

# Fostering innovation through public procurement: rationale, implementation and best practices in Italy and Europe

Andrea Petrella\*

## Abstract

In the last decade, the European innovation policy has been increasingly characterized by the strategic use of public procurement as a mean to jointly fulfill complex societal needs and spur innovation on the firms' side. This approach may be regarded as an attempt to complement the traditional supply-side policies, often accused of crowding out private investments, with more effective demand-side ones. This work is intended to review the economic literature that triggered this change in perspective, as well as to describe the procurement practices that have been designed to turn these economic principles into a tangible innovation strategy, with a special focus on pre-commercial procurement. Besides discussing definitional aspects, functioning mechanisms and strengths of these new instruments, the paper highlights some of the most critical points that may dampen the innovation potential of these tools. Moreover, it presents some successful pre-commercial procurement applications in a selected sample of European countries, and outlines the state of the art of innovation-oriented public procurement in Italy.

## 1. Introduction

In its most general definition, public procurement encompasses the entire set of processes and operations by means of which an institutional buyer (called a *public procurer*) purchases goods or services from private suppliers, with the ultimate goal of fulfilling human, social and – broadly speaking – public needs in the most efficient way. Nonetheless, public procurement has long been used to target additional goals besides the mere satisfaction of public needs, such as stimulating demand, creating employment and offsetting negative cyclical episodes (Edler *et al.*, 2005). Among the desirable byproducts of the activity of procuring, its potentially beneficial effects on innovation began to receive increasing attention, leading to the adoption of approaches that see public procurement as an additional innovation policy tool.

Besides traditional procurement activity, which may in itself be capable of indirectly fostering innovation,<sup>1</sup> alternative public-procurement strategies have been introduced to

---

\* Bank of Italy Regional Economic Research Department, Venice. The opinions expressed in this paper are those of the author, and do not necessarily reflect those of the Bank of Italy.

<sup>1</sup> Cabral *et al.* (2006) single out three channels by means of which regular PP may indirectly affect innovation: (i) by enlarging the size of the market for new goods, thus providing firms with the necessary incentives to invest in R&D; (ii) by fostering the adoption of new standards; and (iii) by acting on the competitive structure of the market. For a broader discussion of direct vs indirect effects of PP on innovation, see Cave and Frinking (2007) and Uyarra and Flanagan (2010).

encourage institutional buyers to engage in the direct procurement of innovative goods, and even of specific R&D services. The purpose of this paper is to present some of the leading direct innovation procurement practices adopted by European policy makers, along with a review of the theoretical and empirical literature that inspired them. Focusing in particular on pre-commercial procurement practices, the paper then describes some cases of successful application of pre-commercial procurement in a selected group of European countries, and ends by outlining the state of the art in Italy.

The idea of using public procurement as a vehicle for innovation is rooted in the recognition that today's societies are increasingly complex, integrated and dense, and that these conditions almost certainly give rise to sophisticated needs, whose fulfillment may not be viable merely by purchasing particular goods or services "off the shelf", for the simple reason that such products may not exist on the market yet. These cases represent an opportunity for the public procurer to engage actively in innovation, acting as an interface between public needs and private agents and thus spurring the adoption of innovative solutions on the firms' side.

From the point of view of innovation policy, this change in perspective may be regarded as an attempt to complement traditional *push* strategies (such as R&D incentives) with more effective *pull* ones. While in the former approach the drive to develop and introduce new products on the market lies with the firm, which tries to foresee the evolution of demand or to "create" a need for new products on the consumer side, in the latter it is public demand that triggers innovation by setting targets, standards and requirements for the producers. In this context, public procurers' role should be to rationalize and synthesize the needs of an extremely fragmented demand side and to bring them to the market.

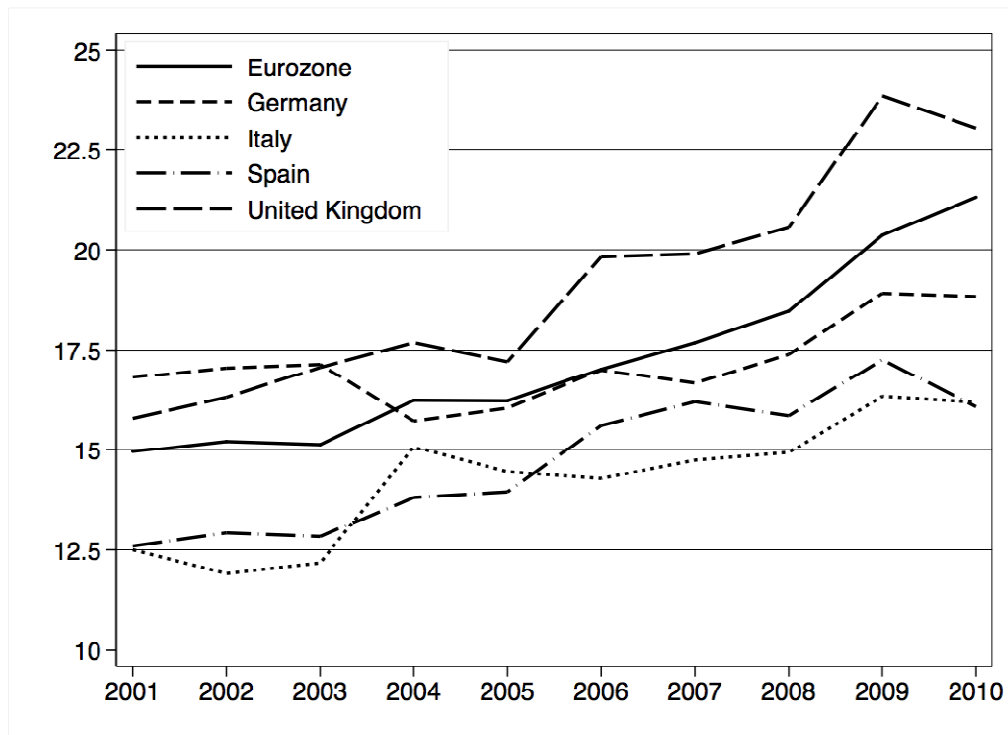
A virtuous notion of "demand-pull" effect was introduced by von Hippel (1978, 1978b) and Mowery and Rosenberg (1979) in the late Seventies. Another strand of the literature explicitly targeted the use of procurement as an innovation-triggering tool, as opposed to R&D subsidies. Rothwell and Zegveld (1981) showed that procurement was more effective in promoting innovation than the traditional supply-side policy instruments. Geroski (1990) analyzed the introduction of a set of successful innovations thanks to public procurement (computers, semi-conductors, massive transport aircraft, etc.); the author argued that procurement might well foster innovation, and sketched the necessary conditions for an innovation-oriented procurement strategy to succeed. Among these, he stressed the need for a forward-looking vision to single out the problems to be tackled, a prospective market for the innovative product, and the enforcement of a competitive environment for the suppliers; he even highlighted the critical points that may lead to a poor performance of the procurement strategy, emphasizing the negative effect of protectionism and state aid directed at specific industries. As will be seen in the following section, all these points are among the building blocks of the European

framework for innovation-oriented public procurement. More recently, Aschhoff and Sofka (2009) investigated the effect of public procurement on firms' innovative performance from an empirical standpoint, assessing its effectiveness compared with traditional supply-side policies. The core data used in the paper comes from the Mannheim Innovation Panel survey on the innovation activities of German firms. The dependent variable is the share of turnover triggered by the introduction of products representing a novelty in the firm's reference market. The independent variables of interest are a set of dummies containing information on the innovation-related public policies that the firm had benefited from; together with public procurement (further distinguished in defense and administration procurement); these policy instruments include changes in specific regulations, the existence of a university/research centre nearby, and explicit public R&D funding.

It needs to be stressed that the firms involved in public procurement were a small fraction of the sample (around 5%), while those that benefited from R&D funding were the largest category (33%). Using these data, the authors estimated the effect of these policy tools on innovation (as measured by the share of turnover with market novelties). In a second stage, the authors assessed whether these effects were driven by particular characteristics of the firms. They found that procurement and the presence of a domestic university/research centre were the only policy tools that generated a positive effect on the firm's innovation performance; interestingly, only administrative procurement entailed a positive and significant effect, while defence-related procurement did not. They also found that the presence of a nearby university affected all firms equally, irrespective of their observable characteristics (size, sector, location, etc.). On the contrary, public procurement appears to have been more effective for smaller firms, and for firms operating in depressed areas, or belonging to technological service sectors. According to the authors, public procurement brought the most benefit to firms with limited resources, because they may have used public procurement to escape binding credit constraints or periods of demand shortage to take advantage of the unexpected profits arising from the public procurement initiative and afford new investments for innovation.

The insights arising from the academic debate have been further reinforced by the narrative evidence concerning the successful experiences of some US Agencies, which have exploited the public-procurement framework to achieve substantial technological advances (the best-known examples being NASA and the US Department of Defense).

**Figure 1.** Total public procurement as a share of GDP



Source: based on Eurostat data.

Note: The Eurozone data were calculated as an average of the public-procurement shares of the eleven countries that joined the Eurozone on 1 January 1999.

Nonetheless, European policy makers have long been reluctant to incorporate public procurement as one of the building blocks of EU members' innovation policies (Edler and Georghiou, 2007). Starting in the early years of 2000, however, renewed interest in the use of demand-side instruments to foster innovation re-emerged in the EU, culminating in the so-called Aho Report (Aho *et al.*, 2006). In this publication, the authors highlighted the ineffectiveness of the traditional supply-side policies alone (basically R&D incentives), advocating – among other instruments – the use of public procurement as a driver of innovation-oriented demand.<sup>2</sup> The ultimate acceptance of this approach among the EU innovation strategies occurred in a Communication of the European Commission (2007) and from the inclusion of public-procurement policies in the Europe 2020 agenda (European Commission, 2010), which states:

From 2011, Member States and regions should set aside dedicated budgets for pre-commercial procurements and public procurements of innovative products and services.

---

<sup>2</sup> The Report even suggested some of the most important areas for the application of this new set of innovation-fostering strategies: e-Health, Pharmaceuticals, Energy, Environment, Transports and Logistics, Security and Digital content.

[...] This should create procurement markets across the EU starting from at least €10 billion a year for innovations that improve the efficiency and quality of public services, while addressing the major societal challenges.

The volume of resources that can potentially be allocated to a strategic public-procurement approach is considerable. As a matter of fact, modern societies spend a considerable amount of public funds on public procurement: for example, Figure 1 shows total public procurement as a share of GDP for some of the largest EU countries and for the Eurozone as a whole. The selected countries spent between 15 and 25 per cent of their GDP on public procurement in 2010. Italy and Spain spent the smallest shares (around 16 per cent in 2010), although, like the other countries they display a rising trend over the entire decade.

Since the resources potentially employable in a more attentive public-procurement strategy are very large, the next step is to describe in greater detail the actual procedures that the public procurer has at its disposal. The following section addresses this point, by broadly defining the features of two of the public procurement schemes most debated among European policy makers, and by highlighting the challenges that they pose to public procurers.

## 2. Definitions and concepts

Public procurement can be classified into a wide array of varieties, according to the nature of the final user, the features of the procured product, the possible cooperation with private procurers, etc. From the point of view of its innovation potential, public procurement can be further classified according to the type of innovation pursued (radical, adaptive, incremental).<sup>3</sup>

The remainder of the paper will not be devoted to a detailed analysis of the single varieties, but will consider two of the most widespread practices of direct public procurement of innovative solutions. Their importance in today's debate is considerable, since in the last decade European institutions have focused on these procurement schemes as a possible means of switching from a *push* to a *pull* innovation strategy.

We shall define them separately.

**Public procurement of innovation (PPI)** - The object of such procurement is a *new good or service*, especially designed to address particular societal or public needs. In other words, the public procurer issues a tender, specifying the *functions* that the innovative product is intended to fulfill. Note that, while this setup preserves the original features of “regular” public

---

<sup>3</sup> For a broader discussion on the classification of innovation-oriented public procurement, refer to Edler and Georgiou (2007) and to Edquist and Zabala-Iturriagoitia (2012).

procurement, the output of this form of procurement is now intimately linked with the production of innovative solutions.

Public procurement of innovation is more frequently used when the object procured is deemed to be so close to the current technological frontier that its production is within the firm's reach without an excessive R&D effort. Public procurement of innovation will thus usually be associated with incremental and adaptive advances, rather than with radical ones.

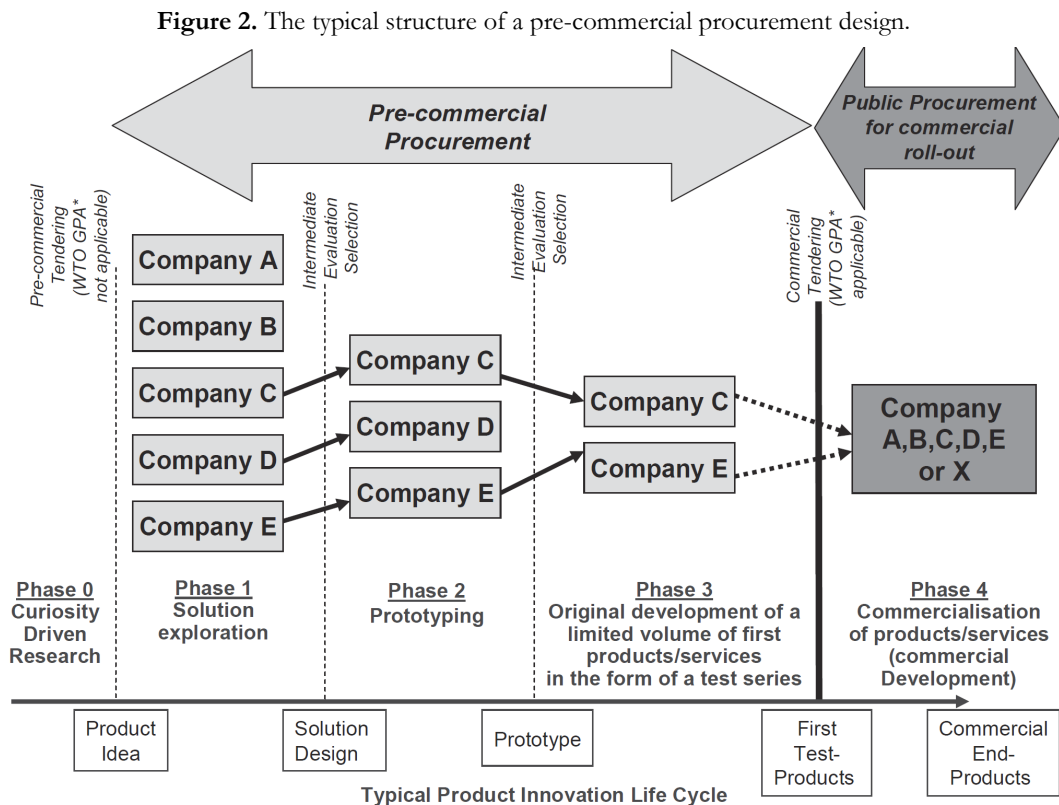
**Pre-commercial procurement (PCP)** - The classification of this public procurement-activity is slightly more complex than that of the previous one. Its final output is not a product (either existing or innovative), but a *research and development service*. Hence, this particular instrument targets a form of innovation that is more ambitious and disruptive than public procurement of innovation, capturing all the cases in which a substantial amount of R&D is still needed to obtain a final product or service. Once more, at the root of the pre-commercial procurement innovation strategy lies the public procurer's ability to highlight the most pressing societal needs; however, in this case the public procurement activity only seeks to create the conditions for the fulfillment of such needs. By definition, pre-commercial procurement is limited to the "pre-commercial" phase of an innovative product's life cycle, while the commercialization phase is left in the hands of private firms and agents. This does not rule out the possibility (i) of a prototype or a test series being produced during the pre-commercial phase; and (ii) of the public procurer being among the purchasers of the commercialized good/service (or even the only purchaser, in the event of an exclusive development contractual clause<sup>4</sup>).

The basic functioning of the typical pre-commercial procurement scheme is well described by Figure 2, which is included in the 2007 Communication of the European Commission and lays down the guidelines for the application of pre-commercial procurement in European member states. From the very beginning and throughout its implementation, the whole pre-commercial procurement process must be characterized by openness, transparency and competition between the participating firms. The first step is a public call, in which the public procurer invites a set of companies to develop innovative solutions to target a selected issue. From this moment on, each of the participating firms will start developing its own project in competition with the others. The public procurer's role will be to evaluate the different projects and select the best ones. In order to ensure a real-time interaction between public procurers and participating firms, the selection process is organized as a "stepwise process": different intermediate evaluations should be placed in correspondence to the various R&D phases. These

---

<sup>4</sup> European Commission (2007) contemplates the case in which a public procurer may want to reserve an exclusive use of the procurement output. This clause applies, however, only in some peculiar cases where the exclusivity can be justified (national security, defense, etc.). For a more detailed description of exclusive development, see European Commission (2007), p. 5.

intermediate evaluations should (i) eliminate the less promising projects and (ii) provide the surviving firms with feedback and guidance on future developments. The pre-commercial procurement process ends with the production of a limited volume of products (test series). The European guidelines state that at least two companies must be retained at the end of the selection process, in order to ensure the existence of a competitive market once the developed products/services enter the real commercialization phase (Phase 4 in Figure 2).



GPA = Government Procurement Agreement

Source: European Commission (2007).

This mechanism brings significant advantages, since it allows the burden of risky and ambitious R&D investments to be shared between the public sector and private firms. At the same time, it involves the sharing of any benefits arising from a successful product/service brought to the market: the firms are rewarded with increasing market shares and revenues, while the public benefit is not limited to the efficient satisfaction of the targeted need, since the whole pre-commercial procurement process also generates innovation as a byproduct. From the European legislative perspective, this framework entails another significant advantage: the competitive and transparent nature of the process rules out the possibility of granting state aid through the procurement channel.

Notwithstanding the great interest that pre-commercial procurement has raised among European policymakers, a part of the literature is somewhat skeptical about its nature of demand-side policy. As an example, Edquist and Zabala-Iturriagoitia (2012) state that:

[...] no actual product development and no buyer of such a product are involved in PCP [i.e. pre-commercial procurement]. The product prototype that may result may be possible to commercialize or not. It is a matter of R&D funding; i.e. it is a supply-side policy instrument in relation to innovation. Hence, PCP is something very different from PPI [i.e. public procurement of innovation], which is a dedicated demand-side policy instrument in relation to innovation. Therefore, PCP cannot be considered as PPI in our sense of this term, since this largely includes instruments other than public R&D funding. PPI and PCP may thus supplement each other as parts of a policy-mix, but they should not be mixed up. PCP may be an important preparation and specification phase before a PPI process is started.

This suggests that defining pre-commercial procurement as a demand-side policy may be incorrect. Nonetheless, it undoubtedly represents a significant novelty in the toolbox of European innovation policies: to start with, it can be regarded as a strategic and strongly market-oriented implementation of traditional R&D funding. Moreover, the hypothesis of using pre-commercial procurement as a complement of public procurement of innovation may create the conditions for a coordinated and fully monitored process of innovation creation.

Having said that, both public procurement of innovation and pre-commercial procurement are not free of problems, which have been thoroughly examined in OECD (2011), a policy report discussing the scope of application for broadly-defined demand-side innovation policies, including public procurement.

As mentioned in the previous section, European policy makers have taken the successful experiences of some US Agencies as a model in structuring their innovation plans. One frequently cited source of inspiration (Rigby *et al.*, 2012) is the US Small Business Innovation Research programme (SBIR), whose aim is to spur small domestic firms to engage in Federal R&D projects and whose mechanism closely resembles the pre-commercial procurement process described above.<sup>5</sup> There are a number of reasons, however, why the kickoff of these new European policy tools may fail to obtain the satisfactory results that the SBIR programme has achieved:

---

<sup>5</sup> Many studies have assessed – both from a narrative and from a quantitative point of view – that the SBIR program has fostered the creation of new firms and has benefited employment and growth in local economies (see the periodic reports by the US National Research Council), but a number of authors claim that the results of the program are not entirely satisfactory. Wallsten (2000), for example, points out that SBIR awards have not generated employment within firms, while they have crowded out private money that would have been used for R&D in the absence of the SBIR funding.



1. public procurers should have a *vision* of the future: they should be able to highlight the most pressing public needs and imagine the future development of society;
2. public procurers should have adequate skills and capacities to judge and select the most promising, market-oriented and innovative projects among the competing ones.

Both of these points require highly-skilled and high-level personnel in charge of driving the public-procurement process, and it is reasonable – especially at lower levels of government – to expect that European public procurers may fall short of the level of human capital needed to fulfill these tasks. With the words of OECD (2011): “A demand-side innovation policy [...] (e.g. through procurement, regulation, setting and certifying standards) [...] puts greater pressure on [public administration] to play a leading role in driving innovation. This requires investment in skills and competencies in public administrations, as well as changes to organization and culture to allow the public administration to play its role as an innovation champion”. This view appears even more valid once it is acknowledged that European policymakers have imagined a very diversified structure of public-procurement agencies, encouraging local authorities to play the role of public procurers.<sup>6</sup> On the contrary, the SBIR programme acts as an interface between small innovative firms and at most twelve US Federal Departments and Agencies,<sup>7</sup> whose composition of skills is much better structured to cope with a complex innovation-oriented public-procurement strategy.

The involvement of local authorities may also entail other pitfalls. On the one hand the fragmentation of resources across many small procurement units may dampen the scale effects associated with innovative procurement. On the other, the involvement of a wide variety of agents should be accompanied by a strengthening of coordination and joint strategic planning (Uyarra and Flanagan, 2010), in order to avoid resource dispersion on duplicated projects undertaken at different governmental levels.

A third point should also be noted: innovation is a risky activity and its success relies on a sequence of path-breaking decisions.

Risk aversion is a distinctive feature of public administration and may distort the decisions of the public procurer and lead to the undertaking of more conservative solutions, thus dampening the innovation potential of the procurement initiative. Again in the words of OECD (2011): “Many structural features of government inhibit risk taking and innovation. These barriers include cost-based budgeting and departmental structures, as well as audit and accountability processes. They create an environment in which uncertainties are significantly reduced, but also one in which the space available for innovation is limited. [...] Innovative procurement projects

---

<sup>6</sup> On this point, OECD (2011) states: “At the local level in particular, where the procurement system is decentralized and professional procurers are few, the lack of skills for innovative purchasing is an important challenge”.

<sup>7</sup> The full list is available at <http://www.sbir.gov/about/about-sbir>.

also entail risks that tend to increase with the degree of innovation involved. Pre-commercial public procurement in particular involves significant amounts of R&D and can present considerable risks so that few companies and public institutions may be willing to tackle such projects". The successful implementation of innovation-oriented public-procurement strategies may thus require both a cultural and an organizational change within the public administration: once it is acknowledged that the appointed public procurers have the required vision and skills to govern a complex innovative public-procurement process, they should be encouraged to take the necessary decisions to engage in ambitious innovative efforts, instead of acting in the less risk-averse fashion; they should also be provided with the proper tools and incentives, which implies that both the budgetary constraints and the criteria of evaluation of public procurers should be modified accordingly. From this point of view, the approach of many European member countries to innovation-oriented public procurement appears to be more conservative than that of the US case, where the most significant technical advances (such as the achievements of the NASA and the Defense Department) have been fostered by a fair amount of discretion in the disposal of the available funds.

Having defined the new frameworks through which public procurement is intended to trigger innovation, and highlighted their strengths and limitations, the next section will present some real-life cases of innovative solutions achieved by means of public-procurement activities in Europe, with a special focus on the state of the art in Italy..

### **3. Pilot cases of innovation-oriented public procurement in Europe**

Together with European policy makers' endorsement of public-procurement instruments as one of the building blocks of the European innovation agenda, some EU countries have started to design the domestic mechanisms for applying these new policy tools and actually launched some public-procurement initiatives.<sup>8</sup> While cases of public procurement of innovation have emerged more frequently – though still rarely – in the innovation strategies of the EU countries, proper pre-commercial procurement activities have been undertaken in only a group of countries, where they have mainly taken the form of pilot studies.<sup>9</sup> The aim of this section is to

---

<sup>8</sup> A more thorough review of recent and past demand-side approaches to innovation in the EU countries can be found in OECD (2011) and Veys (2009).

<sup>9</sup> At present the countries that have started PCP pilot projects are Denmark, Sweden, Finland, the Netherlands, the United Kingdom, Belgium (Flanders), France, Germany, Norway, Austria and Italy. The progress of PCP implementation in European countries can be monitored through the webpage [http://cordis.europa.eu/fp7/ict/pcp/msinitiatives\\_en.html](http://cordis.europa.eu/fp7/ict/pcp/msinitiatives_en.html). Most of these projects have not been notified to the European Commission yet; this means that they still have not passed the legal verification that certifies their compliance with the European PCP guidelines.

give a bird's-eye view of some of the projects undertaken in these “first mover” countries, and to hint at the range of possible applications revealed by innovation-oriented public procurement schemes.

A frequently-cited case of successful application of public procurement of innovation and pre-commercial procurement principles is that of Flanders.<sup>10</sup> In fact a combined public-procurement-of-innovation and pre-commercial procurement approach has become an integral part of its national innovation policy. In 2008, the Flemish government appointed IWT, a governmental agency whose aim is to promote innovation through R&D, as the main actor in charge of running a pilot scheme to test the effectiveness of these new policy instruments. The scheme has been awarded a budget of €10 million to put innovation-triggering public-procurement schemes into practice in 13 policy domains. The project is coordinated by a knowledge centre for innovative procurement, established within IWT and composed of five members plus additional external experts if needed. At the proposal of the individual policy domains, broad areas of intervention are defined and discussed together with public and private stakeholders, in order to evaluate the opportunity of using public-procurement instruments versus traditional supply-side policies. If an agreement on public-procurement strategies is reached, concrete projects are translated into innovation platforms: in this phase, it is decided whether a project needs further R&D, and therefore has to be carried on using a pre-commercial procurement strategy, or whether it can be directly taken to the commercial stage, thus using public-procurement-of-innovation-like instruments. In all cases, the pre-commercial procurement period cannot last more than 6 months, and is always followed by a commercialization phase. To date, several projects have already been launched,<sup>11</sup> and some of them are now close to completion. Among them, we can list: (i) a platform for the distribution of e-books, aimed at storing digital book editions as well as fostering the exploitation of innovative media content by some of the culture industry's stakeholders (editors, libraries, bookshops, etc.); (ii) an eye scanner able to diagnose children's optical dysfunctions at a very young age; (iii) a monitoring system for improving safety in building sites through a continuous record of critical parameters affecting the stability of building excavations; and (iv) an integrated programme of geographic imagery acquisition from different sources (aerial, terrestrial, satellite, etc.), which will serve as the building blocks of the Flemish Spatial Data Infrastructure.

The experiences of other European countries are characterized by a slightly less structured institutional design and, above all, by a substantially smaller coverage in terms of policy domains of application. Nevertheless, very interesting pilot projects have been undertaken in the last few years. The Nordic countries, for example, have been particularly receptive in the adoption of

---

<sup>10</sup> For a schematic illustration of the Flemish experience, see Veys (2012).

<sup>11</sup> The full list of projects is available at <http://www.procurementofinnovation.eu/projects>.

the new public procurement strategies. Norway, Sweden, Denmark, Finland and Iceland have launched a joint cross-border call for proposals in the health-care-policy domain, as part of the broader programme called “Nordic Lighthouse Projects”.<sup>12</sup> The aim is to enhance these countries’ cooperation in terms of both pre-commercial procurement and public-procurement-of-innovation activities. Six projects are currently under way, even though they are at different stages of completion; depending on the project, the public procurers involved belong to regional or local levels of government, thus adapting to the specific organization of public purchasing in the different countries. Three out of six projects involve the supply of housing and meal services to elderly or severely disabled people. The other three projects aim at satisfying the needs of both hospital patients and staff, through the creation of innovative hospital equipment. In this category, there are the design of a more efficient chemical analytical laboratory in Iceland and the development of PVC-free blood bags in Sweden; but probably the most interesting case is that of the “Intelligent hospital bed” in Denmark; this project began as a spontaneous initiative of a director of nursing at Randers Hospital, and was only converted into a properly defined innovative procurement process at a later stage. The project underwent a period of testing in early 2012 and will soon be implemented in the hospital.

Besides this joint initiative, the Nordic countries have also undertaken innovative public-procurement initiatives on their own. In Norway, for example, two state enterprises in the oil and gas sectors, Statoil and Gassnova, launched a pre-commercial procurement call in 2011 to get innovative solutions developed for carbon capture and storage in the industrial site of Mongstad, in Western Norway. The goal is to develop new solutions to prevent the release of large quantities of CO<sub>2</sub> into the atmosphere, generated by the fossil fuel combustion in the heat and power plant in Mongstad. At the moment 5 leading world technology provider companies are competing to develop the best technical solutions to meet the requirements of the tender.

In the United Kingdom several projects are about to be launched, and some are fully operative. The best known is that of the National Innovation Center (NIC), an organism created within the National Health Service with the goal of fostering innovation in the health domain,<sup>13</sup> which is pursuing a procurement strategy that combines both pre-commercial procurement and public procurement of innovation to meet the increasingly demanding health-care needs. The identification of the most pressing clinical needs takes place within a series of workshops called “Wouldn't it be Great If...” (WBGI), where all the actors involved in day-to-day health care (doctors, nurses, etc.) are represented. With the help of an expert facilitator, the most important clinical needs are identified and discussed; the final outcome of this process is a so-called

---

<sup>12</sup> More details can be found at <http://www.nordicinnovation.org/da/projekter/lighthouse-projects/nordic-lighthouse-projects/>.

<sup>13</sup> For more detailed information, visit the NIC webpage at <http://www.nic.nhs.uk/>.

“statement of clinical needs”, where the highlighted needs are ranked in terms of importance and both the scope for application and the qualitative/monetary gains of each innovation are considered. As soon as a statement of clinical needs is produced, it is published on the NIC website, in order to collect feedbacks from firms to understand the feasibility of the proposed innovation in relation to the current state of the art in industry. This step is crucial for the positioning of the project in one of three procurement lines. If the technology is already available on the market, it is purchased via regular public procurement; if the technology is not currently available, but the industry deems that an innovative solution may be within reach shortly after firms are made aware of the need for it, a public-procurement-of-innovation strategy is pursued by directly addressing the market; if, instead, the industry judges that the proposed advance is still substantially distant from the technological frontier and that it needs a mid-to-long term engagement in R&D activity, the NIC would pursue a pre-commercial procurement strategy to procure the required R&D effort. The NIC monitors the advances made by the competing suppliers that responded to the call, and typically completes projects in 18 months, devoting approximately six months to designing, six months to prototyping and six months to testing. Each call specifies whether, at the end of the process, the intellectual property rights of the innovation will be assigned to the NIC (exclusive development) or remain with the supplier upon payment of a consideration. The application of this procurement scheme has led to the actual production or prototyping of several innovative products, which are currently employed by the National Health Service. For the time being, nine projects carried out by the NIC are being distributed, and several others are at different stages of the procurement process.<sup>14</sup>

The completed projects include hospital equipment (such as technological room dividers, enhanced blood donor chairs and inclined planes for rehabilitation), diagnostic tools (such as portable cancer diagnostic devices and an online platform for remote self-diagnosis), portable post-operative pain-killer apparatus, and even advanced devices and techniques for very specialized surgeries. Among the distributed products, there is even an online platform offering peer support (the “Big White Wall” project), whose aim is to provide remote therapeutic support for the most common mental disorders. The fundamental goal of all the projects undertaken is to substantially improve the quality of the services offered by the National Health Service, even though in many cases the procured innovation may also lead to greater process efficiency and therefore to sizable savings in the overall spending of the health-care system. The

---

<sup>14</sup> The webpage <http://showcase.nic.nhs.uk/#stage/id5> lists all the completed projects, along with extensive presentations of the innovative products. Browsing the website, it is possible to monitor the progress of the projects underway.

estimated monetary gains are reported for each project, pointing to conspicuous savings per pound spent.

To conclude, it is worth citing the Dutch Small Business Innovation Research (SBIR) programme. This programme started in 2004, based on the US SBIR model . Even though its functioning closely resembles a pre-commercial procurement strategy (as defined in European Commission (2007)), it differs from the latter in two respects: (i) it has an explicit focus on SMEs as preferential partners; and (ii) its structure is slightly simpler, since it only entails two phases, merging the prototyping and testing stages (phases 2 and 3 in Figure 2). The Dutch SBIR claims that this guarantees a simpler, more flexible and cheaper framework than “pure” pre-commercial procurement (Roos, 2011). The total approximate time to completion for a SBIR project is 3 years, under the supervision of an independent committee: after a phase of identification of needs and technical dialogue with the market, lasting about 4 months, the selected ideas are awarded €50,000 to produce a feasibility study within 6 months; a further 4 months are spent on evaluating the studies produced studies and assigning proper R&D contracts; ultimately, the best projects are awarded about €450,000 to engage in a product development phase lasting 2 years. Between 2004 and 2011, SBIR launched 30 procurement projects on behalf of 7 Ministries, with total spending of €69 million (Roos, 2011). Among the examples of successful projects fostered by the SBIR strategy, a frequently cited case is that of real-time monitoring of dikes and dams. The need for an innovative solution in this field emerged as a consequence of unexpected breaking of dikes in two Dutch regions in 2003 and 2004; to tackle the problem, SBIR Netherlands launched a call in 2007, resulting in the creation of two new companies in 2010: one of them is now offering real-time monitoring through sensors installed inside the dike/dam, while the other provides the same service exploiting satellite images.

#### **4. The state of the art in Italy**

In Italy the implementation of innovation-oriented public-procurement projects is still left up to individual players, since a detailed institutional framework is not yet in place. So far, the bulk of Italian policy makers’ efforts have focused on rationalizing “regular” public-procurement activity; this goal has been pursued through the creation, in 1998, of Consip S.p.A., a public limited company owned by the Ministry for the Economy and Finance, to act as the central purchasing agency on behalf of the state. Besides other activities, Consip is entrusted with rationalizing public expenditure on goods and services through the extensive use of ICT instruments.<sup>15</sup> Consip, however, is not charged with pursuing innovation-related objectives in

---

<sup>15</sup> More information can be found at <http://www.consip.it/on-line/Home.html>.

the implementation of its activities. As a matter of fact, no Italian agency has yet been awarded the task of tackling these objectives through public procurement, and for the time being the sentence formulated by Edler *et al.* (2005, p. 150) – “[in Italy] Public Procurement policy is not formally linked with national innovation policy” – remains valid.

Things are rapidly evolving though, and a first step towards the inclusion of the European guidelines in the Italian legislative framework has been taken with the approval of the so-called “Decreto Crescita 2.0” (Decree Law 179/2012, turned into Law n. 221/2012), introducing the “Digital Agenda”. The text of the law spans a heterogeneous array of policy interventions, but the most important (for our purposes) is Article 19, which is entitled “Major research and innovation projects, and pre-commercial procurement”.<sup>16</sup> This article allows for the implementation of pre-commercial procurement projects within large-scale R&D initiatives, and draws the boundaries of application of these programmes, in accordance with the European framework outlined above. The whole initiative will be supported by the Italian Ministry for Education, Universities and Research (MIUR) and the Italian Ministry of Economic Development (MISE). This legislative turning point has acknowledged the existence of pre-commercial procurement among the tools at Italian policy makers’ disposal to foster innovation and has set aside funds for its use. More steps, however, need to be taken to put this normative directive into practice and to include it as one of the working mechanisms in the national innovation policy.

In line with the European orientation, the *Horizon 2020 Italia* document (MIUR, 2013) lists public procurement of innovation and pre-commercial procurement among the most promising policy tools to meet the research and innovation goals in the Europe 2020 agenda. In the same document, the involvement of small and medium enterprises, the consolidation of the legal and administrative framework, and the development of a coordination mechanism across different territorial procurers are regarded as the most pressing requirements for a successful implementation of an innovation-oriented public procurement strategy in Italy.

This progress will benefit considerably from the extensive preparatory work done by some ministries, regions and consultancy firms: in the last few years, these actors have jointly started to ask what institutional architecture and functioning mechanisms should sustain a successful introduction of pre-commercial procurement in Italy, and have undertaken some pilot projects in some regions.

The most complete normative and organizational framework is contained in the guidelines issued by the Dipartimento per la digitalizzazione della pubblica amministrazione e l’innovazione tecnologica (2012). On the one hand this document outlines the legal framework

---

<sup>16</sup> PCP (and PPI) had already been included in the previous “Decreto Crescita” (Article 60 of Decree Law 83/2012) among the priorities of the Italian Digital Agenda.

that lies behind the pre-commercial procurement architecture, with particular stress on how European principles have been translated into the Italian system, on the other it sketches the workflow of operations characterizing a typical pre-commercial procurement initiative. The structure of the process closely resembles that put forward in European Commission (2007), but here it is dealt with in greater detail. The whole process is made up of six phases:

1. identification of the problem: the public procurer brings together the intended users of the innovative advancement and encourages them to participate actively in a debate, whose goal is to identify the needs and quantify the technological gap with respect to the solutions currently available on the market;
2. inform the market: provide the market with open and transparent information on the needs to be fulfilled; this phase serves both as a cross-check to ensure that no viable solutions are already present in the market and as a moment of “technical dialogue” with the supply side, intended to make firms aware of the public procurer’s goals and to ensure that they will be responsive, once the call is published;
3. issue an open and transparent call: the procurer encourages firms (the guidelines suggest at least 5, if possible) in order to obtain the best possible project to tackle the problem;
4. compare the strengths and weaknesses of the alternative solutions: in this phase the procurer should evaluate the projects and select some, but it should not close too many doors, since it has to consider the possibility of switching between alternative technologies during the development process, thus paving the way for the introduction of open standards;
5. evaluate prototypes: compare the performance of the proposed solutions and formulate a technically detailed outline of the preferred solution, which could be (but is not necessary) the object of a commercial tender;
6. pick out the best offer: issue a tender and single out the producer that is able to offer the desired technical solution at the best price.

Of all these steps, only phases 3 to 5 can be said to be part of a properly defined pre-commercial procurement strategy. Phases 1 and 2 are preliminary actions entrusted to the public procurer, while phase 6 closely resembles a pure public-procurement-of-innovation initiative.

Interestingly enough, these guidelines also contain a list of the main criteria that should drive the public procurer’s evaluation of the competing projects before entering the development phase. These criteria include:

- the degree of innovativeness of the proposed solution with respect to the current state of the art in the sector;
- the extent to which the innovation could improve the quality of the services currently offered to the public and meet the needs that were intended to be overcome;



- the cost of the proposed solution and the potential savings associated with it, both evaluated over the entire life of the product;
- the supplier's ability to organize and manage the proposed R&D effort, and to transform the project into a successful commercial product.

As said before, the preparatory initiatives in prospect of a full-scale introduction of pre-commercial procurement in Italy have also included pilot projects in some regions. Without the purpose of being exhaustive,<sup>17</sup> the final part of this work will discuss some of the projects that are being planned or that have actually been undertaken.

The first properly-defined pre-commercial procurement experience in Italy was probably the one made in Valle d'Aosta. This region has issued two calls, for a total value of more than €1.2 million, for the acquisition of R&D services in two policy domains, namely “Intelligent mobility” and “Smart energies”. The project's structure entails two broad stages: (i) a period of R&D managed according to the pre-commercial procurement principles, in which the participating firms will compete to present solutions to tackle the needs specified by the public administration; and (ii) a phase of real-life testing, which envisages the active participation of a selected group of intended final users in at least one of the regions participating in the Alcotra Innovazione French/Italian project. Following the first call, whose deadline was set in June 2012,<sup>18</sup> the region has received nine offers presented by firms and temporary groupings of firms, all of which are located in North-Western Italy. Four of these offers were accepted and were awarded a contract for the provision of R&D services. For the smart energy domain, the accepted offers pertain to two fields: (i) energy storage systems, whose aim is to achieve a local-level balance between production from renewables and actual consumption; and (ii) advanced systems of monitoring and control, allowing remote management of energy production and consumption. In the intelligent mobility policy domain, two offers were awarded a contract: (i) real-time systems of road monitoring; (ii) innovative solutions for city parking, aimed at integrating the management of parking facilities with information on public transport services. The whole process lasted 10 months (6 months for the R&D stage and 4 for the testing one), and came to an end in October 2013. The second call, restricted to the sole “smart energies” domain, was issued in November 2012 and was characterized by a lower budget and a shorter timing (4 months for the R&D stage and 2 for the testing one) with respect to the previous one.

---

<sup>17</sup> For a more thorough review of the first pre-commercial procurement experiences in Italian regions, see Nulli (2013).

<sup>18</sup> The second call focused explicitly on the smart energy policy domain, and closed in January 2013.

Two out of the four offers received have been admitted to both the R&D and testing stages, which also ended in October 2013.

A similar type of initiative has been launched by the Puglia region, which issued a call in the “Independent living” policy domain, aimed at finding innovative solutions to improve the quality of independent life for people who are not self-sufficient. The call has been further divided into two areas – namely “Personal care and inclusion” and “Safety and health” – and have been awarded a total budget of €2.3 million. The R&D services acquired in the “Personal care and inclusion” area are intended to offer innovative solutions to people suffering from severely invalidating pathologies, implying continuous personal-care assistance, in order to guarantee them a satisfactory social, scholastic or working inclusion; on the other hand, the “Safety and health” area wants to address advanced solutions to improve people's safety (broadly defined, including workplace safety, monitoring of road systems, etc.) and physical health (new screening techniques, pharmacologic therapy management, medical equipment, etc.). Besides detailing the evaluation criteria for the projects in each area, the call specifies some characteristics that are to be met in both the fields of intervention, such as the integration of various functions in a single device, the simplicity of the interface, and the scalability/modularity of the project. By August 2013, the received offers were evaluated, and a maximum of 8 R&D services were selected for acquisition. The firms are now given 8 months to develop the purposed projects; at the end of this period, another evaluation step will take place, and at most 4 firms will be selected to engage in the final stage of testing and validation of prototypes. This last phase will last 4 months, and will be carried out in a real-life testing environment, similar to the one adopted in Valle d'Aosta.

By contrast in April 2012, the Lombardia region, through its Department of Universities and and Research and with the support of The European House – Ambrosetti, launched a technical dialogue with the market, which is intended to prepare the ground for the launch of a pre-commercial procurement initiative in the health domain. The call to be put out is expected to focus on three main intervention areas, selected in collaboration with the Niguarda Hospital, which was identified as the pilot public procurer: (i) robotic systems for the automation of venous blood extraction; (ii) universal interfaces for home-care medical equipment; (iii) automated devices for the displacement of hospital beds. An online forum was activated, with the goal of facilitating the dialogue between governmental bodies the market; moreover, the public stakeholders had the option of organizing meetings with individual market operators. The technical dialogue phase was intended to generate feedback on the technological state of the art in the three areas of intervention identified, in order to understand which procurement strategy was more suitable to fulfill the needs that emerged. Since the requested solutions were not deemed to be readily available on the market, a pre-commercial procurement tender was issued

on March 2013. A budget of €750,000 has been allocated to this procurement initiative, that kicked off in September 2013 with the selection of the received offers into the first stage of R&D. At the end of the procurement process, the obtained prototypes will undergo a phase of testing, involving the active participation of a group of final users (again, following the Living Labs experience).

To conclude, it is worth citing a recently issued “call for ideas”,<sup>19</sup> encouraging the public administration of the four “Convergence regions” (Calabria, Campania, Puglia and Sicilia) to identify a list of needs, achievable by means of innovative solutions, to improve the quality of general-purpose services; the ideas emerging from this call will be used to structure some pre-commercial procurement / public-procurement-of-innovation initiatives in the regions in question. The whole project has been awarded the sizable budget of €150 million (€100 million from the Ministry for Education, Universities and Research (MIUR) and €50 million from the Ministry of Economic Development). The call was closed in July 2013, and the emerged needs will form the basis of a technical dialogue with the market, regarded as a preparatory phase in sight of a prospective procurement initiative.

## 5. Concluding remarks

The purpose of this work was to provide an introductory description of the main changes under way in public procurement practices at the European level. By revising the academic and institutional debate that has accompanied this shift in perspective, the paper shows how a new category of procurement tools has emerged to meet the main changes in the European approach to innovation policy. The switch from a push strategy, based on supply-side policies such as R&D fundings, to a pull one, based on a virtuous interplay between final users and the market, has spurred the adoption of public-procurement-of-innovation and pre-commercial procurement schemes as one of the building blocks of the EU countries’ innovation agendas. Definitional aspects, functioning mechanisms and strengths of these new instruments have been discussed, along with some of the most prominent problems that may diminish the innovation potential of these tools if they are not taken into account. The lack of the necessary skills – among public procurers – to evaluate the competing projects and to interact with the supply side, the fragmentation of resources and the coordination issues across different territorial levels, the risk aversion characterizing public administration, and the limited discretionality in the disposal of funds appear as the main obstacles opposing a complete unfolding of the effects of public procurement of innovation and pre-commercial procurement schemes on innovation.

---

<sup>19</sup> Ministerial Decree 437/2013, jointly issued by the Ministry for Education, Universities and Research and the Ministry of Economic Development.

To give some real-life examples of how these procurement strategies work and how ambitious are the results we can expect from their implementation, this paper presented some cases of successful application of pre-commercial procurement strategies in a selected group of European countries; when applicable, the discrepancies between the adopted national frameworks and the European guidelines were highlighted. To conclude, the paper offered a discussion of the current state of the art of innovation-oriented public-procurement strategies in Italy, explicitly focusing on the recent pre-commercial procurement initiatives launched in some regions. While its normative and organizational framework has been recently catching up with the one adopted in European countries with a longer pre-commercial procurement experience, Italy is still lagging behind in terms of concrete-case applications: for the moment few pre-commercial procurement initiatives have reached the testing stage, even though some of them are at an advanced state of implementation and major new projects are currently being launched.

## References

- Aho, E., J. Cornu, L. Georghiou and A. Subira, *Creating an innovative Europe*, Report of the Independent Expert Group on R&D and Innovation, 2006.
- Aschhoff, B. and W. Sofka, *Innovation on demand – can public procurement drive market success of innovations?*, in «Research Policy», 38(8): 1235–1247, 2009.
- Cabral, L., G. Cozzi, V. Denicolo, G. Spagnolo and M. Zanza, *Procuring innovations*, in «Handbook of Procurement» ed. by Dimitri, N., G. Piga and G. Spagnolo, Cambridge University press, 2006.
- Cave, J. and E. Frinking, *Public procurement for R&D*, University of Warwick, 24 (2007).
- Dipartimento per la digitalizzazione della pubblica amministrazione e l'innovazione tecnologica, *Gli appalti pubblici pre-commerciali. Istruzioni per l'uso*, Digital Agenda Italia, Edizioni Forum PA, 2012.
- Edler, J., C. Edquist, L. Georghiou, S. Hafner, L. Hommen, M. Papadakou, J. Rigby, M. Rolfstam, S. Ruhland and L. Tsipouri, *Innovation and public procurement – review of issues at stake*, Technical report, Fraunhofer Institute for Systems and Innovation Research, 2005.
- Edler, J. and L. Georghiou, *Public procurement and innovation — resurrecting the demand side*, in «Research Policy», 36(7): 949–963, 2007.
- Edquist, C. and J. M. Zabala-Iturriagoitia, *Public procurement for innovation as mission-oriented innovation policy*, forthcoming on «Research Policy», 2012.
- European Commission, *Pre-commercial procurement: Driving innovation to ensure sustainable high quality public services in Europe*, COM(2007)799 final.
- European Commission, *Europe 2020 Flagship Initiative – Innovation Union*, COM(2010)546 final.

- Geroski, P. A., Procurement policy as a tool of industrial policy, in «International Review of Applied Economics», 4(2): 182-198, 1990.
- Ministero dell'Istruzione, dell'Università e della Ricerca, *Horizon 2020 Italia – Ricerca e innovazione*, March 2013.
- Mowery, D. and N. Rosenberg, *The influence of market demand upon innovation: a critical review of some recent empirical studies*, in «Research Policy», 8(2): 102–153, 1979.OECD, *Demand-side innovation policies*, May 2011.
- Nulli, M., *Gli appalti precommerciali in Italia: una ricostruzione fra teoria generale ed esperienze regionali*, Provincia autonoma di Trento – Dipartimento della Conoscenza, Servizio Università e ricerca scientifica, August 2013.
- Rigby, J., P. Boekholt, A. Semple, J. Deuten, R. Apostol, S. Corvers and J. Edler, *Feasibility study on future EU support to public procurement of innovative solutions: Obtaining Evidence for a Full Scheme*, Final report for European Commission – DG Enterprise & Industry, February 2012.
- Roos, A., *Pre-commercial procurement in the Netherlands: SBIR*, Ministry of Economic Affairs, Agriculture and Innovation, 2011.
- Rothwell, R. and W. Zegveld, *Government regulations and innovation*, in «Industrial Innovation and Public Policy» ed. by Rothwell, R. and W. Zegveld, Frances Pinter, London, 1981, pp. 116–147. Uyarra, E. and K. Flanagan. *Understanding the innovation impacts of public procurement*, in «European Planning Studies», 18(1): 123–143, 2010.
- Veys, C., P. Thevissen, H. Bodewes, S. Hargeskog, L. Müller, M.Ottolander and N. Widmark, *Exploring Public Procurement of Innovation as a Strategic Innovation Policy Mix Instrument*, EU project Procurement of Innovation, 2009.
- Veys, C., *Pre-commercial Procurement. The Flemish experience*, Presentation at the PROGR-EAST workshop on pre-commercial procurement, Budapest, October 2, 2012.von Hippel, E., *A customer-active paradigm for industrial product idea generation*, in «Research Policy», 7(3): 240–266, 1978.
- von Hippel, E., *Successful industrial products from customer ideas*, in «The Journal of Marketing», 42(1): 39–49, 1978b.
- Wallsten, S., *The Effects of Government Industry R&D Programmes on Private R&D: The Case of the Small Business Innovation Research Program*, in «Rand Journal of Economics», 31(1), 2000.