Regional Innovation Systems of Capital Cities: The Role of Public Procurement

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Abstract

This paper conceptualizes capital cities as innovation systems. Drawing on the regional innovation system (RIS) approach, the paper develops a framework to understand the role of public procurement in the economic diversification of capital cities. We criticize the RIS approach for rationalizing innovation policies merely on different forms of failures. In capital city innovation systems, however, the nation state takes on a proactive role on the demand side. Moreover, the paper identifies public procurement as a key driver for the internal dynamics of capital city innovation systems. Considering knowledge-intensive business services as diffusers of knowledge, which were generated in public procurement processes, different stages of development can be identified. The conceptual model elaborated in this paper provides a useful framework for empirical work for analyzing innovation dynamics in capital cities.

Introduction

As the seat of power and decision making, capital city functions cause multiple regional economic effects. NGOs, lobbyists, trade associations and others generate direct, indirect and induced income and employment impacts, which can be measured by input-output modeling (Geppert & Vesper, 2006). Yet, the interaction of these entities with the public sector also creates a distinctive regional innovation system (Asheim et al., 2011; Tödtling & Trippl, 2011). Those innovation systems, driven by the capital city functions, tend to be overlooked in the fields of economic geography and there is a lack of research and resulting theory describing the capital city's knowledge-based economy. At the same time, capital city functions are in transformation due to the decline of the nation state, the rise of transnational institutions and the ascendance of global or world cities (Mayer et al., 2013).

The aim of this paper is a conceptual one. We construct a theoretical framework for understanding the innovation systems of capital cities. Only a few scholars have so far conceptualized the capital city as an innovation system. The regional innovation system approach (RIS) provides a rich understanding of collective learning processes (Cooke et al., 2004) and thus is well suited to capture the interaction between public agencies and private actors. More precisely, it provides insights about how interactive learning as an internal mechanism influences the success of RIS (Doloreux, 2002).

However, RIS literature lacks the capital city as a distinctive type of region. The question about how the role of the state differ between conventional RIS and capital city RIS (CC-RIS) has not been raised yet. As a result, innovation policies remain limited to different forms of interventions.

Considering the role of state government or the public sector on the demand side, we propose public procurement as a driver for internal dynamics in CC-RIS. Public procurement takes place at the interface between the public and private sector, and thereby creates a key element in CC-RIS. It is argued that public procurement fosters demand-led innovations through strong interactions between users and producers (Edler & Georghiou, 2007). In particular, evolutionary economics pay attention to the dynamic nature of innovation (Simmie & Strambach, 2006). Moreover, according to Feldman, companies often develop their products for public demand but then, over time, start to adapt them for private client's use (Feldman, 2001). Thus, from an evolutionary perspective, we address the question: What role does public procurement play in the diversification of the capital city economy? In order to answer this question we focus on knowledge intensive business services (KIBS) and investigate how they contribute to the diversification processes.

The remainder of this paper is structured as follows. The following section provides three conceptualizations of capital cities as innovation systems. The third section discusses how the role of the state differs in both conventional and CC-RIS. The fourth section considers public procurement as a force for economic diversification and discusses the ways in which the RIS is influenced by public procurement. The fifth and sixth section considers KIBS as key components of the diversification processes and distinguishes between three stages of development of CC-RIS. Finally, the paper ends with a short summary.

Conceptualizing capital cities as innovation systems

Empirical research on the economic geography of capital cities is relatively sparse leading to a lack of a coherent set of theories about this specific type of cities (Campbell, 2000). Along those lines, Gordon (2003) notes that "as a category 'capital cities' clearly lost ground within geographic writing over the last couple of decades – casualty both to fashionable enthusiasm for 'clearl cities' against national centres, and to a shift of interest toward less formal and monolithic kinds of institution than those which were the staple of political capitals during the last century (if not before)" (p.3). Both Campbell and Gordon identify a a need for comparative research about the economic function of capital cities.

Gottman and Harper (1990) define capital cities as the "seat of power and a place of decision-making processes that affect the lives and future of the nation ruled, and that may influence trends and

events beyond its borders. Capitals differ from other cities: the capital function secures strong and lasting centrality; it calls for a special hosting environment to provide what is required for the safe and efficient performance of the functions of government and decision-making characteristics of the place" (p. 63). As the quote illustrates, the nation state with its adjacent government entities, departments and agencies plays a central role in the capital city economy. The public sector would need to be conceptualized as a central actor in the CC-RIS.

Given the trend towards outsourcing and towards increased tertiarization, scholars have conceptualized the capital city as "information city" or as the "national information broker". Abbott (1999) highlights the "rise of the private idea brokers" (p. 123), and illustrates how capital cities such as Washington D.C. specialized in information services and knowledge-based business services. He notes that "these are lawyers, business consultants, lobbyists, direct mail specialists, public relations firms, and trade journal editors who work for shifting sets of clients. On this prosperous substrate is an imposing array of trade and professional organizations. On these foundations perch a smaller number of highly influential think tanks, public interest lobbying organizations, and public issue advocacy organizations" (p. 123). In economic geography, these "idea brokers" have also been labeled as knowledge-intensive business services.

Capital cities can also be conceptualized as "state-anchored industrial districts" (Markusen, 1999, p. 37). Markusen (1999) argues that the ability to attract and to keep firms is based on governmental institutions. Companies establish themselves in close proximity to anchor-entities in order to take advantage of agglomeration economies (Feldman, 2005). In terms of capital cities, anchors are public entities such as universities, national research institutes and admission offices. In state-anchored regions, She clarifies that the mechanisms leading to growth in state-anchored regions are very different compared with other districts. Thus, she provides a concept that explicitly pays attention to the characteristics of capital cities. However, such a perspective is static and do not account for evolutionary processes such as those that lead to the economic diversification of a capital city.

The third conceptualization is provided by the regional innovation systems literature. According to Doloreux and Parto (2005) a RIS is "typically understood to be a set of interacting private and public interests, formal institutions, and other organizations that function according to organizational and institutional arrangements and relationships conducive to the generation, use, and dissemination of knowledge" (p.134). Departing from this definition, we want to conceptualize capital cities as a distinctive type of RIS.

Although the RIS literature distinguishes between different types of RIS, characteristics of capital cities are not taken into account. RIS are extremely heterogeneous in nature. To do justice to this diversity, the scientific discussion of RIS has become increasingly focused on the differentiation of RIS types. This has yielded a range of classifications (table 1). The assignment of a RIS to a category is not exclusive; rather, it can take place repeatedly on the basis of different classification criteria (Doloreux, 2002). However, the ways in which a capital city innovation system differs from other types have not been conceptualized in the theoretical discussion. In the following, we will theoretically examine the capital city innovation system and the ways in which its characteristics, such as the prominence of the nation state, differ from the discussions normally found in the RIS literature.

Table 1: Classifications of RIS

Classification	**Categories**			**Authors**
Potential for developing a RIS	Strong	medium	low	Cooke
Level of regional integration	Top-down perspective	Bottom-up perspective		Howell
Social cohesion	regionalized national IS	territorially embedded IS	Regionally networked IS	Asheim & Isaksen, Asheim & Gertler
Governance nodes of technology transfer	grassroots	network	dirigiste	Braczyk
Regional barriers	organizational thinnes	lock-in	fragmentation	Isaksen; Trippl & Tödtling
Cross-border integration	Weakly integrated system	Semi-integrated system	Strongly-integrated system	Lundquist, Trippl

Sources: Doloreux, 2002; Tödtling & Trippl, 2011; Lundquist & Trippl, 2013

For conceptualizing capital cities as innovation systems, the RIS approach is instructive for two reasons. Firstly, it draws on the systems of innovation concept (Edquist, 2005). Innovations seldom result from isolated entities, such as R&D departments, but rather emerge through processes of interactive learning within different departments of a firm or even more among different organizations (Asheim & Isaksen, 2002). Thus, the concept replaces an actor-oriented perspective by a relational perspective on innovations which not only takes the relational but also the evolutionary

character of innovation systems into account. Secondly, the RIS approach addresses the localization of interactive learning actions (Cooke et al., 2004). Sternberg (2007) stresses that knowledge spillovers are spatially sensitive. In particular, transfer of tacit knowledge requires social interaction and is, thus, promoted by spatial proximity (Gertler, 2003). As a result, regions have become a prominent level for investigating localized innovation processes (Moulaert & Sekia, 2003).

Two groups of actors are at the core of regional innovation systems (Asheim & Isaksen, 2002). The first group consists of private actors such as suppliers, partners and competitors, customers and contractors (Tödtling & Trippl, 2005). The knowledge generation subsystem, on the other hand, is a set of technology transfer offices, universities and non-university research institutions. The two groups are characterized by a high degree of interaction within and between them. The two groups are influenced by national and regional innovation policies that aim to overcome certain network problems. Since the RIS is not a closed system, also external factors have an impact on the performance of the two core groups. Among others, this includes the classification into higher-level regional units such as the national level and the level of associations of nation-states.

The role of the state in capital cities innovation systems

The RIS literature has not conceptualized the role of the nation state on the demand side. While the literature highlights the importance of the state as a key component of successful RIS particularly in terms of policymaking and intervention when it comes to system failures (Martin et al., 2013), there is a lack of attention on the role of the public sector as an actor who demands goods and services and thus may initiate innovation dynamics in an innovation system. As a result, the literature neither provides any insights about how interactions between public and private sectors contribute to interactive learning in the RIS, nor how the state not just indirectly influences, but moreover initiates innovation activities.

In conventional RIS, the state takes on a corrective and thus responsive function. Private actors must fail first, in order to legitimate public interventionist actions (Klein Woolthuis et al., 2005). Thus, the different kinds of failures within the system provide the rationales for innovation policies (Tödtling & Trippl, 2005, 2011). Instruments that are derived from this orientation often focus on improvements to the knowledge infrastructure. For example, public support of universities and research institutions is intended to strengthen the knowledge-generation subsystem. In addition, support programs are launched to promote the exchange of knowledge between companies and research institutions. However, such policy tools are highly criticized for ignoring differences among regions. In this regard,

Tödtling and Trippl (2005) argue that systemic failure ought to be the foundation for policy instruments. Following Isaksen (2001), Tödtling and Trippl (2005) distinguish between three types of system failure:

Organisational thinness refers to the condition of a RIS where key players are missing, or not adequately present. The critical mass of players has not yet been reached. This deficiency limits the possibilities for interactive learning, and thus the innovation capacity of the region. Peripheral regions are particularly threatened by this type of market failure.

Lock-in describes a state of excessive embeddedness. Certain approaches have solidified and are no longer scrutinized in a critical manner. Past successful collaborations have resulted in a strong focus on well-known actors at the exclusion of new ones. The lack of connections to actors outside of the RIS may mean that technological developments literally pass by the actors in the RIS. This regional barrier is most clearly evident in traditional industrial areas (Coenen et al., 2013).

There is a threat of *fragmentation* if the elements of a RIS are actually present, but insufficiently linked. Such fragments firstly consist of isolated groups of firms, meaning that there are few opportunities for interaction between these groups. Secondly, research institutions form fragments that are not well-linked with the companies, and thus only display limited knowledge transfer. This is commonly observed in metropolitan regions.

In contrast to these conceptualizations, in capital city innovation systems the state takes an active role in innovation processes as the entity that demands products and services from private sector actors through the public procurement process. Mazzucato and Lazonick (2013) assert that the classic image of the state and businesses is reversed by public procurement of innovation: the state is occupying the leading role in radical innovations, and bears hefty risks. Companies, however, wait until the risk has declined, and only enter the market at a later stage. Mazzucato and Lazonick (2013) thus coin the term "entrepreneurial state", tasked with "opportunity creation" (p. 8). Through public procurement, the state determines not just the specific sector for which demand is to be generated in; rather, specific technologies can be consciously fostered. By defining more specific requirements in the tenders, the state is in a position to determine the resulting innovation activities with a higher level of precision. This may mean that the supplying companies take on a leading position, thus gaining competitive advantages over companies located elsewhere. Ideally, the benefits are not limited to the leading companies. A local knowledge pool is created by way of spill-over effects, which improves the region's overall economy and which may be the nucleus of a regional innovation system. However, the exact opposite may occur. The precise definition of the required technologies may mean that other, perhaps more appropriate technologies are not pursued further (Edler &

Georghiou, 2007). The innovation activities determined by the state may have been confined to an area that is suboptimal for product application. Consequently, the resulting innovation cannot attain a position of dominance over other solutions on the free market (Uyarra & Flanagan, 2009). However, since the innovation activities in enterprises are based on the technology required by the state, there is a knowledge gap vis-à-vis the leading companies located elsewhere.

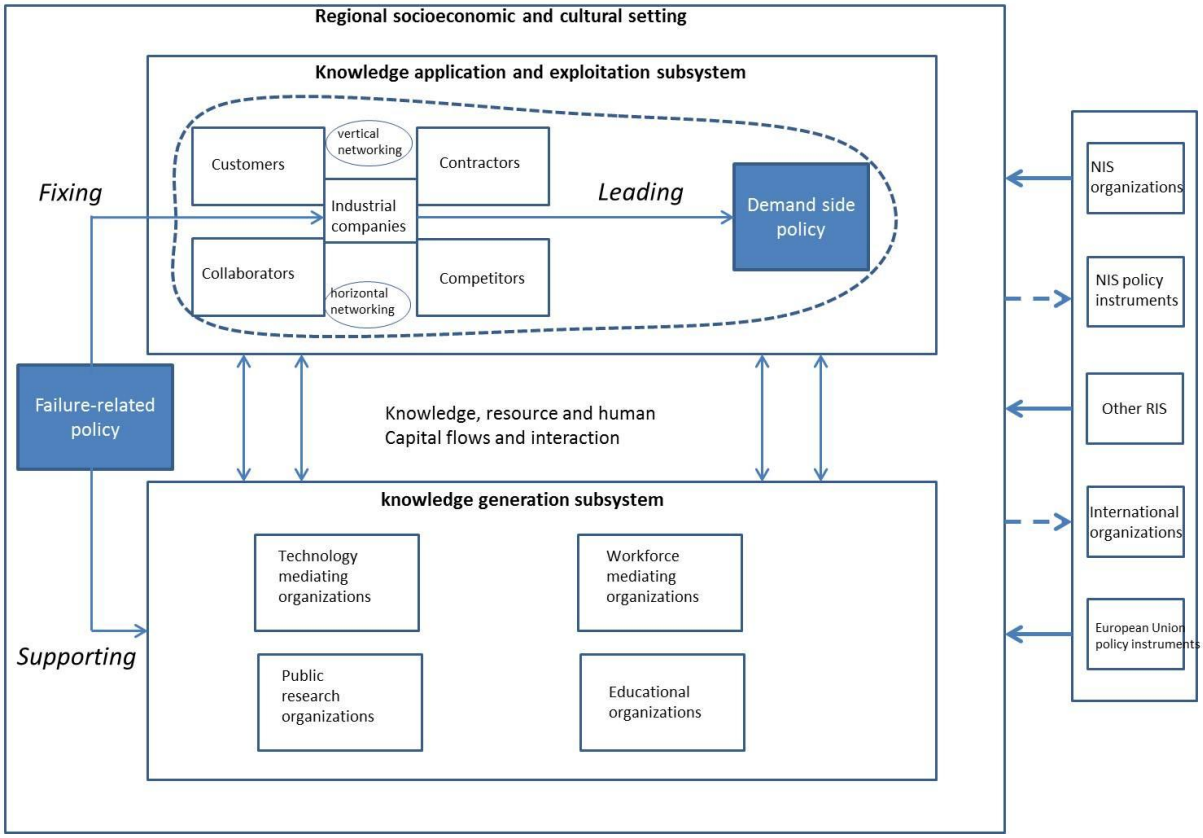

Figure 1: Innovation policy in CC-RIS. Source: Own modification of Tödtling & Trippl (2005)

To sum it up, three sets of innovation policies take place in CC-RIS: *Supporting*, *fixing* and *leading*. Supporting refers primarily to funding of the knowledge generation subsystem including public research institutes. Fixing describes innovation policies that aim to overcome market or system failures. So far, these policies are identical to conventional RIS. The third kind of innovation policies, however, takes place above average in CC-RIS: The state takes on a leading role in stimulating innovation activities and contributes to creating new markets on the demand side (Rolfstam, 2008).

Public procurement as a driver for internal dynamics in CC-RIS

The literature on innovation processes identifies four principle mechanisms that dominate the internal dynamics of RIS (Doloreux, 2002). The first two mechanisms refer to the innovation process

itself, whereas the latter mechanisms describe underlying promoting dynamics. Firstly, *knowledge production* refers to different forms of knowledge which are generated and shared in a RIS. Knowledge exchange can result in incremental innovations, which are created by re-combining already existing knowledge. Secondly, *interactive learning* is a central mechanism that contributes to the performance of RIS. Thus, innovation is a process which takes place not in but between firms and other types of knowledge-generating institutions. This interactive process is not limited to a knowledge exchange, but it is better conceived as learning. Thirdly, *proximity* promotes interaction between the actors in a RIS. Spatial proximity can provide opportunities to create other forms of relational proximities, such as routines and habits that are shared among the actors. Lastly, *social embeddedness* refers to the specific context RIS actors are situated in. This is important for RIS because it highly influences the extent to which personal interaction can take place.

Taking these dynamics into account, we can acscribe public procurement an important role in shaping interactive learning (Rolfstam, 2008) in the CC-RIS. Taking place at the interface between the public and the private sector, public procurement links innovation actors from both sides (public and private sector). Thus, public procurement is an inter-organizational process per se. Edler and Gerorghui (2007) note that “not only demand as such, but also the interaction between demand and supply has crucial implications for innovation dynamics” (p. 950). Such a perspective moves away from procurement as a linear model and instead, highlights procurement as an interactive process. The ways in which public procurement facilitates interactive learning can be described as twofold:

Firstly, public procurement provides opportunities for entrepreneurship. Linking PPI with knowledge-intensive entrepreneurship, Edquist et al. (2012) emphasize that government offices play an important role by providing market and technical opportunities. Market opportunities arise from the public demand of new products and services. On the supply side, this requires that firms not only start R&D within their own boundaries, but also tap into external knowledge. Doloreux (2002) notes “the ability to innovate is thought to be linked to the extent to which an actor learns through diffusing knowledge” (p. 249). Thus, the fulfillment of procurement requires the firm to get involved in inter-organizational innovation processes.

Secondly, public procurement reduces risk in the innovation process (Rolfstam, 2008; Uyarra & Flanagan, 2009). As pointed out by Storper and Scott (1995), risks lead to a delay of transforming technology development into production, since "consumers, like producers, tend to be risk-averse" (p. 514). Public organizations help to bridge this gap by taking the risk of being the first users - a role which is usually connected with high transaction costs since the product or service is not yet optimized (Edler & Georghiou, 2007). Moreover, public procurers reduce risks by demanding a critical mass which enables suppliers to take advantage of economies of scale (Uyarra & Flanagan,

2009). Its conceptual strength lies in focusing on demand and requirements as a crucial source of innovation – an approach whose empirical and theoretical significance is highly emphasized (Rolfstam, 2005; Henkel & Hippel, 2005; Edquist & Zabala-Iturriagagoitia, 2012) while being largely ignored by innovation policy for many years (Edler & Georghiou, 2007).

The state uses public procurement not just for the fulfillment of requirements. Public procurement activities may also constitute a policy tool for knowledge-based regional development (Rolfstam, 2005). This takes place when public organizations "place orders for a product, service, good or system- that does not yet exist, but which could (probably) be developed within a reasonable period of time" (Edquist & Hommen, 2000, p.5). A two-step-taxonomy defining the concept more closely has been formulated (Edquist & Zabala-Iturriagagoitia, 2012). In a first step, a distinction in terms of the dependency of the actual users of the innovation between direct and catalytic PPI is made. Direct PPI takes place when the commissioning public institution is the main final user of the innovation. However, the state also requests products on behalf of third parties, including private end-user products, to promote development in a particular area; this is called catalytic PPI. In a second step, the character of the result can be distinguished as either adaptive or developmental PPI. Adaptive PPI refers to innovations that are created by the diffusion of knowledge, and are only considered novel in a specific local context. Developmental PPI, on the other hand, produces radical innovations that are new notwithstanding any spatial context.

A conceptual link between public procurement and the characteristics of and dynamics within a regional innovation system has not yet been formulated. Public procurement research is largely conducted in the field of economics, which might explain why the analysis of space is marginalized in this context (Uyarra & Flanagan, 2009). The role of space and territory is primarily mentioned as a normative dimension: The location of the companies should not be relevant for the awarding of contracts, since this is not regarded as a qualifying characteristic (Edler & Georghiou, 2007). Discussing public procurement's effects on CC-RIS, a rough categorization can be made between standardized products and services, and knowledge-intensive products and services. This differentiation is only theoretical, and should not be interpreted as a negation of the real-world fluid transition between the two. Simple products may include stationary and furniture. These are generally produced elsewhere, and play no role in the innovation system of capital cities. The situation may be different for simple services, which include services such as security. The uno-actu principle of service provision, the spatial coincidence of supply and use, requires the direct interaction between buyers and suppliers (Kulke, 2009). Simple services thus contribute to the RIS, although the expansion of the local knowledge pool is only marginal due to the low knowledge intensity.

Knowledge-intensive products, on the other hand, may make a significant contribution to the expansion of local knowledge pools, particularly in capital cities as knowledge-intensive products are key to the dynamics of these cities that function as "national information brokers" (Abbott, 1999). The provision of products requires the tight integration of partial production stages; the company is therefore usually situated in close proximity to the administration. However, this does not apply to all companies involved in production. The headquarters, located in the capital city, is the originator of a range of innovation activities, which are provided elsewhere (Markusen et al., 1991). The knowledge generated there is codified in products. The location in the capital city assumes control of all downstream activities to ensure that the product is adapted to the needs of the commissioning governmental institution. The requirement for interaction is highest at the outset of this process, and decreases in due course (Meier, 1998).

Finally, the CC-RIS is strongly characterized by knowledge-intensive services. Washington, D.C. provides an illustration of how knowledge-intensive services were gaining in importance in the CC-RIS: During the late 1980s and early 1990s, the region benefited from increased government outsourcing of tertiary activities that were not linked to manufacturing. Markusen et al. (1991) called this development the "tertiarization of the defense industry" (p. 213). These tertiary activities were mostly associated with business, engineering and management services that involved advanced technologies and systems requirements (Stough, Haynes, & Campbell, 1998). Often contracting for these services required close face-to-face interaction between the contractor and the government agency from the time contract requirements were written to when the product or service was delivered. The requirement for information exchange facilitated the emergence of a critical mass of contractors in the Washington D.C. region, a knowledge hub that benefits from close interactions between government, administration, nonprofits and the private sector (Mayer & Cowell, Forthcoming). However, assessments of the continued importance of the D.C. region as a location for tertiary defense activities are missing.

KIBS in CC-RIS

We argue that one should consider KIBS as unit of analysis for economic diversification of CC-RIS. To find out to what extent the regional economy is diversified, one would need to analyze the extent to which knowledge that has been generated through interactive learning, is used elsewhere. In this regard, KIBS are particularly useful since they are defined as "services that involve economic activities which are intended to result in the creation, accumulation or dissemination of knowledge" (Miles, 2005, p. 18). Muller and Doloreux (2009) add that KIBS "are mainly concerned with providing

knowledge-intensive inputs to the business processes of organizations, including private and public sector clients" (p. 65). A more narrow definition of KIBS is provided by the NACE classification, KIBS are firms in the sectors computer and related activities (72); research and development (73); and legal, technical and advertising (74.1-4) (EUROSTAT, 2008).

Even though a variety of private organizations is involved in the procurement process, KIBS play a special role in CC-RIS. Firstly, the importance of KIBS for innovation activities is highly recognized (Doloreux et al., 2010). Secondly, KIBS highly concentrate in capital cities or in a country's most important economic center (Jakobsen & Aslesen, 2003; Wood, 2006). However, studies about KIBS in the context of capital cities tend to consider capital cities simply as a metropolitan area without paying attention to the role of KIBS in the interaction between the private and the public sector. Vence-Deza and González-López (2010) note „although most of the theories tend to be limited to the incorporation of factors arising from the private market, there is evidence that public institutions and, in particular, administration and public bodies are high-profile clients of KIBS" (p. 4).

A closer look at the concentration of KIBS in capital cities reveals some differences with respect to the industries they specialize in. KIBS in marketing, advertising and finance industries are more likely to be located in capital cities, whereas technically-related KIBS also seek spatial proximity to clients in construction and manufacturing and therefore are distributed across various regions (Wood, 2006). However, recent research highlights that even KIBS of the same industry can rely on very different types of knowledge and therefore diverge regarding their spatial configurations (Tether et al., 2012).

Diversification

Regional innovation systems are based on the assumption that innovation is the result of interactive processes (Lundvall, 1988). As a result, they may be conceptualized as a dynamic construct. Academic discussions that have contributed to this understanding aimed for an explanation of innovation processes within a RIS (Cooke et al., 2004; Tödtling & Trippl, 2011). However, questions just how these processes contribute to the overall development and the evolution of a RIS have so far not been well researched (Boschma & Fornahl, 2011). At the same time, such an evolutionary perspective is necessary in order to explicitly account for the process of interactive learning between the public and private sector.

Entrepreneurship is considered a crucial factor for the development of clusters (Braunerhjelm & Feldman, 2006; Sternberg, 2007; Karlsson, 2008; Avnimelech & Teubal, 2010). Romanelli and Feldman (2006) show that two types of entrepreneurship promote cluster development: Firstly,

investment by local entrepreneurs and businesses is crucial. On the other, clusters only grow in a sustainable manner if some entrepreneurs are prepared to leave established companies and become self-employed.

For the development of CC-RIS, this type of entrepreneurship can be defined in detail: In an analysis of the development of the innovation system of Washington DC, Feldman (2001) identified three factors that have led to the evolution of a regional entrepreneurial economy: Release of government employees, access to government resources, which also involved changes in intellectual property (IP) rights, and finally, public procurement (Feldman et al., 2005). In any economic context, public procurement takes on a special role by virtue of its sheer scope. In 2010 the average expenditure on goods, works and services for the member states of EU was 19% of GDP (European Commission, 2012). In addition, public procurement seems to be a permanent and stable phenomenon on the demand side. And finally, public procurement differs from the other two factors Feldman et al. identify due to the type of entrepreneurship it may generate. The release of employees and access to IP is primarily associated with start-ups, and thereby reflects the process of layering (Martin, 2010). Entrepreneurship by way of public procurement, however, also entails the process of conversion (Martin, 2010) meaning that companies change their routines and behaviors. In CC-RIS, this process takes place when companies realize that they cannot just offer their products and services to the state alone, but that they can also enter the market of private sector clients (Feldman et al., 2005).

We conceptualize three stages of development depending on the respective degree of maturity of the capital city innovation system. Such a conceptualization may help in understanding the ways in which public procurement contributes to diversification:

At an early stage, the interaction between public and private sectors is a key element of the innovation system. Public authorities commission products and services for their own purposes. These cover a wide range of goods with a high degree of standardization to services with a high degree of complexity. The complexity of service provision arises not just from the commissioned objects themselves, but also increasingly from quality requirements, e.g. environmental standards, to be observed in the course of execution. The commissioning of knowledge-intensive objects requires the delivering companies to access the local knowledge base. The companies engage with local knowledge pool, and expand it at the same time. An innovation system that is capable of meeting the administrative needs for external knowledge thus emerges around the administration. From the perspective of the administration, the solution of specific problems requires external knowledge. Interactive learning processes between the public and private sector permit the development of goal-oriented solutions. The limited number of actors positively affects the frequency of contact of

the actors, and thus the probability of knowledge transfer. However, this type of innovation system does not go beyond the mere satisfaction of administrative demands.

In an advanced stage, the RIS continues to be heavily dependent on the public sector. The symmetry of the innovation system, however, undergoes a shift. The interaction is no longer a central element of the RIS, since public procurement yields impulses for innovation activities that go beyond the mere delivery of a service to the commissioning client. Participating companies manage to expand their knowledge pool by way of purchasing. This pool is then also used to interact with private sector actors (2001), which, in turn, enhances the ability to innovate. A prominent example for innovation activities that were initiated by public procurement and developed its own dynamic is the development of the Internet. In the early and mid-stage of development, the Department of Defense commissioned numerous computer-related research projects (Ceruzzi, 2008). Initially just a bundle of different research activities at a non-profit research institute, the outcome, the Internet, was transferred to the private market in the mid-90s (Abbate, 2001). Public procurement specifically provides orders to small businesses that are entering high-growth markets (Mowery & Simcoe, 2002). The companies are thus highly dependent on interaction with state institutions, but they grow quickly. They use the knowledge generated from the procurement contracts to reorient to customers other than the State.

In the mature innovation system of capital cities, the interaction between state institutions, especially the administration, and the company is even less pronounced. The reason for this is the fact that innovation activities based on public procurement increasingly take place elsewhere. Markusen et al. (1991) investigated the distribution of government contractors in relation to the Department of Defense and identified a clear spatial pattern, which is reflected in the title of their book "The Rise of the Gunbelt" (Markusen et al., 1991). Accordingly, mature innovation systems result in the formation of regional focal areas outside of the capital city. In this form, the capital city increasingly assumes the control of the innovation activities based on public procurement. This role is performed by companies or parts of companies that are located in close proximity to the administration, and which have established themselves at the interface between the public and private sector. These companies have an excellent understanding of the public sector, meaning that they understand how to translate between public-administrative and economic rationales. From this position, they coordinate innovation activities, which are conducted elsewhere (Warf, 1993). Even though the demand generated by public institutions is distributed across all sectors, one or two sectors that dominate the innovation system have emerged. For instance, in Washington DC, there is a concentration of innovation activities focusing on the Internet, as well as biotechnology (Feldman, 2003; Ceruzzi, 2008). In these industries, the interaction between the public and private sector has

set an impulse that has become independent in the course. Thanks to the strengthening of these sectors, the number of companies in the sector has grown. The growth in this sector, in turn, attracts more companies. Furthermore, an environment fostering the formation of new enterprises has been established. Growth in this sector causes the share of companies directly involved in the interaction with the public sector to decrease. Consequently, the relative importance of the state in this form of the innovation system declines.

However, such a development is by no means linear in nature. Spigel (2011) demonstrates by the example of Ottawa how capital regions can be thrown back on the development axis due to external shocks. Up to the 70s, Ottawa was a city of officials, whose knowledge economy was primarily concentrated in state institutions. With the development of the Internet into a global technology, IT companies were given a significant development thrust in Ottawa. The region benefited from decades of continuous investment in the IT sector, which resulted in the establishment of reputable research institutes (Doloreux, 2004). The growth of such semi-governmental institutions drew well-trained workers from other regions to the capital. With the continuing growth of the industry, a first generation of start-ups resulted, whose founders were mostly former employees of the local IT giants. The success of these start-ups led to an environment favoring start-ups, and was eventually followed by further generations of start-ups. For the capital region, this boom entailed an initial diversification of its economy. In this form of the regional economy, the interaction between public and private was relegated to a minor role. However, this changed for a first time when the Internet bubble burst. Only a few years later, another economic shock in the financial crisis took its toll. These shocks severely affected the business environment, and reduced diversification in the region. Companies that had previously displayed promising growth went bankrupt, and venture capitalists and business angels withdrew from the regional market. Ever since, Ottawa has once again constructing an entrepreneurial environment - this time with a different structure - to foster further diversification of the local economy.

Conclusion

The aim of this paper has been to illustrate the role of public procurement in the diversification of capital city innovation systems. So far, literature on knowledge economy has conceptualized capital cities as “national information brokers” (Abbott, 1999) or “state-anchored industrial districts (Markusen, 1999). Thus, public agencies have a magnetic effect on private firms which are located in close proximity in order to take advantage of agglomeration economies. However, these concepts

are limited to a static perspective and therefore lack any explanation of how economic diversification is created.

Various insights can be gained from the RIS literature. The RIS approach puts the emphasis on the role of the state as a crucial success factor. According to the RIS approach, the motives for innovation policy are system failures such as “organizational thinness”, “lock-in” and “fragmentation”. However, despite an increasing effort in the differentiation of RIS characteristics, the theory lacks the concept of the state on the demand side. The conceptual framework provided in this paper discusses the extended role of the state in capital city innovation system. Firstly, the state plays a proactive role by demanding products and services that do not yet exist. Secondly, the state’s action influences innovation activities directly regarding technologies and sectors.

Considering public procurement as a driver for internal dynamics of CC-RIS, we distinguish three stages of development. In short, they differ in respect to the meaning of the interactions between the public and private sector. At an early stage, a limited number of firms work on goal-oriented solutions. Knowledge generated in the procurement process is barely used elsewhere. In an advanced stage, public procurement has contributed to the diversification of the innovation system. Firms use the knowledge generated from the procurement contracts for businesses with private clients. In the mature innovation system of capital cities, public procurement has set an impulse that has become independent over time. A large number of firms take place in sectors which originally emerged through risk taking from the state.

As illustrated, public procurement heavily influences the diversification of a capital city’s innovation system. However, this should not obscure the fact that this kind of diversification derives from many causes. The conceptualization in this paper serves as a framework for empirical studies. Empirical work that draws on KIBS which involved in the procurement process might provide some valuable insights and might result in some conceptual adjustments.

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