



# Innovation on demand—Can public procurement drive market success of innovations?

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## ABSTRACT

Public procurement has been at the centre of recent discussions on innovation policy. We embed it into the broader framework of public policies to stimulate innovation: regulations, R&D subsidies and basic research at universities. We synthesize the characteristics of all four instruments conceptionally and quantitatively compare their effects on innovation success for 1100 firms in Germany. We find that public procurement and knowledge spillovers from universities propel innovation success equally. The benefits of university knowledge apply uniformly to all firms. However, public procurement is especially effective for smaller firms in regions under economic stress and in distributive or technological services.

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## 1. Introduction

As innovation is acknowledged to be a key driver of economic growth, governments promote innovation activities both in the public and in the private sector. The promotion of R&D is also an essential element of the Lisbon strategy launched in 2000 and further defined by the Barcelona Research Council in 2002. The objective is to increase investment in R&D to 3% of GDP by 2010 – two-thirds of this increase should be funded by the private sector – so that Europe becomes the most competitive and dynamic knowledge-based economy in the world. There are different instruments available to stimulate innovation activities of the private sector. Public procurement has been revitalized as an innovation policy instrument on both European and national levels. In recent years major initiatives have been launched to foster innovation through public procurement, e.g., the Aho-Report (European Commission, 2006); Barcelona Strategy (European Commission, 2003). Public procurement may have a large potential since it

accounts for 16% of combined EU-15 GDP (Georghiou et al., 2003). In Germany public procurement spending is around 260 billion euros a year and thus takes up about 12% of GDP (BMBF, 2006).

Public procurement follows multiple objectives with promoting innovation being potentially one of them. Several more dedicated innovation policy instruments exist. Regulations, R&D subsidies and the scientific and technological infrastructure have also been identified as other main types of public innovation policy which are designed to improve industrial innovativeness (Rothwell and Zegveld, 1981; Geroski, 1990). In this study we explore the specific features of public procurement in innovation policy conceptually and embed public procurement into the broader context of stimulating innovation in enterprises by public policy. More precisely, we identify shared and distinctive features of public procurement compared to other major policy instruments, i.e. co-public funding for private innovation projects, knowledge spillovers from publicly funded universities as well as intervention through regulation. Empirically, we translate this analytical framework into a comparative assessment of how public procurement performs relative to these other policy options. We measure performance in terms of the market success of firms' innovations. Moreover, we question whether these effects apply uniformly to all firms, independent of their size or the industry and region in which they are operating. Instead we suggest that firms are heterogeneous with regard

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to whether certain policy instruments are relevant, accessible or useful to them. As a result distinct subpopulations of firms can be identified that respond differently to the policy instruments under investigation. Based on these findings, policy recommendations are derived. In essence, we ask: Is public procurement an effective instrument to provide public support for innovation compared to other options and if so, for which firms does it work? We explore these research questions empirically for a broad sample of more than 1100 firms and their innovation activities.

The remainder of the paper is organized as follows. Section 2 reviews the literature on public procurement in innovation policy. Section 3 relates it to other important policy instruments and presents previous empirical results. The database and the estimation strategy for the empirical study are described in Section 4. Section 5 presents its results. Finally, we draw conclusions in Section 6.

## 2. The role of public procurement in innovation policy

Public procurement has received a lot of attention in recent discussions on favorable innovation policy options, both on the European level, such as in the Barcelona Strategy (European Commission, 2003) and the Aho-Report (European Commission, 2006), and on the national level. In Germany, for example, public demand for innovative products will be extended as part of the federal government's Hightech-Strategy. Examples are intelligent energy concepts for city halls or schools and the equipment of public service cars with novel types of engine/propulsion technologies (BMBF, 2007).

With regard to innovation, public procurement can be divided into two types: the purchase of standard products like office supplies (paper, paperclips, etc.), i.e. involving not necessarily innovation, and public technology procurement, i.e. the purchase of new technologies and innovative products and services. Innovative products and processes triggered by general public procurement can be considered a potential by-product. Public technology procurement, though, is referred to if a government announces its clear intention to foster public procurement as an innovation policy instrument.<sup>1</sup> Public technology procurement is a demand-side instrument and can be defined as the purchase "of a not-yet-existing product or system whose design and production will require further, if not completely novel, technological development work" (Edquist and Hommen, 2000, p. 5). Ideally the functional requirements of the demanded product are predefined by the government, but the realization and design are not (see Rothwell and Zegveld, 1981; Geroski, 1990; Edler and Georghiou, 2007). Then public procurement might be a suitable tool for stimulating the generation and diffusion of technological innovation (Geroski, 1990). The two principal reasons for the use of this policy tool are to satisfy and improve the supply of public services and to meet certain political goals by stimulating demand, e.g., in areas of sustainability or energy efficiency (Dalpé, 1994; TAB, 2006). After the government has placed a tender for a specific need and firms have applied, the decision is made by the government. Only one firm or a consortium of firms gets the order to generate and deliver the product or service. Thus, it is a competitive and selective system. A major advantage of public procurement in innovation policy is that the government specifies a desired output and leaves it to the creativity of private businesses to achieve this result with the most effective and efficient technologies.

Since the purchase of the new product by the government is contracted, the market risk for the developing and delivering firm

is reduced because a certain amount of sales is guaranteed. The government is a large scale and major customer in certain industries such as defense, education or health services. It can act as an early-state or lead user which bears the costs of learning and refining novel products even outside these core industries. Besides, the public sector's significant scale enables innovative firms to experience cost reductions quickly. This should lead to reduced prices and therefore newly created or extended markets for private demand as well.<sup>2</sup> Through the use of a particular innovation the government can also send positive signals to the private market and increase awareness, so that public procurement also spills over to the private market and propels the diffusion of innovations (Rothwell, 1984; Porter, 1991; Edler and Georghiou, 2007). However, there is a risk that the developed product will only meet an idiosyncratic demand so that further sales in the market will be limited. This may be especially the case of military demand, as stated, e.g., by Stoneman (1987), Lichtenberg (1989) or James (2004). In addition, the risk that the R&D project will fail is not reduced.<sup>3</sup>

The role of public procurement in the development of new products and its success has not yet been well analyzed. Several case studies have been conducted; see for example for the USA Cohen and Noll (1991) and for European cases Edquist et al. (2000) or Edler et al. (2005). Examples of both success and failure are known. However, quantitative analyses of the firms that are responsive to the stimulation of innovation via public procurement and benefit from the government as a customer are still rare. One aim of this study is to contribute to the literature by empirically investigating the role that public procurement plays for the innovation success of firms.

## 3. A comparative perspective on public procurement in innovation policy

Other forms of public support for private innovation activities have received significant attention in both academic and policy making discussions. They are typically divided into instruments providing additional inputs for private innovation processes (i.e. supply side) and instruments influencing innovation outputs (i.e. demand side). The former is most importantly associated with the public provision of resources, both tangible (e.g., funding) and intangible (e.g., scientific knowledge) in nature, while the latter influences markets for innovative products or services (e.g., through mandatory standards). Public procurement is a demand-side instrument. We will briefly outline major features of other important innovation policy instruments: regulation on the demand side and knowledge spillovers from universities as well as R&D subsidies on the supply side. We conclude the conceptual discussion by drawing a synthesis of all four policy instruments under consideration with regard to shared and distinctive features and a review of comparative studies.

### 3.1. Regulation

Regulation is a demand-side instrument. It refers to the "implementation of rules by public authorities and governmental bodies to influence the behavior of private actors in the economy" (European Commission, 2004, p. 4). Regulations can be classified as economic (e.g., antitrust policy, price control), social (e.g., environmental or safety regulation) or administrative (e.g., product liability) regulations (OECD, 1997). Regulation policy can be considered as an indirect method of affecting innovation since it defines the framework conditions for a firm and no public funds are used (Geroski,

<sup>1</sup> In the following, the term public procurement implies the purchase of technologies. We will use the terms public procurement and public technology procurement interchangeably.

<sup>2</sup> For the concept of lead users in innovation see Von Hippel (1986).

<sup>3</sup> For a more detailed description of public procurement see, e.g., Geroski (1990) or Edler and Georghiou (2007).

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