

Regional innovation policy and public-private partnerships

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Introduction

For innovation policies to become effective, smoothly functioning interfaces between innovation agents, assembling resources from diverse sectors of the economy, and sound strategy development and policy implementation are all required. Connecting independent innovation agents is a core feature of several theories of innovation, for example: systemic approaches to innovation (Asheim et al. 2011; Cooke 2002; Nelson 1993; Lundvall 1992; Freeman 1988); the triple-helix approach (Etzkowitz and Leydesdorff 1997); the learning region approach (Morgan 1997; Florida 1995, 2002), and the smart specialization approach (Foray et al. 2009). Further, innovation is usually characterized by increasing returns to knowledge implementation and diffusion, which typically takes on both public and private goods attributes. Forming partnerships for innovation and balancing public and private interests can play a significant part in combining innovation-relevant resources such as technical expertise, production capacities, regulatory power, user requirements, and finance which are spread out among multiple agents. An instrument for connecting agents in innovation policy is public private partnerships (PPP), which are – loosely defined – a co-operative institutional arrangement between public and private sector agents (Hodge and Greve 2007).

PPPs have been used by government in the field of innovation policy for a variety of purposes from providing the organizational frame for ‘producing’ innovations: developing a new product, a new process, a new form of economic organization etc. and bringing it to the market. However, as discussed below, there are variations in PPPs along divergent institutional, political, historical and cultural settings as well as along differing strategic objects of the PPPs. The rest of the chapter presents out an overview of PPPs, before considering PPPs specifically in relation to innovation policy and then concluding.

PPP: a general overview of the concept

Definitions and types of PPP

History provides many examples of public and private sector co-operation which may even date back to the biblical era². Despite the extensive literature which has developed since the second half of the 1990s (e.g. Grimsey and Lewis 2005; Akintoye et al. 2003; Osborne 2000; Rosenau 2000; Montanheiro et al. 1995) a universally accepted definition of public-private partnership does not yet exist³ as the term covers a variety of conceptually distinct forms of relationship. The OECD defines a PPP largely in terms of a contractual relationship as ‘an agreement between the government and one or more private partners (which may include the operators and the financiers) according to which the private partners deliver the service in such a manner that the service delivery objectives of the government are aligned with the profit objectives of the private partners and where the effectiveness of the alignment depends on a sufficient transfer of risk to the private partners’ (OECD 2008: 17). In a broader sense PPPs cover all kinds of arrangements that work within the framework of cooperation and involvement of partners in order to

map out a strategy and a framework for accomplishing a common goal defined by public and private agents (Grimsey and Lewis 2004: 6; Kolzow 1994). Therefore the concept of PPP – on which this paper is based – also includes joint organizations of public and private partners.

Innovation policy relies on the assumption that stakeholders cooperate to fortify regional or national competitiveness and places a strong emphasis on ‘bargained cooperation’ and ‘political exchange’ (Fogelberg and Thorpenberg 2012; Marshall 1996). However, private participation is often opposed by governments’ fear of losing regulatory control, which results in ‘multiple grammars’ to the meaning of PPP across countries (Linder 1999). For instance in Victoria, Australia, PPPs are argued to have nothing to do with privatization, while in the market-liberal political environment in the UK Treasury sometimes speaks of PPPs as directly equivalent to privatization (Hodge and Greve 2007). In Sweden’s corporatist organization of society the term ‘partnership’ is sometimes deliberately avoided and the more moderate connotation of ‘association’ or ‘cooperation’ is preferred motivated by the fact that the term partnership is imported from the EU. At the same time, however, public-private partnerships are considered ‘merely a new formulation of a longer tradition and working mode of the Swedish welfare model’ where the responsibility for economic development is usually shared between public and private sectors (Fogelberg and Thorpenberg 2012).⁴

According to their organizational structure PPPs can be categorized into two types: contractual and organizational PPP. In a ‘*contractual*’ PPP a partnership is solely based on contractual links between public and private agents and is regulated by administrative contract(s). Contractual PPPs were significantly used first in Anglo-

Saxon countries. Britain's Public Finance Initiative (PFI) projects have been prototypical in which the state claimed to retain control over the activity through complex contracts while operational tasks have been delegated to the private sector. Such PFI projects were frequently used for providing infrastructure in a rather broad sense including transport, waste water disposal, schools, hospitals and jails. In innovation policy contractual PPPs have been used particularly for the provision and/or operation of infrastructures and services which are important for the general business environment, and thus also for innovation. This is confirmed by the survey of Swedish municipalities' innovation policy (see below). An '*organizational*' PPP is manifested in the establishment of an entity jointly owned by the public and private parties and is regulated by the shareholder agreements. This type of PPPs is characterized by a potentially more direct government influence in the PPP and is used in regional innovation policies especially for the establishment and operation of enabling organizations, which provide common ground between the public, private and third sectors to promote economic and social development policies. Our empirical results for Swedish municipalities' innovation policies support this assumption. Beyond these more supply-side-focused tasks, both contractual and organizational PPPs can also focus on stimulating demand in order to promote regional innovation activity. Hence PPPs are seen as one of a number of options to assist national and regional innovation in different circumstances.

The economic rationale for and major lines of critique of PPPs

PPPs comprise a broad range of institutional arrangements which emphasize different general characteristics or mechanisms and reflect a variety of economic, social and political reasons and motives for their growth (McQuaid and Scherrer 2010). We distinguish three groups of explanations based on: first, micro-economic

arguments concerning the efficiency and effectiveness of public spending; second, on budget or macro-economic factors focusing on the availability of public resources; and third, on arguments concerning the coordination of public and private agents.

Microeconomic motivations postulate that PPPs make it possible – as the UK Treasury (2000) formulates – to tap into the disciplines, incentives, skills and expertise that private sector firms have developed in the course of their normal everyday business, while releasing the full potential of the people, knowledge and assets in the public sector. The private sector involvement should result in greater commercial incentives for delivering efficient and effective services, a greater focus on customer requirements, and innovative approaches to providing services or infrastructure. Government retains the basic responsibility and democratic accountability for deciding and defining objectives, delivery standards required and safeguarding wider public interests (McQuaid and Scherrer 2010: 29). Thus PPP fits well into the ‘enabling view’ of government, and microeconomic drivers of PPPs have been an instrument to spread New Public Management concepts in the public sector (McQuaid 2010).

However, the long-term character of PPPs and complex financial structures, entailing risk- and cost-sharing among the partners, results in high transaction costs, which may exceed the potential advantages compared to other forms of public service delivery. Transaction costs are largely fixed cost and raise the efficient minimum size of a PPP, thus giving rise to organizational economies of scale (e.g. the organization having breadth and depth of experience) or economies of scale related to the physical project (e.g. it may be technically more efficient to construct

and/or maintain a series of buildings rather than doing one), or to economies of scope (as a PPP may involve a range of activities including, for instance, construction and operation). The occurrence of economies of scale and/or scope may lead to governments favoring larger firms which have acquired specialized PPP-specific knowledge whereas learning effects will mostly occur in large government units due to repeated implementation of PPPs. This results in asymmetries in information about and experience with PPPs between the public partners (particularly if small authorities are involved) and the private sector (particularly if large experienced private firms are involved), which can be exploited by the private partners. The complexity of projects over their life cycles may also lead to poor protection for public interests (Da Cruz and Marques 2012). Establishing dedicated PPP units in government (OECD 2010b) and the standardization of PPP contracts (Verhoest 2012) can help alleviate these problems.

Risk sharing between the public and the private sectors is a fundamental micro-economic constituent of PPPs. Compared to other ventures an extra element of risk – technical risk – appears in projects which either develop or are based on or implement a new technology. Therefore the private sector's desire to share risks with (public) partners is particularly strong when projects which involve new technologies are concerned. If such projects are considered politically or economically 'important' governments have an incentive to save them from failing; huge infrastructures (e.g. infrastructures in the fields of energy, transport or communication technologies) and networking organizations (e.g. cluster organizations) are potential candidates. Therefore in technologically risky PPPs (but also in other PPPs) the taxpayer tends to be the ultimate risk-taker. From a technology perspective it is important to note that, long-term contracts restrict

changes in the future because an organization is tied into a specific type of technology thus reducing flexibility and making the introduction of newer technologies in the future depend on costly re-negotiations (McQuaid and Scherrer 2010: 32).

Major *macroeconomic explanations* of the use of PPP are its attractiveness for government because it is a way of off balance sheet funding which does not appear as capital expenditure in the year in which it occurs, but rather as a series of smaller annual ‘revenue’ expenditures over the project’s life. This is particularly attractive in times when new technologies emerge and demand for related infrastructure raises investment requirement of the public sector. Official public debt can be kept low which might improve the government’s standing in the international financial markets and will facilitate meeting formal fiscal requirements like the deficit and debt limits of the European Monetary Union rules on Member States⁵. Further, the overall tax burden could be reduced in the medium term if PPP turns out to be a more cost-effective mode of providing public services compared to traditional public procurement. Finally, deregulation and economic structural change has made previously sheltered sectors – which usually undergo major technological innovations through this phase – attractive for PPPs (McQuaid and Scherrer 2010: 30). Anglo-Saxon countries (e.g. United Kingdom, Australia, New Zealand) have long-time experience with PPPs because they have privatized and liberalized utilities sectors relatively early and used PPP as an instrument of infrastructure delivery, which contrasts with other countries who mainstreamed PPPs later and in divergent ways.

Empirical evidence on whether PPPs alleviate public finances is mixed⁶. Efficiency gains of PPPs from non-finance-related activities would at least have to compensate for the cost disadvantage which PPP-financing has compared to traditional government finance (e.g. the interest to be paid usually is higher for private than for public debtors) in order to break even with other forms of providing public infrastructure. Further, off-budget financing gives way to a kind of ‘fiscal illusion’ as the financial burden related to PPPs does not show immediately in public budgets but is indiscernibly dispersed over a long period into the future (McQuaid and Scherrer 2010).

A third explanation of the wide use of PPP emphasizes their *coordination function* between public and private agents and is particularly relevant for regional innovation policies. PPPs act as vehicles to promote a policy which is mostly based on a more bottom-up orientated approach, taking into account the different interests of the parties involved in innovation. The coordination function explanation of PPP distinguishes itself from pure microeconomic theorizing as it reflects ‘a willingness to share some forms of public authority with citizens and communities’ (Considine 2005: 90). In innovation-related PPPs, the public partners’ benefits are derived primarily through the improvement of innovative capacity for regional competitiveness and growth and exploitation of skills and knowledge of the private partners. On the side of the private stakeholders, apart from risk- and cost-sharing advantages in developing new technologies, products, and services, commercial profits are gained by the utilization of new market opportunities and the expansion of the regional market.

The alignment of interests between partners reflects also the *political nature of PPP formation* as different interests are involved. The alignment of interests ought to be achieved by creating and fostering partnerships and networks, involving public and private agents in goal and strategy definition, project development and selection, and project or policy implementation. This means more than merely re-structuring and economizing the contracting relations between government and private suppliers but aims at establishing and fostering regional networks, forming social capital, and facilitating cross-sectoral local and regional governance. European Union policies, which seek to establish such public-private networks at the local, national and European Union levels to promote its goals particularly in the areas of regional innovation policy and research and development, are a good example of fostering this type of PPP.

Yet, despite the widespread use of PPPs, there is still much debate on their connotation and applicability in different contexts. In Anglo-Saxon market-oriented societies, for instance, PPP is usually commenced through competitive selection of private stakeholders and is characterized ‘by very detailed contracts and ... monitoring institutions’ founded with the purpose to ‘supervise’ this cooperation; whereas continental forms are more flexible and often initiated by the government who acts as regulator and provider of legislation at the same time enabling private participation in joint execution of operational functions (Beliczay and Pál 2006). The decline of corporatist governance alters the relationship between various organizations and public authorities making them ‘less formal’ and more competitive ‘for attention from politicians’ (Hodge and Greve 2007: 446). If there is a matching interest between public and private entities then PPP reflects that match⁷. Private sector lobbying becomes more important in influencing the political

decision-making process; what projects eventually materialize is a highly political issue. ‘In some cases governments will not choose the most able firms that would have been selected through the market process but will select those actors that are most influential in lobbying’ (Hospers et al. 2008: 443).

PPP in innovation policy

Types of PPP in innovation policy

PPPs are widespread in the field of research and development policy (which may differ from innovation policy) where the cooperation between public and private sectors has a long history (see e.g. Hagedoorn et al. 2000; Stiglitz and Wallstein 1999). PPPs are also a key ingredient of (regional) innovation policy: Technology-based economic development policies traditionally have been implemented in the United States as PPP (Briem and Singh 2014), regional innovation systems ‘should be based on PPP’ (Landabaso et al. 1999), and there exist ‘cases of regions’ where ‘close public-private partnership and policy networking operate’ (Cooke 2004: 512). PPPs are ‘an essential instrument for fostering innovation in OECD countries’ (OECD 2004), they are both relevant at the national and regional levels, and ‘have become increasingly popular in R&D and innovation’ (OECD 2010a: 104). Surprisingly, in the register of a recent Handbook of Research on Innovation and Clusters (Karlsson 2008) the only entry for ‘Public-Private Partnership’ refers to the role of PPP in place marketing. Surprisingly, too, PPP was considered an ‘emerging instrument’ in regional innovation policy recently, arguing that technology centers have been created which do not focus exclusively on new technology development but also on ‘exploitation in the business sector, emphasizing the co-creation of new knowledge between public and private actors’

(OECD 2011: 94). This section sets out some conceptual issues concerning PPPs and how these relate to our empirical results in the Swedish survey.

In order to achieve a general overview of the use of PPPs in innovation policy at the regional level within a whole nation all 290 Swedish municipalities were surveyed. Sweden is characterized by a long history of corporatist governance and innovation policy, by a high degree of autonomy of players in the innovation system, by considerable regional diversity in terms of innovation activity, and by a favorable overall innovation performance in international comparison (EU 2012a). This suggests that a broad variety of PPP uses for innovation policy purposes exist in Sweden and therefore this country provides a good example for such an investigation. In total, 63 municipalities or 21.7 per cent responded, 21 (one third) municipalities reporting to have no PPPs in innovation policy. The remaining 42 municipalities reported 68 cases of public-private cooperation of which 50 cases meet the requirements of our understanding of PPP.

PPPs are used for a variety of purposes in the field of innovation policy. First, PPP is a mode of *fostering the generation and exploitation of innovation activities* by providing the organizational frame for ‘producing’ innovations: developing a new product, a new process, a new form of economic organization etc. and bringing it to the market. Research partnerships between private firms and private research institutes on the one hand and the public sector (particularly universities and other public research bodies) on the other hand are – if the venture is not confined to basic research but is market oriented – a good example for a traditional form of an innovation-producing PPP. Like other innovation policy instruments PPPs could reduce variety by selecting specific industries and technologies as targets of direct

policy intervention, but establishing co-operation between agents from different sectors induces variety (which is a pre-requisite for innovation). Government takes a particularly active role in technology and innovation policy in this context: The economic rationale for PPP here is based on market failure which entails a large gap between private and social returns of R&D. If properly implemented (particularly with regard to risk allocation), government-industry R&D programs could potentially yield enormous benefits (Stiglitz and Wallsten 1999: 70). Of innovation-related PPPs in Swedish municipalities 44 per cent focus on generation and 20 per cent on exploitation of innovation activities; 36 per cent of innovation-related PPPs of Swedish municipalities carry out joint generation/exploitation of innovation.

Generating and exploiting innovation activities might also necessitate the use of different organizational structures of PPP as well as different roles being assigned to the partners involved. Swedish municipalities' PPPs which aim at generating innovation are carried out under both contractual and organizational forms of PPP with a slight difference in responsibility structures. In organizational PPPs tasks assigned to the private sector are widely scattered across a range of categories varying from operative tasks to R&D and commercialization whereas in contractual PPPs, there is a clear-cut line of responsibilities between the partners with the public sector actively engaged in the early stages of cooperation (e.g. creation of conditions for innovation output and R&D) and the private sector assuming the risk for further development of the innovation outcome. Swedish municipalities' PPPs aiming at exploiting innovation, by contrast, seem to require closer ties between partners which go beyond merely contractual relationships (like joint equity) and which might facilitate the appropriation of economic benefits by the partners

involved. Consequently, organizational PPPs are in the vast majority of exploitation-cases preferred over contractual ones. They are characterized by joint execution of operational functions (e.g. management, production planning etc.) and testing and networking, occasionally solely assigned to the private sector. PPPs with ‘mixed’ modes of innovation (i.e. where generation and exploitation of innovation is combined), are predominantly of organizational form, too, where both partners jointly execute operational tasks. In contractual PPPs the research and development task is performed jointly while operational and design tasks are primarily carried out by the private sector.

Second, PPP is used in the field of innovation policy as a *mode of providing innovation-related, mostly physical infrastructure*. This function has a long tradition, particularly in the build-up of infrastructure for the diffusion of key technologies which were the drivers of ‘long waves’ in economic development (e.g. railway networks, telecommunication; see Scherrer 2014) which have been accomplished through close cooperation between the public and private sectors. 20 per cent of innovation-related PPPs of Swedish municipalities focus on providing innovation-related infrastructure; empirical results indicate that structural properties of a PPP usually govern the scope and remit of public-private arrangements in providing and operating innovation-related infrastructure. For example, in organizational PPPs, R&D and project design are primarily carried out by public sector agents whereas the transmission of tacit knowledge by means of joint activities (e.g. workshops) is assigned to the private sector. In contractual PPPs, operational responsibilities are often jointly executed by both sectors; additionally, the private sector is also in charge of designing the infrastructure for the public sector (occasionally building and operating it as well). Cooperative

research and marketing of innovation is not a major objective for this form of public-private cooperation.

Finally, PPP is a *mode of policy delivery* in the field of innovation – often with a focus on technology transfer – comprising innovation strategy development, and program and project implementation. Innovation support programs, like those typical of the European Union which aim at enhancing R&D and regional innovation, are conducive to the establishment of PPPs because they usually require forming networks in which both private and public partners are to be integrated. Therefore, the policy delivery-type of PPPs' primary objectives of innovation advancement and fostering regional competitiveness are best managed in the proximal context of interaction between the public and private agents. 80 per cent of innovation-related PPPs of Swedish municipalities focus on policy delivery aspects. Strategy development and program delivery which aim at strengthening regional competitiveness and improving innovative capacity are only carried out under organizational PPPs. Operational tasks usually are jointly executed by public and private partners, the responsibilities of the private sector are widely scattered across various functions indicating that every launch of a new program activity requires specific functions performed by the private partner, for example, R&D, marketing or commercialization of the innovation outcome. PPPs in innovation project implementation are strongly commercially-oriented with research tasks falling mainly under the competence of the public sector partner(s) and commercial application of research results is the private partners' task. The majority of PPPs in project implementation are contractual, which can be explained by their degree of specificity and efficiency. Project implementation requires the achievement of a single, clearly defined goal through execution of inter-reliant activities; therefore,

the contractual links between partners enable appropriate resource planning and management control over the entire process of project implementation (Wysocki 2009).

Spatial aspects of innovation and PPP

Spatial aspects of innovation have become major issues in innovation theory, particularly since the discussion on the national innovation systems approach has emerged in the 1990s (Hassink and Ibert 2009). This approach claims that national patterns of production specialization are not caused by differences in factor proportions (as standard neoclassical theory would assume) but by differences in the knowledge bases across nations (Lundvall 1998). A major family of approaches emergent from the literature on national innovation systems, which is particularly relevant for the discussion of the role of PPPs as an instrument of innovation policy, has its focus on innovation at the sub-national level. This focus is reflected in approaches of economic geography and regional economics like ‘Industrial Districts’, ‘Innovative Milieus’, ‘Clusters’, ‘Learning Regions’, ‘Regional Innovation Systems’ (Rutten and Boekema 2007; Moulaert and Sekia 2003; Cooke 2002), and ‘Learning in space’ (Hassink and Klaerding 2012).

The regional dimension has also become highly relevant in practical innovation policy at all levels of government: at the supra-national level within the EU programs on regional technology plans (RTP), regional innovation strategies (RIS) and regional innovation and technology transfer systems (RITTS), and at the level of national states in programs to support innovation in regions (Dohse 2007). PPPs have emerged as a preferred mode of innovation policy delivery, particularly in research and development policies and in cluster policies (OECD 2011). In addition

to supply side measures, which are traditional in innovation policy, PPPs also include demand side policy elements as public procurement exerted by means of PPP can be targeted at stimulating technological innovation in the private sector (Edquist et al. 2000). PPP might serve as a policy vehicle both as contractual and organizational PPP and are likely to stimulate mutual exchange of knowledge between partners.

The use of PPP as an instrument of innovation policy and its concrete designs vary across regions and reflect different regional preferences, different regional structural characteristics, and differences in public entities' ability to incur debt. The major expression of regional preferences with reference to PPPs is that the use of partnerships – particularly those allowing participation in decision making by members of the civil society – are likely to increase the legitimacy of actions (McQuaid 2000). For each service, local and regional governments need to make pragmatic decisions based on their own circumstances within their constitutional boundaries. The principle of local self-government enables local and regional authorities to decide democratically the best means of delivering local public services, including decisions to use companies they own or control and contract based arrangements with private partners. Regional innovation policy in such circumstances means mostly moderating and stimulating processes and brokering ideas to set incentives for cooperation to the most important and competent agents in a region. A more decentralized approach to PPPs is expected to increase its focus and accountability and to involve agencies with a more narrow range of objectives (McQuaid 2000, 2010), to allow more targeted interventions (Silva and Rodriguez 2004), and to increase effectiveness and efficiency; accordingly, growth of PPPs should occur mainly at the local and regional levels (Carroll and Steane 2000).

Concerning the importance of regional structural characteristics it was found that Swedish municipalities' PPPs in the field of innovation policy cover a broad spectrum of industries both in manufacturing and services reflecting the respective region's economic structure. Furthermore, smaller public entities like municipalities might have an incentive to prefer PPPs over traditional public procurement because of limited access to credit and capital markets (McQuaid and Scherrer 2008).

An economic impact on innovation at the regional level arises also from PPPs that are initiated at the supranational level (e.g. the European Union's PPPs for advancing technology in the automotive, manufacturing and construction sectors; EU 2012b) or at the national level but which are implemented at the regional level (e.g. examples quoted in OECD 2011). Regional differences in implementation of central government-initiated innovation-related PPPs may be expected to occur both in centralist and federalist states. The impact of such programs differs across regions depending on a region's structural characteristics. As there emerge regional spillovers from decisions which are made outside of the region the choice of using PPP as a mode of delivery for public services therefore does not only reflect regional preferences.

Finally, PPP have an impact on regional innovation because of substantial fixed cost of negotiating contracts. Thus the efficient minimum size of provision are high, too, particularly so if the provision of large infrastructure and/or advanced technology is concerned. The regional economy might be negatively affected as small firms from the region tend to be crowded out by national or international contractors.

PPP – a systemic instrument of regional innovation policy

In an innovation environment which is characterized by a linear view of innovation PPPs' primarily role is to connect agents at similar stages of the innovation process (e.g. several research agents) or connecting agents in neighboring stages of the innovation process (e.g. basic research and applied research, government which is interested in a new technology and private partner(s) who deliver). PPP here is primarily a mode of 'producing' innovation. Further, within a linear model of innovation PPP can have a role in providing innovation related infrastructure, frequently used to foster innovation capacity for regional competitiveness and business growth.

After the rise of systemic approaches in innovation research the scope for PPP in innovation activity has widened. Innovation policy now does not only focus on individual organizations or on the relation between two organizations, but also at the system's level (Smits and Kuhlmann 2004: 11). Thus emphasis shifted from project and individual firm oriented support of innovation towards a more systemic understanding of the innovation process in the expectation that systemic instruments will improve the functioning of the entire (innovation) system (Wieczorek and Hekkert 2012: 74). For a PPP to unfold its systemic potential, proximity of agents is considered important because it is supportive to co-operation between innovation agents, such as universities, research institutions, innovating firms, and the public sector (Simmie 2005). Proximity facilitates the exchange of different forms of knowledge and expertise and the development of productive relationships; it is much more than merely a spatial or territorial concept. Boschma (2005) distinguishes five dimensions of proximity (cognitive, organizational,

social, institutional, and geographical) and shows that agents should seek an optimum, rather than a maximum of proximity on each dimension.

Systemic instruments of innovation policy ought to accomplish five functions (Smits and Kuhlmann 2004: 11ff): First, managing interfaces between the agents involved in the innovation process; second, building and organizing (innovation) systems; third, providing a platform for learning and experimenting; fourth, providing an infrastructure for strategic intelligence; and finally, stimulating demand articulation, strategy and vision development. By their very nature alone, PPPs have the potential to fulfill at least two functions of a systemic instrument of innovation policy: the management of interfaces and the building and organizing of innovation systems. PPP is fundamentally about cooperation building among agents involved in the innovation process, and addressing the build-up and strengthening of relationships between the public and private sectors. The other three systemic functions can be addressed by using PPP as a mode of policy delivery, too, particularly the ones which are concerned with strategy development (PPP can be a mode of policy delivery most of all if a bottom-up approach is applied) and with the stimulation of demand for goods based on specific new technologies.

The survey among Swedish municipalities suggests that PPPs may in fact be considered systemic instruments of regional innovation policy⁸: Only one out of 50 cases of PPP is reported that it does not fulfill any systemic function, while the other 49 PPPs perform at least one systemic function. On average a PPP in regional innovation policy fulfills approximately two (out of four) systemic functions, organizational PPPs slightly more than contractual type PPPs (2.29 vs. 1.95). Nearly 90 per cent of PPPs contribute to innovation system building and nearly 60

per cent to managing interfaces; 46 per cent of PPPs aim at developing strategic intelligence, demand articulation, strategy and vision development, and a quarter of all PPPs provide a platform for learning and experimenting. When the total amount of systemic functions performed by all PPPs is considered, approximately 40 per cent are related to innovation system building, 25 per cent to managing interfaces, another 25 per cent to strategic intelligence, demand articulation, strategy and vision development, and less than 10 per cent of systemic functions performed by PPPs are related to providing a platform for learning and development.

PPPs of Swedish municipalities aiming at *generating* innovation on average fulfill 2.45 systemic functions. This is well above the results for PPPs focusing on *exploiting* innovation (where the small number of cases makes the result less meaningful) and those combining generating and exploiting innovation. The different modes and intensities of private participation, as well as different degrees of uncertainty, which are inherent in every innovation process, imply differing properties of PPPs. All PPPs, which focus on generation *and* exploitation of innovation, fulfill a function in innovation system building reflecting the necessity to harmonize the interests and competencies of the agents who seek long-term economic relations that appear in the process of innovation generation on the one hand and cost advantages through exploitation of regional innovation potential on the other hand.

All forms of PPP in innovation policy concentrate on innovation system building, particularly so in innovation project implementation. PPPs used in *innovation program delivery* on average fulfill 2.53 out of four possible systemic functions which is far more than PPPs in innovation project implementation and, to a lesser

extent, in innovation-related infrastructure do. PPPs in innovation programs are preferred when management of independent subsystems and facilitation of bargains between various stakeholders ought to be offered. Most PPPs in *innovation project implementation* are carried out as contract-type PPPs; they are usually commercially-oriented with a relatively small number of stakeholders, and therefore only in a minority of cases managing interfaces is a systemic function to be performed within these projects. Platforms for learning and experimenting tend to be mostly created by organizational PPPs in innovation programs and projects.

Conclusions

Despite the increased use of different types of PPP in regional innovation policy, little scholarly attention has been devoted to the systemic characteristics of PPP in the innovation processes. In part this can be attributed to differences in definitions of PPP and the dissimilarity of application in innovation policy across countries and regions.

The systemic approach to innovation instigates complex interactions between the public and private actors as well as their external environments thereby gradually advancing partnership schemes. PPPs can meet most requirements of a systemic instrument of innovation policy, and our empirical evidence indicates that nearly all cases of PPP in regional innovation policy involve at least two systemic functions. Organizational PPPs are more likely than contractual PPPs to exert systemic functions, especially managing interfaces and acting as a platform for learning and experimenting. Generators of innovation carry out more systemic functions on average than exploiters or joint generators and exploiters of innovation.

For a better understanding of the role of PPP in regional innovation policy further quantitative and qualitative research is needed. As current empirical research consists nearly exclusively of case studies more quantitative research (covering more nations and larger samples of PPPs) would improve the generalizability of results. More detailed qualitative information should improve the understanding of internal power dynamics and changing dynamics of PPPs over time. Comparative analyses should identify the impact of macro-institutional influences (e.g. culture, socio-economic model, state structure, political system, macro-economic conditions, administrative history) and the impact of policies, regulation, and supporting institutions which are relevant for establishing PPPs in innovation policy⁹. From a policy perspective, a better understanding of whether PPPs can be realized in specific situations, and whether they can only be applied in certain situations and circumstances, is needed.

Notes

1 Support by the Humer Foundation is gratefully acknowledged.

2 Based on Wettenhall (2003), Hodge and Greve (2007: 545) mention ‘Mathew the private tax collector from the Bible; the private cleaning of public street lamps in 18th-century England; the private railways of the 19th century; or the fact that 82 per cent of the 197 vessels in Sir Francis Drake’s fleet, which successfully conquered the Spanish Armada in 1588, were private contractors to the Admiralty’

as early forms of co-operative partnerships and examples of innovation in organization structures.

3 For an overview of further definitions see OECD (2008: 15-17).

4 Accordingly, many left-wing municipalities in Sweden report strong involvement of the public sector in innovation-related PPPs going beyond financial aid, including also one or several other functions like planning design, research and development, but only rarely the commercialization of innovations, which is given to the private domain. In essence, PPP is then an improved method of service procurement by means of joint efforts between the public and private sectors which is more than just a new form of funding of public services. The role of the private sector is no longer to simply comply with the predefined set of criteria in service delivery but also to share responsibilities and risks in service operations and quality management and sometimes in the development of services.

5 Although this may be influenced by international financial reporting standards; see McQuaid and Scherrer (2010: 30-31).

6 For a survey of evaluations of contract-type PPPs see Hodge and Greve (2007).

7 This might also help explain why ex-post evaluations of PPPs based on information given by stakeholders usually indicate that PPP is superior to other forms of public procurement.

8 In this analysis, only four categories of systemic functions are used instead of five by Smits and Kuhlmann: the functions ‘infrastructure provision for strategic intelligence’ and ‘demand articulation, strategy and vision development’ are merged in this paper into one category ‘Strategic Intelligence, Demand Articulation, Strategy and Vision Development’. The other functions – managing

interfaces, innovation system building, and providing a platform for learning and experimenting – are as in Smits and Kuhlmann (2004).

9 See Verhoest et al. (2013) for PPPs in a non-innovation-policy context.

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