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Measuring effects of public procurement of innovation

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Abstract

Underway for quite some time now has been the discussion on using public procurement as a means to stimulate innovation. However - with some exceptions this has been mainly a conceptual discussion vastly surpassed a corresponding development of appropriate monitoring tools. Also, even if both qualitative and quantitative studies have been made, they tend to lack connection to the underlying mechanisms envisaged in the conceptual and/or case based literature. A challenge in this endeavour prevails in the nature of how public procurement of innovation works. Some of the effects rendered may not always manifest in ways that are easily quantified on aggregate levels. Other effects may emerge over time, as results of multi-causal effects, which may yet further impose measuring difficulties. Yet a further challenge consists of the uncertainties regarding to what extent the sometimes bold claims about the usefulness of public procurement of innovation are at all realistic and feasible in practice. After reviewing different currently available means to measure both public procurement of innovation measures, as well as public procurement of innovation, the paper outlines a case-based approach to measure public procurement of innovation.

Introduction

Since the Millennium Shift the idea that public procurement can be used as a way to stimulate demand has increasingly gained attention among policy makers. The most prominent protagonists in this policy development have been European policy makers and academics. For Europe public procurement of innovation has been identified as a central tool in the general ambition to promote demand-side policies in order to boost innovation in order to sustain competitive advantage in a global economy. But through the years this interest has emerged and evolved in more or less the whole world (OECD, 2011; UNOPS, 2014), even if the amount of efforts spent by national governments might vary between different countries (Lember et al., 2014). The development of policy has however vastly surpassed a corresponding development of appropriate

monitoring tools and “there is today no systemic unified mechanism to track the total amount of R&D procured by public entities in Europe, and even less information is available about the share of ICT-related R&D procurement” (European Union, 2014, p. 3). Similarly, OECD notes that “there is very limited evidence on what share of governments’ procurement budgets are dedicated to the development or adoption of new goods and services, let alone what is the overall impact of those purchasing decisions. This evidence gap is particularly relevant at a time in which several countries are considering the introduction of targets and complementary policies to promote the use of procurement as an innovation policy tool.” (Appelt and Galindo-Rueda, 2014, p. 3.). In other words, even if both qualitative and quantitative studies have been made both in the past and more recently that supports the general claim that public procurement can indeed generate demand for innovation, measurement concerning the link between policy and realised public procurement of innovation is in principle a completely unexplored area.

The purpose with this paper is therefore to explore the possibilities for measuring the effects of public procurement of innovation and based on such an analysis develop a set of indicators to be used for monitoring public procurement of innovation outcomes. The research question addressed is formulated as follows. How can the effects of public procurement of innovation be measured?

Potential ways of measuring public procurement of innovation

An initial issue to settle is how innovation should be understood, which might not necessarily be a straightforward task. As a useful starting point would nevertheless be to incorporate any kinds of Schumpeterian innovations i.e. new combinations manifested as the introduction of a new good, a new method of production, the opening up of a new market, or the use of a new source of supply of raw materials or new ways of organising industries (Schumpeter, 1934). Kotsemir and Abroskin (2013) note that the notion of innovation over the years has been incorporated in many different contexts outside scientific realms, in policy, marketing, used as a metaphor, slogan or buzzword, resulting also in great variation of its use. This might create some problems. One possibility is to define innovation in relation to the local context, i.e. with reference to the Oslo manual, and thus distinguish between innovations new to the firm, not new to the firm, new to the public authority and not new to the public authority (Appelt and Galindo-Rueda, 2014). Studying public innovation in general, Kattel et al. (2013) make the point that public innovation might not follow the same evolutionary mechanisms as would private firms. Rather, in order to understand public innovation “we should try to focus on evolutionary processes within public sector that originate from logics of public sector and pertain to such phenomena as power, legitimacy, trust, etc.” (Kattel et al., 2013, p. 7). Drawing on interviews with representatives from public agencies, Bloch and Bugge (2012) define four relevant and adequately covers the types of innovation that applies to in the public sector; product innovation, process innovation, organisational innovation and communication innovation.

There is a range of thinkable ways of measuring public procurement of innovation which essentially can be populated in a quantitative- qualitative spectrum. To the quantitative end belong surveys like different types of innovation scoreboards, which apply different types of indicators. Indicators used by the Innovation Union Scoreboard fall into three broad categories, enablers, firm activities and outputs (Adam, 2014). Indicators under the enablers concerns human resources, e.g. the number of doctorate graduates in relation to the whole population, or other measures of education levels. Other indicators rely on publication performance and e.g. R%D expenditure. Firm activities gather information about R&D expenditure in the business sector or the degree to which different IPR schemes are utilised such as patents or trademarks. Under the outcomes category are information gathered that concerns medium of high-tech exports or employment in knowledge-intensive sectors. A major problem with these types of measuring is that "...quantification and use of sophisticated statistical methods and mathematical models in itself and a priori do not enable the attainment of scientifically relevant insights. These methods and models are useful as research tools, yet they cannot be taken as a sufficient and necessary basis for the production of valid empirical evidence and a theoretically relevant interpretation of this evidence. They cannot be applied in a routine and simple way and cannot be a substitute for theoretical elaboration. The social sciences need a more integrated and deliberative methodological approach." (Adam, 2014, p. 6).

Another form of quantitative surveys relies on indicators developed by using input from experts. One example is the global competitiveness report issues by the World Economic Forum w (Schwab, 2014). Out of a range of different things this survey asks national experts, to what extent government purchasing decisions foster innovation. The outcome is a ranking list ordering the 144 countries included in the survey based on the responses. Another example of a survey relying on collected opinions focusing in public procurement specifically is Uyarra et al., (2014) which identifies lack of interaction with procuring organisations, over-specification (as opposed to the use of outcome-based specification) and poor management of risk, as the main barriers preventing public procurement of innovation. The latter, one could argue, is more adequate as the sample used consisted of responses from managers and leaders in firms with a substantial track-record as public suppliers. What neither of these studies can provide information about is to what extent the result draws on prejudice or actual experience; or to what extent a single bad experience is given un-proportional weight. In Adam's analysis of quantitative studies these problems generates a debate about positivism, and the current preference for quantitative research, where qualitative approaches are discarded as 'anecdotal' or 'unstructured'. "Positivism somehow presupposes that data are good quality and adequate if they can be quantified, and bypasses the problem of context by dealing with the multitude of variables and correlations between them." (Adam, 2014, p. 6).

Trochim, writing about evaluation policy, uses the notion substantive policy to be understood as those policies that "get translated into operational objects and practices" (Trochim, 2009, p. 15).

One such substantive policy for public procurement of innovation are the Millennium goals that were set for the EU to increase its R&D investments to raise from 1.9% of EU GDP in 2000 to 3% of EU GDP in 2010, in order to become the most competitive and dynamic knowledge-based economy in the world. A few years later, the connection to public procurement was made explicit, as public procurement could provide the necessary demand for R&D and innovation (Rolfstam, 2009). Trochim (2009) then turns to the programs, 'operational objects and practices' emerging from the substantive policies. For public procurement of innovation there are quite a few such examples, for instance the lead market initiative, or the development of pre-commercial procurement (PCP). For lead market initiative public procurement of innovation was given a central role emphasising the importance of "[m]obilizing public authorities to act as 'launching customers' by promoting the use of [public procurement] practices supportive for innovation..." (European Commission, 2007a, p. 7). Pre-commercial procurement (PCP) was introduced as an "approach to procuring R&D services" (European Commission, 2007b), aiming specifically to bridge the gap between scientific knowledge and the market through application of public demand-pull.

Interestingly, Trochims (2009) interests concern evaluation of operational objects, practices and programs that come out of the substantive policies, not the substantive policies themselves. The implicit evaluation and measurement objective exists in this perspective in the relation between the substantive policies and lower operational levels, without taking into account whether or not the substantive policies are valid. For the purpose here, it should be noted that the literature offers examples of attempts that could be considered to make judgements to what extent the substantive policies underscoring the use of public procurement of innovation. Examples of such more recent quantitative studies have compared different innovation effects suggesting public procurement and university spillovers to be more important than other measures such as regulation and public funding of innovation projects (Aschhoff and Sofka, 2009). Similar results have been found by drawing on data collected from EU Member States, Norway and Switzerland (Guerzoni and Raiteri, 2012). These authors however also find that biggest impact is achieved with policies considering the simultaneous application of R&D subsidies and public procurement. There is also a range of case studies reporting on how public procurement has helped to stimulate innovation (c.f. Rolfstam, 2013). The problem with these studies, from an evaluation perspective is however, that they scrutinize real occurring phenomena as they happened, without much attention given to the role of policy and to what extent policy could actually help to stimulate new occurrences of, what in these studies tends to be spontaneous instances. In other words, although these studies warrants the conclusion that public procurement may create demand for innovation, they do not provide sufficient evidence for the general claim that public procurement of innovation policy do.

One approach to measuring public procurement of innovation policy understood as operational objects, practices and programs, is different attempts to benchmark the level of national implementation of concrete programs as responses to EU policy. For instance, based on a surveys

distributed to national representatives from the EU Member States and Associated Countries, the European Commission tried to benchmark the extent to which pre-commercial procurement (PCP) was implemented. One of the outcomes was a display in which countries were grouped into four categories; Awareness Raising/ Exploring Possibilities, Working on framework, Framework identified, pilots started (Bos, 2011). Drawing mainly on secondary data, Izsak and Edler (2011) conducts a similar exercise addressing the implementation of demand-side policies. Also here countries are grouped into categories depending on their relative performance in terms of policy implementation. These categories are 'Strong policy discourse and experience', 'Relevant policy discourse and experimentation', 'Limited policy discourse and/or action'. Maybe a comment to the accuracy of these kinds of desk studies, or at least a side-remark in general would be that the corroborative evidence putting Denmark into the for-runner category 'Strong policy discourse and experience' is its implementation of public-private partnerships. This is indeed a very established set-up in the Danish context, but characterized in particular for its lack of demand aggregation, as these projects to large extents involve learning and pre-commercial testing of supplier-side innovation typically not leading to a commercial procurement (Rolfstam and Petersen, 2014). This means that this instrument could hardly be used as indicator of well-developed demand-side innovation instruments.

The point to make here is not to degrade these benchmark studies. They are certainly useful, in particular to create incentives for increasing efforts among currently 'underperforming' domains. It is nevertheless important to be aware of the challenges such studies always have to live with. "Researching performance information is difficult because the concept may refer to very different realities across organizations. Using very narrow conceptions of performance information, however, forces researchers to analyse organizations that are very similar, or that operate in a single jurisdiction" (Hammerschmid et al., 2013, p. 262). Thus, one generic limitation these kinds of surveys suffer from is translation problems, i.e. uncertainty when national respondents try to fit into an internationally surveys, incompatible elements of their local contexts. There is also a possibility that alternative but functional approaches developed in a specific endogenous context may reduce the score for a certain country, only because the particular approach is not regarded in the survey. Furthermore, even if these surveys would provide an adequate account of the current policy development, they tend to say little about the actual outcome, i.e. if the measures taken actually render innovation.

Towards an alternative approach to measuring public procurement of innovation

It has been proposed that public procurement of innovation should be understood as a phenomenon that requires a multilevel institutional analysis (Rolfstam, 2012; 2013). For Europe, the main policy drivers as well as legislative authority prevails on the European level. The substantive policies are developed as European innovation policy. EU Member states also have to transpose into national law the legislative framework in the form of the EU Directives on public procurement. Such implementation follows the subsidiarity principle which means that the way

the directives are implemented is determined by each national legal authority. So, even if the Directives should be implemented national-specific differences may exist. The same goes with policy implementation. Then there are other levels, in particular public agencies or even public procurement units (to the extent there exist such units) and the level of practice, that each may determine what kind of public procurement behaviour actually manifested in practice. These are all elements that make policy making as well as measuring the effects somewhat complex. "In complex organizations or systems it is likely that policy making will itself be a hierarchical process with different levels of the hierarchical organization developing different levels of policy. High-level policies (outer circles) would be specified at the highest level of the organization, and responsibility would be delegated to subunits that inherit with those policies the responsibility for determining more detailed policies and ultimately evaluation practice." (Trochim, 2009, p. 26.). In some situations public procurement may not be the most commonly used tool for public sector innovation in general. Following a study of public innovation (i.e. not only innovation generated with public procurement) in the Nordic countries, the most common way of innovating was in-house development (Bugge et al., 2011).

The general point to make is that reality is complex and context specific, which creates challenges when it comes to policy making as well as measuring. It is this reality the different measuring approaches reviewed above struggle with. Also, it is very hard to forecast when public procurement of innovation takes place. It is often the resultant of different factors such as endogenous demand, availability of technology, funding and an array other resources. There are also situations where it would make little sense for a public actor to engage in public procurement of innovation at all. A large investment in new technology may not typically occur every year in a particular context, but will be followed by a "lull" where spending activities may be limited to operations and possibly incremental improvements. A new public procurement of innovation project will not become relevant until the end of the life-cycle of the old technology. These lulls captured in a survey that collects data on public procurement of innovation without taking into account context will reduce the scores for the particular context, although it might in reality be an effect of perfectly adequate procurement behaviour.

The measuring approach proposed here is therefore based on actual cases, and the elements to be measured should be connected to what extent these enabled or hindered the success of a specific project. A central construct in this sense is the public procurement of innovation system. It has been proposed that a procurement system is good or sound if two conditions are satisfied (OECD, 2012)

- Existence of decision centres setting possible multiple and non-contradictory objectives, and periodically assessing whether the system works coherently with those objectives.
- The system is built on a set of processes that maximize the likelihood of reaching the system's objectives while minimizing the use of resources.

The essential aim would thus be to evaluate how this system performs in a given public procurement of innovation project. Examples of entities included in a procurement system for a country would be public agencies involved in monitoring procurement activity and international developments in law or in best practice; the court system, and public procurement departments on different levels and sectors; and public agencies responsible for a policy domain where public procurement is envisaged as a useful tool for policy implementation. Viewed in the framework applied here becomes public procurement a system where achieving value for money in procurement processes is not the only aspect that should be considered in evaluations. To the extent a certain public procurement system is performing according to set expectations relates both to efficiency and to other policies or strategies that might go beyond mere efficiency.

This public procurement system should however not be defined in an absolute way but in relation to the specific context. If a specific (attempted) public procurement of innovation project occurs in a municipality setting, the components to be measured concerns probably primarily the interaction that takes place with municipality procurers and suppliers and stakeholders located in the neighbourhood. Another project may take place as a cross-border procurement project drawing on different international funding sources, and requires a corresponding development of variables to be measured. Then, tentatively, it would be possible to aggregate data based on cases occurring on different institutional levels, and thereby capture also an aggregated view.

What would be used as an argument in favour for such a measurement set-up is that there appears to be an institutional explanation for success in public procurement of innovation and that many of the determinants rendering success prevail on lower institutional levels (Rolfstam, 2013; table 1). These could be used as a theoretical case to compare actual outcomes with. For instance, public procurers need to possess skills related to the procurement procedures and procurement law, the ability to make technical specifications, and general management skills. It usually requires a significant level of tacit knowledge and experience to apply the rules in the specific context. Technical competence for specification refers to the ability to know and formulate what is to be procured preferably in such a way that also solutions the procurer was not initially aware of are allowed to be submitted. Cooperative PPI in turn raises a need for skills able to coordinate and negotiate demands stemming from different collaborating rationalities. The need for skill-upgrading came also forward in a recent Swedish public inquiry that concluded that the negligence of using public procurement as an innovation policy tool could partly be explained by the lack of available academic education on the topic (SOU, 2013).

Table 1: Success factors and to what extent they are within range of public procurement training. Adopted from Rolfstam (2013)

Success-factor	Description
Expertise on public procurement procedures and public procurement law	Understanding how to apply procurement procedures, award criteria and other activities regulated by law.
Technical competence for specification	Possess sufficient competence to know what to procure.
Coordination for co-operative procurement	Coordinate demand in projects with several customers.

General project management skills	The ability to coordinate information, stick to agreed plans and meet deadlines.
Allocation of Resources	Non-routine allocation of resources necessary for time-consuming search and for setting-up and manage projects.
Political Support	Support from political leadership.
Commitment from other institutional actors	Support not only from contractors but also other stakeholders affected by the project outcome.
Appreciation and understanding of the procurement rules	Supplier understanding of the peculiarities associated with dealing with a public customer.
Technology Champions	The availability of a person or a group of persons who champions the introduction and diffusion of the procured item.

Some of these success factors, for instance skills for specifications as well as management skills are controllable in the sense that they can either be developed by individuals or be allocated to a project by appropriate recruitment. Some success-factors are however external to the actual procurement context. Sometimes success depends on commitments from actors other than those formally included in the contract, e.g. future users, operators and suppliers to the procured system once in operation. Achieving such commitment is partly controllable if the procurer manages the project well, but the decision to become committed prevails with the external stakeholder. Other success-factors are political support and the allocation of resources, which underline that also other categories of staff within the public sector should be considered as potential targets for skill upgrading in PPI. Two final and sometimes neglected success-factors are the appreciation of the procurement rules in general and the roles of technology champions. The former stresses that not only the procurer's side needs to appreciate the peculiarities of public procurement; also suppliers need to possess the knowledge and skills required to do business with a public client and understand relevant rules and procedures. The latter stresses that uptake and actual use of a procured innovation may require e.g. user training and promotion initiatives made, for instance initiated by technology champions.

By applying the approach described above, i.e. by taking as starting point the actual occurrence of cases, would take into account endogenous contexts. It would also capture problems to the extent they actually evolved. Thinkable variables could correspond to the success factors listed in table 1, i.e. what the Expertise on public procurement procedures and public procurement law sufficient for the given situation; was there sufficient technical competence; to the extent required, did procurers master the coordination etc. The outcome of such evaluation would then be context specific, and probably make more sense than an international survey based on national experts stating to what degree a country applied public procurement of innovation in practice.

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