

In line with BOSCHMA et al. (2002) and BEUGELSDIJK et al. (2010), it is argued in this dissertation that we urgently need more detailed and sophisticated firm-level and regional-level case studies that help to open *"the black box containing the organizational and knowledge relationships which mediate and facilitate the links between place and space, and between multilocal and multinational firm behavior"* (BEUGELSDIJK, et al., 2010, p. 491). In the current era of globalization, in which MNEs are seen to be playing a highly important role in the reshaping of the world's economic geography, these research gaps are highly problematic (McCANN, 2010). Figure 5 summarizes the key theoretical frameworks introduced above and outlines the research goals of this dissertation.

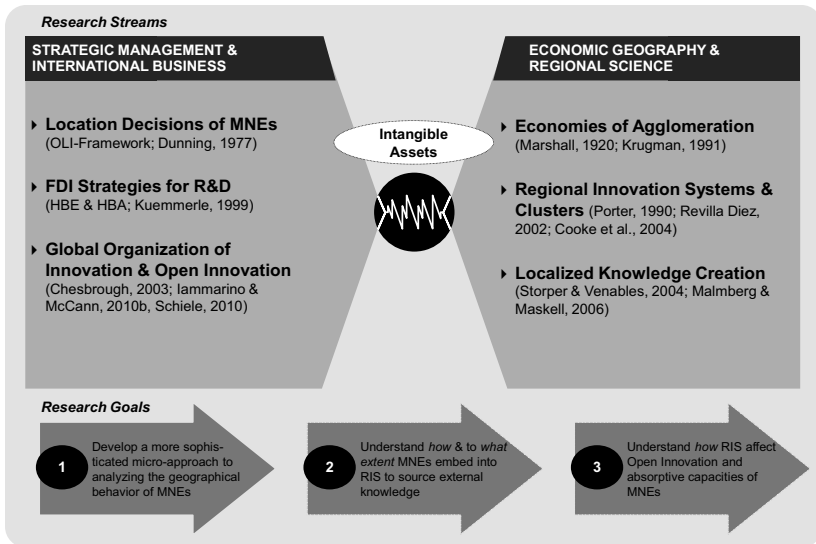


Figure 5: Conceptual Background and Research Goals

Source: Figure provided by author.

Acknowledging the need for a more sufficient understanding of the complexities of the regional location behavior of MNEs in innovation processes (a strategic management perspective) and a more sophisticated approach to analyzing firm strategies in respect to location (an economic geography perspective), this research incorporates elements of the two literatures and applies a micro-approach to analyzing the innovation behavior of multinational enterprises in two advanced economies, Germany and the United Kingdom (UK). Secondly, it is strived for an enhanced understanding of the strategies and extent of MNE embeddedness in RIS. Finally, new insights into the role of regional innovation potentials for OI and its effect on the innovation activities of MNEs will be provided. In sum, this analysis will enable us to highlight both micro (firm level) and meso (regional level) implications for innovation processes in the ongoing progression of knowledge-based economic development.

Based on this discussion, the following guiding research questions for this dissertation were identified, combining *theoretical*, *empirical*, as well as *policy* and *managerial* dimensions as advocated by SCHÄTZL (2001):

<ul style="list-style-type: none"> ▶ What are the pivotal characteristics of intangible assets based on the concepts discussed in the literature on firm innovation processes, systems of innovation, and multinational enterprises? 	Theoretical Remarks
<ul style="list-style-type: none"> ▶ What are the conceptual linkages between Open Innovation and Regional Innovation Systems as well as the theoretical implications of OI on the dynamics of RIS (and vice versa)? 	
<ul style="list-style-type: none"> ▶ How and to what extent do MNEs strategically embed themselves into RIS to source external knowledge? 	Empirical Analysis
<ul style="list-style-type: none"> ▶ What determines the regional embeddedness of MNEs in highly developed RIS within advanced, knowledge-based economies in Europe 	
<ul style="list-style-type: none"> ▶ What is the spatial distribution of MNEs' knowledge networks for Open Innovation and how do these spatial distributions relate to the spatial configuration of innovation activities? 	
<ul style="list-style-type: none"> ▶ Is the absorptive capacity of MNEs and their Open Innovation efforts related to localized learning in RIS? 	Policy & Management Implications
<ul style="list-style-type: none"> ▶ How can regional policy makers stimulate MNE regional embeddedness and increase the benefits of Open Innovation? 	
<ul style="list-style-type: none"> ▶ How can firms and MNEs in particular optimize the use of regional knowledge capabilities and draw on the comparative advantage of locations? 	

1.3 Outline

This dissertation combines theoretical frameworks from four decisive streams of research: on intangible assets, multinational enterprises, Open Innovation, and Regional Innovation Systems. Figure 6 outlines the structure of this cumulative dissertation: Chapter two presents theoretical considerations on the role of intangible assets in knowledge creation processes in firms (MNEs in particular) and regions. Recognizing the increased attention paid to the openness of innovation processes, chapter three explores the economic geography of Open Innovation, providing conceptual links between OI and RIS and some first evidence from empirical studies on the issue. Building upon this background, chapters four, five, and six provide qualitative evidence on intangible assets, Open Innovation, RIS, and MNEs in the automotive, pharmaceutical, and information and communication technology (ICT) industries, derived from in-depth qualitative case studies in Germany and the UK.

Theoretical Remarks

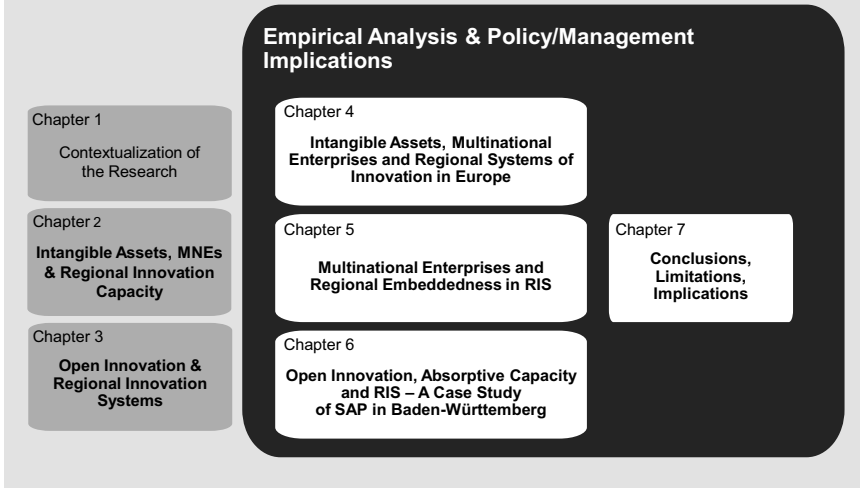


Figure 6: Schematic Structure of this Dissertation

Source: Figure provided by author.

Chapter four provides qualitative insights into the key channels through which intangible assets are enhanced in MNEs innovation processes, and describes their spatial roots and impacts, while chapter five presents a new matrix and empirical evidence on the embeddedness of MNEs in RIS. In chapter six, the collected qualitative data will be used to provide evidence on the Open Innovation efforts of the leading German software firm SAP, and the role of localized learning in an RIS for the firm's absorptive capacity and OI activities. Finally, in the closing section of this dissertation, conclusions from the theoretical discussion and the qualitative empirical research will be derived and future research needs identified. Moreover, policy and management implications will be discussed.