

# Chapter 2

## Public Procurement and Innovation: Theory and Practice

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**Abstract** This chapter provides a preliminary framework for understanding innovation-oriented public-procurement policy. The first part will give a short overview of how innovation-oriented public procurement is defined in the literature and summarizes today's main theoretical debates. In the second part, by distilling from international policy practices, past and present, and theoretical debates, four different policy modes in which innovation-oriented public procurement can be applied are presented: innovation-oriented public procurement as technology- and industry-development policy, as R&D policy, as generic policy and as “no policy” policy. Using these four policy modes as a starting point helps to explore the evolution and development of innovation-relevant public-procurement policies in different country settings and in wider institutional contexts.

### 2.1 Introduction

As was outlined in the introductory chapter of the book ([Chap. 1](#)), the interest of applying public procurement for the sake of innovation has increased rapidly during the past decade. The contemporary drive seems to build heavily on the historic, and often military-related, post-WWII public-procurement experiences. What seems to differ in the case of the currently emerging policy initiatives compared to the previous programmes, is, however, that the recent policy initiatives have explicitly centred on the wider innovation impacts at the core of public procurement, and it is often seen as a horizontal rather than a sectoral policy

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measure, whereas the well-known cases and policy initiatives from the past can be characterized primarily as mission-critical technology-oriented government procurement programmes, having wider innovation impacts only as a secondary goal.

In light of such expansion of innovation-oriented public procurement, at least in policy talk, this chapter sets out to do the following: first, we will give a brief overview of how innovation-oriented public procurement is defined by various authors and policy documents; second, we will give a brief overview of wider theoretical debate surrounding innovation-oriented public procurement between neoclassical and heterodox economists; third, in light of post-WWII experiences, we summarize today's theoretical debates and their lacunae; fourth, distilling from international policy practices, past and present, and theoretical debates we show that there are in fact four different policy modes in which innovation-oriented public procurement can be applied; each innovation-oriented public-procurement mode has distinct goals and means, institutional and policy-capacity requirements and, consequently, distinctive challenges. Exploring these four policy modes helps to considerably widen current theoretical discussions on innovation-oriented public procurement and so help policy makers globally to better understand how to apply innovation-oriented public procurement in their own specific context.

## 2.2 Understanding Public Procurement and Innovation

The significance and potential of public procurement in inducing innovation has been discussed under many different labels such as “innovation-oriented public procurement” (Rothwell and Zegveld 1981), “public procurement for innovation” (Edquist and Zabala-Iturriagagoitia 2012), “public procurement of innovation” and “innovation-friendly public procurement” (Rolfstam 2012), “innovative public procurement” (Edler and Georghiou 2007), “developmental public procurement” (Weiss in the current volume), “public technology procurement” (Edquist et al. 2000a), “far-sighted public procurement” (Lucchese and Pianta 2012), “forward commitment procurement” (UK DBIS 2011), “strategic public procurement” (Edler 2010) or “enlightened public purchasing” (Williams and Smellie 1985). All these various labels—although with somewhat different conceptual nuances and logics—refer to government purchasing activities that foster innovation. In more general terms, one can identify two main approaches how public procurement is associated with innovation in the current literature. First, it is understood as a tool for stimulating the development of new products (goods, services, systems); second, it can refer to public procurement that attempts to open up innovation possibilities without necessarily targeting new products (for more in-depth discussion, see Uyarra and Flanagan 2010; Rolfstam 2012). The former is often referred to as “public procurement for innovation” (or sometimes as public technology procurement) which

occurs when a public organization places an order for the fulfilment of certain functions within a reasonable period of time (through a new product) (Edquist and Zabala-Iturriagoitia 2012, 1758).

This approach aims at deliberately stimulating markets and assumes product innovation to take place before a certain public function can be fulfilled. Although the potential of public procurement to induce innovation is frequently illustrated through the successful diffusion of radical, new-to-the world breakthrough technologies (see, e.g., Ruttan 2006 on the role of public procurement in the development of Internet or GPS technology), it has an equally central, if not even bigger role to play in promoting incremental innovations where existing products are adapted to the local context and are, thus, new to a country or a region rather than a world (Edquist and Hommen 2000).

The second approach ascribes public procurement a broader role in inducing innovation and stresses that innovation is not limited only to new products, but it is also about new capabilities (organizational and technological) as well as about innovations in mature markets that the government purchasing decisions can stimulate. Max Rolfstam has defined this broader perspective as public procurement of innovation, which refers to “purchasing activities carried out by public agencies that lead to innovation” (2012, 5).

This approach stresses the importance of giving the market the possibility to come up with innovative solutions by deliberately using innovation criteria in tender documents (e.g., functional specifications) (Edler and Georghiou 2007). In addition to new products, the broader approach acknowledges the potential of public procurement to induce innovation across the technological life-cycle. For example, by employing R&D procurement, the public sector has the ability to facilitate learning and knowledge creation already during the pre-commercial phase of products that are deemed important for meeting social challenges (see, e.g., ECWG 2006). At the same time consolidative public procurement can reduce risks and uncertainty in the market and motivate companies to invest in innovation if it leads to more standardized markets for already existing products (Hommen and Rolfstam 2009). Relatedly, a deliberate application of purchasing techniques such as lifecycle costing can trigger short-term efficiencies in public services that can positively affect innovation capabilities (Rothwell and Zegveld 1981). Therefore, public procurement can contribute to innovation not only through fostering the development of new or improved products, but also via creating innovation-conducive environments that stimulate learning as well as the emergence and uptake of new organizational and technological capabilities (or “soft” technologies as emphasized in Nelson and Winter 1982). We will refer to the broader perspective as innovation-oriented public procurement in the rest of the book.

In most cases innovation-oriented public procurement is carried out without any wider economic policy goals linked to it—it is the specific public sector needs or social challenges that usually drive government purchasing. Yet it can be expected that if public procurement led to innovation and if in later stages innovation diffusion took place in other public agencies or private markets, it may have high

chances to contribute to economy-wide innovation and/or market upgrading. Thus, the economy-wide innovation can in most cases be regarded as a by-product or an unplanned positive spillover from government purchasing activities. However, economy-wide innovation and market upgrading can also be a deliberate aim of government purchasing and respective policies. In this context public procurement is often seen as an instrument of demand-side innovation policy, which aims at overcoming

structural hindrances hampering the market introduction and the market diffusion on the demand side, as well as the transformation of needs into market signals (Edler 2010, 276–277).

More specifically, these demand-side systemic hindrances can be found in lacking markets for products and technologies of high potential (thus, hinting to the need to tackle high entrance costs, awareness problems, lock in-effects etc.) and insufficient articulation of demand (interaction problems between producers and the demand side) (ibid.). The demand-side innovation-policy goals are often addressed through public procurement aiming at new products and systems (or even emerging industries) that go beyond the state of the art—the public sector can either act as a testing-ground for innovative products or encourage innovation by providing a “lead market” for new technologies (Rothwell 1994; ECWG 2005). Still, innovation-oriented public procurement can also serve the ends of innovation policy challenges beyond new products, such as by supporting knowledge creation via R&D procurement (Edquist and Zabala-Iturriagagoitia 2012) or supporting market diffusion of already existing technologies (Hommen and Rolfstam 2009; Rolfstam et al. 2011).

All in all, be the innovation effect deliberate or accidental, innovation-oriented public procurement has the potential to enhance providers’ skills and innovativeness, to create and protect infant industry, to support innovation diffusion and, thus, to increase diversification of economic activities and support economic development (Rothwell and Zegveld 1981; Geroski 1990; Edquist and Hommen 2000; Edler and Georgiou 2007).

### **2.3 Theoretical Meta-Debate: Innovation-Oriented and “Regular” Public Procurement**

In spite of the growing popularity, innovation-oriented public procurement has never been the “only show in town” for governments. This is even truer for economic theorists. There have always been competing conceptual and ideological understandings on the proper role of public procurement in innovation and economic development in general (see Edquist and Hommen 1998). The conventional understanding dominating in public procurement-related thinking and policy-making is actually quite different from the basic ideas of innovation-oriented procurement. It is a widely held argument that economic, social and other

side-goals should not be explicit part of the government purchasing decisions or policy as it distorts competition and free trade (Arrowsmith 2003; Evenett and Hoekman 2005). The dominant conceptual wisdom, stemming from neoclassical economic theory and also characterizing the existing World Trade Organization's (WTO) Government Procurement Agreement (GPA) framework, underlines a "level playing field" as the main principle which public procurement and its institutions should stem from. In other words, public procurement should foremost be organized so that it would not prevent in any way open competition and access to government contracting opportunities. It is held that transparency, non-discrimination and maximum competition are the main, if not the only key principles to follow. Moreover, it is often maintained that even if one can make a theoretical case for using public procurement for some sort of side-policies (see, e.g., Trionfetti 2000), public authorities are still better-off without designing these policies, as governments are inherently prone to failing in implementing these policies (Arrowsmith 2003).

Be these theoretical claims as they are, governments often do introduce policies where public procurement explicitly serves socially and economically valued goals (McCrudden 2004). For example, the introduction of public-procurement programmes for small and medium-size enterprises is to a large extent motivated by the innovation aims. Moreover, many governments have in the past successfully used public procurement as part of their industrial policy toolkit to upgrade domestic market capabilities (see, e.g., Rothwell and Zegveld 1981). By today R&D procurement has become an increasingly vital innovation policy instrument in many countries around the globe (Wessner 2008).

In principle, conventional economic as well as legal thinking associates public procurement side-policies with discriminatory practices, which generally lead to inefficient allocation of resources, limit access to foreign markets, hamper the liberalization of domestic markets, increase budgetary costs and consequently diminish the competitiveness of national economy (for an overview on discriminatory public procurement, see Evenett 2002; Arrowsmith 2003; Evenett and Hoekman 2005). However, the "level playing field" perspective falls short in differentiating between discriminatory public procurement implemented on the political, self-interested, nationalist or protectionist grounds on the one hand and public procurement for developmental and innovation goals on the other.

The currently dominant (neoclassical) economic thinking does not provide us a set of tools to understand innovation, as it focuses on trade and competition as the main drivers of innovation and growth. According to this tradition, free trade on the basis of Ricardian "comparative advantage of nations" brings higher efficiency and thus more, better and cheaper goods to the consumer. In this view, competition forces companies to incessantly innovate and overcome competitors, which eventually results in lower prices for consumers through higher efficiency. For heterodox economists, this is a much too simplified representation of reality and abstraction away from the core issues that make competitiveness of nations, regions or firms an important problem for policy makers or the society in general. One of the best known examples of these simplifications is the idea of "perfect

competition”, which is based on the assumption that knowledge is freely and instantly available to all agents, that all agents have access to the same technology and produce goods of the same quality, and that the goods are sold on the price-clearing markets where the only issue for government is to see that nobody distorts the prices, i.e. to “get the prices right”. As a result, the main body of economic analysis of competitiveness was based on the only factor—price (Fagerberg et al. 2007). In the heterodox and in particular evolutionary economic tradition, however, Schumpeter argued that the true basis of capitalist competition is not price. Competition, in his view, resulted

from the new commodity, the new technology, the new source of supply, the new type of organization ...—competition which commands a decisive cost or quality advantage and which strikes not at the margins of the profits and the outputs of the existing firms but at their foundations and their very lives (Schumpeter 1943, 84).

The focus in the Schumpeterian understanding of competition comes from his original definition of innovation, with an emphasis on novelty in products, processes, technologies and organizational practices. As the competitive race stimulates innovation in firms, it lowers the cost of production and can also improve product quality, thus resulting in increasing demand. As a result, those firms that were successful in the competitive game will not only benefit from increasing demand but will also develop capabilities through learning and interacting with others in the process of competition. In evolutionary understanding, competition is often imperfect, yet this imperfection leads to further learning and innovation (Arthur 1994).

The roots of the heterodox arguments for innovation-oriented public procurement can be found in infant industry protection ideas and similar policies that have accompanied capitalism for half a millennium. Interestingly, such policy measures have a longstanding history, reaching back to the Renaissance (Reinert 2007), and that has been shared by economists of almost any school or affiliation (Evans and Alizadeh 1984). Williamson’s original 1990 list of Washington consensus policies (1990, 2002) included infant-industry protection, too. Indeed, such arguments for industrialization and diversification are easily justifiable also within neoclassical economics, based on a market-failure approach, as shown by Rodrik (2007) or also by previous chief economists of the World Bank, Justin Lin (2009). However, most neoclassical economists do not follow such arguments.

In sum, when competitiveness is attained not through price-based competition, but through innovation, it is easier to accept it as an objective of national policy, including procurement (Fagerberg et al. 2007). Today’s surge of conscious policy-making on innovation-oriented public procurement around the world reflects the very idea of evolutionary competitiveness that rests on innovation. Accordingly, in what follows, and throughout the book, we will leave the mainstream understanding of procurement aside and follow a broadly heterodox framework in which innovation-oriented public procurement is a worthy policy tool to be understood and used. (For a more detailed discussion, see Kattel and Lember 2010).

## 2.4 Current Theory of Innovation-Oriented Public Procurement and Policy Research

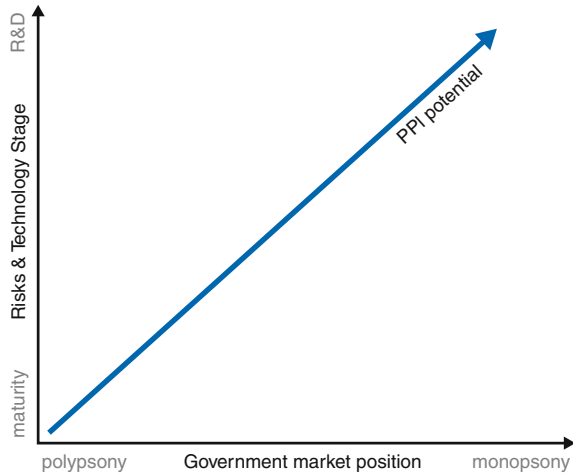
While the theoretical and conceptual aspects of innovation-oriented public procurement have received some renewed attention in the past years and by now a bulk of preliminary empirical evidence exists supporting the idea of innovation-oriented public procurement (see e.g. Dalpé et al. 1992; Edquist et al. 2000a, Edler et al. 2005, Aschhoff and Sofka 2009; Lember et al. 2011), the conceptual understanding on the institutional contexts enabling the governments to pursue innovation-oriented public-procurement policies and to overcome policy challenges is still largely missing. In other words, the current innovation-oriented public-procurement literature has paid only a lip service to policy-level developments.

Edquist and Hommen (1998) have previously identified some country-specific innovation-oriented public procurement models. They distinguished between the Swedish model (based on long-term collaboration between public agencies and major firms, which formed so-called “developmental pairs”), the Japanese model (relying heavily on catalytic technology procurement within state-led public–private networks) and the US model (defence-led technology procurement programmes emphasizing on commercial viability). However, as the focus of their analysis was not on the state-level policy as such, their treatment did not go into much detail.

Historically, to summarize, the explicit public procurement policies aiming at fostering and nurturing innovation are to be found mainly in public procurement of technology and R&D, and not in “procurement of innovation” as such. Accordingly, the central theoretical arguments of innovation-oriented public procurement reflect the historical success stories (e.g., the Internet, various military solutions)—the better the government knows what it wants and the higher-end the R&D is that the government wants, the higher the success rates that the innovation-oriented public procurement activities will have (Fig. 2.1).

This theoretical stand reflects innovation-theory basics from the heterodox and evolutionary standpoints as it takes into account the following key categories: relationship between technology development stage (basic research, feasibility studies, prototype development, diffusion, maturity) and associated risks and government market positions (monopsony, oligopsony, polypsony) in terms of innovation-oriented public-procurement potential (Rothwell and Zegveld 1981; Edquist and Hommen 2000). The highest potential to spur innovation is reached when a government has a monopsonistic position and targets a technology early in its life-cycle. At the same time the government’s room for manoeuvre is constrained by uncertainty and high financial and technology risks as well as a limited number of markets where the government possesses monopsonistic power. These categories are steeped in and derived from such evolutionary concepts as user-producer interaction, interactive learning, evolution, product- (or technology) life-cycle, market development and lead-users concept.

**Fig. 2.1** Technology, innovation theory and public procurement of innovation (PPI) (Authors based on Overmeer and Prakke 1978)



However, all of the technology-related arguments follow what can be called a narrow innovation-system approach: either innovation-oriented public-procurement measures focus on R&D and its counterpart in science and technology or on few sectors (i.e. the focus is on public procurement for innovation). What tends to be left out of such arguments are the issues concerning innovation-oriented public procurement in the context of matured technologies and sectors as well as of learning and knowledge production beyond the development of new products. After all, traditional government suppliers usually come from matured markets. Also, one needs to take into account the peculiarities and rationales of different administrative and policy fields. Most of the past public-procurement policy initiatives supporting innovation have been motivated not necessarily by the need to redress systemic failures of innovation systems, but to meet social challenges (e.g. military, energy consumption, environmental protection, ageing societies etc.) or to improve public services. Therefore, there is a need to understand how different sector-specific logics can be coordinated under the innovation policy aims.

Several recent works have started to address these issues by arguing that the relationship between innovation and public procurement is much more diverse than what has been analyzed in the context of the traditional treatments. For example, Uyarra and Flanagan (2010, 124) have stated that the narrow focus dismisses the wide range of types of goods and services procured by the public sector, downplays the varied nature of innovation and undervalues the multiple potential innovation effects of public procurement. Rolfstam and colleagues (2011) have argued that as public procurement is capable of affecting private-sector innovation also in cases of emerging, but already existing products (as first users), the endogenous institutions and organizational rationales should be considered important factors for innovation and diffusion, and therefore should be incorporated as a central activity in innovation-related public procurement co-ordination and institutional re-design.



Nevertheless, there is still a considerable gap in the literature dealing with these issues and especially when it comes to governance of public procurement and innovation.

## **2.5 Policy Modes in Innovation-Oriented Public Procurement**

In order to understand where innovation-oriented public procurement as policy framework currently stands, we can bring out from the discussion two basic forces that influence our present understandings and activities: first, the historic success of specific technology and R&D related procurement activities that has guided much theoretical and empirical scholarly work; second, the current international policy talk that envisions a much wider role for innovation-oriented public procurement as a general demand-side policy tool. There is quite a mismatch between what we know to work in innovation-oriented public procurement (technology and R&D procurement in specific contexts) and what policy makers seem to want (innovation-oriented public procurement as a general demand-side innovation policy). These two somewhat conflicting dimensions informing today's innovation-oriented public procurement debate give us the opportunity to devise what we call innovation-oriented public-procurement policy modes. Innovation-oriented public procurement as policy can take four rather distinct modes (that can simultaneously exist in a country): innovation-oriented public procurement as technology policy, innovation-oriented public procurement as R&D policy, generic innovation-oriented public procurement policy (so-called "policy for all seasons"), and innovation-oriented public procurement as "no policy" policy.

On the one hand, innovation-oriented public-procurement policy could be understood very broadly as a set of deliberate and coordinated government activities to direct public spending on works, goods and services towards innovative rather than off-the-shelf solutions in order to facilitate innovation. On the other hand, and following the discussion on the narrow versus broad concept above, innovation-oriented public-procurement policy could be understood as an actual practice or behavioural pattern of a government using public procurement in creating, diffusing and adopting innovation. The latter, rather loose, perspective allows one to consider not only public procurement policy initiatives explicitly mentioning innovation as their main goal, but also any other government purchasing measures that make innovation possible. The actual policy solutions governments tend to adopt, as will be demonstrated below, can vary from rather loosely coupled approaches (e.g., fostering maximum and transparent competition among market players that lead to innovations) to complex decades-long procurement programmes (e.g., employing a mix of pre-commercial and commercial public-procurement mechanisms to create new technology platforms). In addition, this perspective also allows one to take into account the fact that governments have

only very seldom implemented deliberate and generic innovation-oriented public-procurement policies and that, as will be demonstrated in this chapter, innovation-related procurement has been historically implemented through a rather different set of policy measures and often through vertical rather than horizontal policy-making.

### ***2.5.1 Innovation-Oriented Public Procurement as Technology Policy***

Historically, perhaps the most influential and most frequently exploited innovation-oriented public-procurement instrument has been government technology procurement (see, e.g., Edquist et al. 2000a). Before World War II (WWII) public procurement of innovative goods and services was mostly related to military equipment and arsenal (Nelson 1987). It continued to be so and, even in increased volumes, also after WWII, which was due to many successful military procurement projects, especially in the US (Ruttan 2006), but also elsewhere (e.g., Eliasson 2010), that resulted in successful diffusion into the non-military markets (e.g., semi-conductors, Internet, mobile technologies, jets). The technology-procurement ideas were soon also adopted in other policy domains such as space, telecommunications and electrical utilities (Nelson 1987). The positive innovation spillovers that emerged from military procurement can indeed be seen as one of the most crucial drivers for later developments in innovation-oriented public procurement policy-making, but there have also been other reasons. Some large government technology procurement programmes in infrastructure development or environmental protection have proven to be as conducive to innovative technologies and related spillovers as military projects. This is, for instance, evidenced from the development of long-distance low-loss energy-transmission technology in the 1940s in Sweden, where the emergence of the so-called “development pair” between the state and technology provider ASEA led to the creation of the world leading technology of its time (Fridlund 2000). Also, digital switching technology developments in many European countries in the 1950s to the 1980s (e.g., Austria, Finland, France, Sweden) produced a variety of new technological solutions that created many innovation spillovers and economic side-effects (Edquist et al. 2000).

There is no single approach how governments have been applying public technology procurement as a systematic policy instrument. Moreover, the scope and scale as well as a concrete mix of instruments employed in public technology procurement have been varying substantially. Two aspects seem to have historically determined the governments’ actual behaviour. One is the government’s position in the technology development process in a particular society. This can be either indirect, limited mostly to supply-side policy intervention and only occasional policy intervention in the form of public procurement, or it can be substantial, with frequent use of government procurement to create and diffuse new

technologies. The latter can be associated with both small-scale projects as well as mission-critical technology-development programmes. Usually the technology platform developments are the ones that tend to define the scope and scale of the public technology-procurement policy approach. Often these start off with the procurement of pure R&D and gradually transform into a set of procurement contracts for ready-to-use products. This has been the case with complex military technology (e.g., fighter jets in the US and Sweden) as well as in civilian technology (e.g., switchboard technology in Japan, Finland, Sweden etc.). Because of the length and sophistication of these types of endeavours, Eliasson (2010) has labelled the government commissioned technology development programmes as “technology universities”, where governments generate specific problem-oriented institutional structures conducive for knowledge creation, development, application and diffusion. One can assume these technology universities to emerge more often in countries and regions where government positions itself as an active player in identifying and solving social challenges through developing new technologies rather than acquiring existing ones.

The other aspect is related to industrial policy-making and public procurement’s role in it. The public sector can consciously use its monopsonistic power in selected technology-intensive sectors or apply catalytic procurement to guide the potential technology providers or industries towards adopting innovative solutions and practices. In other words, public procurement can be deliberately employed as an industrial (re)development tool by exploiting local demand (Rothwell and Zegveld 1981; Kattel and Lember 2010). This does not necessarily mean developing home-biased government procurement policies, but rather targeting a set of measures towards creating sophisticated and challenging demand on local sectors and markets that are considered important for the national economy (Edler and Georghiou 2007). Historically, Japan’s programmes in the 1960s and 1970s represent perhaps the most overwhelming example of how public procurement can be used for technology and industrial upgrading with considerable wider economic effects. In cases such as the electric-switchboard technology, microwave and cable technology, computer technology, the very large-scale integrated circuits etc. Japan simultaneously used—depending on the final goals and technological risks involved—its state-owned enterprises and government agencies as demand articulators, competitive as well as negotiated tendering procedures, dual-sourcing, coordinated procurement within consortiums/networks and other approaches to develop technologies, upgrade firm’s skills and competitiveness in local as well as foreign markets (see Overmeer and Prakke 1978).

Regardless of the government’s approach to technology procurement, it is not only radical R&D-intensive innovations or new technology platforms that are in the focus. Often the focus is on adaptive innovations by using, for example, standard-setting and technology-transfer initiatives as part of public-procurement initiatives. For example, since the 1960s Brazil has extensively relied on state-owned enterprises in the oil, electronics and electric-energy sectors, where, by using its monopsony power, the government has stimulated the entire supply-chain to induce innovative behaviour by setting demanding standards for procured products and

upgrading the technological capabilities of local producers by making technology transfer a compulsory part of procurement contracts for international suppliers (Westman 1985; Faucher 1991; De Oliveira and Roa Rubiano 2011).

Thus, as post-WWII history demonstrates, public technology procurement can as often be technology-driven (i.e. based on social needs, e.g. low-carbon solutions in environmental protection or defence systems) as industry-driven (i.e. where national industry has a potential advantage to grow), and in fact, it is very often almost impossible to distinguish which is actually a focus of a certain public technology-procurement programme. This makes it rather challenging to locate and incorporate public technology procurement into the context of innovation policy-making. Not only may technology procurement remain hidden from innovation policy makers as the procurement decisions tend to follow the rationales and needs of specific policy fields, but the actual driving forces as well. For example, before the 1990s the main rationale for public (technology) procurement in Finland was said to be import substitution, job creation and infant industry protection (Palmberg 2002). At the same time, one of the most influential public technology procurement cases in Finland, where the state cooperated with Nokia for developing digital switching systems, the main driver was not seen in industrial policy, but in the entrepreneurial spirit cultivated in a state agency responsible for the procurement as well as the early presence of foreign companies and technological diversity (*ibid.*).

In addition, the innovation element can be easily overruled by competing agendas, as has happened in many countries. For instance, France, especially in the 1950s/1980s was an example where technology-oriented public procurement was very much influenced by the ideas of national champions and buy-national policies (Callon 1980; Llerena et al. 2000a). This approach was foremost used to sustain the competitiveness of local industries through public contracts and where technological innovation came often as a second-order purpose. The companies that took part in the public-procurement programmes were more or less guaranteed with state contracts, an approach that made eventually many French initiatives and sectors that depended on government procurement uncompetitive on world markets (Callon 1980). That was the idea of industrial policy very often employed in other European countries, as well, such as, for instance, Austria or Italy (Llerena et al. 2000b; Husz 2000). At the same time, Japan and other East Asian countries used innovation-oriented public procurement foremost for technological upgrading of local companies, and the success of these programmes was right from the beginning measured through technological upgrading or export increase (Overmeer and Prakke 1978). The competition was maintained all the time, although not necessarily always through bidding for government contracts, but, when seen necessary, by meeting technological standards or by gaining shares in export markets. In fact, one could even say that the overall Japanese industrial policy very much resembled the idea of public procurement for innovation.

### ***2.5.2 Innovation-Oriented Public Procurement as R&D Policy***

Innovation-oriented public procurement often takes place in the form of public procurement of R&D. To put it another way, public procurement is often used as a tool to fund industrial R&D, which is deemed important to redress systemic and market failures in knowledge creation and technology development (Edler and Georghiou 2007). As argued by Nelson (1987, 551)

... the heart of such policies are efforts aimed at developing and bringing into production particular products. In contrast with more broadly oriented basic research support programs that rely heavily on the relevant scientific or technical community for guidance, procurement-oriented policies tend to be tightly controlled by government agencies pursuing their own ends.

Thus in this case public procurement serves directly the goals of science, technology and innovation policy, but is at the same time directly oriented towards production and not only knowledge creation.

Public procurement of R&D as a policy has many points in common with technology procurement programmes and in many occasions it is not possible to draw a clear line between these two. However, there are important aspects that make R&D procurement a distinct mode in the context of innovation-oriented public procurement. If public technology procurement can be targeted towards radical as well as incremental innovations, R&D procurement almost by definition aims at radical innovation. In case of R&D procurement, governments usually establish separate horizontal (e.g. Small Business Innovation Research type of schemes) or field-specific programmes (e.g. in defence, security, health, energy) that focus on early phases of product/technology life-cycles (pre-commercial solutions) and which assume high-level R&D work from providers in order to meet (sometimes loosely) specified public demand. In addition to tackling the so-called “societal grand challenges”, the introduction of R&D procurement programmes usually explicitly serves to increase the overall level of R&D spending in society. Another distinction between technology procurement and R&D procurement comes from international regulation. Signatories to the WTO GPA (mostly developed world), who as a general rule are not allowed to use any sort of discriminatory procurement practices, are free to use any procurement practices deemed necessary in contracting for R&D. This principle is often used in bilateral trade agreements, as well. These rules, thus, elicit differentiation between procuring R&D up to prototypes and marketable solutions, and enables countries to design their policy programmes accordingly. Another distinguishing factor is the way the diffusion of the new knowledge is addressed. In public technology procurement the public sector is either the first user or bundles together private demand via catalytic procurement to guarantee a market for the new product. In R&D procurement the prospective public or private markets are not automatically available for the prototype producer; however, the possibilities for receiving public or private orders serves as a crucial incentive for the providers to participate in R&D procurements.

As was the case with public technology-procurement programmes, the current R&D procurement ideas and on-going programmes have been very much influenced by the legacy of military technology procurement. When the success of the military-procurement programmes targeting R&D after WWII (especially in the US) became more widely acknowledged, many governments decided to emulate the approach as a direct developmental or industrial policy tool (Rothwell and Zegveld 1981 provide a good overview) or as a generic R&D policy tool. For example, in the 1970s Canada was one of the countries that began to experiment with the deliberate public R&D procurement policy, trying to balance the one-sided “technology push approach” and contract out as much public-sector R&D and feasibility studies as possible (Overmeer and Prakke 1978). The US Small Business Innovation Research (SBIR) is perhaps the most prominent civilian example born out from military experiences. It was created in 1982 and has since then been used on projects varying from biomedicine to energy and security (Connell 2006), and it has been regarded as one of the most successful economic development policy tools of the US (Block and Keller 2011). The SBIR programme acts as a knowledge centre which gathers and articulates government or social demand for new (technological) solutions and procures needed R&D from small businesses. The programme is financed by federal departments: all departments with R&D budgets over \$100 million are mandated to spend 2.5 % of their annual R&D budgets through SBIR (Bound and Puttick 2010). Prototypes financed and developed under the programme do not automatically guarantee that the government will also buy a certain volume of these products for their own use (although it is the driving force of the programme), but the programme also works as a quality-certification scheme by giving the grant-winning small businesses much higher chances to get access to venture capital or contracts from the public as well as the private sector (Lerner 2008). By now countries like Finland, Japan, the Netherlands, Russia, Taiwan and the UK are following the SBIR path (Wessner 2008).

In the EU context, the R&D procurement idea is being implemented under the label of pre-commercial public procurement, which

refers to the procurement of Technological Innovation up to and including a first pre-commercial volume batch of products and/or services validated via field tests (ECWG 2005, 17).

Again, the idea has been taken over from the (US) military procurement practices, and it is about procuring “yet-to-be-designed” technology research, which supposedly helps the providers to reduce investment risks and gain capital for R&D (ibid.). Since 2006 China has been pursuing its endogenous innovation policy, where one of the policy measures developed is the key-equipment catalogue (Edler et al. 2007). This catalogue is a kind of wish list of high priority technologies yet to be designed for China, based on the domestic demand and needs. Here the government looks for unsolicited proposals from enterprises in the listed areas and provide the enterprises a mix of supporting measures from R&D subsidies to tax reductions and pre-commercial procurement (Li 2011). Once a

technology is developed under this programme, it will be removed from the list, but can then be placed on another list called innovative products category (*ibid.*), which is basically a measure mixing innovation-oriented and buy-national procurement policies.

Thus, taken from the above, public R&D procurement policy usually takes place via specific programmes created to articulate demand and tackle structural hindrances for socially and economically relevant radical innovations. Here governments usually outline challenges to be tackled and either act as financiers or as brokers between market stakeholders. This policy assumes strong and competent centres capable of gathering and articulating public user needs, contracting with the private sector and evaluating results.

### ***2.5.3 Generic Innovation-Oriented Public Procurement Policy***

Contrary to the public technology or R&D procurement-policy modes, which concentrate on some specific sectors, technologies or challenges, governments can also opt for more generic policy solutions to promote and foster innovation. Within this, so-called policy “for all seasons”, the innovation dimension is made a central and explicit part of government procurement strategies and decisions across the public sector. The generic policies aim at exploiting government consumption expenditure in general as a vehicle for inducing innovation. In these cases, emphasis is given not only to dedicated public-procurement programmes, but to the maximum use of specific, allegedly innovation-friendly procurement practices and methods such as performance (outcome) specifications, competitive dialogue, variant bids and idea competition. The focus is on creating innovation-friendly public-procurement culture with supportive environment; innovation in its widest sense is explicitly targeted for so that it would become a legitimate criterion for government spending decisions. Under the generic approach the “regular” public procurer, responsible for every-day purchasing transactions, becomes the key policy implementer in the field.

The idea of exploiting general public procurement as an explicit policy tool for innovation promotion is not a new one, but it has probably never gained as much attention by governments around the world as it has since the 2000s. The previous decades have witnessed only limited attempts to introduce “policy for all seasons” types of initiatives. One period when this was the case was the 1970s, when several experimental programmes were initiated, e.g. in the US, West Germany and Sweden (Overmeer and Prakke 1978; Rothwell and Zegveld 1981). Although technology-oriented in nature, these programmes also aimed at introducing new and innovation-oriented procurement methods across the public sector. This was the case, for example, with Sweden’s STU programme, where the government took both the role of a broker (catalyst) between social needs and market

opportunities (articulation of demand) and the role of a promoter of the innovation-friendly public procurement in society. Being very much driven by innovative technologies, the STU programme was not limited, though, to a particular technology or sector, and it searched ways to make innovation an important aspect in public service delivery. The US Experimental Technology and Innovation Program (ETIP) is another example where the public sector aimed at supporting innovation through public procurement above sectors and specific technologies. Although ETIP was perceived as having only limited success in terms of technology diffusion and was abolished in the early 1980s, it succeeded in introducing the concepts of life cycle costing, performance specifications and the value-incentive clause in many federal and state agencies (see also Tassey 1985).

Today, perhaps closest to the “policy for all seasons” position are the China’s recent endogenous innovation initiatives (since 2006), but also some of the latest developments within the EU and other countries. In Europe, the idea of innovation-friendly public procurement emerged into the policy debate at the beginning of the 2000s (ECEG 2006) and outside the technology- and R&D-related public procurement initiatives, the generic policy-making has mostly been about awareness-building and context creation in order to encourage the public sector to use its purchasing power to nurture innovation (see Izsak and Edler 2011 for the latest overview).

Although the generic policy perhaps reflects best the recently emerged policy talk, it is still a policy mode waiting for a reality test.

#### ***2.5.4 Public Procurement for Innovation as “No Policy” Policy***

Innovation can result not only from deliberate innovation-friendly public-procurement policies or programmes, but in many cases in spite of deliberate policy actions or just by accident. Indeed, many governments have never pursued massive technology, R&D or generic procurement policies to spur innovation, and even if innovation is declared to be an important part of economic-development policies, governments may, in terms of innovation-oriented public procurement, still opt for “no policy” policy. Much of today’s government spending on goods, works and services is still done according to routine by employing regular public-procurement practices (e.g., simple price auctions targeting on-the-shelf solutions) without secondary (i.e. innovation) intentions in mind. Governments may deliberately opt for the “no policy” policy because they assume that public funds should not be used to intervene into the economy (as markets know best how to innovate) and governments’ actions should be limited to fixing market failures only (as opposed to systemic failures), or, as mentioned earlier in this chapter, governments are considered to be prone to failing in policy intervention even if the cause was perceived as right. In terms of “no policy” policy, governments limit their



activities to creating a level playing field for market players as it is believed that innovation can be best stimulated by applying the principles of open procedures and maximum competition, whereas built-in innovation incentives are often regarded as entry barriers to the market (see also Cabral et al. 2006 for discussion). This policy strategy can also be chosen unconsciously simply because public officials, politicians and other stakeholders are not aware of alternative policy options. In the case of “no policy” policy there still can exist random cases where innovative solutions are sourced for—initiated and implemented by single public organizations—but this is done without any linkages to innovation policy areas. In many ways this is what characterizes the standard approach to public procurement and what some authors claim to characterize the European Union’s public-procurement policy-making in the 1990s (Edquist and Hommen 2000).

Table 2.1 summarizes the modes of innovation-oriented public-procurement policy described above.

## 2.6 Towards Explaining the Policy Trajectories

What becomes clear from the above is that depending on a specific policy mode, innovation-oriented public-procurement policy-making assumes a rather different set of policy and institutional capacities from the public sector. And not only to fulfil specific goals of each policy mode or to overcome policy hurdles, but also in order to create synergies between different innovation-oriented public-procurement policy modes and with other innovation as well as public-sector policy domains.

The existing, but scarce evidence points to the fact that the assumed institutional capacities are difficult to develop. For example, Williams and Smellie (1985), based on the UK policy experience, argue that innovation-friendly public-procurement policy can be too broad a target for the public-sector stakeholders to grasp, and it opens up possibilities for different interpretations. Moreover, innovation-supportive government purchasing assumes substantial changes in the behaviour of civil servants, and the diffusion of this change is difficult, often contested on the ideological as well as short-term efficiency grounds, and time-consuming (*ibid.*). Focusing on technology changes in areas where government has weak buying power, dependence on political requisition on quick results, and limited knowledge on markets all seem to contribute to policy failures (Overmeer and Prakke 1978; Rothwell and Zegveld 1981). At the same time, the limited historic knowledge seems to suggest that successful innovation-oriented public-procurement policy-making assumes from a government not only a delicate understanding of the functioning mechanisms of its home markets as well as the global situation, but also a clear consensus on the viability of policy intervention and high-level in-house competence on technology, demand articulation, procurement methods and various intervention logics (*ibid.*). In addition, local circumstances and path-dependencies should be seen as the most crucial building

**Table 2.1** Overview of innovation-oriented public-procurement policy modes (Authors)

Policy mode	Primary driver	Implementation mechanism
Innovation-oriented public procurement as technology policy	Tackling social challenges (e.g. environmental, defence) and/or industrial development	Mission-critical technology (platform) development, sometimes in the form of catalytic procurement. Can be: (a) technology driven (i.e. sectoral needs, e.g. low-carbon solutions in environmental protection or defence systems); (b) industry driven (i.e. where national industry has potential advantage to grow)
Innovation-oriented public procurement as R&D policy	Knowledge creation in science, technology and innovation	Procurement of R&D to meet social demand and increase R&D spending. Emphasis on pre-commercial procurement, but government contracts for ready-to-use solutions as important incentives. Built around public competence centres capable of articulating public needs. Partly based on unsolicited proposals. Often SME-centred
Generic innovation-oriented public-procurement policy (so-called “policy for all seasons”)	Innovation spillovers from better public services	Innovation policy goals incorporated into all public procurement decisions. Emphasis on the use of specific procurement practices and methods such as performance (outcome) specifications, competitive dialogue etc. that are perceived as innovation-conducive
Innovation-oriented public procurement as “no policy” policy	Non-intervention via level playing field (innovation results from “perfect” competition)	a. Innovation as an unintended by-product of “regular” public procurement b. Public procurement for innovative solutions randomly initiated and implemented on the organizational level, but no explicit policy or links to other innovation policy areas exist

blocks of innovation-oriented public-procurement policy-making (Rothwell and Zegveld 1981; Edquist et al. 2000b), as is, for example, characterized by Spain's failed attempt to emulate the US military technology procurement (Mollas-Gallard 1998) or France's failed effort to copy the US electronics-development programmes (Callon 1980). Overmeer and Prakke's conclusion on the Japanese high-tech development policy from 1978 summarizes these policy lessons well:

Procurement policy is a part of innovation policy clearly embedded in a national economic and industrial strategy which are based on a national consensus. Japanese government has a large in-house competence in the various agencies and ministries. This makes it possible for various agencies, not only to define the strategy, but also be involved in the implementation of it. A procurement policy based on the most effective use of the limited resources is designed for every technology and product. Depending on the technology, the number of a product to be constructed and the anticipated costs of competition, co-ordination or a mix policy chosen. (1978, 75)

Nevertheless, there are considerable lacunae in today's knowledge how countries, in the current policy space, develop and nurture the innovation-oriented public procurement policies and related policy expertise. This is the focus of the remainder of the book.

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