Introduction[◊]

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The seven essays in this volume address different issues related to green and innovation procurement as well as more general challenges in public procurement. These studies address both general, abstract problems of optimal public procurement and concrete cases of national or even local public procurement systems. The evidence that they present covers a broad spectrum of countries including Italy, Latvia, the Netherlands and several African countries. Reflecting the different expertise of the authors, the studies draw from the Economics, Engineering, Law and Organization approaches to public procurement and use both theoretical and empirical methods.

We divided these studies into three groups on the basis of their main topic area: green procurement, innovation procurement and challenges in public procurement.

Green (or environmental) procurement is defined as:

«*The purchase of products and services which have less impact on the environment and human health compared with competing products or services that serve the same purpose*». (UNDP, 2008).

This definition highlights the fact that the main difference between traditional and green procurement consists of the emphasis assigned by the latter to the implications for human health and the environment of the procurement process. Green procurement typically does not entail a radical change in the procurement

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process but solely an explicit attempt to incorporate green performance among the goals of the procurement process. Thus, the goal of traditional procurement, cost-effectiveness (or value-for money), is expanded in the case of green procurement to account for factors like: the consumption of raw materials and energy, the use of chemicals in products, the presence of polluting emissions and the amount and type of waste generation.

These goals of green procurement respond to the main environmental challenges of today's society. The over-consumption of resources and the systematic increase of greenhouse gases, hazardous chemicals and waste pose a major threat to the present and, especially, the future of our society. Green procurement aims to address these problems by introducing into the procurement process the need to compare alternatives on the basis of their environmental impact. Such comparison has to be considered in a broad sense, involving the various stages of the procurement process. At the design stage, this could mean assessing the relative environmental impact of different solutions, for instance what are the environmental costs of connecting two cities with a certain type of infrastructure relative to a different one. At the tender evaluation stage, instead, this could imply taking into consideration the type of materials or the type of production technologies that the bidders plan to use. At the realization stage, this implies that environmental considerations have to enter into the decisions taken regarding variations to the original project. Additionally, when the procurement entails delegating the management of the procured object, environmental objectives should enter into the evaluation of the management performance.

During periods of significant cuts in public spending, efficiency in spending on public procurement has become a priority. The economic policy debate in public procurement assumes a key role for sustainable development through concrete stimulus to innovation.

In this context, Green Public Procurement (GPP) is becoming a cornerstone of environmental policy in both the EU and the Member States. The purchasing power of the public administration (19% of GDP in the EU) is a factor with big potential in the market (EC, 2008). GPP is now one of the most innovative operational tools in the context of "second generation" green policies, which have now overcome the setting of sectorial legislation, by embracing a broader, comprehensive approach and aiming to involve all actors within the system of production and consumption.

Several studies have highlighted the potential benefits to be gained from the extensive practice of GPP, in particular in the field of energy consumption and

greenhouse gases emissions. For example, a public demand-oriented, greener energy supply could save 60 million (tons) of greenhouse gases, which corresponds to 18% of the allocated allowance to the EU under the Kyoto Protocol. Still, if all IT purchasers in Europe followed the example of Copenhagen City Council and the Swedish Administrative Development Agency, energy consumption would be cut by around 30 terawatt hours – roughly the equivalent of four nuclear reactors (EC, 2012).

Green procurement is likely the most prominent aspect of a broader trend in procurement toward sustainable procurement. In addition to the environmental aspects, sustainable procurement entails paying attention within the procurement process to elements related to social aspects, such as sustainable supply chains and labour conditions, including child labour, occupational health and safety and compliance with regulations. It is evident how these goals complement the environmental ones of green public procurement in terms of fostering societal well being. Therefore, assessing the performance of green public procurement is a key element of a strategy that seeks to make procurement sustainable.

The first three papers published in this volume concern different aspects of green and sustainable public procurement.

Despite the evident potential benefits that the uptake of GPP can provide to the whole economic system, several obstacles and drawbacks were encountered by local authorities in its application as it emerges in the related literature (see for instance Testa *et* al. 2012). In line with this strand of research Annunziata, Frey, Iraldo and Testa, in the paper «The contribution of Green Public Procurement to Energy Efficiency Governance in buildings», analyze which factors influence the development of green public procurement practices in the building and construction sector. By using data collected by a questionnaire survey among local authorities of the Tuscany Region, descriptive and inferential statistics were performed to test the impact of the following factors on the probability to develop GPP practices: *i)* the knowledge of GPP toolkits and official guideline documents, provided by national and European institutions; *ii)* the participation of public employees in *ad hoc* training sessions on GPP; *iii)* the size of public authority; iv) the adoption of an environmental management system. The results confirm, in particular, that official documents and guidelines produced by the European Commission and National governments are useful for supporting public technicians in defining and implementing green tenders. Also training sessions are effective to create know-how, as well as to improve the ability to include green criteria in each phase of the tender.

In line with the above mentioned contribution, in the paper «Sustainable Procurement in Practice: Explaining the Degree of Sustainable Procurement from an Organizational Perspective», Grandia, Steijn, Groeneveld and Kuipers explore how organizational factors influence the degree of sustainable procurement in public procurement projects in the Dutch national government. The authors address the broader issue of sustainable (*i.e.*, both green and social) procurement from an organizational perspective, by using a case study analysis. In detail, they investigate how three organisational factors – top management support, expertise and commitment – influence the adoption and effectiveness of sustainable procurement in two public procurement cases in the Netherlands. The results show that effective commitment appears to be a determinant of the degree of sustainable procurement while further research is need to investigate the role of the other two factors in supporting sustainable public procurement.

A different approach to the issue of green procurement for the building sector is offered in «A Holistic Approach To Developing Existing Building Commissioning In European Public Real Estate» by Cesarotti, La Bella, Varani, Rotunno, Martinelli, Spada, Di Fausto, Casara. In this paper, the authors study the improvement of building conditions and performance achievable through Building Commissioning. Building Commissioning is a type of facility management according to which building systems and their interactions are tested and verified to suit current requirements. In the study, the authors describe this method and illustrate its application drawing from two cases involving, respectively, a large private firm and an international agency and highlight how this approach could be effectively used by a public purchaser to improve the energy management of public buildings.

The second group of studies presented in this volume is mostly focused on issues related to innovation procurement. By innovation procurement, we refer to the process of procuring works, goods or services that are characterized by being innovative either because they represent novel works/goods/services or because the means through which they are produced or managed is novel. Relative to traditional procurement, innovation procurement is characterized by certain peculiar features. For instance, even defining innovative procurement is not a trivial task because it requires identifying the degree of novelty that a product or process must satisfy to be considered an innovation.

A second feature of innovation procurement that makes it special is the fact that it entails a greater amount of uncertainty relative to other types of procurement. Indeed, in addition to the traditional cost uncertainty intrinsic to the pres-

ence of a time lag between when the contract is procured and when its execution is finalized, in the procurement of innovation there is no certainty that the object of the contract can be developed within the expected amount of time. Indeed, the contractor who wins the contract will have to invest in research and development activities whose outcome is *ex ante* uncertain.

Contrary to green procurement, whose objectives, as we mentioned, are often achievable through the same tools as in traditional procurement, addressing the peculiarities of innovation procurement typically requires more radical departures. In the case of defense procurement, where historically most of innovative procurement has been concentrated, an example is the use of split-award contracts (see Anton and Yao, 1989): to increase the probability that the new defense technology will be completed within the desired amount of time, two or more bidders are awarded the contract and simultaneously work on its realization. Then, the contractor that finishes first (conditional on having met the other *desiderata* for the new technology) is paid a bonus while all the other contractors are paid a basic fee.

In part because of the numerous and important spillovers that originated from defense procurement of innovation (the Internet, just to name one), innovation procurement has become a major theme in the public sector. Numerous public institutions have explicitly stated the goal of using public procurement to foster innovation so that its development could later be transferred to the private sector and benefit the entire society. For instance, the European Commission put forward the "Innovation Union" program as a key element of the 2020 strategy with the intent to guide and support contracting authorities in implementing procurement of innovation. Efforts to promote innovation procurement have interested different areas like health care and green procurement. As regards the former, an example is the institution in Canada of a Council for Innovation Procurement in Health Care that collaborates with health care organizations in transferring knowledge and best practices related to innovation procurement processes.

As regards the interaction of innovation and green procurement, an example is the procurement of Alternative Fuelled Vehicles (AFVs) in the USA. This program fosters innovation by making targeted acquisitions of vehicles running on alternative technologies and, as a result, can stimulate the production of new, greener technologies in the private market. More generally, it is natural that the relatively novel attention of society to environmental issues can be usefully addressed by public procurement of innovation which has the potential to stimulate the development of environmental friendly products and green energy technologies.

Therefore, innovation is not only a topic of great relevance by itself, but it is also a key complement to green and, more generally, social procurement. The second group of papers in this volume are then particularly relevant for understanding how innovation procurement interacts with the issues of green procurement described by the first group of papers. The first study in this second group is «Public Procurement for Innovation in Small States - The Case of Latvia» by Cepilovs. This paper analyzes the special constraints that innovation public procurement encounters when used as a demand-side tool to promote innovation in the context of a small state like Latvia. The key problems identified revolve around the problems for a small state to develop the administrative capacities necessary for effective design and implementation of innovation procurement.

The second study on innovation procurement is «A Conjecture on Institutional Rationalities and Property Rights in Public Procurement of Innovation» by Ågren and Rolfstam. The paper develops a comparison between the process of concluding a procurement contract and Nash bargaining. This leads the authors to stress that a key and often underestimated element of effective procurement, is the knowledge of all the participants in the procurement activities of both their own and the others' institutional rationalities. Rationality in this context resembles an evolutionary assumption that organisations are entities that evolve with scarce resources through purposeful selection. Without shared knowledge of the drivers of these institutions, the complex structure of the procurement process is unlikely to function properly.

The challenges involving innovation procurement presented by the two latter studies are linked in one case to the small-nature of the procurement state and in the second case to the limits of institutional rationalities. Innovation procurement faces a few other challenges that are specific to its nature; they entail, for instance, issues related to *(i)* the intellectual property rights associated with the innovation and *(ii)* the long term perspective needed to evaluate the benefits of a technological spillover. The latter is obviously a major challenge for green procurement too. Furthermore, both green and innovation procurement are potentially affected, possibly to a higher degree, by the same challenges that characterize traditional public procurement.

The final part of this volume presents two studies that analyze some of these challenges. In particular, these studies focus on corruption and favouritism in two different environments: one looks at a developed economy (Italy), while the other analyzes a collection of developing African countries. Corruption and favoritism, together with the risk of non-completion of the contract, the risk of

contractors' collusion and the risk of defects in the project design are the major challenges that traditional procurement systems are designed to address (see Decarolis *et* al., 2010).

There are multiple reasons why green and innovative procurement are likely to be particularly sensitive to the risk of corruption and favouritism. In particular, both types require greater discretion from the public procurement authority, for instance evaluating the long run effects on the environment and innovation spillovers of a certain project or a certain tender. More specifically, in green public procurement, advantaging local contractors might be a form of favoritism that unduly exploits green motivations. Similarly, in innovation procurement, the greater uncertainty intrinsic in the production process and the lack of a clear benchmark for the product to be delivered imply an increased scope for the risk of corruption and favouritism.

The first paper in this third and last group is «Favouritism and Inefficiency in procurement: Evidence from Public Works in Italy» by Decarolis and Giorgiantonio. In it, the authors analyze both theoretically and empirically a series of local reforms affecting the local regulations of public work contracts, in terms of both the contract awarding rules and the entry qualification criteria for bidders. They show how, despite the usage of rigid and transparent rules, the regulation changes introduced by local procurement authorities can be explained best by considering them an attempt to manipulate the market in favour of local contractors.

The second paper is «Public Procurement And Corruption in Africa: A Literature Review» by Mushagalusa Nshombo and Appolloni. This paper reviews the state of the literature on corruption in public procurement with a focus on Africa. More specifically, it examines what it is known about the determinants of public procurement corruption in Africa, and finds that the economic, political, organizational and social determinants have a significant relationship with public procurement corruption in Africa.

The findings in these latter two papers are a cautionary tale about the challenges facing green and innovation procurement and suggest that even for traditional procurement many problems are still unsolved.

In conclusion, the papers in this volume discuss the potential for green and public procurement, but also stress the main challenges to both these specific areas of procurement and those more generally affecting all public procurement. The studies in this volume offer a broad array of perspectives on these issues. Accordingly, they contain policy suggestions that encompass the economic, engineering, legal, and organizational perspective that are likely to be useful for the

design of policies in these areas of public procurement which are hotly debated topics both in the policy and academic circles. Some insights for future research are also provided. In particular, more research is needed to understand the effect of green and innovative public procurement on economic systems. In detail, it would be very notable to analyze if GPP and PPI are able to steer firms and supply chains into greener development paths promoting resource saving and green innovation.

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