Veiko Lember · Rainer Kattel
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Public Procurement, Innovation and Policy

International Perspectives

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Foreword

After several decades of market fundamentalism and the drive for smaller governments, most countries—advanced, emerging or developing—are facing the need for rethinking the role of the State in the economy.

This change of face is consistent with the view that the major bubble collapse reveals a serious decoupling between the financial world and the real economy as well as an acute polarisation of income within and between countries. It is illusory to expect markets to overcome these cleavages. Such ills can only be healed through the intervention of the State as an active and creative agent of innovation for growth and widespread well-being.

Among the many ways of government action in pursuit of such goals, innovation procurement seems to be a prime instrument. It is both a form of public investment that spurs economic activity and a way of stimulating private efforts in innovation directed at fulfilling social needs.

Although government procurement is a proven and effective instrument, together with investment, for mobilising the economy, innovation procurement is much less used and less well known, except in the case of the defence industries, especially in the US. It is therefore of great relevance to examine a set of diverse policies and their results in a wide range of countries.

This book analyses eleven experiences with public procurement of innovation in countries as diverse as Australia, China, Greece and the US, including consciously proactive governments and "no policy" hands-off ones.

Having been a public servant in charge of technological development in the Ministry of Industry in Venezuela, I am acutely aware of the difficulties involved in using public procurement as a tool to strengthen and encourage production and the even greater complexity of using it to induce innovation. That personal background also makes me appreciate all the more the usefulness of having such a varied set of experiences described, analysed and compared. It has always been desirable to have a social science perspective on policy innovation and its relative effectiveness; in the current circumstances, when decline threatens the advanced countries while the governments of the emerging and developing countries face unprecedented opportunities and daunting challenges, it is a crucial input.

This book is destined to become indispensable reading for policy makers in all countries. In one way or another, promoting innovation is no longer an additional element of economic strategy. Whatever the position of a country in the global

economy, innovation will be a central part of any strategy for seeking a better future. The authors are keenly aware of this and have provided an invaluable resource to help policy makers and politicians to intelligently incorporate innovation procurement into the tool-kit of economic and development policy. I hope that it will also inspire researchers to delve deeper into the many aspects of innovative public policy to serve as a guide for action in these complex and uncertain times.

January 10, 2013 Carlota Perez

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Chapter 1
Introduction

Veiko Lember, Rainer Kattel and Tarmo Kalvet

1.1 Renaissance of Innovation-Oriented Public Procurement

The recent decade has witnessed a growing interest in using public procurement to spur innovation and development. An increasing number of governments are claiming that public procurement—often worth of 10–30 % of a country's GDP as exemplified by European Union member countries (EC 2011b)—should be used more extensively and explicitly to promote innovation, technology, and economic development.

Indeed, diverse countries from Asia to North America and from Europe to South America have started to develop new and explicit policies that place public procurement into service for innovation and development (see country chapters in this volume but also Edler and Georghiou 2007; European Commission 2008, 2009, 2010, 2011a; OECD 2009a, b, 2011a). Such initiatives include the European Commission's (EC) Lead Market Initiative (EC 2011c, 2012a) and pre-commercial public procurement-related activities (EC 2012b); numerous new initiatives in the EU member countries (Edler and Izsak 2011); the New Directions for Innovation, Competitiveness and Productivity program in Australia with a highlighted role for public procurement (OECD 2011a); the Indigenous Innovation Policy initiative in China (Edler et al. 2007); and industrial policy initiatives using public procurement in Brazil (Prochnik 2010). These are only a few examples of recent policy initiatives that are based on the idea of public procurement of innovation. The issue has also been picked up by international organisations, which suggest that developed as well as developing countries ought to introduce their own public procurement of innovation policies as part of a demand-side innovation policy mix. For example, the Organization for Economic Cooperation and Development (OECD) believes

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that public procurement of innovation-related programs must be accelerated and expanded "wherever possible" (OECD 2009a, b).

Using public procurement for innovation and development is, however, not a new phenomenon. The contemporary drive for cohesive and explicit policies builds heavily on historic and often military-related post-WWII public-procurement experiences. Here the example of the US is especially notable, where public procurement programs played a crucial role in creating technologies such as the Internet, global positioning systems, and the semiconductor industry—all of which have had major economic impacts (see Chap. 13 in this volume but also Ruttan 2006). Other past successful government-initiated projects that led to major innovations and positive developmental effects have been found in Europe, East Asia, and elsewhere (see the country chapters in this volume but also Overmeer and Prakke 1978; Rothwell and Zegveld 1981; Edquist et al. 2000). In the 1960s, for example, Japan used to employ public purchasing as a direct developmental policy tool (Rothwell and Zegveld 1981). In Sweden a "developmental pair" approach evolved between the state and technology companies based on technology-intensive public-procurement programs (Edquist and Hommen 1998; Fridlund 2000).

Compared with earlier programs, what seems to differ now is that recent policy initiatives have broader innovation impacts as a primary goal of public procurement, often seen as a horizontal policy measure; whereas, well-known cases and policy initiatives from the past can be characterised primarily as mission-critical technology-oriented government procurement programs, making broader innovation impacts a secondary goal.[1] If the immediate post-WWII and later public-procurement programs were mainly concerned with specific technologies and industrial upgrading, the emerging consensus (as reflected, e.g., by OECD 2009a) targets the entire spectrum of public-sector activities, not limiting them to "hard" technologies or products but, increasingly, including services and organizational innovations. Prevailing theoretical understanding reflects this view: today public procurement of innovation is mostly understood in a relatively narrow and well-defined context as a situation where a public agency places an order for products (goods, services, or systems) that do not yet exist but that could probably be developed within a reasonable period of time, based on additional or new innovative work (Edquist and Hommen 2000, 5). More recent policy initiatives, however, considerably widen the scope of innovation-oriented public procurement, stressing that public procurement can have a broader role in encouraging innovation. Further, stimulated by governmental purchasing decisions, that innovation is not only limited to new products but can include new market capabilities (organizational and technological) as well as innovations in mature markets.

Public procurement as innovation policy faces a conflict. On the one hand, there is an emerging interest in public procurement as an innovation policy instrument,

[1] For instance, Eliasson (2010) claims that the successful entrance of Ericsson into the international mobile market in 1990s was an indirect consequence from Ericsson's involvement in the Swedish government's procurement project to develop their 4th generation fighter jet technology in 1980s and not because of explicit innovation policy measures.

yet, on the other hand, the current theory is, with some notable exceptions, constrained and often guided by the historical successes of (mostly) military procurement. This conflict is deepened by many economic theorists who still believe that public procurement should not and cannot deal with innovation at all. Innovation can be, so the argument goes, at best a by-product of procurement activities that should be geared towards efficiency in public money spending as a first priority. This understanding is also reflected in the World Trade Organization's (WTO) agreement on public procurement.

In spite of the growing interest in innovation-oriented public procurement and related policy instruments, it is striking that apart from some notable exceptions (e.g., Overmeer and Prakke 1978), the systematic and comparative empirical knowledge on innovation-oriented public-procurement policymaking and historic developments remains limited. In sum, policymakers see increasing potential in public procurement as a substantial and widespread tool for spurring innovation, while currently prevailing theoretical frameworks either deny such a possibility or develop this tool for a much narrower context. This book attempts to build some bridges over these theoretical and practical gaps.

1.2 Research Focus

Our goal is, therefore, to advance knowledge on public procurement as a specific policy instrument for stimulating innovation. Our focus is, first of all, on exploring the evolution and development of innovation-relevant public-procurement policies in different country and regional settings and, secondly, on analysing the evolution and development of the various policy solutions in wider institutional contexts. This process should help policymakers and academic theorists better understand country-specific challenges as well as formulate future policy options in relating public procurement to innovation.

From the conceptual and theoretical perspective, three aspects characterise our work. Firstly, the book stems from evolutionary economics and, more specifically, from innovation and systems of innovation theories. It is generally accepted today that throughout history, the generation, exploitation, and diffusion of knowledge has been and still is fundamental to the economic development and well-being of nations. According to Joseph Alois Schumpeter's main argument, economic development is driven through a dynamic process in which new technologies, skills, and industries play a key role—a process he labelled as "creative destruction". In most instances, there has to be a systemic interplay of various actors for innovation to take place and diffuse. Public procurement can be a mechanism to advance such interplay.

Secondly, the book analyses the links between public procurement and innovation in the context of the historical move from industrial policy measures to innovation policy measures in the 1990s. This shift does not change final policy goals—to influence the economic specialisation of the private sector towards

activities that foster structural techno-economic change (or the creation part in creative destruction)—but changes, instead, perceptions about what kind of policy instruments and institutional systems are suitable for fulfilling policy goals. While industrial policy interventions were often aimed at creating technological and production capabilities in a handful of industries with a limited number of firms and suppliers, innovation-policy measures aim at strengthening a much wider set of capabilities (including R&D and skills at all educational levels) for a wider number of companies to upgrade their activities. It is important to add that the key underlying ideas supporting macroeconomic policies changed similarly. During the industrial-policy period, macroeconomic tools (mostly exchange and interest rates) were used in conjunction with industrial policies; whereas, in the 1990s the driving idea behind macroeconomic stability was investment stability for foreign companies (mostly low inflation and taxes) and the economic impact of its presence on a broad set of skills through various spillovers. This historical shift is especially significant when drawing meaningful lessons from the previous surges of innovation-oriented public-procurement policies. Both negative and positive consequences ensue: as innovation policy is seen to be much more horizontal than industrial policy, public procurement could be more readily accepted as another horizontal tool in the innovation policy toolbox; conversely, highly concentrated industrial policy efforts often meant that civil servants were very well informed about what went on in key industrial sectors and companies. Today this can often not be assumed to be the case, making it much more difficult for procurement officers to judge and negotiate various bids.

Thirdly, we employ an institutional-organizational perspective in order to understand the evolution of innovation-oriented public-procurement policies. The institutional-organizational perspective is the missing link in innovation studies, which cannot be ignored if the aim is to understand in-depth policy processes. Moreover, as will be demonstrated in the country chapters, innovation-oriented public procurement has operated in a very fragmented, not a centrally located, policy arena, where single organizations operating in specific institutional contexts seem to dominate. An institutional-organisational perspective allows us to assume that the evolution of public procurement as an innovation policy tool in various countries is not only shaped in the public sector by prevalent governmental policy and historical institutional practices but also by factors affecting administrative and policy capacities (Painter and Pierre 2005; Christensen and Laegreid 2007; Pollitt and Bouckaert 2011). In other words, how public procurement is or can be used for innovation policy depends on country-specific factors. We find that the most beneficial way to understand the current dilemmas and conflicts surrounding public procurement of innovation is to examine various case studies and to try to abstract certain principles from them.

The two research questions presented here are (1) what policies are countries currently pursuing in promoting innovation through public procurement, and (2) what explains the differences and similarities of the current international policy patterns?

The country chapters analyse how innovation-oriented public procurement and related policymaking is understood in specific national contexts, looking into issues like actual policy practice vis-à-vis policy rhetoric. Is policymaking purely about creation and/or diffusion of new (high-tech) technologies and respective sectors or about elements of learning and upgrading of "soft-technologies" (organizational skills)? Related to the latter, does the use of innovation-friendly regular public-procurement methods (the so-called generic approach) dominate policy discourse or do specific innovation-oriented public-procurement approaches (sectoral/technological) emerge? Are any new, currently neglected policy approaches appearing?

We analyse the main drivers and institutional factors of innovation-oriented public procurement mechanisms and examine how policy in general is carried out. Namely, earlier research shows that the main (and successful) historical and current policy practices are very often driven and enabled by some specific socio-economic features that are used to legitimise innovation-oriented public procurement. For example, we can point to current security issues in the US and environmental issues in the Nordic countries or, as a historic example, to the developmental state idea in Japan after WWII. These features seem to provide governments a needed "anchor" for using innovation-oriented public procurement, even when the general public-procurement framework and assumed capacities move towards opposite directions. However, these anchors (if present) are usually nurtured in specific, often idiosyncratic, institutional contexts, which in turn influence where the public sector innovation-oriented procurement capabilities reside and are maintained and, thus, how innovation-oriented public-procurement policy evolves. Equally important is the question of what makes the different innovation-oriented public-procurement policy trajectories possible under the rather similar regulatory frameworks that different countries have adopted.

If we want to understand the underlying mechanism of innovation-oriented public procurement, we must understand what makes (or made) or what hampers institutional changes within innovation-related public procurement policymaking.

1.3 Countries Selected

We collected case studies representing countries with varying international influence as well as differing socio-economic and policy-level contexts.

The book covers the policy experiences of 11 countries, including small (Sweden) as well as large (USA, China); highly developed (Denmark) as well as less developed (Estonia); old democracies (Australia) as well as newly democratized (South Korea); and Asian (Hong-Kong), American (Brazil), and European (UK, Greece) countries. Also, the selection includes countries that joined the WTO Government Procurement Agreement (EU countries, USA) and those that did not (China, Australia).

More specifically, we tried to include countries with very high (such as USA, China) as well as with low absolute GDP (Estonia) as well as those with different

Table 1.1 Overview of countries

	2011 GDP per capita[a]	2011 GDP in billions[a]	2009 Service Employment[b]	2009 Industrial employment in[b]
Australia	$25,351	$573.5	75.5 %	21.1 %
Brazil	$4,803	$944.6	60.7 %	22.1 %
China	$2,640	$3,547.9	n/a	n/a
Denmark	$30,687	$171.1	77.1 %	20.3 %
Estonia	$6,438	$8.6	64.1 %	31.3 %
Greece	$12,653	$143.0	66.9 %	21.2 %
Hong Kong	$37,352	$264.1	87.4 %	12.4 %
Korea, Republic of	$16,684	$830.5	76.6 %	16.4 %
Sweden	$33,513	$316.8	77.4 %	20.1 %
UK	$28,033	$1,756.0	78.7 %	19.5 %
USA	$37,691	$11,744.2	80.9 %	17.1 %

World Bank (2012a)
[a] Constant 2000 $US
[b] Percent of total employment

economic development levels as illustrated by GDP per capita and with different shares of industrial employment (Table 1.1).

As it is the national innovation system within which innovation processes take place, policies related to public procurement can have a direct influence. Previous extensive research on public procurement and innovation has examined strong innovation systems (Denmark, Republic of Korea, Sweden, USA), while not much research has been done on weaker innovation systems (Estonia, Greece). We hypothesise that innovation-system context influences the actual application and further application potential of policy measures (Table 1.2).

The countries also differ in the role of government in consumption and in the organisation of public procurement systems. For some, the size of the public procurement market is close to one-fifth of GDP (Estonia, Sweden, UK); while for others, it is considerably lower (Hong Kong having the lowest ratio). According to one study, government procurement decisions foster technological innovation most in the USA and Sweden, although we would be careful in making far-reaching conclusions based on this limited data (Table 1.3).

Since our research questions concern policy-level variables and public procurement of innovation, our sample countries represent differences in governance. For example, some rank very highly in government effectiveness, regulatory quality, rule of law, and control of corruption (Nordic countries, Australia, Hong Kong), while others (China, Greece) are weaker (Table 1.4).

As demonstrated in the following chapters, the selection of countries indicates that there is a considerable variety among the countries included. They tend to have a rather different mix of policies when it comes to public procurement and innovation. While making it harder to draw any firm conclusions on the general

Table 1.2 Innovation systems (Authors based on OECD 2012, United Nations 2012, World Bank 2012a)

	2008 GERD[a]	2010 BERD[a]	2000–2010 Patent applications[b]	2010 High tech exports[c]	2009 Knowledge-intensive services exports[c]	2010 Royalty/ licence fees[a]
Australia	2.3 %	1.3 %	2,481	1.7 %	n/a	0.04 %
Brazil	1.1 %	n/a	3,624	3.5 %	11 %	0.01 %
China	1.5 %	1.3 %	118,486	23.2 %	6 %	0.01 %
Denmark	2.9 %	2.1 %	1,686	5.3 %	29 %	n/a
Estonia	1.3 %	0.8 %	38	4.8 %	18 %	0.06 %
Greece	0.6 %	0.2 %	497	1.7 %	35 %	0.01 %
Hong Kong	0.7 %	n/a	129	0.2 %	3 %	0.13 %
Korea, Republic of	3.4 %	2.8 %	107,389	17.5 %	4 %	0.24 %
Sweden	3.7 %	2.3 %	2,884	7.0 %	21 %	0.79 %
UK	1.8 %	1.1 %	18,581	8.8 %	32 %	0.54 %
USA	2.8 %	1.9 %	206,773	7.9 %	15 %	0.55 %

[a] Percent of GDP
[b] Average annual by residents
[c] Percent of total exports

Table 1.3 Public procurement system (Audet 2002: 159–161; OECD 2011b; World Economic Forum 2012)

	Public procurement market size[a] (%)	Do government procurement decisions foster technological innovation in your country?[b]
Australia	12.0	3.9
Brazil	7.2	3.9
China	12.8	4.3
Denmark	16.0	4.4
Estonia	18.0	4.2
Greece	9.0	3.0
Hong Kong	8.7	4.2
Korea, Republic of	12.0	4.1
Sweden	19.0	4.5
UK	19.0	3.9
USA	11.0	4.7

[a] Percent of GDP of general government procurement
[b] 2011 public survey of government effectiveness in fostering technological innovation. [1 = no, not at all; 7 = yes, extremely effectively]

processes that shape public procurement of innovation policies, this variety in country selection was necessary in order to overcome the dearth of empirical information that prevails in the field. Our research should be, therefore, regarded as a first step in a longer journey aimed at understanding the potential of this increasingly important policy field.

Table 1.4 Governance indicators[a] (World Bank 2012b)

	Voice and accountability	Political stability	Government effectiveness	Regulatory quality	Rule of law	Control of corruption
Australia	1.429	0.815	1.816	1.657	1.77	2.061
Brazil	0.499	0.048	0.071	0.189	0.002	0.056
China	−1.65	−0.766	0.123	−0.231	−0.347	−0.603
Denmark	1.581	1.01	2.167	1.901	1.878	2.374
Estonia	1.127	0.635	1.222	1.447	1.148	0.911
Greece	0.898	−0.114	0.521	0.653	0.615	−0.121
Hong Kong	0.583	0.907	1.737	1.891	1.559	1.941
Korea, Republic of	0.709	0.097	1.189	0.914	0.989	0.423
Sweden	1.583	1.076	2.016	1.72	1.948	2.251
UK	1.313	0.404	1.561	1.745	1.77	1.482
USA	1.162	0.311	1.442	1.418	1.585	1.233

[a] Range: −2.1: +2.5

1.4 Research Process

In parallel with the selection of countries, in 2011 the editorial team developed the initial conceptual framework for the book, developed the guidelines for the country chapters, and started to contact possible contributors. Overall, the book benefitted from the fact that the researchers' diverse backgrounds (law, public administration, etc.) provided an interdisciplinary perspective. While for many countries, the research focus was on innovation and mainly on innovation-oriented public procurement; for other countries, the focus included other areas as well.

The first drafts were refined through discussions and guidance at the workshop entitled, "Public Procurement Policy for Innovation: International Perspectives," held on 29–30 March 2012 at the Ragnar Nurkse School of Innovation and Governance at Tallinn University of Technology, Estonia.

1.5 Structure

The introductory chapter is followed by Chap. 2, entitled, "Public Procurement and Innovation: Theory and Practice," in which a framework is provided for understanding innovation-oriented public-procurement policy, including a short overview of how innovation-oriented public procurement is defined in the literature and a summary of today's main theoretical debates. Distilling international policy practices, past and present, and theoretical debates, four different policy modes can be described in which innovation-oriented public procurement is categorised: (1) technology policy, (2) R&D policy, (3) generic policy, and (4) 'no policy' policy.

Chapters 3 to 13 are the 11 country chapters, arranged in alphabetic order. All case studies—Australia, Brazil, China, Denmark, Estonia, Greece, Hong-Kong, Republic of Korea, Sweden, UK and USA—follow a common generic structure with some deviations.

The country chapters include country background information, summarising aspects like the socio-economic environment, characteristics of national innovation systems, general politico-administrative regimes and structures, and state-market-society relations.

Each country's public-procurement system is reviewed, including the main characteristics of the national public-procurement system, national public-procurement policy and institutions, regulation of public procurement and implications to innovation, and general characteristics of public-procurement practice.

The main focus of the country chapters is on analysis of public-procurement policy and innovation, covering public-procurement policies and measures that either explicitly or implicitly target innovation and/or technology development, including the evolution of such policies over time. The focus includes the drivers and hindrances of policy developments, e.g. environmental pressure (globalisation, ideology, politics), socio-economic challenges, and cultural processes/institutional context (path-dependence and values). The developments surrounding public procurement are related to the developments of national innovation systems.

By synthesizing empirical evidence from the country case studies, the book concludes with Chap. 14, "How Governments Support Innovation Through Public Procurement: Comparing Evidence from 11 Countries" which revisits the main research questions—what policies are different countries pursuing in promoting innovation through public procurement and what explains the differences and similarities of the policy patterns. The analysis is built around three domains: international pressures, country-level socio-economic variables, and policy-level variables. We discuss the impact of globally competing ideological and paradigmatic principles (for instance, neo-liberalism vis-à-vis innovation policy thinking), international regulatory and trade regimes (such as WTO's GPA, bi- and multilateral trade agreements), and economic globalisation (including crises). Procurement-related developments are related to the general economic background and developmental stage as well as to the national innovation systems of a country. Third, developments are related to the general public-procurement system, values, and market conditions, including formal and informal support institutions.

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Chapter 2
Public Procurement and Innovation: Theory and Practice

Veiko Lember, Rainer Kattel and Tarmo Kalvet

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-Iturriagagoitia 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 Georghiou 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.

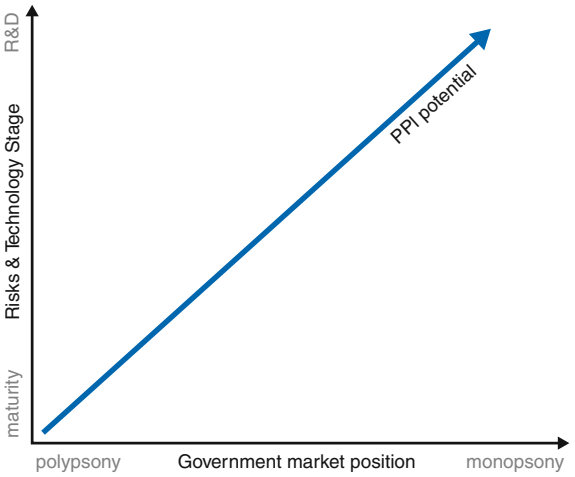

Fig. 2.1 Technology, innovation theory and public procurement of innovation (PPI) (Authors based on Overmeer and Prakke 1978)

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., semiconductors, 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-intense 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 financers 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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Chapter 3
Australia

Public Purchasing and Innovation: The Australian Case

Elizabeth Thurbon

Abstract Over the past decade, a host of new economic challenges have fuelled calls in Australia for a more strategic approach to innovation policy, perceived by many as central to restoring the nation's techno-industrial competitiveness. Recent reforms to this end have been promising, with public procurement emerging as a key policy instrument in the government's quest to improve the innovative capacity of local firms. In this chapter, we document the efforts underway to redress long-standing obstacles to the deployment of public purchasing as a techno-industrial upgrading device: from an entrenched 'buy-non-Australian' bias and risk-averse procurement culture; to complex and costly tender processes that discourage innovative offerings; to intellectual property laws that sap companies' innovative spirit, to name a few. But while recent regulatory and policy shifts are impressive on paper, the extent to which they will translate into meaningful changes in public-procurement *practices*, and thus to the innovative activities of local companies, remains to be seen.

3.1 Introduction

The Global Financial Crisis (GFC) that erupted in 2008 sparked a range of debates about the appropriate role of the state in the economy. In the immediate wake of the crisis, debate turned primarily on the desirability of Keynesian pump priming as a short-term solution to economic downturn. But as time has passed, governments around the globe have increasingly focused their attention on the longer-term question: what can and should states be doing to promote ongoing techno-industrial transformation and competitiveness? Australia is no exception in this regard, the

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global turmoil triggering significant soul-searching about the effectiveness of existing approaches to economic governance broadly, and techno-industrial governance in particular. Despite Australia's outstanding performance in the GFC, deep anxiety exists amongst many policymakers and observers about Australia's economic future, and in particular the extent to which the current mining boom can counterbalance recent declines in national productivity and manufacturing competitiveness. These anxieties have fed widespread calls for a more proactive and strategic approach to promoting innovation as the foundation of Australia's techno-industrial revival.

Recent reforms to this end have been promising, with public procurement emerging as a key policy instrument in the government's quest to improve the innovative capacity and competitiveness of local firms. In this chapter, we document the efforts underway to redress long-standing obstacles to the deployment of public purchasing as techno-industrial upgrading device: from an entrenched 'buy-non-Australian' bias and risk-averse procurement culture; to complex and costly tender processes that discourage innovative offerings; to intellectual property laws that sap companies' innovative spirit, to name a few. But while recent regulatory and policy shifts are impressive on paper, the extent to which they will translate into meaningful changes in public-procurement *practices*, and thus to the innovative activities of local companies, remains to be seen.

3.2 National Economic Overview

Despite its relatively small population of just over 20 million, Australia is currently the world's 13th largest economy and one of the most open, thanks to its enthusiastic embrace of economy-wide trade and capital account liberalization in the early 1980s. An original signatory of the GATT and the WTO, Australia is also a party to numerous regional and bilateral preferential trade agreements and in 2012 ranked third on the Heritage Foundation's Index of Economic Freedom, behind Hong Kong and Singapore.[1] A standout performer in the GFC, over the past two years Australia has maintained the fastest growing economy of all developed nations and remains relatively immune to the economy-wide credit-crunches, corporate closures and job losses plaguing its OECD counterparts.

Yet despite these enviable achievements, Australia also faces some long-standing economic challenges, particularly the steady erosion of its manufacturing base (in terms of output, investment and employment) and a decade-long decline in productivity performance. Historically a leading agricultural exporter thanks to its abundant natural endowments, from the end of WWII Australia also fostered a sizable manufacturing sector behind large tariff barriers. Funded mainly by foreign investment, Australian manufacturers were focused primarily on import

[1] See http://www.heritage.org/index/country/australia.

substitution and not required to meet performance criteria in exchange for protection. As a result, producers across key local industries from steel and autos to textiles, clothing and footwear (TCF) failed to keep pace with the productivity improvements of their overseas counterparts, leading to a decline in foreign investment in the 1970s. That decade also saw wild fluctuations in commodity prices, undermining confidence in Australia's reliance on agricultural exports for national income expansion. As such, by the 1980s, improving the competitiveness of local manufacturers and encouraging their export orientation had become a priority of the Australian government.[2]

To this end, in 1983 the federal government led by Labor Prime Minister Bob Hawke (1983–1991) embarked upon a series of aggressive tariff cuts coupled with substantial public investment in the promotion of techno-industrial upgrading and export promotion, a trend continued under Hawke's Labor successor, Paul Keating (1991–1996). These moves, combined with other microeconomic reforms including deregulation and privatization, soon translated into improvements in the productivity and export performance of local firms in manufacturing industries and beyond. However, with the 1996 election of the Coalition government led by Liberal Prime Minister John Howard, significant cuts to public investment in innovation and export-related activities along with heightened competitive pressures from Asia led to a decline in the fortunes of Australian manufacturers. An additional set of challenges emerged in 2004 with a boom in global demand for and prices of mineral commodities, such as coal and iron ore, of which Australia is a major exporter. The subsequent appreciation of the Australian dollar squeezed manufacturers further. The decades since the 1980s have thus been a period of major structural transformation of the Australian economy, with the manufacturing sector shrinking in relation to its thriving commodities and services counterparts.[3]

Of course not all policy players perceive these structural changes as cause for concern. The Productivity Commission (PC) for example, the Government's independent research and advisory body, depicts the decline of Australian manufacturing as the natural outcome of the free market allocating resources to align with Australia's resource-based comparative advantage (Banks 2008). Intervening in this natural process by 'propping up' manufacturing (or any other sector) will only distort the market's allocative efficiency and pervert economic outcomes—so runs the argument. The PC thus warns against any industry- or sector-specific promotion policies, or policies aimed at encouraging particular kinds of economic activity including exporting and research and development (R&D).

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[2] Australia has a three-tier political structure, including the federal (Commonwealth) government (top tier) and six State and two Territory governments (second tier), each with their own budgetary responsibilities. The term 'state government' is employed herein to refer to both state and territory governments. The third tier is made up of more than 650 local councils, funded by a combination of state and commonwealth government grants and local land taxes. The procurement activities of councils are beyond the scope of this chapter.

[3] For data on the changing sectoral contribution to national output, employment, investment and exports in Australia from the 1960s to the 2000s, see Reserve Bank of Australia (2010).

But while such a minimalist view of the state's role in industrial governance has held sway in some segments of Australia's economic policy-making apparatus since the 1980s, it has never been, and now is far from, the consensus view. Indeed, since the mid-2000s, the idea that the maintenance of a vibrant local manufacturing base is central to Australia's long-term interests has gained powerful momentum, with Prime Minister Kevin Rudd famously declaring upon the day he was elected in 2007: "I don't want to be Prime Minister of a country that doesn't make things anymore…" (Rudd 2007). The question of how to secure Australia's manufacturing future has since been the subject of reviews at both federal and state levels.[4] At the same time, an alarming decline in national productivity growth since 2003 has focused attention on the question of innovation, and the extent to which Australia's national innovation system is up to the task of securing economy-wide competitiveness generally and manufacturing competitiveness in particular. The answers have not been promising.

3.3 The Quest for a National Innovation

Australia's national innovation system was forged in the mid-1980s with a view to redressing the economic challenges detailed above. I use the word 'system' loosely, given the frequently overlapping and occasionally contradictory initiatives that emerged from the 1980s onwards, run by a host of federal and state government agencies. At the federal level, the first major step was the introduction of a 150 % business R&D Tax Concession in 1985. Then came the Partnerships for Development Programme (1987) aimed at encouraging technology transfer from foreign companies to their local suppliers through the public procurement process. The establishment of industry-focused public–private research, development and commercialization initiatives began in 1989 with the creation of Rural Research and Development Corporations (RDCs) and Cooperative Research Centres (CRCs). The federal government also continued to expand investment in secondary and tertiary education, a trend that had begun in the 1970s and which would, by the 1990s, deliver Australia into the ranks of world-leaders in educational attainment (see Cutler 2008: 5). Such initiatives were supplemented by a host of programs designed and implemented by Australia's state governments, although rarely in a coordinated manner.

However, following the election of Liberal Prime Minister John Howard in 1996, the government's commitment to investment in innovation changed dramatically. It immediately began to reduce spending on science and innovation,

[4] For example, the Prime Minister created a federal Taskforce on Australian Manufacturing in November 2011; for a statement issued after its first meeting, see: http://www.pm.gov.au/press-office/prime-minister%E2%80%99s-taskforce-manufacturing-communiqu%C3%A9. At the state level, the government of Victoria established an Inquiry into Manufacturing in Victoria, which reported in July 2010 (EDIC 2010).

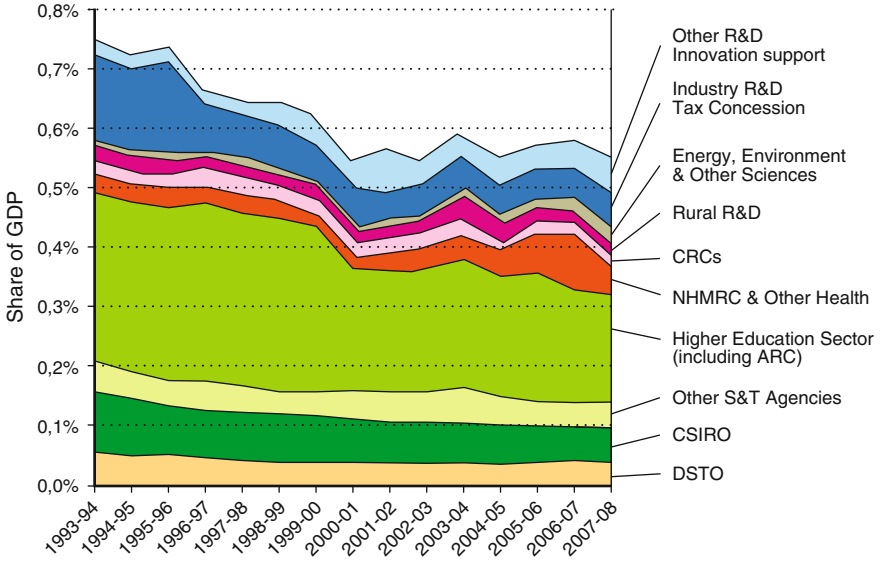

Fig. 3.1 Australian government expenditure on science and innovation as proportion of GDP (1993–1994 to 2007–2008) (Reproduced from Cutler 2008: viii)

which over the next decade would fall by nearly 25 % in GDP percentage terms (see Fig. 3.1). Within 15 years, Australia fell from OECD leader to laggard in public expenditure on R&D and higher education, and lost significant ground in international innovation-related rankings.[5] The 'miraculous' growth in multifactor productivity achieved during the 1990s went into reverse, while business R&D investment hovered around half the OECD average. Australia also experienced a marked decline in the number of researchers per 1000 employees and in US patent registrations, and in OECD education rankings.

It was in the context of such deteriorating performance, which ironically coincided with vast increases in national income thanks to the mining boom, that the newly elected Rudd Labor government announced the National Innovation System (NIS) Review, chaired by Terry Cutler. Its findings, presented in the August 2008 report *Venturous Australia,* painted a picture of an innovation 'non-system' in disrepair: 155 different programs operating across nine governments and innumerable agencies with little or no coordination and in the absence of a clear or coherent set of national objectives.[6] Moreover, most of these programs were designed around an increasingly outdated concept of innovation, focused almost exclusively on the generation and commercialization of research, scientific

[5] For an overview of Australia's deteriorating comparative innovation performance see Cutler (2008: Chap. 1).

[6] See the report by the Cutler Commission, *Venturous Australia*, available at: http://www.innovation.gov.au/Innovation/Policy/Pages/ReviewoftheNationalInnovationSystem.aspx.

discovery and technological advances. The newer and increasingly pressing challenges of knowledge and technology adoption, adaptation and diffusion within and between firms were almost entirely neglected within the innovation policy framework (Cutler 2008: vii). *Venturous Australia* thus proposed a system-wide overhaul, from the creation of a National Innovation Council to provide strategic leadership and improve program coherence and coordination, to the identification of National Innovation Priorities to ensure the more focused allocation of limited resources, and to the re-orientation and expansion of support programs to target new innovation challenges, along with a host of additional recommendations, all to be achieved through a vast increase in government spending.

Prior to its formal response to the NIS Review, the government had signaled its intention to adopt a more coordinated and targeted approach to innovation policy with the creation of Industry Innovation Councils in key industries in November 2008.[7] It confirmed its intentions in May 2009 with the release of its 67-page innovation agenda, *Powering Ideas*.[8] This statement promised a comprehensive suite of organizational and policy reforms aimed at redressing the weaknesses outlined in the NIS Review, the most significant for our purposes being the commitment to use procurement to "stimulate home-grown innovation", with the government becoming "a demanding and discerning customer … (that) favor(s) innovative solutions" by local firms (*Powering Ideas* 2008: 54). As the global financial crisis intensified in 2009, the government moved swiftly to implement many of its innovation-system reforms, particularly those that might stimulate business investment. And as economic stimulus became the driver of economic policy, innovation was the big winner; over the 2008–2009 period, Australia introduced the largest stimulus packages of all OECD nations (at 2.6 % of GDP), the majority of which was dedicated to investments that support and promote innovation (OECD 2009: 20).[9] A full examination of the progress and effectiveness of recent NIS reforms is beyond the scope of this chapter. Rather, in the sections that follow I focus on recent reforms to government procurement and its evolving relationship with industry development and innovation goals. My overall finding is that, in terms of developing a more strategic approach to public purchasing of innovation, the Australian government has been strong on promises but weak on delivery. The implementation of promised reforms has been slow and patchy at best, and in some instances a case of two steps forward, one step back.

[7] By 2012 there were eight industry innovation councils in operation in the following industries: automotive, built environment, future manufacturing, information technology, pulp and paper, space, steel and TCF industries. http://www.innovation.gov.au/Industry/IndustryInnovationCouncils/Pages/default.aspx.

[8] This is an odd document. It is not a 'White paper' nor a 'Green paper' yet it states government intentions. It carries the signature only of the Minister for Innovation, Industry, Science and Research. I refer to it as MIISR 2009.

[9] Including spending on technology infrastructure such as the national broadband network, direct spending on science and R&D, education and green technologies.

This points to both a lack of appreciation of the potential power of public purchasing of innovation (PPI) as a techno-industrial upgrading device and the weakness of elite cohesion around the idea of using PPI to this end.

3.4 Public Procurement Overview

According to most recent OECD figures, Australia ranked 21st of 34 countries in terms of the size of its general government procurement market, with the public purchase of goods and services approximating 12 % of GDP in 2008 (OECD 2011).[10] This figure represents the combined spending of Australia's Commonwealth and state governments. Commonwealth spending is dominated by defence-related agencies, which in 2009–2010 accounted for around 50 % of the value of all reported government contracts.[11]

Australia's federal and state governments all maintain their own separate procurement legislation, policies and procedures. At the federal level, *The Commonwealth Government Procurement Guidelines* (CGPGs) provide the core principles and policy framework within which purchasing activities are conducted. The central principle is value for money, which in turn is advanced by a commitment to competition, the efficient, effective and ethical use of resources, and the enforcement of accountability and transparency. These principles are pursued through a policy framework that stipulates mandatory procurement procedures and the circumstances under which these procedures can be waived, including the pursuit of developmental and social goals. The CGPGs have been amended numerous times since their inception to reflect evolving understandings of their underlying principles (for example, broadening conceptions of 'value for money') and new ideas about how these principles might best be achieved.

Like their federal counterpart, Australia's state governments all enshrine 'value for money' as their foundational procurement principle, whilst also maintaining scope to pursue wider developmental and social goals. It is important to note, however, that at both state and federal levels, the balance between the goals of 'value-for-money' and 'industry development' has historically been weighted heavily towards the former, narrowly conceived, i.e., with price being the primary determinant of procurement decisions. The regular sidelining of industry development goals in procurement processes at both state and federal levels and the tendency to base procurement decisions on purchase price alone is a long-standing

[10] The most recent local figures put expenditures on goods and services at 13.3 % of GDP in 2008–2009 (Anthony and Evans 2010: 12).

[11] The Defence Materiel Organisation accounted for 29 % and Department of Defence for 19.3 % of contracts awarded in 2009/10. Note these figures do not reflect total departmental expenditure but rather the value of contracts published on AusTender. Only contracts over $10,000 need be published under existing guidelines.

gripe of industry players and developmentally-minded policy observers in Australia, an issue explored in greater detail below.

Since 1997, the commonwealth government has pursued a devolved approach to procurement, with ultimate responsibility for purchasing decisions resting with the executives of individual departments and agencies, who may then pass responsibility further down the line in accordance with managerial objectives. So long as procurement activities conform with the CGPGs (and with executives' broader responsibilities under the *Financial Management and Accountability Act* of 1997), departmental purchasing decisions are relatively free from centralized control. However, revisions to the CGPGs in 2008 aimed at improving value for money, and efficiency paved the way for a more coordinated approach to procurement contracting across the whole of government. The parameters surrounding certain federal procurement decisions, particularly ICT services, are thus likely to be set more centrally as time goes on. While some state governments (such as Western Australia) already have such centralized systems in place, the degree of centralisation varies widely.

But while Australian governments at the federal and state levels maintain their own procurement policies, procedures and legislation, they all must meet the transparency and non-discrimination obligations of the international agreements to which Australia is a party. While it is not a signatory to the WTO Government Procurement Agreement (for reasons explained below), Australia has been an observer to this treaty since 1996. It is also party to a number of preferential trade deals, most significantly the Australia-United States Free trade Agreement (AUSFTA), which includes a comprehensive government procurement agreement covering all state and federal governments.[12] Since signing the AUSFTA in 2004, Australia has received glowing reports from the USTR for the transparency and non-discrimination of its public purchasing policies and procedures.[13] Without putting too fine a point on it, this can only be interpreted to mean that Australia's public-procurement policies have been seen to work to the benefit of foreign (particularly US) suppliers.

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[12] Under the FTA, procuring entities must use fair and transparent procurement procedures, including advance notice of purchases and timely and effective bid review procedures for procurement covered by the Agreement. For Commonwealth government purchases, procurement of goods and services above AUD $70,079 and construction services above $7,804,000 are covered by the Agreement. For state governments, procurements of goods and services over $554,000 and of construction services above $7,804,000 are covered. (Adjusted thresholds January 2010). Significantly for the purposes of this chapter, the procurement of research and development services is excluded from the Agreement, as is the procurement of a range of goods and services considered central to security concerns.

See AUSFTA Chap. 15 Text: http://www.dfat.gov.au/fta/ausfta/final-text/chapter_15.html.

[13] In 2009, the USTR noted: "Australia is the only major industrialized country that is not a signatory to the WTO Agreement on Government Procurement. However, under the FTA, the Australian government opened its government procurement market to U.S. suppliers, eliminating discriminatory preferences for domestic suppliers and using fair and transparent procurement procedures" (USTR 2009).

Australia's strict compliance with 'non-discrimination' obligations returns us to the question of the relationship between public purchasing and industry development, and the extent to which Australian governments remain willing and able to employ local purchasing preferences for industrial promotion purposes. This issue has been a source of intense local debate since 2004, when Australia made its first significant international procurement policy commitments under the AUSFTA. The onset of the GFC in 2008 intensified this debate, prompting widespread calls for the strengthening of 'buy local' policies to shield Australian firms from the global downturn and prompting significant regulatory reforms and policy shifts aimed at increasing local participation in government contracts. In Sect. 3.5, I provide a brief history of the relationship between public purchasing and industry development in Australia so as to contextualize these more recent developments and make the demands for more focused public procurement intelligible.

3.5 Public Procurement for Industry Development in Australia

Australian attempts to strategically link government purchasing with industry development date back to the 1970s, with early efforts concentrated predominantly in the defence sector and involving the imposition of offset obligations on foreign suppliers. It was not until the 1980s that responsibility for defence and civilian offset programs were formally separated and public purchasing became a central platform of the government's *civilian* industry development strategy. The most significant initiative was the *Partnerships for Development (PfD)* program, introduced in 1987 with the goal of fostering local high-tech industry creation. The program sought to encourage the MNCs that dominated Australia's high-tech industries to enter into partnerships with local firms for the purposes of transferring technology and business know-how, and encouraging export orientation. Under the program, MNCs bidding for government Information Technology (IT) contracts were encouraged to sign long-term agreements to meet R&D and export targets, in collaboration with local IT companies. The scheme was expanded in 1991 to cover other strategic industries, including aerospace and telecommunications. PfDs were complemented by campaigns to encourage government departments to 'buy Australian'.

In the years that followed, however, a series of reviews of government purchasing questioned the efficacy of the PfD program and identified major ideational, organisational and procedural barriers to the more effective use of public procurement for industry development purposes. The most influential of these was the 1994 report *Australian Government Purchasing Policies: Buying Our Future*, led by Arch Bevis, which documented "an attitudinal problem among government purchasers which results in a reluctance to purchase from Australian suppliers or in a lack of knowledge concerning the capabilities of Australian suppliers" (Bevis 1994). This 'buy-non-Australian bias', as we have termed it elsewhere, was a by-product of the historic dominance of MNCs in Australian manufacturing

(Weiss et al. 2004). Since WWII, government departments had developed a preference for purchasing from these large, established, foreign companies that were typically viewed as the 'less risky', cheaper supplier option. The Bevis report also noted problems arising from the devolved structure of government purchasing that frustrated the sustained and coherent pursuit of development objectives. It further criticized the complexities of procurement rules and procedures that made selling to the government time-consuming and costly, deterring smaller local firms from participating. The report thus concluded that "the opportunities which Commonwealth procurement ought to provide for Australian industry development are not being fully grasped" (Bevis 1994) and called on the government to make 'buying Australian' a top policy priority.

The Keating government responded by promising to achieve a greater balance between 'value for money' and 'industry development' and introducing a range of reforms to this end. The most significant shift was insisting upon the *mandatory* participation of foreign suppliers in the PfD program from 1994. Over the next ten years, the government continued to align procurement frameworks more closely with developmental goals. For example, in 1995 the government decided not to sign the WTO GPA on the grounds that it might negatively impact industry development plans without delivering improved access to foreign procurement markets. In 1997 the Supplier Access to Major Projects (SAMP) program was introduced to advertise the capabilities of local firms to Australian and foreign governments planning major projects. The SAMP program continues to frame major federal government procurement projects right up to the present. In 2001, all state governments signed up to the Australian Industry Participation National Framework, aimed at securing a more nationally consistent, transparent and non-discriminatory approach to procurement so as to increase local firm participation in state contracts. While for many industry representatives the progress was slow and patchy, evidence over this period points to a degree of improvement in public servant attitudes towards purchasing from local companies and in local industry participation in government contracts.[14]

However, advancements made in linking public purchasing more directly with industry development objectives over this time were largely annulled (or even reversed) with the signing of the Free Trade Agreement between Australia and the US (AUSFTA) in 2004.[15] The Government Procurement chapter of this agreement (AUSGPA) outlawed mandatory offsets, making it impossible for Australian governments to require MNCs winning government contracts to participate in local R&D or export activities, or to involve local people or firms in their operations. The aforementioned mandatory PfD program was thus phased out in 2002

[14] For example, a 1998 review of procurement reforms noted some positive changes in public servant attitudes and local firm access to projects—although much remaining room for improvement. See the full report at: http://www.aph.gov.au/house/committee/jcpaa/purchasing/CHAPTER1.PDF. A 2001 review of SAMP also showed that significant benefits had flowed to local firms (see DITR 2007: 2).

[15] This and the following paragraph draw on Thurbon (2012).

during AUSFTA negotiations and replaced with a weaker set of local participation 'ideals' to which MNCs could 'aspire'. The AUSGPA also introduced a 'transparency clause', giving US companies failing to win Australian government contracts the right to appeal. This served to reinforce Australia's 'buy-foreign' bias, rendering bureaucrats wary of not awarding contracts to US firms lest their decisions be appealed. Australia also agreed to extend the AUSGPA to all levels of government—federal, state as well as local. In this sense, like many aspects of the AUSFTA, the AUSGPA was remarkably lopsided, since the US refused to extend the Agreement to all of its State government agencies (together accounting for around 40 % of total US government spending)—or to abolish its small business set-asides programs. It is thus hardly surprising that Australian firms have reported few gains since the agreement was signed. In a 2009 Australian Industry Group survey, 87 % of Australian exporters surveyed rated the AUSFTA 'low or not effective' in helping them access US government contracts (AIG 2010: 9).

The onset of the GFC in 2008 prompted a new wave of calls for mandatory 'Buy Australian' policies to match those being adopted in the USA. These, however, were rejected by the Rudd government on the grounds that they would violate Australia's bilateral obligations—even though these obligations had been incurred by the previous Howard government and had been explicitly criticized by the then Labor Opposition. Instead, in July 2009 the federal government announced a $20 million package of non-mandatory measures designed to encourage the purchase of Australian goods and services by Australian and foreign governments, mainly through advertising the abilities of local firms. However it has to be said that given the historic 'buy-non Australian bias' of government departments, the success of policies lacking mandated 'buy Australian' muscle is far from guaranteed.

These non-mandatory federal initiatives coincided with the introduction of a range of state-based programs, some of which did include mandatory buy-local obligations—such as the NSW 'Local Jobs First' plan.[16] Not surprisingly, these caught the attention of the Office of the USTR, which noted in its 2009 *Trade Barriers Report*: "Several new procurement policies have emerged recently, both at the national and provincial levels, which could potentially adversely impact U.S. suppliers or bidders. The United States is closely monitoring these policies to ensure consistency with Australia's obligations under the FTA" (USTR 2009). Interestingly, there is a high degree of contention between Australian advocates and detractors of such mandatory policies as to whether or not they are AUSFTA-compliant, suggesting some room for interpretation within the text of the Agreement. Nevertheless, it is clear that Australia's public purchasing reforms are now

[16] Under the NSW Local Jobs First Plan, a 20 % discount is applied to locally made content for businesses with up to 500 workers, and every tender over $4 million is required to submit a local industry participation plan: http://www.nswprocurement.com.au/Government-Procurement-Frameworks/Goods—Services/Framework/Local-Jobs-First-Plan.aspx. Amendments to Victoria's Industry Participation Policy in 2009 also placed local content requirements on 'strategically significant' purchases: http://www.dbi.vic.gov.au/projects-and-inititatives/victorian-industry-participation-policy.

taking place under the close scrutiny of its trading partners, and its ability to employ 'old-style' procurement-related industry development policies (such as mandatory set asides and 'buy local' policies) is being increasingly curtailed. This does not necessarily mean, however, the abandonment of public purchasing as an industry development tool in Australia. Indeed, since 2008, Australia has been experimenting with a range of procurement-related industry development policies aimed at increasing the innovative capacities of local firms and their ability to compete in a more open trading environment. It is to Australia's recent experimentation with Public Purchasing of Innovation (PPI) to which we now turn.

3.6 Public Purchasing of Innovation in Australia

Since the 2008 NIS review, the relationship between public purchasing and innovation in Australia has been in a state of flux. Prior to 2008, with the exception of the late PfD program, Australia lacked a strong institutional commitment to, and framework for, using public purchasing to drive private-sector innovation—particularly when compared with major trading partners in North America and Europe. This observation is supported by the findings of a 2005 European Commission-funded study on *Innovation and Public Procurement*,[17] and by comments made at a 2007 forum on *Innovation and Procurement Policy in Australia*.[18] The view of the industry, government and academic participants in that forum was unanimous: Australia was way behind world leaders when it came to public purchasing of innovation (PPI).

However, since the emergence of the global financial crisis in 2008 and in the wake of the National Innovation System Review, the idea of PPI has found its way onto the agenda of governments at both federal and state levels—albeit with little to show so far. The NIS Review made a number of explicit recommendations about the need for a more proactive approach to PPI, and since that time substantial efforts appear to have been made by the federal government to explicitly link public purchasing with innovation goals.[19] Reforms have been both general and targeted in nature: the government has sought to create innovation 'spillovers'

[17] See Fraunhauer Institute (2005: VII).

[18] The Forum was co-convened by the future Chair of the aforementioned NIS Review, Dr Terry Cutler.

[19] Recommendation 10.6 of the NIS Review was devoted entirely to the issue of PPI, stating that: "The Australian Government should[:] recognise its role as an active participant in facilitating innovation through procurement practices[;] … actively manage its ability to enable and demand innovation in procured services and products given its significant presence as a major purchaser; in procurement, be open to participating in risk sharing in relation to innovation demanded; explore the use of forward purchase commitments as a means of fostering more innovative approaches to government procurement; and work with the State and Territories to implement a pilot Small Business Innovation Contracting program based on the US SBIR design principles, to strengthen the growth of highly innovative firms in Australia." (Cutler 2008: r27).

through changes to public purchasing processes and practices (a 'policy for all seasons' approach to PPI), whilst also trying to link public purchasing with more targeted goals, such as the development of strategic industries ('PPI as strategic industry development policy') and the promotion of knowledge creation and commercialization ('PPI as RD&C policy') (see also Chap. 2). In the sections that follow, I detail recent developments before examining the drivers of reforms and enduring obstacles to their realization. I focus mainly on changes at the federal level, where reform efforts have centered, whilst drawing parallels and contrasts with state-based reforms where relevant.

3.6.1 An Emerging 'Policy for All Seasons' Approach to PPI

A 'policy for all seasons' approach to PPI involves governments making the promotion of innovation an explicit and inherent part of overarching public purchasing frameworks. Such an approach requires a number of steps: first, the acknowledgement by government that public purchasing has an important role to play in promoting the innovative activities of private firms; second, the identification of obstacles to the utilization of procurement as an innovation driver; and third, the reform of procurement policies and processes aimed at addressing these obstacles and re-orienting public purchasing frameworks towards innovation goals. Between 2008 and 2012 the Australian federal government advanced relatively swiftly from step one to three and is currently in the process of implementing reforms intended to make innovation the natural outcome of public procurement activities.

Step one came in 2008 with the revision of the Commonwealth Government Procurement Guidelines (CGPGs), which now enshrine the promotion of innovation as a key procurement principle (but subject to numerous restrictions, as discussed in a moment). According to the revised CGPGs: "Agencies should seek to ensure that wherever possible their processes allow for suppliers to provide innovative solutions to their requirements." (CPG 2008: v) Then, in its 2009 response to the NIS Review, the government explicitly acknowledged the positive role that public purchasing can play in promoting innovation and committed to demanding innovative solutions to public-sector needs: "The Australian Government will drive innovation in the private sector by being a demanding and discerning customer. It will favor innovative solutions and work with suppliers to translate new ideas into better outcomes for Australian taxpayers and Australian industry." (MIISR 2009: 54) Moreover, the government stated its determination not to be constrained by international obligations in this endeavor, stating that it retains significant policy 'room to move' within its existing multilateral and bilateral trade agreement commitments:

> International agreements give Australia considerable scope to support its own innovators. For example, the WTO rules allow members to aid the development of small and medium-sized firms, including through government procurement. They permit local preference in the supply of certain goods and services, including research and development. The same is true of our free-trade agreements. (MIISR 2009: 54–55)

But while it is one thing to commit to PPI, it is another to come to terms with the obstacles to implementing such an approach. In reality these obstacles have little to do with Australia's international trade obligations. The most significant barriers to a more proactive and strategic approach to PPI in Australia are home grown—and the most entrenched are 'attitudinal'. Strong attitudinal barriers find a home in the procurement culture of Australian public servants; they include an extreme form of risk aversion and the tendency to conflate 'value for money' with 'lowest purchase price'.[20] The outcome of these cultural quirks is the routine privileging of large (read: foreign) suppliers and proven (read: non-innovative) solutions in government purchasing decisions. Attitudinal barriers also include the erroneous conflation of the idea of industry/innovation policy with the notion of 'picking winners' through 'protectionism'—language used to convey bad practices associated with Australia's (failed) protectionist past. Such is the fondness for such language that critics seem no longer able to process the idea that some forms of government intervention—for instance, support for a diverse range of technologies and multiple pathways—are the opposite of 'winner-picking'.

Such attitudinal barriers, particularly those associated with risk aversion, are manifested in a range of obstacles to more innovative responses to government needs. For example, risk aversion leads public servants to privilege established suppliers in procurement decisions; quite astonishingly, a 2010 survey of public officials found that around half of all procurement dollars spent at the federal level are not subject to competitive tender processes but filtered through panel arrangements or discretionarily offered to known suppliers (Anthony and Evans 2010: 17). For those contracts that are open to competition, risk aversion leads public servants to emphasize *procedure* over *outcome* in the tendering process; early discussions with potential suppliers to explore innovative ways to meet the government's needs are avoided at all costs in the name of 'probity', 'fairness', 'transparency', and out of fear of allegations of corruption. As a result, tender specifications tend to be written in a highly prescriptive manner, detailing the specific solution required as opposed to outlining the government's functional requirements and inviting creative responses. An emphasis on procedure over outcome has also resulted in administrative complexity, creating a huge cost burden for tenders and constituting a significant deterrent to the participation of smaller local firms in competition for public contracts. Another manifestation of

[20] 'Risk aversion' was cited by all local participants in the aforementioned 2007 forum on *Innovation and Procurement Policy in Australia* as a major barrier to PPfI. For example, John Stamford, former Bureaucrat (Prime Minister & Cabinet) noted "Bureaucrats are very, very nervous of picking winners. In the government purchasing area there are no prizes for innovation; it really is safety first." Cited in Cutler and Dodgson (2007: 12).

risk aversion in Australia is the desire of public servants to retain control of all aspects of a purchase, including the retention of any associated intellectual property (IP)—which once acquired is rarely further exploited. This contrasts with quite different trends in leading countries, such as the determined efforts in the United States to export IP from the public to the private sector (e.g. under the Bayh-Dole Act).

The most astonishing barrier is that which effectively annuls limited liability for government suppliers in Australia. The tendency to insist upon unlimited supplier liability has also long deterred smaller local firms from bidding for government contracts, especially in technology based industries like ICT, thus curtailing these firms' expansion. While the government has implemented a number of regulatory reforms since 2006 intended to address these issues—particularly that of unlimited liability—changes in procurement *practises* have not followed suit. As the 2008 *Review of the Australian Government's Use of Information and Communication Technology* by Sir Peter Gerson noted:

> While the Government has, in principle, adopted fair and acceptable policies on liability, insurance and intellectual property (IP), implementation has been inconsistent. Many tenders contain onerous clauses, resulting in no-bids and restricting the solutions available to the Government. For example, unlimited liability, or caps on liability are set so high as to be essentially the same as unlimited liability.

Since that time, the government has taken a number of steps intended to address these obstacles. In addition to enshrining the promotion of innovation as a core procurement principle via the revision of the CGPGs, the government has sought to effect cultural shift by placing greater emphasis on the training of public servants engaged in procurement activities so as to familiarize them with the broader strategic goals of public purchasing and their options and obligations under the current procurement guidelines. With ultimate responsibility for procurement still resting with individual government agencies, however, the uptake of training opportunities and thus the pace of cultural change is likely to be uneven across the government. There is no substitute for the demonstration effect created by some major procurement decisions favoring local suppliers.

The government has also sought to establish platforms to purport to provide closer engagement with industry prior to the formulation of tenders—although progress in this area has fallen well short of industry expectations. To illustrate with another example from ICT, in the wake of the aforementioned ICT Usage Review, the government agreed with the recommendation to establish open, pre-tender dialogue with ICT firms and to produce less prescriptive tender specifications. Industry was hoping that the engagement model adopted by the government would be along similar lines to the UK's Intellect industry body model, as suggested by the Review. The Intellect industry body includes representatives from IT, Electronics and Telecommunications industry associations, providing a peak point of contact for the UK government. Prior to announcing a tender, the UK government sends an overview of its functional requirements to Intellect, which then circulates them to its relevant members for feedback, which is then passed back to the government to

help shape tender specifications. The Australian government, however, eschewed this approach, opting instead for a set of *Government and Industry Principles on Engagement on ICT* that stipulate government and industry expectations around the issues of improving accessibility, collaboration, governance and problem resolution in government purchasing. The Principles were endorsed by the Minister of Finance and the two peak ICT industry bodies in May 2010, but industry groups have continued to voice their frustration at the lack of progress in institutionalizing more open dialogue with industry in the pre-tender procurement stage.[21]

The government has since pledged to reconsider a UK-style Intellect engagement model, but remains concerned that the intense nature of competition between Australian ICT vendors will frustrate the kind of open inter-firm engagement that the UK Intellect model has achieved (see Reinecke 2010: 27). As I discuss in more detail below, this fear seems unfounded in light of the impressive level of collaboration between firms, including ICT firms, that has recently been achieved under Defence sector procurement programs. Unfounded or not, this fear remains a barrier to the embrace of a more institutionalized form of pre-tender government-business collaboration in the civilian sector to facilitate more innovative outcomes from government purchasing processes.

In terms of addressing the barriers to innovation posed by procurement-related IP and liability regulations, some progress has been made. For example, in 2012 the government revised the *Statement of IP Principles in ICT Procurement Contract Negotiations* to stipulate new default ownership arrangements in favor of suppliers. While this move is promising on paper and has been well received by peak industry bodies, it is too early to ascertain its impact on the purchasing activities of government officials or the innovative activities of local firms. It should be noted that, based on previous experience, industry has expressed reservations about the government's ability to enforce agency compliance with these new IP procurement arrangements.[22] The government has also recently acknowledged compliance problems with its 2006 reforms procurement-related liability arrangements and reiterated its commitment to upholding limited liability regulations in the future (see for example DIISR 2010: iii). But again, in the absence of any punitive enforcement mechanism, only time will tell whether agency compliance is likely to be forthcoming.

Compliance is also emerging as an issue at state level, where some governments have recently adopted similar procurement-related IP and limited liability reforms. Indeed, the Victorian government has led the federal government in the area of IP reform, effecting its shift in default IP ownership provisions and limited liability in

[21] For an overview of industry complaints see the report of the independent evaluation of the government's implementation of the Gershon Review's recommendations (specifically, Reinecke 2010: 27).

[22] The 2010 review of the implementation of the government's ICT reform agenda noted that industry holds some reservations about the government's ability to implement its reforms: "(industry) has questioned the consistency with which the new arrangements will be applied through legal and contractual units, especially in smaller agencies." (Reinecke 2010: 28).

2005, although compliance remains patchy. Like its federal counterpart, the Victorian government is also vesting hope in the training of procurement officials to ensure that the principles of PPI are internalized more rapidly. Indeed, a shift towards the more thorough training of procurement officers can be observed in most states since the mid-2000s, with NSW, Victoria, Queensland, Western Australia, South Australia and the ACT all undertaking reforms aimed at increasing the skills of public procurers and their awareness of the broader strategic objectives that they are required to consider when making purchases on behalf of the government. Significantly, Australia's largest state (in spending terms), NSW, has also recently jumped on the PPI bandwagon, announcing a major review of public purchasing, including an investigation into obstacles to a more strategic relationship between public purchasing and innovation. The NSW government has also followed the federal government's lead in changing its default position on IP ownership and introduced clearer regulations around limited ICT supplier liability in 2011.

We might thus conclude that recent reforms at both federal and state levels are indicative of an emerging 'policy for all seasons' approach to PPI in Australia. These reforms are aimed at reorienting public purchasing frameworks to make innovation a natural outcome of the procurement process; the hope is that the very act of selling to the government will require firms—across all sectors and industries—to think about ways to improve their technologies, products or services so as to meet the needs of a discerning customer that actively seeks out innovative solutions to its needs. But beyond a policy for all seasons approach, PPI is also currently being directed towards more targeted goals in Australia, including the promotion of strategic industries and technologies.

3.6.2 PPI as a Strategic Industry/Technology Development Policy

In announcing the NIS Review in January 2008, Senator Kim Carr, (then) Minister for Innovation, Industry, Science and Research proclaimed: "In today's economy, innovation policy is industry policy." But what does this statement mean in the Australian context? In Australia, 'industry policy' has historically been understood as policy aimed at influencing the techno-industrial structure of the nation in line with the government's broader security goals. In other words, in Australia, 'industry policy' is widely perceived to involve the targeted promotion of those industries (or indeed technologies) considered 'strategic' for economic, military and, more recently, environmental security purposes. This is certainly the understanding of industry policy advanced by Carr in his capacity both as Minister for Industry, Innovation, Science and Research (2007–2011) and Manufacturing Minister (2011–2012). Indeed, Carr is well-known as an admirer and emulator of former Labor Industry Minister John Button (1983–1993), the pioneer of strategic industry policy in Australia and founder of the controversial 1980s' 'industry

plans' designed to revive the local steel, autos and TCF industries and create local ICT and pharmaceutical industries.

So, in proclaiming that 'innovation policy is industry policy', it is reasonable to conclude that Carr meant this: in an era of economic integration, in which 'protectionism' is no longer a policy option, the future of Australian firms ultimately depends upon their ability to innovate in the pursuit of price and/or quality advantage or to secure a market niche based on the uniqueness or superiority of their technology, product or process. Should specific industries or technologies be deemed central to Australia's future security, government efforts to retain local competencies in these areas must focus on promoting innovation within them. That this is the meaning of Carr's statement "innovation policy is industry policy" is backed up by recent policy shifts targeted directly at fostering innovation in government designated 'strategic industries'. The 2008 establishment of Innovation Councils in eight key industries is a prime example,[23] along with the creation of industry-specific innovation funds such as the $300 million Steel Transformation Plan, the $2.5 billion Automotive Transformation Scheme and the $5 billion Clean Energy Initiative (including the Solar Flagships Program and the Carbon Capture and Storage Program).

It is in this context of recent efforts to support strategic industries by promoting innovation within them that PPI as a strategic industry development tool has assumed recent relevance in Australia. This brand of PPI involves public agencies articulating and bundling demand for specific needs and then carrying out a continuous dialogue with the private sector to ensure these needs are met. The most significant developments in this regard have been concentrated in the Defence sector, which traditionally has been as infamous for its 'buy non-Australian bias' as its civilian agency counterparts.[24] Since the early 2000s, concerns have been growing as to weaknesses in Australia's local defence industrial base, which was once dominated by government-owned corporations and has since the 1980s been dominated by a handful of large prime contractors (or 'primes')—all foreign owned. Recent policies aimed at bolstering Australia's defence industry capabilities have sought not to displace the primes, but to encourage the inclusion of local SMEs as suppliers in primes-dominated contracts in priority industry capability areas. Current defence-industry policy thus reflects the longstanding emphasis of Australian industry policy broadly on building more developmentally oriented relationships between MNCs and local firms.

In terms of *procurement* policies directed towards this end, these have historically involved placing mandatory offset and local content requirements on MNCs.

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[23] Namely, automobiles, future manufacturing, aerospace, ICT, pulp and paper, steel, built environment, and TCF.

[24] Although there are some important exceptions to this rule; the Collins Class Submarine project, for example, which ran from the 1980s to the early 2000s, sought to locally build a submarine designed specifically to Australian requirements and was far more inclusive of local industry than most other defence projects. See Yule and Woolner (2008) for a comprehensive analysis of this project and (amongst many other things) its developmental implications.

However, in line with the idea that 'innovation policy is industry policy', such policies are now depicted as 'protectionist' and explicitly rejected at the federal level (see DoD 2010: 16). Defence focus now rests squarely on policies designed to foster innovation by local firms in strategic industry areas to make them suppliers of choice in a competitive procurement market. The first step down this path was the decision in 2000 to begin identifying future defence capability needs so as to send a signal to industry as to where future procurement dollars are likely to be spent. This kind of signaling is important as it gives firms the confidence required to invest in longer-term R&D efforts in these areas, in the knowledge that a potential market is likely to exist for their technologies or products (see DoD 2010: 46).

But it was not until 2009, in the wake of the NIS Review, when the Department of Defence (DoD) began identifying Priority Industry Capabilities (PICs) and designing local industry innovation-support measures around these capabilities that PPI as a strategic industry development tool really came into its own. PICs are defined as "capabilities that confer an essential strategic advantage by being available from within Australia and which, if not available, would significantly undermine defence self-reliance and Australian Defence Force (ADF) operational capability" (DoD 2009: 1).[25] To ensure the development and retention of local industry capabilities in these areas, the government announced a range of measures designed to support the innovative activities of local firms working in PIC-related fields.[26]

The most prominent is the Priority Industry Capability Innovation Program (PICIP). Introduced in 2010 and with an allocated budget of $44.9 million until 2019, the PICIP is a competitive grants scheme that seeks to assist firms to modify or further develop existing products or technologies in order to meet PIC needs. In this way, the program is best classified as a strategic industry/technology *adaptation* or *upgrading* device; it is not aimed at creating new technologies from scratch (such programs fall under the PPI as RD&C policy, discussed in Sect. 3.6.3).[27] While the PICIP is open to all Australian-based firms, it is targeted explicitly at SMEs (DoD 2010: 70). The first round of the program (in progress as

[25] PICs are reviewed on a regular basis in consultation with industry and subject to update and amendment in line with changing strategic circumstances. For a full list of current PICs see the DoD PIC website:http://www.defence.gov.au/dmo/id/dcp/html_dec10/PriorityStrategic/index.html.

[26] The government has also been introducing wider local industry participation programs, such as the 2011 Australian Industry Capability Program (AICP). Under the AICP, all firms bidding for government contracts will need to demonstrate how they intend to foster local industry development through the mandatory inclusion of an AIC Plan (see the AICP website at: http://www.defence.gov.au/dmo/id/aic/). Since 2011, any tenderer for a government contract directly relating to a PIC must include an AIC Plan. Australian industry participation is assessed under the 'value for money' criteria of the procurement and the AIC Plan forms an enforceable provision of the contract of successful tenderers. However the AICP is not an *innovation* program explicitly, but rather an industry *participation* program.

[27] For an overview of eligible projects see the DoD PICIC Fact Sheet available at: http://www.defence.gov.au/dmo/id/pic/PIC_Factsheet.pdf.

of 2012) attracted 18 applications; 17 from local SMEs (only one prime applied; primes generally having the resources to do their own innovation of this scale). Under the program, local firms submit proposals to adapt or further develop existing technologies or products to meet the DoD's PIC needs. Successful applicants are awarded grants of between AUD$3 and 4 million, which they must also agree to match. Should a sale to Defence result from PICIC participation, firms will be expected to discount the purchase price by the amount of money received under the PICIP scheme. And should a sale to a non-Defence government agency or an export order arise, the firm may be required to repay a proportion of the grant to Defence, which will go back into the project funding pool. Clearly, the intention is to create technologies/products that will be reasonably readily commercialized, thus helping to create a self-sustaining innovation fund.

It is important to note that the DoD is under no *obligation* to acquire a product or technology developed under a PICIP grant; indeed in all of the literature on the PICIC, and in author conversations with Defence employees, the DoD goes to great lengths to emphasize the fact that its programs are aimed at supporting priority *capabilities* not priority *companies;* firms wishing to sell their technologies to the government will have to win the right to do so in a competitive environment. Indeed PICIC proposals "need to ensure that competition aspects are addressed—Defence will not attempt to 'pick a winner' [that analytically irrelevant phrase again!] and then experience subsequent price increases imposed by a monopoly supplier" (DoD 2010: 71). But while participation in the PICIP does not *guarantee* a sale to the government, it is reasonable to assume that firms participating in a scheme tailored to support the development of products directly relevant to the government's defence capability needs will have a reasonable chance of finding a government buyer. PICIP thus represents an important demand-driven innovation program designed to support local firms working in strategic industry/technology areas.

In terms of other procurement-linked innovation strategies from Defence, we might also add recent efforts to foster open, ongoing dialogue between the government and local firms concerning the government's evolving capability requirements. The recent reinvigoration of the Capability Development Advisory Forum (CDAF) was an important step in this regard, providing a biannual opportunity for industry to communicate directly with senior Defence capability decision-makers.[28] Evidently then, in the sphere of Defence, there has been a recent shift towards the embrace of PPI as an industry/technology development tool. This has been characterized by the government's identification of a range of strategic industry/technology capability requirements and the introduction of demand-driven programs intended to encourage local-firm innovation in these areas. Yet it has to be said that there are as yet no major procurement programs in Defence that would compare with previous outstanding examples such as the aforementioned Collins Class Submarine project, praised by informed observers

[28] See (DoD 2010: 71) for an overview of CADF operations.

for its nation-building significance, which drew on an army of local suppliers and delivered excellent outcomes in material capability terms.[29]

Turning our attention to the civilian sector, developments have been more low-key. This is certainly not to say that the federal government has not progressed the impressive reform agenda set out in its 2009 Innovation Statement; a range of innovation-oriented reforms have indeed been introduced over the past four years at the federal level. However few of these are procurement-related, and evidence suggests that the federal government has a long way to go before it can be said to have embraced PPI as a strategic industry development tool in the civilian sector.

As noted above, one of the core components of PPI as a strategic industry development tool is the bundling of government demand in key industry/technology areas and the establishment of an ongoing dialogue with industry about how these demands might best be met. Since the NIS Review, the federal government has gone to great lengths to consolidate a coherent set of national innovation priorities, i.e. industry and technology areas that are of strategic importance to Australia or in which Australia has the potential to build a competitive advantage, and thus to which public resources for supporting innovation will be targeted. Again, this kind of priority setting sends an important signal to industry about future public spending intentions, providing firms with the certainty required to make longer-term investments in R&D and/or upgrading/up-skilling. But while national innovation priorities have now been set and strategic industries and technologies identified for promotion, the Commonwealth government is yet to draw effectively on public purchasing as a means of supporting firms working in these areas. I have already noted limitations of the government's attempts to reform public purchasing frameworks to support the ICT industry; while the 2008 revisions to the Commonwealth Government Procurement Guidelines facilitated a shift towards whole-of-government purchasing and thus the bundling of ICT demand, obstacles remain to the early engagement of ICT firms in tender processes, and compliance issues with IP and limited liability regulations continue to deter smaller firms' participation (and thus opportunities for innovation).

This is not to suggest that such obstacles cannot be overcome. The Queensland government for example has recently made good progress in its quest to employ public purchasing as an ICT industry development tool. Queensland's 2010 *SME Participation Scheme* made it mandatory for Queensland government agencies to demonstrate that they have considered SME firms for all ICT-related contracts, for example, by showing that they have obtained at least two quotes from SMEs for every ICT-related tender.[30] In terms of harnessing public purchasing to promote ICT industry development, Queensland is arguably leading the nation. Undeniably however, beyond ICT, many opportunities remain at both state and federal levels for the more effective use of PPfI as a strategic industry development tool.

[29] For a balanced examination of the Collins Class project and its contribution to local industry development, see Yule and Woolner (2008).

[30] See the full Guidelines at: http://ict.industry.qld.gov.au/industry-support/244.htm.

The 2012 *Inquiry into Manufacturing in Victoria* (conducted by the Victorian Parliament's Economic Development Infrastructure Committee (EDIC)) was revealing in terms of the extent to which existing approaches to major procurements at state and federal levels serve to *inhibit* the R&D activities of local firms. The procurement of rolling stock for railways is a case in point. Australia is a vast continent in which rail constitutes a major means of commercial transport. Combined public expenditure on rolling stock in Australia is massive, and managed correctly could provide a significant stimulus to industry development and innovation. Yet the absence of a coordinated national approach to planning future rolling-stock requirements and expenditures makes it almost impossible for suppliers to plan and invest in R&D (See EDIC 2010: 139). And in EDIC's view, this is a problem that extends far beyond the rail industry.

And even if governments were to commit to planning and coordinating expenditures in such a way as give industry the confidence to invest in R&D, there would still exist major barriers to the use of bundled demand to promote industrial transformation, particularly but not only in the rail industry. One of the most significant obstacles is the existence of so many different standards between state and federal jurisdictions. This makes it almost impossible to pool demand for major purchases and to thus achieve the economies of scale required to underpin a truly sustainable industrial base. The submission of the CEO of the Australia Rail Authority to the Manufacturing Inquiry is worth citing at length on this:

> The national standardization of components is a huge issue for us … the same rail carriage is built in Maryborough Queensland for Queensland Rail and Western Australia. They are both built for narrow gauge rail; they are both the same carriage if you look at them exactly. However, there are 653 differences between them. It is all about different specifications. Each state has a different crash worthiness test and a different thickness of glass standard … the one thing that we could change very quickly is we could move to a standardization of components, because we could actually reduce the cost to Australian manufacturing dramatically. That is something that is part of the history. We all know we have different gauges. We have grown up that way but we cannot survive if we are going to continue to do that (cited in EDIC 2010: 140).

Sadly, this story will have to stand for many more that indicate the sorry state of public procurement as a development tool in Australia. Evidently, then, while some progress has been made in Defence and in some states, much work remains to be done before Australia can be considered to have truly embraced PPI as a strategic industry development tool.

3.6.3 PPI as Research, Development and Commercialisation (RD&C) Policy

The third and final form of PPI that is gaining wider acceptance in Australia is the use of public purchasing to stimulate RD&C in areas likely to meet future social needs. The stand-out international example of this kind of PPI is the US *Small*

Business Innovation Research (SBIR) Program (see Chap.13). In light of America's SBIR success story, Australia's Department of Defence (DoD) adopted its first pre-commercial technology development initiative in 1997—the Capability Technology Demonstrator (CTD) Program. Under the Program, Australian firms propose ideas for new technologies that might bolster 'in a previously unexplored manner' the priority capabilities of the Australian Defence Force (AFD).[31] But whilst improving Australia's priority defence capabilities is its overarching aim, the CTD program also has an explicit industry development objective. Specifically, it "promotes innovation, productivity and competitiveness in local industry" and "assists companies to bridge the 'gap' between technology development and uptake for commercialisation and/or manufacture by industry" (DoD 2010: 80). In this way, the CTD program is similar to the SBIR, in that it "does not operate like a traditional grants program, but rather a program of collaborative development, where risks, costs and rewards are shared between the parties",[32] and in which commercialisation of new technologies and their manufacture by Australian-based firms is the ultimate goal.

The CTD program works as follows. Each year, the DoD calls for Initial Proposals from firms detailing their idea and its relevance to a Defence capability requirement. Successful firms are allocated a Sponsor from within the DoD Capability Development Group to guide them in the preparation of a Detailed Proposal. If their Detailed Proposal is accepted, firms then qualify for the CTD Project phase, entering into a Contract of Development and Demonstration with the DoD. The amount of funding awarded is dependent upon the nature of the project; the average amount allocated to each project is approximately $2.5 million. The government provides 100 % of the costs involved with no matching fund requirements. Once commenced, CTD projects move through a number of project-specific phases with projects running for between two and three years. Progress is monitored against milestones stipulated in the Contract and undertaken in such a way as to build productive relationships between government and industry (see DoD 2010: 80). The CTD program develops new technologies to the point at which their effectiveness can be demonstrated to Defence. Since 1997, more than 104 CTDs have been awarded, totaling $250 million in funding. Of these, 80 new technologies have been successfully demonstrated and 12 subsequently further developed and acquired and deployed by Defence. Another 12–15 successfully demonstrated technologies have been identified by the CTD Program Office as likely candidates for further development, acquisition and deployment

[31] From the DoD's CTD Program website, available at: http://www.dsto.defence.gov.au/collaboration/3743/page/3693/. The CTD program is open to both Australian-owned firms and Australian-based subsidiaries of foreign firms, as well as universities and public-sector research organisations.

[32] See the DoD statement at: http://www.dsto.defence.gov.au/collaboration/3743/page/3685/.

(Ferguson 2011: 29).[33] Again, Defence is under no obligation to acquire the technologies developed under the CTD Program. Yet it is clear that the ultimate goal is to create technologies that Defence (or other entities) *will* acquire—and in doing so help bolster Australia's defence industrial base.

That commercialization is the end-goal was reinforced in 2007 with the introduction of the CTD Extension (CTDE) program, which funds the further development of successfully demonstrated CTD technologies into a more mature product ready for transition into capability (read: acquisition by defence). Since its inception in 2007, $31.6 million has been dedicated to the CTDE Program, with excellent initial results.[34] However, a question mark now hangs over its future; the program was only ever originally funded until 2012, and there is no current policy to extend funding. According to government sources, the DoD intends to abandon the CTDE program and expand the aforementioned PICIP as an alternative. This, however, represents a lack of appreciation of the differences between the CTDE and the PICIP programs, which are targeted at very different levels of commercial readiness. As noted above, the PICIP represents an *upgrading* device as opposed to a commercialisation device, focusing on finding new applications for existing technologies. If the Extension program is discontinued it will leave a gaping hole in what has only just become a coherent and complete research, development *and commercialisation* program. This indicates that knowledge about the innovation cycle is understood well in some government circles but is yet to be fully comprehended and embraced institution-wide.

Another significant technology development and acquisition initiative run by the Australian DoD is the world-class Rapid Prototyping, Development and Evaluation (RPDE) Program. Established in 2004, the RPDE Program is unique because it aims to develop innovative solutions to pressing issues currently compromising defence capability and hindering operations, i.e. serious problems that require rapid solutions. As such, the turn-around time for solutions is very short – around 18 months. The other unique aspect is the way in which the RPDE has so effectively marshaled an impressive number of firms—large and small—to openly collaborate with each other and the government to swiftly solve urgent capability issues. Responsibility for identifying these issues lies with the DoD's Capability Development Group (CDG), which then refers the issues on to the

[33] The program is also important in terms of showing which technologies are not viable: it has been reported that two failed CTDs saved the government more than $100 million by demonstrating that certain technologies were not able to deliver capability (Ferguson 2011: 28).

[34] For example, in 2006, Melbourne-based SME Sentient Vision Systems was granted a CTD to develop a real-time Video Motion Target Indication system that would track small, moving ground targets from the air. By 2008, the technology (dubbed 'Kestral') had been successfully tested in an operational environment by the Maritime Patrol Group of the Royal Australian Air Force. Sentient was thus awarded a CTD Extension grant to further refine the technology and render it a deployable solution in both air and sea-based environments. Under the CTD program, Senitent also received significant support to help it link with both partner companies and potential end-users within Defence—the kind of connections that are difficult for a SME to engineer independently (Ferguson 2011: 30).

RPDE Program 'board': a small group of Defence, industry and academic representatives. The board is charged with the task of assembling a team to develop either a 'quicklook' (a brief report and set of solution recommendations/options) or a 'task' (an actual prototype solution) in response to the challenge at hand. The team is drawn from the RPDE's 200+ industry and academic 'participants': Australian-based companies and research institutes that have been invited into the RPDE fold based upon an assessment of their capabilities. Firms selected as part of a team are required to collaborate openly with other team members (firms) in developing the prototype solution. Whilst payment for participants' involvement in a quicklook or task is relatively modest, there are significant flow-on benefits. While the Commonwealth retains any foreground IP produced in a task, team members are granted a perpetual, unlimited licence enabling them to further develop and commercialize the technology if they choose. Participants also benefit from real insight into defence capability requirements and are not precluded from bidding on government RFTs that arise from the creation of a successful prototype.

The RPDE is thus distinguished from the CTD program by being a true demand 'pull' program—demand for the creation of specific technologies is driven entirely by the government in response to pressing and clearly defined technology needs. The CTD program on the other hand involves more of a 'push' from industry—the program is certainly designed to meet defence capability requirements, but it is up to firms to propose new technologies or products and to convince the government of their relevance to defence needs. Moreover, while the CTD program invites proposals from individual firms, the RPDE is a much more collaborative enterprise—indeed collaboration is demanded of team members in exchange for their right to participate in a task. The RPDE is thus an outstanding example of a government fostering deep industry cooperation and collaboration, which many believed was doomed to failure in light of competitive pressures between firms (see Seaborn 2011: 40). In 2005 there were 5 RPDE member companies. By 2011 there were 208, and the RPDE program had already undertaken more than 100 tasks for defence, solving a range of significant problems.

The success of the PRDE in promoting open and effective collaboration between firms seems to contradict civilian agency assumptions, noted above, that inter-firm competition would probably thwart emulation of the UK's Intellect Model in the civilian ICT procurement sphere. It is important to point out that many ICT firms are listed as participants in Defence's RPDE program, in which the willingness to collaborate openly has been amply demonstrated. As such, it seems assumptions about industry-based barriers to more open pre-tender collaboration in the civilian sphere are overstated. So long as the necessary Relationship Frameworks are in place, the RPDE program suggests no reason to assume that industry cooperation would not be forthcoming.

Despite the existence of successful RD&C programs in the defence sector, there seems little openness to such an approach within civilian departments at the federal level. The 2008 NIS review recommended that "The Government … work with the State and Territories to implement a pilot Small Business Innovation Contracting program based on the US SBIR design principles, to strengthen the

growth of highly innovative firms in Australia." (Cutler 2008: r27). However the government's response to the Review made no mention of the SBIR or of plans to experiment with such an approach in the civilian sphere. The absence of a federal civilian SBIR-style program was the source of great lamentation by industry and academic participants in the 2007 *Innovation and Public Purchasing* symposium. But while the federal government (or its civilian components) is dragging its feet in this area, one state government is pioneering SBIR-style efforts to great effect. In 2009, the Victorian Government began piloting its Smart SMEs Market Validation Program (MVP), the aim of which is "to develop innovative products, processes and services that meet the future technology needs of Victorian Government Agencies". $40 million has since been dedicated to the pilot competitive grant scheme, which is open to any SME incorporated in Australia with at least 51 % of its current business activities, employees and/or assets residing in Australia. The MVP differs from the US SBIR in that it is centrally funded and administered (as opposed to being funded out of the budget of individual agencies), although individual agencies are invited to submit Calls for Proposals targeted at their particular technology needs. And in practical terms, the MVP operates in much the same way as the SBIR:

Once a year, SMEs are invited to respond to a Call for Proposals from public-sector organizations detailing a particular technology need. SMEs that submit the best proposals (based on technical merit, capacity to undertake R&D and availability of facilities and personnel) are awarded funds for a period of four months to undertake a feasibility study. Successful feasibility studies are then further funded through a proof of concept phase, for a total of up to 4 years. SMEs also retain IP developed in the process. Based on the success of the MVP pilot, a more targeted program was announced in 2011, aimed at encouraging innovation by Victorian-based SMEs in the biotech and medical-device industries. The $15 million Health Market Validation Program (HMVP) works in much the same way as the Smart SMEs MVP: Victorian health-focused public-sector agencies are invited to develop 'Technology Requirement Specifications' that detail their technology needs. SMEs are then invited to respond with ideas that might meet these needs.[35] Successful firms are awarded a grant of up to $100,000 to undertake a 4-month feasibility study. If they succeed once more, they move on to the validation phase, receiving up to $1.5 million over 4 years to undertake the necessary R&D and clinical trials (with larger sums available on a case-by-case basis). The condition is that at least 80 % of R&D must take place in Victoria.

Based on the success of the Victorian programs, the Queensland government is now, too, considering experimenting with procurement-linked RD&C programs but is yet to announce a formal commitment to doing so. Evidently then, whilst

[35] Larger firms can also bid but must have R&D facilities in Victoria and partner with a SME that leads the project.

substantial progress has been made by the federal government in the Defence sphere and by the Victorian government, experimentation with PPI as RD&C policy in Australia is only just beginning.

3.7 Conclusions: Drivers of Change and Future Trajectories

Evidence presented in this study points to the discursive embrace of public purchasing of innovation in Australia at both federal and state levels, with governments nation-wide pledging—on paper at least—to become more demanding and discerning customers so as to drive private-sector innovation and achieve true value for money from purchasing activities. So how might we account for this shift, particularly in light of the historically weak link between public purchasing and developmental goals in Australia?

A number of drivers of change have been alluded to herein. The role of industry, particularly high-tech industry associations such as the AIIA, deserves first mention insofar as these groups represent the most consistent and longstanding agitators for change. However, it is possible to overstate the influence of private-sector pressure, as for many years their calls for a more strategic approach to industrial governance fell on deaf ears. In light of the government's historic failure to act on business demands, it is imperative to ask: what has changed in recent times to make the government more open to strategic activism generally, and PPI in particular? This returns us to the challenges identified at the outset of this paper: the longstanding decline in manufacturing competitiveness, lagging productivity growth and now the GFC, which combined have elevated the question of Australia's long-term economic security—and hence its techno-industrial capacity—to the top of the policy agenda. That answers to this question must comply with international trade obligations explains the Australian government's (and many other governments') focus on 'innovation policy' as the instrument of choice in promoting ongoing techno-industrial transformation. Such policies are amply accommodated—even encouraged—by multilateral and bilateral regime rules.

Another factor playing into the government's recent receptiveness to the idea of PPI was the re-election of the Labor Party in 2007 and the ascendency of people amenable to strategic activism to positions of power within key economic bureaucracies. Prior to 2007, Australia was governed for more than a decade by a Liberal government for which the idea of 'industrial strategy' was anathema. The election of the Rudd-led Labor Government in 2007 was a significant moment in terms of greater openness to the idea of PPI, with the Labor Party more naturally aligned with manufacturing sector concerns (given its union roots) and comfortable with the idea of strategic industrial governance. The appointment of long-standing

advocates of strategic industry/innovation policy as Industry Ministers by Prime Minister Rudd has guaranteed PPI a more receptive audience in the necessary policy-making circles.

Nevertheless, as evidence presented throughout has shown, a significant disjuncture remains between the government's enthusiastic discursive embrace of PPI and the implementation of reforms required to make this a reality. We have discussed a plethora of obstacles to the realization of a more coherent and effective approach to PPI in Australia: from an entrenched 'buy-non-Australian' bias and risk-averse procurement culture to complex and costly tender processes that discourage innovative offerings and intellectual property laws that deter as opposed to encourage innovation. And as our discussion has also revealed, there are no easy solutions to any of these obstacles. For example, it is clear that the decentralization of procurement responsibility at the federal level has made it difficult to enforce national priorities and ensure compliance with reforms designed to promote PPI in Australia. But as a major European study recently found, there is little evidence to suggest that greater centralization will necessarily lead to more effective PPI outcomes (see Fraunhofer 2005: IX). Indeed, the US also has a relatively decentralized approach to procurement, but this has not prevented the development of a coherent set of overarching national goals with which agency compliance has been effectively secured. Of course, what distinguishes the US from Australia is the former's strong cultural preference for buying local, a preference fostered over the years through powerfully mandated 'Buy-American' policies. This stands in stark contrast to the Australian public service's cultural cringe and its historic preference for sourcing from large foreign-owned firms. In light of this entrenched preference, in the absence of mandated buy-local policies and a bi-partisan commitment to PPI, only one thing can be safely concluded about recent regulatory and policy procurement shifts: meaningful change will be painfully.

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Chapter 4
Brazil

Public Procurement and Innovation in Brazil: A Changing Course of Public Procurement Policy?

Victor Mourão and Rodrigo Cantu

Abstract Despite recent advances, Brazil still faces serious social and economic problems as an emerging economy. Public procurement can be considered an important instrument in overcoming some of these adversities, particularly in promoting domestic innovative capacities. We tackle some of the main aspects of the connection between public procurement and innovation in Brazil, a relatively recent issue in the country's political and economic arenas. We argue that the Brazilian government does not have, so far, a procurement policy that can successfully integrate its innovation policy. Its procurement system focuses primarily on fighting corruption, neglecting the quality and the more broad results of purchases. Against this background, two types of policies stand out: sector-specific procurement policies addressing innovation—still rather fresh and few in numbers—and funding policies directed at specific technological areas, which are in turn not integrated into the purchasing power of government. Since these policies have not yet displayed their full potential, we conclude by pointing out the main obstacles on their way. The development of a more consistent association between public procurement and innovation policy in Brazil thus depends on the coordination between different public policies already in existence, the improvement of procurement departments and the better synergy between public and private actors.

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4.1 Introduction

Brazil is a country of vast dimensions, with a population of about 190 million people in its 8.5 million square kilometers area. This places it as the fifth largest country, both in territorial extension and population. The distribution of population in this territory is uneven, concentrated in urban areas in the southern, southeastern and northeastern regions.

The country is linguistically homogeneous (the vast majority of the population is Lusophone), and ethnic and religious cleavages are weak.Its current political system is defined as a federal presidential republic, with direct elections for the executive and legislative branches at the local, state and federal levels. Its current GDP is 2.52 billion dollars, making Brazil the sixth largest economy in market exchange rates (CEBR 2011).

Positive assessments have pointed out that Brazil was one of the first countries to recover from the crisis that began in late 2008; its agricultural sector thrives, and inequality has decreased mainly because of successful social-assistance programs that became worldwide models. Despite this recent optimism, problems still abound. To start with, high levels of poverty and inequality and poor economic growth are some of the general ills currently plaguing Brazil. More specifically, the risks of regressive specialization and de-industrialization have recently been considered central problems in expert discussion. The current account imbalances—partially generated by the deterioration of the balance of trade in technology-intensive products—is a further element which makes up the picture of what has been considered the main obstacles to sustained economic growth.

The scholarly literature has already identified the importance of public procurement in both achieving social goals and promoting industrial development and innovation (Kattel and Lember 2010; Edler and Georghiou 2007; McCrudden 2004). In Brazil this has also been recognized by actors in the political and economic arena as a key response to the obstacles mentioned above. However, the emergence of this issue is relatively recent, and more systematic investigations are needed on the connection between public procurement and innovation in the Brazilian case. Our objective here is to tackle some of the main aspects of this connection. How is public procurement conducted in a country like Brazil? To what extent can we talk about public procurement for innovation (PPfI)? What are the problems and virtues of the Brazilian PPfI? How does PPfI fit as a solution to the difficulties the country faces? This chapter attempts to answer these questions, arguing that Brazil started acting rather late in the field of PPfIs, although in recent years some initiatives have given greater weight to the developmental role of the public procurement.[1]

[1] A consolidated version of this text was presented at the workshop entitled, "Public Procurement Policy for Innovation: International Perspectives," held on 29–30 March 2012 at the Ragnar Nurkse School of Innovation and Governance at Tallinn University of Technology,

The remainder of the chapter is organized in the following manner. After this first section, we present some basic information about the Brazilian economy and politics, with emphasis on recent decades. In the third section, we examine the main characteristics of public procurement in Brazil. The fourth section discusses the policy initiatives which aim to combine procurement and promotion of innovation. The last section concludes with a brief assessment of PPfI in Brazil and considers the main potentials and challenges facing the country in this field.

4.2 Country Background Information

Traditionally a country marked by economic cycles linked to primary goods (Brazilwood, sugar cane, gold, diamonds, coffee and cotton), Brazil began to industrialize late, amid the Great Depression of the 1930s. As in many Latin American countries, the difficulty in obtaining foreign currency for the import of manufactured products—caused by the drop in international demand for commodities—resulted in a boost for local manufacturers.[2] Between 1930 and 1945, Getúlio Vargas ruled the country first as a revolutionary leader, then as president elected by the 1934 constituent assembly and finally as a dictator. It was during this period that the public effort for industrializing the country first got under way, marking the initial foundations of what would become a developmental state in the following decades. In the 1950s, several public institutions and companies that are still significant nowadays were created, among them Petrobras, CNPq, ITA, BNDES, which augmented governmental power in directing the economy. During Kubitschek's presidential term (1955–1959) many multinationals came to the country, dynamizing further the industrial base. The period of greatest prosperity for industrial development was set between the 1950s and 1970s, a period described as the heyday of the policy model which came to be known as *import substitution industrialization* (ISI).[3] Largely relying on external financing, this development strategy proved to be unsustainable.[4] With the oil crisis in the 1970s and the crisis of Latin American countries' sovereign debt that followed, the hitherto vigorous economic growth began to decline.

(Footnote 1 continued)
Estonia. Some minor developments that have since taken place are not discussed, but hopefully they won't change our general argument.

[2] For a classical assessment of the Brazilian economy in the nineteenth and early twentieth centuries, see Furtado (1963).

[3] For an overview on the main issues concerning the ISI model in Brazil and in Latin America, see Hirschman (1968), Baer (1972) and Burlamaqui et al. (2006). For one of the first discussions on the achievements and weaknesses of this model in Brazil, see Tavares (1964).

[4] Cardoso and Fishlow (1990) summarize the main aspects of this crisis.

The country plunged into a deep crisis in the 1980s and early 1990s, a period marked by large macroeconomic imbalances, huge fiscal deficits, erratic growth, high inflation and soaring unemployment. In the 1990s, Brazil adopted a series of liberalizing measures, bringing down trade barriers and privatizing state enterprises. The Real Plan, implemented as from 1994, reduced inflation by means of a partial de-indexation of the economy. The Plan also established fixed exchange-rate parity with the US dollar and high interest rates, both of which stagnated the economy and expanded public debt. Since 1999, the country's macroeconomic policy is characterized by its orthodoxy: relative fiscal austerity is combined with a monetary policy based on an inflation-targeting regime and a floating exchange rate. In the 2000s, a slight recovery of growth was accompanied by the increased importance of primary product exports as a means to redress the balance of payments.

This recent trajectory is translated into numbers in Table 4.1. Considering its GDP, Brazil has left the 16th position in 1970 with a GDP of US$ 35 billion (current prices) to become the 8th largest economy in 2009 with a GDP of US$1,593 billion. Per-capita income also increased from US$5,233 in the 1970s to US$7,591 after three decades. However, these relatively positive aspects do not overshadow the poor socio-economic indicators of the last third of the twentieth century. Economic growth plunged from an annual average of 8.8 % in the 1970s to 1.6 % in the 1990s. The situation began to reverse in the 2000s, when the average annual growth was 3.3 %. The growth of per capita income fell from an annual average of 6.1 % in the 1970s to practically stagnate in the 1990s. Again, a slight recovery was observed in the following decade, with an average growth of 2 % of per-capita GDP. Another trait of the Brazilian economy is its rather low degree of openness. As shown in Table 4.1, the degree of openness—measured by the sum of exports and imports divided by the GDP—has changed little since 1970. Except for a drop to 15 % in the 1990s, openness remained around 20 %.

An important feature of the Brazilian economy is that the advancements made in the industrialization process between the 1950s and 1970s managed to establish a relatively diverse economic structure in the country (Fishlow 1980). Brazil ranks as one of the most successful cases of import substitution in Latin America. This development went beyond the consolidation of an industry of consumer goods, settling backward linkages with domestic producers of several intermediary goods due to both the large urban domestic market and assistance of development policies promoting industrialization. These linkages—again, largely policy induced—went even further and left rather robust sectors of basic inputs and energy production compounding an important legacy from this period.

In addition to its diversified industrial sector, the Brazilian economy is characterized by a large productivity gap among firms. This heterogeneity emerged already in the 1950s and 1960s, with the coexistence of modern and high-productivity industries along with backward and unproductive ones (Colistete 2009). This characteristic has persisted through time, not only in Brazil but throughout

Table 4.1 Socioeconomic indicators

	1970	1980	1990	2000	2009
GDP at current prices in US$—billions[1]	35.21	191.12	402.14	644.73	1593.02
GDP – percent change*[2]	8.79 %	3.02 %	1.64 %	3.32 %	–
Per capita GDP at constant 2009 prices in US$*[3]	5233.0	6528.8	6683.1	7591.2	–
Per capita GDP – percent change*[3]	6.12 %	0.94 %	0.08 %	2.06 %	–
Gini Index*[3]	0.611	0.600	0.600	0.569	–
Degree of economic openness**[2]	17.2 %	22.3 %	15.2 %	23.2 %	22.1 %

* Average for each decade
** (Exports + Imports)/GDP
[1] UN statistics division
[2] Brazilian institute of geography and statistics (IBGE)
[3] Institute of applied economic research (IPEA)

Latin America (ECLAC 2010, Chap. 3).[5] Several studies of ECLAC (Economic Commission for Latin America and the Caribbean)—home of the Latin American structuralist school—point to this heterogeneity as the main source of the acute social inequalities in the subcontinent. This is especially true for Brazil, as shown in Table 4.1. Even if the Gini index has declined slightly, the country still remains one of the most unequal in the world.

This structural heterogeneity joins yet another imbalance. During the industrialization process, the Northern and especially the Northeastern regions of the country lag behind, producing significant regional differences.[6] These regions still have a less integrated regional structure. As a consequence, they are economically subordinated in a considerable extent to the dynamics of richer states. Linkages between firms are weaker—resulting in the dependence of intermediate goods from the most dynamic parts of the country—and the regional asymmetries in job creation produced waves of mass migrations to the Southeastern states. Since income is lower in these regions, infrastructure presents more problems and State governments have an abiding dependence on transfers from central government to balance their fiscal power.[7]

Much of the national innovation system was designed at the height of the developmental era of the 1960s and 1970s, when industrialization policies were at the center of government's concerns. The National Development Plans (PNDs) are hallmarks of this fundamental programmatic guidance, especially the second PND, which lasted from 1975 to 1979. Scientific and technological institutions were

[5] For recent and more complete assessments of general and sectoral technological capacities of the Brazilian economy, highlighting the heterogeneity here alluded to, see Negri and Lemos 2011a, b.

[6] For an overview of the history and current state of regional imbalances in Brazil, see Baer (2001: 323–354).

[7] This situation clearly has consequences for the differential development of the national innovation system in Brazil. For a glance at this issue, see Soares and Podcameni (2009).

created in this period, such as CENPES,[8] FINEP,[9] EMBRAPA,[10] COPPE-UFRJ,[11] as well as several undergraduate and graduate courses. This techno-scientific infrastructure lived through hard and inconstant years in the 1980s and 1990s, struck by fiscal crisis and shortage of foreign exchange reserves due to the deteriorating balance of payments.

This picture began to change at the turn of the millennium. Table 4.2 shows the amount spent on research and development as a proportion of GDP in the last decade. Brazil experienced an increase in public resources which allowed R&D infrastructure to expand once again.[12] Since 2006, there has been a mild and steady increase in R&D expenditure, reaching 1.16 % of GDP on 2010, while the average rate for Latin America (including Brazil) is roughly 0.7 % (Red Iberoamericana de Indicadores de Ciencia y Tecnología—RICYT 2012). If we consider the figures for Science and Technology—which some authors (Viotti and Macedo 2003; Luiz Ricado Cavalcante 2009: 15) argue to be the best indicators to ascertain the expenditure efforts in innovation of a peripheral country—the proportion rises to 1.65 % of GDP in 2010. This scientific infrastructure is one of the central aspects that sets Brazil apart from other Latin American countries, with the possible exception of Mexico. Brazil awarded, in 2009, about 11,300 PhDs, while the rest of Latin America awarded about 4,000 of them (Red Iberoamericana de Indicadores de Ciencia y Tecnología—RICYT 2012).[13]

In technological terms, the Brazilian economy is not predominantly located at the international frontier. Still, it maintains a rate of product and/or process innovation[14] for manufacturing firms which lies at 38.11 %, and firm's spending on internal and external R&D activities in relation to their net sales is 0.73 %, according to data from PINTEC (Survey on Technological Innovation) for the triennium 2006–2008. Most of the spending on R&D industry is concentrated in the areas of medium-high technological intensity, accounting for over half of the

[8] Centro de Pesquisas e Desenvolvimento Leopoldo Américo Miguez de Mello, Petrobras' research center.

[9] Financiadora de Estudos e Projetos (Financing Agency for Studies and Projects), an agency of the Ministry of Science, Technology and Innovation.

[10] Empresa Brasileira de Pesquisa Agropecuária (Brazilian Agricultural Research Corporation), under the Ministry of Agriculture.

[11] Alberto Luiz Coimbra Institute for Graduate Studies and Research in Engineering, a facility of the Federal University of Rio de Janeiro (UFRJ).

[12] For historical data on releases of funds for the FNDCT projects that confirm a pattern of stagnation of resources in the period of the 1980s until 2000, see Andrade (2009: 8). For more indicators on science and technology in Brazil, see http://www.mct.gov.br/index.php/content/view/740.html. Website in Portuguese.

[13] For a general review of Latin America's science, technology and innovation policies, as well as considerations about the current crisis impact on this matter, see Cimoli et al. (2009).

[14] The rate of product and/or process innovation refers to the proportion of firms claiming to have created a new product and/or process. This rate is very comprehensive, though, encompassing products or processes ranging from new to the international market to new to the firm itself.

Table 4.2 Research and development expenditure as % of GDP (MCT 2012)

	2000 (%)	2002 (%)	2004 (%)	2006 (%)	2008 (%)	2010 (%)
Public	0.55	0.53	0.48	0.50	0.58	0.61
Private	0.47	0.46	0.42	0.51	0.53	0.55
Total	1.02	0.98	0.90	1.01	1.11	1.16

amount, followed by the medium-low technology sector, with about a quarter of total expenditure (Cavalcante and De Negri 2010; IBGE 2010).

Brazil has been a federation throughout its republican history. Although the degree of central government's power over the states has changed over history, the Constitution, promulgated in 1988, returned some autonomy to states and municipalities, when compared to the previous military-authoritarian period. Still, this is not a strong decentralization, such as the one prevailing in the USA. The 1988 Constitution established a political system characterized by presidentialism, multipartism and proportional representation for legislative elections. Despite showing some problems of governance in its early years,[15] this system eventually stabilized, allowing a relatively stable decision-making flow in a model that political scientists have termed "*presidencialismo de coalizão*" or "coalition presidentialism".[16] In this model the president builds coalitions through cabinet power-sharing arrangements between allied parties and political groups, similar to what happens in parliamentary democracies.

State bureaucracy in Brazil has heterogeneity as its central feature: pockets of efficiency coexist with sectors structured in ways which render them incapable of efficient and coherent actions (Schneider 1991). There is a notably high proportion of positions filled by elected officials' appointment, hampering the professionalization of the bureaucratic staff. Fernando Abrucio (2007) evaluates the reforms in public administration in the second half of the 1990s and concludes that, despite advances in recruitment, professionalization and payment amid the higher strata of bureaucracy, the large proportion of positions filled by non-meritocratic appointment remains an obstacle to the State's efficiency. Among other reasons, this is why Peter Evans (1995) describes the Brazilian case as a halfway between a developmental state and a state invested with predatory characteristics.

The relationship between the Brazilian state and the market has been deeply affected by the liberal reforms of the 1990s. First, the state retreated from the economic field, privatizing companies in various sectors such as transport, communications and energy. In addition, the state became somewhat more autonomous from the business community. Previously, employers had direct contact with the government, composing different types of councils within the executive branch. In

[15] The first directly elected president was impeached in 1992, just over two years after assuming office.

[16] For a classic account of coalition presidentialism as we described above, see Figueiredo e Limongi (2000). A summary of the discussion on governance in the Brazilian political system can be found in Amorim Neto (2002).

the wake of reforms, most of these councils were reduced and left up to technical government staff. The business community has since changed the focus of its political action from the executive to the legislative branch, from the circulation in direct decision spheres to lobbying (Boschi and Diniz 2004).

In its relationship with civil society, the Brazilian state seems to go through major changes as a result of the maturing of democracy. There are several pieces of evidence suggesting that the State is overcoming a historical lack of connection and coordination with society. First, during the last decade, several programs directed to the vast poor and vulnerable population (in areas such as welfare, housing, education and urban infrastructure) have been created or substantially expanded. Moreover, conferences sponsored by the federal government have emerged, especially in the last ten years, as an important occasion for enlarged civil participation. These conferences address varied themes such as Human Rights, Youth, Culture, LGBT, Social Assistance, Racial Equality, Health, Environment, etc. Besides, as shown by Thamy Pogrebinschi and Fabiano Santos (2010), they have not remained simple spheres of public discussion, but have been informing the legislative output.

4.3 Public Procurement Overview

The aforementioned federative structure of the Brazilian state projects a character of its own on the Brazilian public-procurement policy. In spite of a unified legislation, the administrative process of procurement is highly decentralized, and each federative element (municipalities, states, central government and autarchies) conducts its own procurement processes. This feature makes it difficult, within the scope of this chapter, to precisely delineate this subject. For this reason, we will focus here on the rules, standards and practices concerning the federal level of government procurement policy, as well as on a general assessment of the possibilities of a Public Procurement for Innovation in Brazil.

A first general characteristic of Brazilian public procurement is the low constraints placed by international agreements. Brazil does not participate in the Agreement on Government Procurement (GPA) of the WTO. The country is neither considering becoming a member nor an observer of the agreement (WTO 2009: 85–86). Regarding Brazil's position in relation to international agreements, the priority that has been announced by authorities is the advancement of the procurement protocol of Mercosur, which has not yet been ratified by its members.

Calculations of the size of the government procurement market in Brazil vary between 7 and 9 % of GDP in 2009—depending on the data source—on an upward trajectory over the past years. In Table 4.3, we present two estimates of the public procurement market size. Estimate 1 was calculated with data from the Brazilian treasury department. Because it relies on more disaggregated data, this estimate is perhaps a little more precise and allows a decomposition of the respective proportions of federal and sub-federal governments. Estimate 2 has the

Table 4.3 Public procurement as % of GDP

	2004 (%)	2005 (%)	2006 (%)	2007 (%)	2008 (%)	2009 (%)
Estimate 1						
General government procurement (GGP)*	5.86	5.84	6.24	6.45	6.82	7.12
General government + Petrobras procurement	–	6.03	7.27	7.69	8.40	8.21
Participation of central government in GGP	20.71	23.24	20.65	23.48	20.54	22.99
Participation of state and local government in GGP	79.29	76.76	79.35	76.52	79.46	77.01
Estimate 2						
General government procurement **	–	8.82	8.91	9.19	9.31	9.65
General government + Petrobras procurement	–	9.00	9.94	10.44	10.89	10.73

*Sum of the following accounts from the detailed government accounts prepared by the Brazilian treasury department: supplies, outsourced services, works and installations, equipment
**Defined as intermediate consumption + gross fixed capital formation (Audet 2002: 159–161), using data from the Brazilian National Accounts (Brazilian institute of geography and statistics, IBGE)

advantage of being more adequate for comparisons, since it uses the methodology similar to the one proposed by the OECD. Considering estimate 1, if we add the procurement of Petrobras—the state-controlled company with the highest procurement figures—public procurement rises about one percentage point of GDP. Still according to estimate 1, the central government is responsible for about 1/5 of the general government procurement, the rest being distributed among states and local governments. Considering estimate 2, Brazilian government procurement reached 9.31 % of GDP in 2008. This magnitude is slightly smaller than the average for OECD countries, 12 % in 2008 (OECD 2011: 148).[17]

It is important to highlight two general features of the structure of public procurement concerning technology. First, there is relatively little amount of high technology purchases. Soares (2005) conducted a research on the profile of firms supplying the government during the beginning of the 2000s and found that government procurement was of little use to stimulate innovative firms, since most acquisitions consisted of low-technology products and standardized goods—involving no innovative expertise in their manufacturing processes. Part of this

[17] Figures from estimate 2 should be taken with a grain of salt for the sake of comparison with OECD estimates. OECD (2011) adds social transfers in kind via market producers in the calculation. This was not done in estimate 2, because the Brazilian national accounts do not disaggregate social transfers in kind via market producers from social transfers in general. On one hand, this means that the results in estimate 2 are perhaps slightly underestimated. On the other hand, the inclusion of social transfers in general in the calculation would excessively overestimate the result.

Table 4.4 Number of firms from high and medium-high technology sectors acting as central government suppliers (2008–2010)

Central Government Department	2008	2009	2010
Defense	117	131	156
Health	34	66	92
Mining and energy	42	42	43
Social security	25	27	36
Finance	–	22	30
Agriculture	–	18	28
Development, industry and foreign trade	3	–	19
Science and technology	39	–	17
Total	206	306	421

Source: Schmidt and Assis (2011: 18)

behavior is due to the strength of the isonomy and competition principles permeating the procurement procedures (as will be discussed below), which discourage public tendering of goods that cannot be produced by a large number of firms. Flavio Schmidt and Lucas de Assis (2011) conducted a similar research for the end of the decade and came to an identical conclusion: between 2008 and 2010, almost half of the companies supplying government were from low-technology sectors. Second, within the government, one can distinguish different groups of agencies according to their demand for technology. Table 4.4 shows the number of firms in high and medium-high technology sectors which supply different central government ministries. Areas that traditionally rely on more sophisticated materials, such as Defense,[18] Health, and Energy and Mining, accumulate most of the contracts made with these firms. For other ministries, the low demand for high and medium-high technology products is the rule. These results show that, if a procurement policy aimed at innovation should emerge, it must take into account the technological asymmetries within government procurement.

For the central government, the procurement policy is under the responsibility of the Ministry of Planning, Budget and Management (MPOG), and takes as its structural point of reference the *System of General Services* (SISG). The *Secretariat of Logistics and Information Technology* (SLTI) is the central body of this system and is responsible for the establishment and dispatching of rules and standards for materials used by the federal public service. The *Department of Logistics and General Services* (DLSG), subject to SLTI, implements, manages and operates the policies and guidelines relating to the management of materials, constructions and services of the federal administration. This department monitors the acquisitions made by the *Administrative Units of General Services* (UASGs). In addition to these central agencies, there are specific divisions, such as the

[18] For an overview of the industrial base that supplies the Defense Ministry, see Schmidt et al. (2012).

Undersecretaries of Planning and Budget (SPOs), present, for example, in the structures of the Ministry of Health and Ministry of Education (Motta 2010: 100–102). The *Court of Audit* (TCU) and the *Office of the Comptroller General* (CGU) are administrative bodies responsible for controlling and monitoring the system of federal procurement.

The main directive norms of public procurement in Brazil are found in Act 8666/1993, which lays down general rules for purchases of products and services for direct and indirect public administration at all levels (municipalities, states, central government and state enterprises). The text of the law contains some basic principles to be applied in government procurement at all levels, such as isonomy, publicity, transparency and guarantee of competition. In its Sect. 1, article 3, the original Act of 1993 reads as follows:

> The tendering process is intended to ensure compliance with the constitutional principle of isonomy and select the most advantageous proposal for the public administration and will be held and judged strictly in accordance with the basic principles of legality, impersonality, morality, equality, publicity, administrative probity, compliance with the public call, objective judgment and those related to them.

The isonomy principle is emphasized not only in the parlance of this article, but in the very construction of the law's sections, as indicated by Motta (2010: 115–117). The supremacy of the isonomy principle in legislation and its interpretation further expresses a great concern with fighting corruption (Motta 2010: 114–116). There is no distinction between domestic and foreign companies, though the law gives preference for services and products bearing technology developed in Brazil. The law's text was reformulated a few times, and a detailed assessment of its contents and reformulations goes beyond the scope of this chapter. However, we can identify two key changes: the first carried out in 2005, with Act 11196, also known as *Lei do Bem*, and the second in 2010, with Act 12349, both enacted in the Lula administration.[19]

The *Lei do Bem* first established, as a tie-breaker in choosing the winner of the bidding competition, the fact that the good or service in question comes from a firm investing in research and technology development in Brazil (paragraph 2, article 3, of Act 8666, as amended by *Lei do Bem*).

Act 12349 of 2010 went a little further, reforming article 3 of Act 8666, mentioned above; there was a change in text, so that the selection of the proposal would not only be "most advantageous to the public administration", but "most advantageous to the public administration and the promotion of sustained national development", which expands the possibilities of selection criteria. This expansion

[19] There have been several other reforms that changed the bidding process in Brazil, such as Act 12462 of 2011, which implemented the Differentiated Regime for Government Procurement (Regime Diferenciado de Contratações Públicas, RDC), and also Act 10520 of 2002, which implemented the Reverse Auction (Pregão) regime. Although these are central reforms for the Public Procurement System, we focus here on the normative guidelines closest to the PPfI discussion. For a discussion regarding the RDC Act, see Fiuza (2012).

appears in, for instance, an overpricing rate of at most 25 % for national products and services, an initiative hitherto unheard of after the 1988 Constitution.

The 2010 Act also expanded the legal basis for the use of Act 10973 of 2004, known as Innovation Act. In addition to establishing incentives for innovation, and scientific and technological research, the Act defines in its article 20, the possibility of at least one specific type of PPfI: one Leif Hommen and Max Rolfstam (2009) refer to as *direct* PPfI. In this kind of PPfI, the innovative product possesses intrinsic governmental interest. According to article 20 of the referred Act, the government can hire firms—which will engage in research and development involving technological risk—for the purpose of solving a specific technical problem or acquiring an innovative product or process. Although in force for some time, we have no notice of the use of this article in public procurement.

According to Alexandre Motta (2010), the main features of the Brazilian public procurement policy are: procurement positions are seen as bureaucratic and non-strategic; the hierarchical position of the administrative staff responsible for it is usually intermediary, below the decision-making level; procurement activities are highly standardized, with little room for interpretation of the agents responsible for applying it, and therefore these agents give priority to the observance of regulations, at the expense of concerns about the results and effects of purchases. This framework is the result of a strict regulatory control of the agencies responsible for administrative control—TCU and CGU—which have better trained and paid staff compared to the bodies directly responsible for procurement. Thus, Motta summarizes this framework claiming that the government procurement system in Brazil is essentially *corruptocentric*; that is, it strives primarily for the extinguishment of corruption, neglecting results and focusing solely on compliance with strict procedures.

4.4 Public Procurement Policy and Innovation

In this section, we will address the association between public-procurement and innovation policies in Brazil. Before examining this association in detail, it would be opportune to outline some brief preliminary considerations based on the characteristics of the institutional set-up, the legislation, and the bureaucracy of governmental procurement, as discussed above. First, until recently, legislation barely focused on what Kattel and Lember (2010) point out as the basic feature of public procurement for innovation, that is, on the purchase of products and services not yet available on the market. Second, the role of procurement officials is not sufficiently underscored, while the corruptocentric bent of the system reinforces institutionally the persistence of a very low risk-taking level on the part of these same officials, who are only encouraged to follow procedures and avoid being prosecuted by control agencies. Third, the new public procurement legislation—which effectively approaches orders of products not yet available—has not been, for now, employed as PPfI. Government purchases of products not readily

available on the market are rare. Consequently, there has been, so far, a somewhat sharp division between public-procurement policy and innovation policies put forward by the Brazilian central government.

The potentials inscribed in the Innovation Act and the changes established by the Act of 2010 represent a breakthrough nonetheless. Although the preferential price margin does not imply PPfI per se and although the potentials from the new legislation have not yet materialized, these changes certainly announce significant transformations in the character of public procurement in Brazil. In what follows, we will present further elements from the field of public procurement in order to attempt a more comprehensive assessment of the strength of this coming inflexion. A first attempt to implement PPfI in Brazil was extinguished in 1990 (we will discuss it in Sect. 4.4.3.1). Currently, two types of initiative stand out. First, funds focused on the development of specific technologies—but with no guarantee of subsequent purchase by the government—carried on by FINEP. We will address this initiative in Sect. 4.4.3.2. Second, punctuated programs and technological orders fostered by specific government and regulatory bodies and state-controlled companies (Sect. 4.4.4).

4.4.1 Main Characteristics, Policy Types and Institutional Set-up

Brazil is a semi-peripheral country that managed to establish, over the past 50 years, a relatively well-built scientific and technological infrastructure, distant from the ones available in more advanced nations, but ahead of most developing countries. This infrastructure has placed Brazil at the technological frontier in some sectors such as energy, aviation and agriculture, supporting the diversification of industry and the economy in general. The innovation and technology-promotion policy is primarily carried out by the Ministry of Science, Technology and Innovation, though with important contributions from other ministries such as Education (which sponsors the federal universities), Defense, Health and Communications, among others. Among the main innovation policies, we can highlight three important initiatives.

The first one concerns tax exemptions. The *Lei do Bem* (Act 11196), together with Acts 8248 of 1991 and 10176 of 2001 (Information Technology Act), instituted various tax exemptions granted to companies that invest in R&D, including: deductions of expenditure in research and development from the taxable corporate net profit; tax reductions (of IPI, an consumption tax on industrial products) on equipment for R&D purposes; full depreciation of equipment and accelerated depreciation of intangible assets for the calculation of corporate income tax, among others (CGEE and ANPEI 2009: 31–32). According to an estimate of the Brazilian Internal Revenue Service, the central government waived

around 6.5 billion reais (3.9 billion dollars) in tax revenues in 2011 for technological, scientific and innovative purposes (MCT 2011).

Second, subsidized credit-contemplating innovative projects are part of programs carried out by FINEP (such as *Inova Brasil* and *Programa Juro Zero*) and BNDES (*Inovação Tecnológica* and *Capital Inovador*) (BNDES 2011). These are the main instruments for promoting innovation in the business sector. There are also non-reimbursable funds, operated by FINEP (which will be discussed in Sect. 4.4.3.2) and BNDES (Funtec). Funtec does not finance firms directly, only technological institutions—working in partnership with companies in areas of strategic interest, such as: energy, environment, health, electronics, new materials, chemicals, transport, and oil and gas (BNDES 2011). In 2007, 54 million dollars were released to this funding program, and in 2008, 62.5 million (CGEE and ANPEI 2009: 57–58).

Third, there is also the Program of Human Resources in Strategic Areas (*RHAE*—Pesquisador na empresa), maintained by CNPq,[20] with the objective of increasing the absorption of graduated personnel in R&D activities of micro, small and medium enterprises. The 2007 public call stipulated 20 million *reais* for allocation in the 2008–2009 biennium, and the November 2008 call stipulated the allocation of 26 million (about 12 and 15 million dollars, respectively). The areas covered were those identified as priorities in the Productive Development Policy (PDP) (CGEE and ANPEI 2009: 59–60).

4.4.2 Drivers and Hindrances of Policy Developments

These policies for promoting innovation face a series of drivers and hindrances in the contexts of the national system of innovation, the macroeconomic background, the state bureaucracy and the business community. A key driver of innovation policies in Brazil is the existence of a comparably consolidated national innovation system. Quality universities (such as USP, Unicamp, UFRJ, UFMG, among others) provide human resources and research capabilities that place Brazil in a privileged situation in comparison to countries outside the center of the world technological system. State agencies such as FINEP, CNPq and Capes maintain several programs supporting training of human resources (grants, support for educational infrastructure), scientific and technological projects, and interaction between companies and universities.

Despite this infrastructure, a major obstacle to PPfI in Brazil consists in the lack of human resources with the necessary skills for such a policy. FINEP has recently conducted several public exams (in 2006, 2009 and 2011) in order to build the necessary bureaucratic staff for the analysis of technological and scientific projects.

[20] National Council for Scientific and Technological Development, an agency of the Ministry of Science, Technology and Innovation.

This is perhaps a good start for the creation of a skilled staff capable of carrying out government procurement focused on innovation, but this is still far from realization. For if the state should become a consumer for innovative products and services (Moreira 2009; Moreira and Vargas 2009) and if it seems that this is increasingly turning out to be realistic in Brazil, it still depends on an increase in the quantity and quality of personnel within the State.

Two other important hindrances come from the macroeconomic arena. First, the monetary policy based on an inflation targeting regime has resulted in the maintenance of a high rate of interest that, though successful in controlling inflation, has severe recessionary effects. Despite a slow decrease during the last decade, Brazil's benchmark interest rate was still at an annual average of 11.7 % in 2011 (which roughly corresponds to a real interest rate of 5.2 %). Second, the increasing overvaluation of the exchange rate during the second half of the last decade has been an obstacle to the competitiveness of Brazilian manufactured products abroad.[21] By restraining international demand and making credit more expensive, this macroeconomic framework not only depresses the economy as a whole, but also shortens the investment horizon of projects of uncertain return and/or time-consuming ones, such as is the case with innovative enterprises.[22] Hence the centrality of current policies for promoting innovation through financing with subsidized credit.

The state's coordination capacity is also an important point to be remembered. The ability to produce convergence around various issues in a democratic environment and in a highly unequal society is one of the main challenges facing the country. Despite the advances described in Sect. 4.2, there is an enormous difficulty for the state to exercise effective coordination and to build a common agenda among different domestic actors. This was a point raised by Souza (1997) in his search for the possible causes of the relative failure of the NAIs (Forums for the Articulation of Industry) experience in the 1970s, as we shall see later (Sect. 4.4.3.1). There is a coordination deficit among agencies and even among different programs within the same government agency (CGEE and ANPEI 2009: 72).

Another major obstacle is the aforementioned corruptocentric character of the Brazilian government procurement system. The attention to the tendering

[21] For an entry into the recent discussion about the exchange rate, industrialization and development policies in Brazil, see Bresser-Pereira (2008, 2011).

[22] It is worth mentioning that recent developments are challenging this framework. In the beginning of 2012, President Rousseff's administration enacted measures to prevent further exchange-rate valuations. Most importantly, the government started an offensive against high interest rates. As the central bank reduced the benchmark interest rate to unprecedented levels, public banks are being used to force down market interest rates and exorbitant spreads. As these developments are largely new and recent, it is still difficult to assess—in the face of protests from the Brazilian bankers association and the critique of economists skeptic of the effectiveness of such a maneuver—to what extent they will be permanent. Nonetheless, it should be emphasized that we are indeed confronting a critical juncture, in which the macroeconomic framework can be entirely redesigned.

procedures, at the expense of concerns about its effects and results, prevents the creation of a comprehensive government procurement policy aimed at innovation.

Another hindrance is the so-called 'innovation culture' that seems to be absent from the national business community, according to another diagnosis of the Brazilian technological backwardness. There is also a considerable information gap regarding innovation policies put forward by the Brazilian government: a large part of firms simply does not know about these policies at all (CGEE and ANPEI 2009: 72–74). Thus, the lack of a disposition toward research and development investments, and the widespread bias toward acquisition of already existent technology developed abroad, leads to an environment where—despite relatively strong innovation policies—the situation changes only slowly.

Despite this generally negative picture, a growing awareness is already noticeable among experts and authorities—especially at the core of the federal administration (including statements of president Roussef herself)—about the importance of government procurement in promoting innovation. Thus, a main driver for innovative policies is related to a general diagnosis among public authorities that in the present global economic context, the market cannot be left alone in charge of the economic development. A loose network of federal officials, intellectuals and scientists—much akin to an epistemic community (Haas 1992)—brought together around development and innovation issues has gained visibility in the last 10 years. Recently, members of this group, mostly from universities such as Unicamp and UFRJ, gathered in the discussion forum called "Developmental Network" (*Rede Desenvolvimentista*) (Lamucci 2011).

This new apprehension around the development issue occurs symptomatically along with a re-primarization of exports as a result of the recent increase in the price of commodities. It is increasingly common to see diagnoses of a variant of the Dutch disease, in which the superior productivity in primary goods hinders industrial development mainly through currency overvaluation—rendering Brazilian industrial products uncompetitive abroad and flooding the domestic market with foreign products.[23] The discovery of huge oil reserves in the pre-salt layer of the Brazilian coast should also be mentioned as a danger (as well as an opportunity) in this context.

[23] Palma (2005) argues that the Brazilian case is characterized by a de-industrialization induced by orthodox economic policies. In a country where there is greater productivity of natural resources, the lack of development policies for the industrial sector leads to a Ricardian return to the position of exporter of primary products.

4.4.3 Development of National Innovation System vis-à-vis Developments in Public Procurement

As we have seen, the development of a modern economy in Brazil has its roots in a process that started in the first half of the 20th century, although its peak was reached in the 1970s. It was during this decade that the State was most shaped in a developmentalist way. Public Procurement used as a means of increasing domestic productive capacity has a rather long history in Brazil, which permeates the developmental state strategy.[24] We also have seen that the shortcomings of this mode of development were its large dependence on foreign finance and the macroeconomics imbalances it produced—such as high inflation. The 1980s and 1990s witnessed unprecedented inflation levels, exceeding 2,000 % in 1993. The stabilization plan elaborated to curb high inflation was based on high interest rates as a way of diminishing the level of economic activity and attracting capital to counter balance payment problems. The economic picture which ensued was of a depressive character: it seemed that the boom of the 1950s–1970s period left only macroeconomic imbalances and low growth as its legacy. Innovation policies have been implemented and exercised in this rather unfavorable environment where many obstacles are combined with recent displays of political willingness to balance them out. Governmental purchasing power certainly has a valuable role in this enterprise. We will start the discussion about the relationship between procurement policy and innovation in Brazil with two of its major landmarks. First, the Centers for the Articulation of Industry, a program that constitutes a first attempt to join the purchasing power of government and the promotion of technological capacities in domestic industry. Second, the Financing Agency for Studies and Projects (FINEP), an agency designed to finance projects in science and technology, which has been gaining great importance in the last decade, as it manages technology sector funds and implements programs of economic support for innovation.

4.4.3.1 Centers for the Articulation of Industry (1975–1990)

In the period from 1975 to 1990, the Forums for the Articulation of Industry (NAIs, from the Portuguese *Núcleos de Articulação da Indústria*) sought to use the purchasing power of state enterprises for the promotion of technological capacity building in the sector of capital goods and in engineering consulting firms. According to its guidelines, public enterprises and their subsidiaries should "organize forums, on a permanent basis, to promote the preferential purchase of

[24] Two examples from the 1970s are notably suggestive of this: the attempt to build a Brazilian mini-computer industry (Westman 1985) and the consolidation of the power-equipment industry (Faucher 1991).

equipment developed and manufactured domestically"[25] (Souza 1997: 26). It was not, however, a market-reserve policy, because the definition of what a national company was could be established by each public enterprise, which made room for more pragmatic interpretations as to the domestic industrial sector's capacity to produce the goods in question (Souza 1997: 27). The NAIs served primarily as a space for articulation between public and private companies, and between research centers and government, coordinating different actors around the development of domestic firms and their technological capabilities.

An illustration of the successful working of the NAIs in its earlier years can be found in the power-equipment industry. Philippe Faucher (1991) identified a major transformation in this industry during the 1970s through the mid-1980s. The production of domestic firms, as well as the technology transfer from foreign sources, was effectively fostered by government, despite the existence of an oligopoly exercised by foreign capital. The monopsonic structure of the market—in which Eletrobras assumed a major role—favored the enterprise. The NAIs then gave further support to this transformation articulating the relevant actors and establishing market rules. In this manner, the government was able to internalize production capacity in the country.

The forums eventually failed and were disbanded at the beginning of the 1990s. In 1979, the CCNAI (Comissão Coordenadora dos Núcleos de Articulação com a Indústria), the body responsible for coordinating actors, was closed. FINEP took over this responsibility from that time on and assumed a nationalistic approach to the NAIs, directing resources only to national enterprises and convening other NAIs' actors to support and strengthen those companies. In the 1980s, the NAI System focused on the development and standardization of parts and components, inducting its actors to exchange information with its small suppliers and finally establishing a supplier list that rationalized the procurement process. But soon coordination turned out to be a serious problem (the private sector, for example, was out of the NAIs' decision-making council), and the unfavorable macroeconomic conditions hindered any attempt of restoring the forums' strength. Furthermore, by the 1990s neoliberalism was already in the winds in Latin America. In 1990, Fernando Collor assumed the presidency and began a series of economic reforms that liberalized the national market and killed several instances of the Brazilian bureaucracy, including the NAI system.

4.4.3.2 FINEP

FINEP is a government agency allocated under the Ministry of Science, Technology and Innovation (MCTI), responsible for promoting and funding scientific

[25] These permanent forums consisted of plenary meetings, circulation of bulletins, courses for the dissemination of the forum's functioning and supervision—by agents of state enterprises—of the development of scheduled products.

and technological research in enterprises, universities, research centers and government itself. Founded in 1967, during the military-authoritarian regime, it has run the National Fund for Scientific and Technological Development (FNDCT) since 1971. FINEP has participated in several successful technology projects in Brazil, such as the Embraer Tucano aircraft, a number of agricultural projects carried out by Embrapa, and employee training for Petrobras (FINEP 2012).

In 1999, the Sectoral Funds for Science and Technology started to be created, and FINEP assumed its management. These funds amounted to 2.8 billion dollars in 2010, although they were only partially used (FINEP 2011b). They are structured around specific areas (such as Oil, Biotechnology and Health) though projects' areas sometimes overlap. These funds are currently a fundamental pillar of the science, technology and innovation policy in Brazil, providing funding and support for universities, companies and research centers. In addition to these funds, there are other exceptional resources, such as the 3.8 billion reais added in 2011 through the Plan for Investment Sustenance (PSI), launched by the federal government to counteract the recent signs of economic slowing-down in world markets. In December 2011, FINEP had about 9.1 billion reais in credit applications for innovation, an amount five times larger than at the beginning of the same year (Olmos 2011). After studies conducted by consulting firm Ernst and Young, expectations are that FINEP will evolve into a development bank. This change, it is hoped, would allow an increase in FINEP's resources available for the funding of science, technology and innovation activities.

FINEP provides several forms of financial support—both refundable and non-refundable—for technological and scientific projects. The 'economic subsidy' (*subvenção econômica* in Portuguese) instrument is of special relevance to our purposes here, because it consists of non-refundable resources, in order to share with firms the costs and risks inherent in technological development activities. For this reason, this program bears resemblance to a PPfI policy. The program works as follows. First, FINEP chooses strategic areas for technological development—currently, six areas are covered: information technology and communication, energy, biotechnology, health, defense, and social development. Firms then submit projects for each specific area in a public tender. Applicant firms should hold a stake in the project, contributing with a proportion of FINEP's grant (ranging from 10 % for micro enterprises to 200 % for large companies). Between 2006 and 2009, about 2 billion reais (about 1.3 billion US dollars) were allocated to this program (Andrade 2009: 8–9). In 2011, the total amount available for the 'economic subsidy' for innovation was 500 million reais (approximately 300 million US dollars) (FINEP 2010). In any case, it is worth noting that, although the agency directs resources to areas of overt (and in some cases almost exclusive) governmental interest—such as health, defense and social development—there is no guarantee of a subsequent purchase of the developed products by the

government.[26] Therefore, the PPfI character of the program remains fragile and uninstitutionalized.

Two aspects stand out in the program evaluations, conducted by FINEP (FINEP 2011a) itself. In an assessment from 40 participating companies in 2006 and 2007, a first positive result is the relative success of the program—58 % of companies had already put the product developed in the project in the marketplace. Also noteworthy is the incentive it represented in terms of R&D—for micro and small enterprises, for example, financing from FINEP represented more than 80 % of the firm's R&D spending. Another important result concerns the type of innovation developed. Only 32 % of companies had developed products that were new for the international market. The other 68 % of companies had developed products new for the domestic market only, that is, they acquired an expertise already in existence elsewhere. Therefore, the most substantial contribution of the program seems to be the technological capability building of domestic firms to produce goods already manufactured abroad.

4.4.4 Sector-Specific Developments

As mentioned in Sect. 4.2, the Brazilian economy is very heterogeneous, with innovative and technological capabilities asymmetrically distributed among and within economic sectors. We also contended in Sect. 4.3 that public procurement in Brazil is predominantly concentrated on the low technology side of this heterogeneity spectrum, as most products acquired are standardized and based on extant technological knowledge. In this section, we discuss four sector-specific developments—in the Oil, Health, Defense and Education sectors—which seem to be exceptions to this picture. In spite of their different degrees of consolidation—ranging from rather established (Oil) to very recent initiatives or re-emerging ones (Defense and Education)—these developments show how serious PPfI is entering the political agenda in Brazil. The constitution of a more structured model of PPfI may be on the way.

The first case comes from the oil sector. Petrobras is a semi-public Brazilian oil company with high technological competence. It was established in 1953 within the framework of state monopoly on activities related to the oil and natural gas industry. The company had to face many challenges in order to maintain its activities in the country, such as overcoming the lack of human resources and of machines for prospecting, producing, refining and transporting oil and derivatives. Despite these adversities, it played a major role in the building of the capital-goods

[26] The authors contacted FINEP and were informed that because the 'economic subsidy' is still relatively new, no systematic survey about public procurement of products developed in the program were carried out—though such a survey is already in the agency's plans. However, there are records within the agency—even if still somewhat informal and not yet disclosed to the public—of a few cases in which the products were later purchased by the government.

industry in Brazil (Alveal 1993). In 1997, the legal monopoly was abolished, though the company still holds a near-monopoly share of the exploration and production market. With the discovery of the pre-salt layer reserves in 2006 on the Brazilian coast, Petrobras has intensified its investments.[27] The current chain of its direct and indirect suppliers reaches 20,000 companies from various industrial and service areas (Durão 2011). Given this scenario, the expansion of investment may well be concatenated with public policies to promote innovation, boosting many of these suppliers, most of them domestically located.

CENPES, Petrobras' research center, is the largest research facility in Brazil, and one of the world's largest in the energy sector. It has about 1,600 employees in the Research, Development and Engineering (RD&E) area (Fraga 2010) and invested 872 million dollars between 2008 and 2010 in RD&E (Fraga 2011).

ANP (National Petroleum Agency), the sectoral independent regulatory agency, is responsible for the regulation, oversight and tendering of oil fields. In concession contracts, ANP establishes a minimum margin of R&D spending. Moreover, it also establishes a minimum percentage of domestic content in products and services used in the field's exploration. The aforementioned sectoral fund for the oil sector (managed by FINEP) also provides funds [in 2010, the amount reached 120 million reais (FINEP 2011b)] to be used in companies' technological and innovative projects.

Petrobras also has technical cooperation agreements with equipment suppliers (Dantas 1999; Silva 2009) presenting PPfI-like features. Through these agreements, Petrobras hires companies to develop prototypes of equipment and machines that may in the future become part of its regular supplies. CENPES' technicians and researchers follow the prototype's development in order to allow knowledge exchange between the actors involved. Cassio da Silva (2009) suggests that this may be an effective way of spreading technological capabilities already present within the Petrobras, but absent in the Brazilian industry—that is, in Petrobras' suppliers. The spread of such agreements between public companies and private firms could broaden the dissemination of technological and innovative expertise in Brazil.

The health sector pursues a PPfI policy through a program called *Profarma Inovação (BNDES* 2012*)*, focused on the development of pharmaceutical products. Started in 2008, the program works on the basis of an agreement between two federal agencies: the Ministry of Health and the National Bank for Economic and Social Development (BNDES). The former discloses lists of products of strategic interest, while the latter provides venture capital—up to 90 % of the project's budget—to its development. If the project fails, the company does not need to return the funds. If successful, BNDES has a participation in sales revenues from the product developed under the program. The company has market guarantee

[27] The current company's Business Plan envisages investments of 224.7 dollars between 2011 and 2015. Output is forecast to jump from the current 2.7 million barrels to 4 million in 2015. For a brief review of the opportunities presented after the discovery of the pre-salt layers for the Petrobras suppliers, see De Oliveira and Rubiano (2011).

since the Ministry of Health commits to purchasing the new product to introduce it in the Brazilian public-health system. An important feature of the list of products disclosed by the Ministry of Health is that it is composed, in large part, by pharmaceutical products and medical equipment already in existence but not manufactured domestically.

There is little information on the results achieved so far by this policy. One of the few results reported was the development, in early 2012, of a more efficient process for the isolation of an input for pharmaceutical antiretroviral products (Calandrini 2012). Despite the vagueness around the general results of the program, the company which developed this process stated that the returns to scale induced by the higher preferential demand from the government are already responsible for higher efficiency and lower prices in the pharmaceutical sector.

In the case of the defense sector, there are great expectations around recent innovation policies. Government procurement of innovative products is far from unusual in this sector, as shown by cases such as the Embraer Tucano aircraft, the development of a nuclear submarine and the KC-390 military transport aircraft[28] (Andrade 2009: 103–104; Poggio 2011). In September 2011, a Provisional Measure[29] (MP 544/2011) was issued, establishing special rules for government procurement in the defense area and providing a variety of tax incentives for the national defense industry. It creates the category of Strategic Defense Company and establishes tendering restricted to the domestic industry (Bresser-Pereira 2011). It has been issued as Act 12598 in March 2012.

Regarding education, there are also indications that the Ministry of Education will use its purchasing power to stimulate innovation, through the intention of purchasing tablets for public-school teachers and students. A range of fiscal incentives were established in 2011 to promote the implementation of a modern electronics industry for that purpose, and one of the key organizers to attract investments from companies in this direction was a former Minister of Science, Technology and Innovation, Aluizio Mercadante. He was recently appointed Minister of Education, which indicates that the government purchases of tablets may become a reality (Costa 2011).

4.5 Conclusions

The Brazilian government does not have, so far, a procurement policy that can successfully integrate its innovation policy (Andrade 2009: 26; CGEE 2007). Apart from the regular processes of public procurement—judiciously done in

[28] The development and production of both the nuclear submarine and the KC-390 aircraft are still in progress. The former is being developed by the Navy Technology Center and the latter by Embraer.

[29] A Provisional Measure is a decree enacted by the Brazilian president established by the 1988 Constitution—having the force of law.

terms of transparency and legality, but poorly executed in terms of actual quality of acquisitions and their technological content—there are two types of initiatives. On the one hand, there are a few specific policies, linked to sectors such as health, defense and procurement of state enterprises (Petrobras). On the other hand, there are funding policies directed at specific technological areas—such as the economic subsidy from FINEP—which are in turn not integrated into the purchasing power of government. Along these lines, we can conclude that the results of PPfI—and of policies akin to PPfI—have not yet had a comprehensive impact in innovation in Brazil and have not yet displayed their full potential. It is manifest that these poor results accrue from problems regarding these policies, which are still many.

A first main problem is the merely reactive nature of some policies. In the health sector the primary goal is to introduce in the country the production of goods which currently have to be imported. The results of the economic subsidy program from FINEP have also shown that it essentially builds capacities of domestic firms for the production of goods already in existence and manufactured abroad. Both seem to be unadorned reactions to current account deficits in products of high and medium technological content. This can be described as a new application of the import-substitution recipe—again induced by imbalances in trade related to technological backwardness.[30] These considerations point, in short, to the fact that there is still a long way for the Brazilian industry: structural heterogeneity needs to be reduced, and whole industrial sectors need to come closer to the international frontier before reactions to trade imbalances can become active innovation policies. Policy-oriented public procurement for innovation certainly has a role in overcoming these difficulties, because it can effectively assist in promoting sustained innovative activities which go way beyond mere reactive import substitution.

Despite this rather disappointing picture for PPfI, there are potentials that, if realized, may put Brazil on a new trajectory with respect to its procurement practices. Evidence can be found, firstly, in the recent legislation on the subject, especially in the recent Act 12598 of 2012 concerning government procurement in defense, and in Act 12349/2010 establishing a margin of overpricing for domestic products and services. Together with Article 20 of the Innovation Act, this legislation lays the legal basis for PPfI. Everything depends now on the law thriving as a tool for the promotion of domestic industry and its innovative capabilities. In addition, existing policies in the areas of defense and health are still relatively recent, preventing a more accurate account of their problems: whether they are transitory and correctable faults or truly structural imperfections. Finally, the lack of integration between funding for specific technological areas and governmental purchasing power is a critical point that is already the subject of public discussion (Andrade 2009: 26; CGEE 2007). If the institutional framework outlined in Sect.

[30] This problematic feature of the ISI model—which would come about, were the economy not to reach a level of sustained economic development—had already been identified in the 1960s by Tavares (1964).

4.2—of increased decision-making capacity from the executive power and its permeability to the democratic debate—is correct, the trend is that criticism regarding this lack of integration is going to be absorbed in future policies.

It is therefore possible that Brazil, in the coming years, is going to constitute—while policies in specific sectors such as defense, health and energy become consolidated and gain strength—a model of *PPfI as technology (platform) development policy*. A new system could emerge, in which procurement is integrated into the development of both sectors where the country already has technological advantages and sectors stimulated to respond to economic and social demands.

This outcome depends, however, on the overcoming of several obstacles. First, it is through the synergy between innovation policies put forth by FINEP and government procurement that the consolidation of PPfI can be contemplated in Brazil. The pursuit of synergy between different policies already in existence can be instrumental in promoting innovation. Programs managed by FINEP should be taken into account as a potential focal point around which PPfI policies could be articulated within state bureaucracy.

Second, the staff responsible for public-procurement policymaking, as well as the staff responsible for the fulfillment of procurement activities, must acquire further necessary skills, developing a comprehensive view of society's strategic needs. The strategic importance of procurement positions needs to be emphasized, and the building of capabilities specific to sectors of high technological intensity must count on constant and strong support from the state bureaucracy. Only by surpassing the mere mastery of legally established procedures will the bureaucracy be qualified for the tendering of innovative products and services at the technological frontier. Only then can the promises of the new legal foundations—such as Article 20 of the Innovation Act—materialize.[31]

Third, spaces of articulation between the staff responsible for government procurement activities and other relevant actors—such as FINEP, users of products/services acquired and companies that produce them—must be created. In this sense, there is a correlation to be sought between public and private technological capabilities: innovation policies should be developed conceiving the national innovation system as systemic interrelationships between public and private sectors (Cassiolato and Lastres 2011). Government procurement policy should not neglect this aspect, contributing to dimensions that cannot be properly addressed by the private system of science, technology and innovation alone.

[31] Mota's dissertation (2010), which makes the case for the corruptocentric character of Brazilian government procurement policy, suggests a starting point for such a transformation. As a substitute to the infatuation with normative procedures, he advocates a results-driven procurement policy, which would highlight the principle of 'best value' as opposed to the current predominance of the principle of 'less value'. In our view, the best-value principle would have to encompass considerations about the level of technological learning that particular purchases would stimulate, and not only product's quality as, it seems, is Mota's argument.

With these concluding remarks, we can conceive of a public procurement system to promote synergies with innovation policies carried forward by the Brazilian government, consolidating political and economic progresses made in recent decades and paving the way for Brazil to continue advancing in its project of offering its people a high level of welfare.

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Chapter 5
China

The Legislation of Public Procurement Policy for Innovation in China

Chen Jin and Cheng Chunzi

Abstract The Chinese Public procurement for innovation (PPFI) policies have taken place quite late comparing to the developed countries. And it has to face the reality of huge economic gap between the East, the Middle and West area in such a vast territory, the truth that Chinese enterprises are still struggling in the gradual process from imitation stage in both technologies and business pattern to innovation driven stage. Yet from the case of Shanghai's PPFI policies we can see that, the Chinese government is adopting the expertise and knowledge of innovation stimulation by transferring the supply policies into demand policies for innovation, which may present the political innovation from inside itself. Yet there are still a lot of hindrances and problems if the government want to further exploit the function of PPFI policies such as the flexibility of public procurement organization setting, the changes of fund save-first priority needed and the level of innovation stimulation that the government should interfere with. Besides, the government should aware that innovation can only be realized through combination of the need for product or service innovation with transparent process to ensure fair competition in public procurement.

5.1 Country Background

As is well known, China is one of the four ancient and civilizational countries in the world. Located in East Asia, it has the world's largest population with its vast territory covering 9,600,000 km^2. To the north, northeast and northwest are the

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Mongolia, Russia and Korea. To the south are Vietnam, Laos, Thailand and the Philippine. To the west and southwest are India, Burma, Bhutan, Nepal and Pakistan. To the east is Japan, which faces China across the East China Sea. China consists of 34 provinces, autonomous regions, and municipalities directly under the Central Government. Beijing, which is situated in the North China, is its capital and cultural center. The People's Republic of China was founded in 1949 after ten years wars of Warlords, eight years of anti-Japanese wars and four years of civil war.

The reason why this old country being famous worldwide now is because of its being a developing socialism country with unique characteristics, especially in the area of economy which is called 'the economy of socialism with Chinese characteristics'. The reform of economic structure started in 1978 with the policy of opening up being made. From then on the old nation has witnessed an amazing leaping growth both economically and socially.

The economic structure reform towards building an open and active market-oriented resource distribution system has focused on the economic development. The government promised to step outside of the micro-economic area leaving the market itself to manage the demand and supply. Unlike the Soviet Union and Eastern Europe pattern of rapid economic privatization and liberalization, the Chinese government took cautious and incremental steps towards economic reform. The reform of economy together with polity gradually makes the compresence of both planned economy and market economy. After years of contribution, the GDP of China has reached 47.1564 trillion RMB in 2011, indicating a great national wealth in this developing country making it one of the largest economies in the world.

Along with China's market economy constructing is the tide of globalization and national competitiveness driven by innovation. The Chinese government is making great efforts to the development of science and technology aiming at building a strong innovative nation. As the reform of economic structure goes deeper together with the goals of innovative nation, some complex difficulties arises due to the lack of political and organizational reform. It is undoubted that the government has to change from manage everything it used to be to well governance in order to deal with complicated international and domestic situation.

The well governance transferring from administration order management acquires two directions: the reform of the government structure and its organization and the perfection of legislation. In the transition process, the government needs to leave space for private enterprises to develop while guiding the strategic competitive innovation direction and providing sufficient public service for them, which means the role that government plays here has become quite sophisticated. The latest government organization reform happened in 2008. The goal of it is to build new super ministries and perfect the macro coordinate system in the organization level. The former refers to the function combination of Industry Department and The Ministry of Information. The later refers to the coordination between the National Development and Reform Commission (NDRC), the Ministry of Finance and the People's Bank of China.

5.2 National Innovation System in China

The ability of innovation is the key strategy to national competitiveness. Nowadays, the growth of science and technology stands for the future of a country's economic and social development. Innovational nation refers to the technology-oriented driven country which benefits from its technology innovation on the economy and society aspects. There are 20 nations which are accepted as innovational nations worldwide including the U.S., Japan, Finland, South Korea and so on. The characteristics those countries have in common are: the high social input of innovation activities; strong competitiveness in international technologies of important industries; excellent performance of innovation output and the great influence the innovation of hi-tech have on national wealth growth and industry development. According to the OECD report, the comprehensive innovation indexes in the innovational countries are obviously higher than common countries: the contribution rate of scientific and technological progress is above 70 %; the share of R&D to GDP is above 2 % generally; the import technology reliance rate index is naturally below 30 %.

The Chinese government has announced its scientific development plan of the next 15 years in 2006 that, it shall establish the innovational nation in 2020, making scientific and technological progress the strong backbone of national development of economy and society. The basic indexes referring to national innovation were: the contribution rate of scientific and technological progress to economy should increase from 39 % to above 60 %, and the total social R&D input of innovation should increase from 1.35 to 2.5 % (Fig. 5.1).

Table 5.1 demonstrates the R&D input that China has invested from 2000 to 2011. Although the increase of the national R&D input in China is impressive, it still lacks more financial and political attention when compared with the western countries. The share of R&D to GDP in most developed countries reaches 2 % above; Japan and South Korea has already reached 3 % while Israel has even reached 4 %. There has been lots of research proving that the level of one's R&D input has positive correlation with its innovation output. But given the trend of China's R&D input, it could barely reach 2 % of the GDP in the next three years.

From Table 5.2 a conclusion can be drawn: the enterprise is becoming the main R&D Investment body in China as with the other developed countries, and the government still focuses most of its R&D input on research institutes which may indicate that the government is paying attention to the basic scientific research providing base for further technology innovation. By this way it may need a long and tough period to realize the actual innovation but does support a strong science base.

The Europe MBA Collage has joined with the WIPO to release the Global Competitiveness Report 2010–2011 which shows Swiss, Sweden and Singapore ranked the top 3 nations in national innovation ability as same as last year, and HK in China ranked 8th while China mainland ranked 34th only. In the report, China mainland is estimated not as the third-class nation driven by innovation, but as the

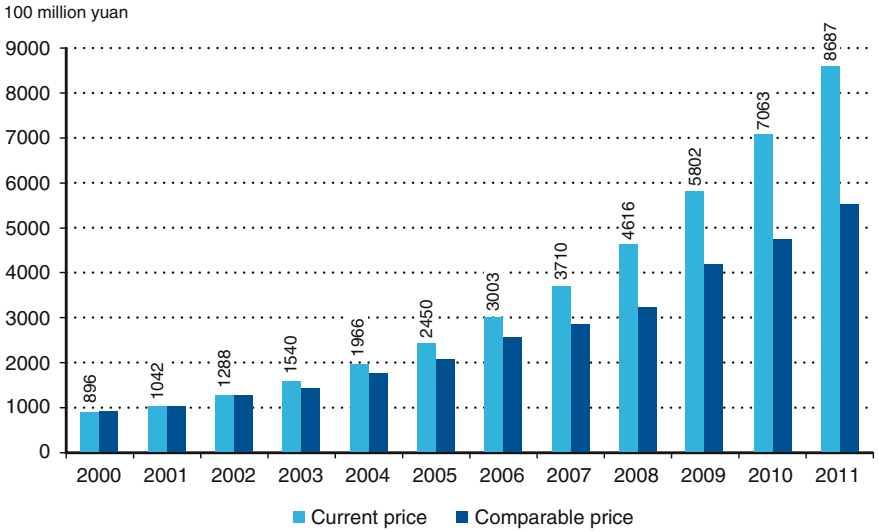

Fig. 5.1 Domestic R&D input in the past decade in China (Ministry of Science and Technology of the People's Republic of China 2012)

Table 5.1 National expenditure on R&D (Ministry of Science and Technology of the People's Republic of China 2012)

Gross domestic expenditure on R&D	2006	2007	2008	2009	2010	2011
GERD (100 million yuan)	3,003.1	3,710.2	4,616.0	5,802.1	7,062.6	8,687.0
GERD/GDP (%)	1.39	1.40	1.47	1.70	1.76	1.84

Table 5.2 Source and implementation of the R&D input in China (Ministry of Science and Technology of the People's Republic of China 2012)

GERD by source of funds and sector of performance, 2011 (100 million yuan) Source of funds	Performance sectors Total	Business	Research institutes	Higher education	Others
Total	8,687.0	6,579.3	1,306.7	688.9	112.1
Business	6,420.6	6,118.0	39.9	242.9	19.8
Government	1,883.0	288.5	1,106.1	405.1	83.2
Abroad	116.2	104.7	4.9	6.0	0.7
Others	267.2	68.1	155.8	34.8	8.4

second-class nation which is driven by efficiency. This could be a signal that the Chinese government still has much more to do in improving the ability of national innovation. More details can be obtained from Fig. 5.2.

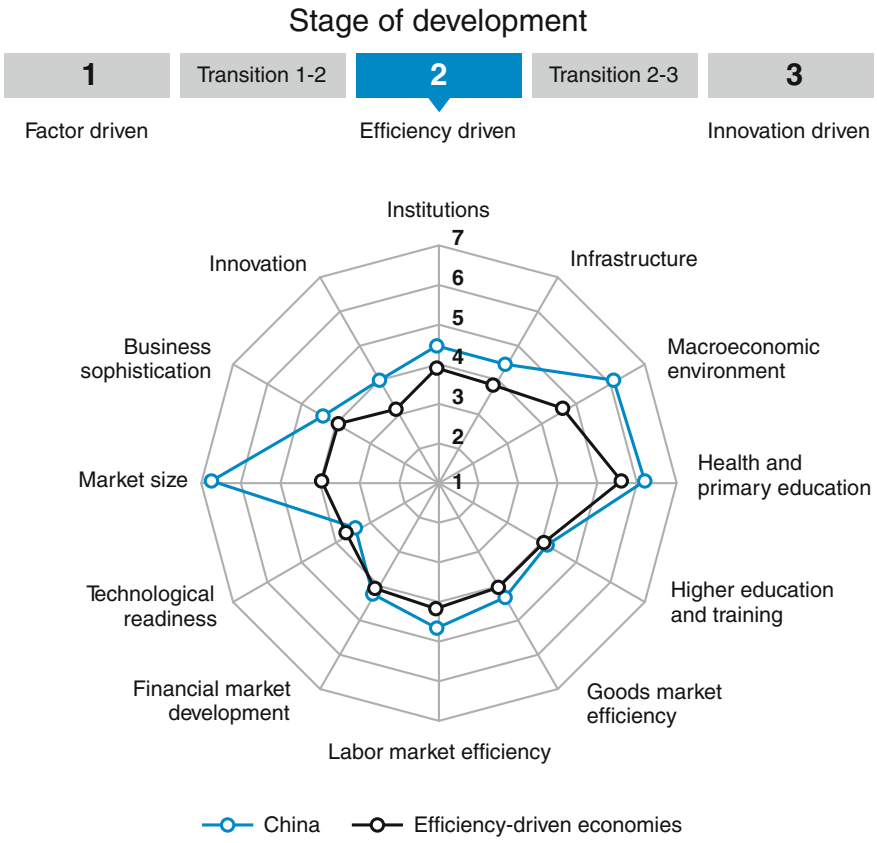

Fig. 5.2 Global innovation ability report (WEF 2011)

'Main Science and Technology 2009–2011' released by OECD shows the latest innovation data of the 30 member countries and 9 other countries. In 2007, the global R&D input reached one trillion $ dollars which shows clearly that the global R&D activities have stepped into a new stage.

One thing needed to be noticed is that, the Chinese R&D input growth has outpaced the U.S., Japan, Germany, France and England dramatically in these years. It can be conclude that the global R&D activities are becoming more diversified, in other words, the innovation centers may spread across the world in the future.

5.3 Public Procurement in China

5.3.1 Public Procurement Legislation

Compared with other countries, Chinese public procurement system has been established since recently, yet has developed quite fast. China has gained experience in the most rewarding way such as public bidding and contractual pricing which are already used internationally. In order to guarantee the fairness and efficiency of the procurement procedure, the country has been reforming its public procurement since 1996 through three different phases: the pilot project launching, universalization and legislation. At each stage, laws and regulations have been made according to the level and implementation of public procurement.

5.3.1.1 Phase One: The Pilot Project Launching (1996–1998)

It is during this period that China started attempting work on the preparation of the context, procedure and concrete steps of the public procurement function.

In October 1996, the Ministry of Finance made a briefing report on public procurement after which some developed regions in China like Shanghai and Shenzhen had been chosen to launch the pilot project.

In January 1997, the Shenzhen government in southeast China announced for the promulgation and implementation of Shenzhen Special Economic Zone Public Procurement Regulations, which was the first legally local public procurement regulations in this country. In the same year, the Ministry of Finance asked the approval of the 'Public Procurement Regulations' for the whole nation from the State Council.

The year 1998 has witnessed the large institutional reform of the State Council with the result leading to the power that grants Ministry of Finance the function of protocol and implementation of national public procurement. Also, 29 provinces, autonomous regions, municipalities directly under the central government have had begun the work of their local public procurement at different levels in the same time.

5.3.1.2 Phase Two: Universalization (1999–2001)

From the year 1999–2000, China has made great efforts on the legislation and universalization of public procurement.

On August 30th 1999, the eleventh meeting of the ninth session of the NPC Standing Committee had passed the 'Public Procurement Law of the Peoples Republic of China (Draft)' and approval its implementation since January 1st 2000.

In 2001, China has been joined the WTO successfully and committed to starting the negotiation of the 'Public Procurement Protocol' with WTO members.

5.3.1.3 Phase Three: Legislation (2002 Until Now)

On June 29th 2002, the 24th meeting of the ninth session of the NPC Standing Committee had passed the 'Public Procurement Law of the Peoples Republic of China' and approval its implementation since January 1st 2003. After that, a few laws including the 'Regulation of Public Procurement Information Disclosure' have followed up to form a comprehensive law system supporting the public procurement.

Among all the laws and regulations being taken, two of them are of significant use: the 'Public Procurement Law of the Peoples Republic of China' and the 'Bidding Approach Law of the Peoples Republic of China'.

Standing as the milestone of the public procurement history in China, the 'Public Procurement Law of the Peoples Republic of China' has regulated the public procurement behavior of Chinese governments and had profound influence on the law construction of the national financial system.

While the first one is the core of the public procurement, the 'Bidding Approach Law of the Peoples Republic of China' constraints the concrete move that the governments shall take in the work, thus shows its power in the detailed government working procedure to prevent corruption and so on.

5.3.2 Varieties of the Procurement Biding Approaches

The four main procurement approaches that the Chinese governments are using are as follows: bidding publicly, selective tenderer bidding, competitive negotiation and appointing tenderer procurement.

Bidding publicly is the way that most developed countries adopt in public procurement. Selective tenderer bidding means the government will inform some specific tenderers of bidding on public procurement. Competitive negotiation is to contact about three suppliers on the purchase issues directly. Appointing tenderer procurement is to buy from the chosen tenderer without public bidding procedure which can be quite formalistic and probably hides discrimination against domestic SMEs.

As with the laws and regulations being established, bidding publicly has become the most widely used approach no matter it is carried by national centralized procurement, locally centralized procurement or decentralized procurement. It has been guided that the bidding publicly approach should be used when the value of equipment or service that the government purchasing reaches 1.2 million RMB, or the construction work purchasing reaches 2 million RMB.

According to the data from 'Public Procurement Yearbook of China' in 2004, the amount that the bidding publicly approach alone was 127.1 billion RMB covering 59.5 % of the total public procurement. In 2008, the number has risen to 428.9 billion and 71.6 % which could be a symbol that the Chinese government has tried to enhance the openness and transparency degree the procedure being doing.

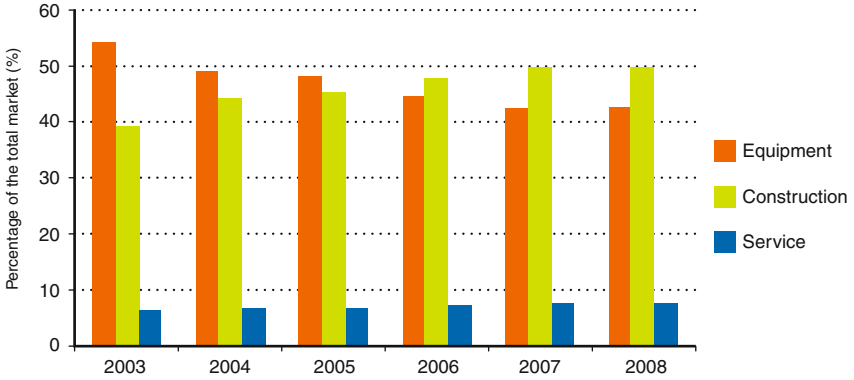

Fig. 5.3 Main public procurement categories measured as of percent in the total market (China Government Procurement Yearbook 2008)

Table 5.3 Main public procurement categories spent from 2003 to 2008 in China (RMB billion) (China Government Procurement Yearbook 2008)

Year	Equipment	Construction	Service	National accounts
2003	89.73	65.83	10.38	165.94
2004	104.87	94.83	13.84	213.54
2005	140.8	132.32	19.58	292.7
2006	164.74	176.39	27.03	368.16
2007	197.33	233.06	35.69	466.08
2008	255.92	297.84	45.33	599.09

5.3.3 Categories of the Public Procurement

In China, the public procurement market is dominated by equipment, construction and service. In 2003, the amount of the public equipment purchasing was 89.73 billion RMB which covered for 54.4 % of the total market. The spent on the construction was up to 65.83 billion RMB covering 39.3 % of the total market. The service cost the government 10.38 billion RMB, which stands for 6.3 %. Five years later in 2008, the spent on public equipment was as much as 255.92 billion RMB, the number of construction purchasing reached 297.84 billion RMB, and the service spent equaled to 45.33 billion RMB. Each one of them has shared 42.7, 49.7 and 7.6 % of the total market (Fig. 5.3, Table 5.3).

After 200 years developing in the developed countries, construction procurement can accounts for 80 % of the total market while it could only reach around 50 % in China until recent years. There will be a lot of space for the Chinese government to improve the structure of its procurement.

In essence, comparing with the U.S., the proportion of public procurement to the national financial expenditure remains about 10 % in China these years while

the former one can reach 50 %. And the proportion of the public procurement to the GDP could only reach 2 %, which if compared with the average 15 % of the western countries is quite low.

5.4 Public Procurement Policy for Innovation (PPFI) in China

Ever since the Chinese government perceived the truth that enterprise is the main body that triggered innovation, it has improved in many ways to let the market-oriented innovation become stronger domestically, combining with the research of technical innovation system in universities and enterprises' R&D departments.

In 2003, the Chinese government realized that not forming a complete law system could lead to the result that makes public procurement an ideal breeding ground for corruption and low efficiency of work, not to mention the innovation stimulation function. So from 2003, the government has passed the 'Public Procurement Law of the Peoples Republic of China' which firstly mentioned that 'the public procurement should be helpful with the SME innovation and development.' But it didn't instruct quite clearly how to deal with the procedure details if aiming at supporting the enterprises' innovation.

From the year 2006, the government has enacted several national regulations to give clear instructions on how to support the innovation referring to the public procurement. The 'Science and Technology Promotion Law of the Peoples Republic of China' has established the prior public procurement of the products of independent innovation system. The 'National Medium and Long-term Science and Technology Development Outline (2006–2020)' gives priority to products of independent innovation domestically when referring to public procurement programs. The 'products of independent innovation domestically' here means the ones that have been listed in the 'Products Catalogue of Independent Innovation for Public Procurement' authorized by the Ministry of Finance.

In general, the steps that the government has taken to improve innovation in its public procurement are as follows:

- Making the 'Products Catalogue of Independent Innovation for Public Procurement'. The products on the catalogue are being certificated as products of independent innovation which will acquire priority when the government needs such kind of products purchasing.
- Making the 'Listed Energy Efficient Products for Public Procurement'. According to the clauses of it, the products granted as the 'listed' ones will get a positive addition or deduction of scores which could be helpful when compete with other traditional products.

The first method of lowest bid evaluation in Table 5.4 means if the tender go with its independent products, the procurement organization will give it 5–10 %

Table 5.4 Preferential content for the public bidding of products of independent innovation (Ma and Wu 2012)

Public bidding evaluation methods for public procurement	Margin of preference in the public procurement documents	
The lowest bid evaluation method	Give the tender 5–10 % Price deduction	
	Bidding price item evaluation	Given an additional 4–8 % points of total scores
The comprehensive scoring method	Bidding technology item evaluation	Given an additional 4–8 % points of total scores
The performance-price ratio method	Offering price item	Given 4–8 % price deduction
	Bidding technology evaluation item	Increase the independent innovation product score factors

price deduction when considering all offering prices, thus makes the tender more competitive comparing with others on offering price. The Comprehensive Scoring Method contains two circumstances: it will give the tender with independent innovation an additional 4–8 % points in total regarding bidding price or the bidding technology items. In the third namely performance-price ratio method, when it comes with the bidding price, it shall give the bidder 4–8 % price deduction to make it competitive, or to increase the independent innovation product score factors at last referring to the bidding technology evaluation item.

Public procurement order system has been made. The so-called 'order' means when the country needs some important independent innovation products or technologies, it could make orders to the specific suppliers such as some domestic innovative enterprises, thus encourages the innovation behavior from the enterprises in a positive and direct way.

5.5 Shanghai's PPFI Policy as a Case

Located in the Yangtze River Delta, as one of the largest and representing cosmopolitan city in China, Shanghai plays a significant role in the national economic and cultural development, which means the central government is more tolerant with its 'active' move in many aspects, thus has granted it lots of opportunities to take reform without too much political constraints.

Enterprises in Shanghai own rich scientific resources from the universities and scientific institutions there and have established strong R&D departments within the companies. Not only does the ability of innovation in these enterprises decide whether they have competitiveness in the world but also represent the average level that the national innovation ability could reach.

Table 5.5 Shanghai Government input on R&D (Qi 2012)

Year	2000	2001	2002	2003	2004	2005	2006	2007
Government input on R&D (billion RMB)	7.67	8.8	10.23	12.89	17.03	21.35	25.67	30.75
R&D input measured of percent in GDP	1.68 %	1.69 %	1.80 %	1.93 %	2.11 %	2.34 %	2.49 %	2.56 %

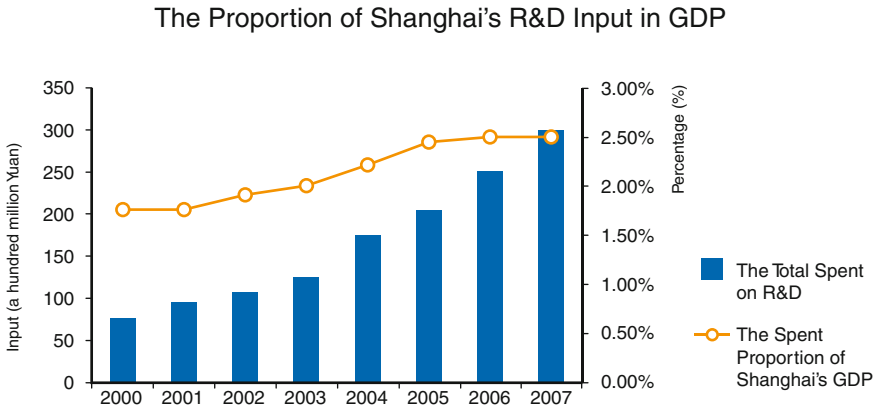

Fig. 5.4 The proportion of Shanghai's R&D input in GDP (Qi 2012)

5.5.1 The Outlook on the Ability of Entrepreneurial Independent Innovation in Shanghai

According to the 'Report on the Ability of Enterprise Independent Innovation in China' (Qi 2012), the ability of enterprise independent innovation evaluation system consists of four dimensions: the first is the input on the R&D that the enterprise has spent; the second is the potential technology resources the enterprise independent innovation owns which includes the innovative human resources as the key figure; the third one is the output that the enterprise independent innovation could make, like the patent numbers the enterprises have; the last but not the least, the pattern of the enterprise independent innovation should also be considered.

One of the most fundamental factors that trigger innovation is finance input. The independent innovation input is the economic basis and guarantee that realizes innovation in the first step. Without enough finance input may lead to the lack of R&D equipment and outstanding R&D personnel, thus independent innovative technologies or products couldn't be expected.

Table 5.6 Shanghai public input on different objectives (Zhu 2006)

	2000		2006		2007	
	Input (billion Yuan)	Proportion (%)	Input (billion Yuan)	Proportion (%)	Input (billion Yuan)	Proportion (%)
Institutions & Research Centers	2.56	33.34	5.21	20.28	5.8	18.87
Universities	0.74	8.68	2.65	10.32	2.62	8.54
Enterprises	4.14	54.01	17.7	68.93	22.22	72.24
Others	0.23	2.97	0.11	0.44	0.11	0.35

Shanghai government attaches great importance to the finance of independent innovation. In 2000, the Shanghai government financed the independent innovation 7.67 billion RMB accounting for 1.68 % of the Shanghai's GDP. In 2007, the number has risen to 30.75 billion RMB which stands 2.56 % of Shanghai's GDP (Table 5.5).

From 2000 to 2007, the scale of Shanghai's R&D input has been much bigger and its proportion of Shanghai's total GDP has been rising since then (Fig. 5.4).

The city's public spent on R&D has been focused on institutions, universities and research centers, enterprises and others among which the enterprises have always been the highlight. The public spent of R&D on financing enterprises in 2000, 2006 and 2007 was 4.14 billion Yuan, 17.7 billion Yuan and 22.21 billion Yuan which can be viewed from Table 5.6.

From the figures above we can conclude that Shanghai government has invested a lot in the organizations from which innovation may derive these years and has taken enterprises as the main body of innovation firmly as financing input rising as a trend.

5.5.2 The History of Public Procurement Policy in Shanghai

The policy of public procurement for innovation (PPFI) is the insurance of public procurement procedure going through successfully to promote innovation. Traditionally, the public procurement has been divided into four sections: procurement for domestic products; to support the development of high technology and special industries as well as its independent innovation ability; to protect the environment, exploit the resources reasonably and promote the 'green' procurement; to balance the inter-regional economic and social development meanwhile stand for the native SEM's developing.

Shanghai's public procurement policy has taken place since the late twentieth century. After years of reforming, dissemination and perfecting, shanghai government has gained lots of experience in enhancing the input fund efficiency, strengthening the supervision and operating the finance function.

In 1995, the Shanghai government had learned from the western countries the public procurement affairs and launched a pilot project for its local public procurement policy. The first departments that employed the public procurement included education department, science bureau, health bureau and others. The Shanghai Finance Bureau made the 'Regulations for Municipal Health and Medical Organizations to Strengthen Franchised Funds Management' jointed with the Health Bureau in 1995 illustrating that: the total cost of any projects that gained approval above 5 million Yuan shall need to go through the public bidding and procurement.

Until 1998, Shanghai has made efforts in broadening the scale of public procurement. In 1999, it has begun to implement the new 'Management Approach for Public Procurement', which listed the detailed catalogue of public purchasing context helping established the public procurement system and operation mechanism primarily.

Ever since the 2000, Shanghai government made great endeavor in perfecting the public procurement system and refining the basic management policy. Besides, as Shanghai has oriented itself as the new international economic, financial, trade and shipping center, the procurement system started to equip with information and technology devices and began investing in the municipal construction area.

In 2006, together with the 'National Public Procurement Law of People's Republic of China' and 'National Long-and-mid Term Program Outline for Science and Technology Development of People's Republic of China (2006–2020)', Shanghai made the local 'Interim Provisions for Shanghai Public Procurement of Independent Innovation' amongst which the article 12th stated: for the national and local government's major construction program, the public purchaser should promise in the feasibility research report that independent innovation products will be included, within which the domestic equipment should at least take 60 % of the total purchase quantity generally, and the amount of the independent innovation products shall be included in the audit of projects completion. Until now, Shanghai government has also promulgated the 'Evaluation Method for the Independent Innovation Products in Public Procurement' and 'Contract Management for the Independent Innovation Products in Public Procurement' according to the principles of 'National Bidding Management Approach for the Public Procurement Goods and Service of People's Republic of China' in 2007.

All of these laws and regulations have shown the determination of shanghai government to incrementally increase the number of independent innovation products being purchased in the public procurement programs and elicit the breakthrough of innovation via large scale public construction.

Table 5.7 The scale and batch of Shanghai's public procurement (Qi 2012)

	2001	2002	2003	2004	2005	2006
Procurement amount (billion)	4.58	6.93	9.06	11.73	15.86	20.69
Procurement batch	9,852	2,0443	27,577	39,108	24,641	30,908

5.5.3 The Function of the Shanghai PPFI to Local Independent Innovation

It can be concluded from above that the promoting effect of Shanghai's PPFI to its independent innovation has been growing as the scale and level the procurement could influence is becoming deeper.

The unbelievable outcome can be attributed to the PPFI to a great extent. Since 2001, the total input amount that the Shanghai government had invested in the public procurement was 4.58 billion RMB, but the number had soared to 20.69 billion RMB just five years later in 2006. The purchase batch had also risen from 9,852 times in 2001 to 30,908 times in 2006. Detailed statistics can be viewed from Table 5.7.

Under this circumstance, the government has also increased the number of experts as think-tank to give scientific and fair judgment on the categories and number of the goods and services in the public procurement. Right until 2006, the experts and procurement had reached nearly 2,000 with public procurement organization being established as well. The Shanghai municipal government has published the 'Handbook of Public Procurement' guiding the regulations and emphasis on the PPFI.

The first positive effect of the PPFI to Shanghai independent innovation was its economic stimulating function. Take Changning district in Shanghai as an example. The Changning Public Procurement Center had been entitled the right to be the agency for Changning's high-tech enterprises to apply for independent innovative productions by public bidding procedure since 2006. In 2007, the agency has applied 10 civic scientific projects for 7 corporations successfully. In 2008, a lot of enterprises had been influenced by the financial crisis. The Shanghai government shadowed some of them to avoid bankrupts via public procurement. For instance, the Songjiang government in Shanghai equipped its public administrative vehicles with the tyre pressure electronic monitor system first to help the local corporations enhance the ability of sustainable independent innovation. Thus, the local government had helped high-tech corporations to develop in a steady and supportive environment.

The second prompting effect could be the social performance. The Shanghai PPFI and its relating policies have made great effort to improve the system and environment of public procurement focusing on the national strategies, important industries and innovative centers. Shanghai municipal government has combined massive scientific data, scientific reviews, equipments, technologies and incubators to form a comprehensive public R&D supportive platform with preferential

policies in 2006, which has been building a bridge between the government, industries and academia. The information and scientific review the platform could provide was 5.41 TB data in 2006. It had attracted 29.57 million visits in 2006 alone and acquired more than 100,000 registered clients who had made 28,191 technological business contracts reaching totally 34.4 billion RMB ultimately.[1]

The last but not least, the Shanghai government has published procurement handbooks and held public procurement process trainings to diffuse the strategy and knowledge of PPFI policies in both the government itself and local enterprises as well.

But there does exist some deficiency in Shanghai‘s PPFI policies. The main cause is the save-first priority standard in shanghai’s PPFI policies which leads to the inadequate function playing of the policies, especially in the prompting function to the innovation of enterprises. The focus on procurement fund in China seemed to be adjusting to the nation’s plans in the long run.

Regarding the share of public procurement input to GDP, Shanghai government left behind when compared with the 10–15 % of other developed countries. At the same time, the lack of sufficient estimation system and deep-rooted concept that consider the import products better than the domestic products are preventing the procurement organization from fair competition regulations making. These are the three basic directions for the change of future if the PPFI policies reform goes deeper.

5.6 Conclusions

The government should have at least three functions to elicit innovation: providing incentives and facilities to support innovation; removing bureaucratic, regulatory, competitive or other obstacles to innovation; and improving knowledge base and its use in developing technical education and R&D structures (Aubert 2010). The public procurement seems to combine those three basic functions together: by purchasing action to elicit entrepreneurial innovation behaviors; by formulating procurement laws to improve the scale of public procurement and remove the competitive obstacles; by public procurement to let allow R&D innovation find its use and strengthen the knowledge base of the country.

The Chinese PPFI policies have taken place quite late comparing to other developed countries. And it has to face the reality of huge economic gap between the East, the Mid and West area in such a vast territory, the truth that Chinese enterprises are still struggling in the gradual process from imitation stage in both technologies and business pattern to innovation driven stage. Yet from the case of Shanghai’s PPFI policies we can see that, the Chinese government is adopting the expertise and knowledge of innovation stimulation by transferring the supply

[1] Shanghai Economic Yearbook (2007).

policies into demand policies for innovation, which may present the political innovation from inside itself. Yet there are still a lot of hindrances and problems if the government want to further exploit the function of PPFI policies such as the flexibility of public procurement organization setting, the changes of fund save-first priority needed and the level of innovation stimulation that the government should interfere with.

But at least one idea now is accepted widely: the innovation outcome through public procurement should not be realized via 'order' or 'request', on the contrary, it can only be realized through combination of the need for product or service innovation with transparent process to ensure fair competition in public procurement.

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Chapter 6
Denmark

Public Procurement of Innovation Policy: The Case of Denmark

Max Rolfstam and Ole Helby Petersen

Abstract Until recently, Danish policy interest in public procurement has mainly been driven by efficiency and cost-effectiveness concerns. Public-procurement policies have in general focused on the utilisation of economies of scale as a means of achieving lower prices on goods and services. Attempts to develop mandatory procurement systems have also been gradually developing, while the focus on innovation has been relatively modest in Danish procurement policies until recently. This picture is currently changing, as several initiatives emphasising public procurement as a means of stimulating innovation have been launched. Whether this gradual change of focus in Danish procurement policies will make a deep and lasting impact on the role of public procurement as a driver for innovation is, however, yet an open question.

6.1 Introduction

The Danish public sector has traditionally not devoted much attention to the use of public procurement as a means of stimulating innovation in the economy. In the often cited Fraunhofer study on public procurement and innovation it was pointed out that Danish procurement policies until 2005 mainly concerned efficiency aspects, while some other EU member states were already working towards developing policies and practices for the public procurement of innovation (Edler et al. 2005).

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The need for a more strategic focus on the interaction between the public sector and private firms was also identified in 2004 by the Danish Innovation Council and again in 2009 by the Danish Technology Council as a challenge to be addressed in future innovation policies (Danish Innovation Council 2004, 2009). The raising concerns over the lack of policies supporting innovative interaction between the public and private sectors was to a large extent a reaction to the fact that the Danish approach to public procurement has historically been focused on purchasing the same services for less money by centralising procurement competencies in larger units and exploiting economies of scale. This aspiration, however, has not yet reached its full potential. Although centrally negotiated framework agreements were found to offer cost-savings and reduce administrative burden for the individual public agency they have not been utilised to the extent envisaged by policy-makers (Larsen et al. 2006). At the same time, comparatively less emphasis has been put on the utilisation of public procurement as a means of stimulating innovation.

In recent years, though, the Danish public sector has launched a number of new policy initiatives intended to stimulate the use of public procurement as a driver for innovation. As a result, what was previously only an emerging policy interest in Denmark has now evolved and been manifested in several government reports and policy initiatives aiming at increasing the interaction between government and business. For instance, the Danish Enterprise and Construction Authority has issued a number of reports on public–private innovation partnerships (PPIs), which is a partnership type that focuses on the procurement of innovative solutions within the welfare sectors, such as health, eldercare and education (e.g. Danish Business and Construction Authority 2009; Weihe et al. 2011). Rather than a traditional buyer–supplier relationship, PPIs offer partnerships where the public and private sectors work together with the aim of developing a joint product or service which did not exist beforehand. Furthermore, recent years have also witnessed a growing interest in the use of public procurement as a demand-side tool to stimulate innovation, for instance through a wider application of pre-commercial procurement (European Commission 2007).

Thus, after a relatively slow start, there is now an increasing focus among Danish policy-makers on using public procurement more actively as a demand-side policy tool, although documented examples of implemented and successful innovation projects are still relatively few (see, for example, Weihe et al. 2011).

6.2 Country Background Information

Geographically located in Scandinavia in Northern Europe, Denmark is a small-open economy with about 5.6 million inhabitants. The Danish society can be characterised as a social-democratic universal welfare system, which means that a broad range of taxed financed welfare services are provided by the public sector (Esping-Andersen 1990: 27). At the structural level, Denmark is characterised by a

relatively decentralised three-tier government structure consisting of local, regional and national authorities. Within this system, regional and local authorities are relatively strong and autonomous, and they have the right to levy taxes. Local government spending accounts for approximately 50 % of total public-sector spending, and local municipalities have the responsibility for carrying out a broad range of welfare services including childcare, primary schools and eldercare.

In line with other (mainly Scandinavian) countries within the group of universalist welfare regimes, Denmark has a long tradition of publicly delivered services and has been a slow adopter of privatisation reforms (Petersen 2010). Until the late 1980s, all significant public companies were still in public hands, but by the early 1990s the Danish state began privatising a number of public companies. This development was the result of the introduction of market-based solutions in the public sector, which has been a part of changing governments' policy agendas since a liberal-conservative government in 1983 launched the first programme of modernisation of the Danish public sector (Ejersbo and Greve 2005). Privatisation thinking was carried forward into the 1990s with the privatisation of a handful of major public companies including the State Airports, Giro Bank, Data Services and Telecom Denmark (Greve 2008). In spite of various initiatives to impose principles of market-based governance in the Danish public sector, though, most public services and utilities hitherto remain in public hands.

The Danish economy is characterised by a relatively large public sector, and general government expenditure accounts for approximately 58 % of GDP (OECD 2011). In 2010, GDP per capita was approximately € 42.500, which places Denmark 2nd compared to the countries in the Euro-zone (Denmark has not adopted the Euro) and 4th when correcting for purchasing power (Eurostat 2012). In spite of recent setbacks due to the financial crisis and a relatively large housing bubble, in comparative terms the Danish economy has displayed small expenditure deficits and a low general government-debt level. As a matter of fact, over the past 10 years, the government sector has produced an average annual surplus of 1.4 % measured against GDP, which compares to an EU average of −3.2 % in the same period (Eurostat 2012), in which also general government debt was brought down from 72.6 % of GDP in 1995 to 46.5 % of GDP in 2010 as a result of the surpluses on government budgets.

However, despite the positive economic developments, the country is currently facing significant economic and structural challenges. During the past two decades, the GDP growth rate has developed at one of the slowest levels among the OECD countries. Furthermore, since the mid-1990s, Denmark has witnessed the second lowest productivity growth among all the OECD countries (Ministry of Business Affairs 2011). Consequently, while in 1995 productivity was almost 30 % above OECD average, the productivity level has now dropped to only approximately 10 % above OECD average. Comparable government statistics illustrate that these developments have been mainly due to poor productivity gains compared to other OECD countries, with the consequence that the Danish

productivity level has been falling behind a number of the country's most significant trading partners including the U.S., Germany, France and the Netherlands (Ministry of Business Affairs 2011).

The challenges to the Danish economy caused by the relative decline in GDP level and the poor productivity development are reinforced by other developments in the political realm. The Danish universal welfare state (Esping-Andersen 1990) is witnessing a growing demand for welfare services at the same time as the tax base is gradually being eroded by an ageing population. Population projections made by Statistics Denmark forecast that the proportion of people at the age of 65 and more will rise by 50 % over the next 30 years, whereas the size of the adult working population will remain more or less unchanged. The resulting erosion of the tax base for the financing of these welfare services and the general structural challenges which the Danish economy is facing have been voiced by several commentators also before the economic crisis struck the global economy (see, for example, Gjerding 2006).

The post-economic crisis years have rendered an intensified political debate concerning the role of government in promoting green technologies (such as windmills and solar cells). In this new context, public funding and investments are being articulated as an important means of stimulating innovation and boosting growth and jobs in the private sector. Towards this end, both the former liberal-conservative and the present center-left government have set up public investment funds to support investments in new technologies and innovative partnership projects between business and governments. To get access to these investment funds, it is in most cases a requirement that both public and private-sector partners participate in the projects (Weihe et al. 2011).

Recent initiatives to bring public and private-sector partners together in pursuits of innovation generally reflect the recommendation of the Danish Innovation Council that "… in order to make Denmark a leading innovating country, it is necessary to strengthen the public–private collaboration for innovation. This requires commitment from firms, public agencies, the government and regional authorities. The government and the regions have to create conditions that stimulate the development of the collaboration. Firms and research organisations need to appreciate each other as strategic partners to a larger extent" (Danish Innovation Council 2004: 1 [the authors' translation]).

These and related initiatives reflect Danish policy-makers' growing awareness of the need to develop a public-procurement system that appropriately meets the country's need to increase its competitiveness and productivity performance in the context of the challenges that the economy is currently facing. In the Sect. 6.3, we outline the fundamental structures of the Danish public-procurement system and discuss recent developments towards a more explicit demand-side oriented use of public procurement as a policy tool for the stimulation of growth and innovation in the Danish economy.

6.3 Public Procurement Overview

The Danish public-procurement market has a value of annually DKK 290 billion (approximately € 39 billion), which is equivalent to 16 % of GDP (Danish Competition and Consumer Authority 2012). In terms of its regulation, the Danish procurement market is subject to a relatively detailed set of procedures. Danish membership of the European Union (EU) dates back to 1973, which means that public procurement is subject to the institutional framework of the EU's Procurement Directives (European Parliament and Council 2004). Furthermore, at the national level, Denmark has issued a national set of procurement regulations applying to the procurement of goods and services below the threshold values set out by the EU in the procurement directives (Danish Competition Authority 2007).

The Danish public procurement market has generally been growing during the past few years, which is in line with a more general trend towards an increased market exposure of public services that were previously carried out in-house by local, regional and national public authorities (Ministry of Economics and the Interior 2011). In terms of sending tasks in EU tenders, Denmark has been placed in the middle field among the EU countries for years. Hence, between 2007 and 2009, approximately 21 % of the capital value of Danish public authorities' purchases of goods, services and construction tasks were announced as EU-wide tenders, which compares to an EU-15 average of approximately 18 % (Danish Competition and Consumer Authority 2011: 86).

The decentralised government structure has the consequence that procurement activities are spread across several tiers of local, regional and national political levels. From Table 6.1 it follows that local governments and public corporations represent the largest share of the Danish public-procurement market with central government and regional governments each representing a slightly smaller part. Moreover it is seen Table 6.1 that over the past few years, the Danish procurement market has been growing by approximately € 1 billion annually.

When measured in percentage of net operating costs (Fig. 6.1), it can be seen that the public procurement of services has been increasing at the local and central government levels but at the same time has decreased at the regional government level. In local governments, the procurement of goods and services from private companies has been increasing from approx. 22.5 % of net operating costs in 2007 to approx. 25 % of net operating costs in 2011 (latest data available). The development in the procurement market at the central government level has been more or less the same and has seen an increase from approx. 25 % of net operating costs in 2007 to 27.5 % in 2011. In contrast to these developments at the local and central government levels, data for the regional level (available through 2009–2011) illustrate a decline in the procurement of goods and services from 22.5 % in 2009 to 21 % of net operating costs in 2011.

Despite the decentralised government structure, the Danish system of public procurement has generally been characterised by striving towards a high degree of coordination. Consequently, recent years have witnessed an increased share of

Table 6.1 Public procurement of goods and services 2008–2011 (billion Euro)

	2008	2009	2010	2011
Central government	7.5	8.0	8.1	8.4
Regional governments	7.3	7.6	7.6	7.6
Local governments	10.0	10.7	11.4	11.1
Public corporations etc.	11.8	11.2	11.8	12.4
Total	36.6	37.7	38.8	39.5

www.statistikbanken.dk, OFF3: expenditure and revenue of general government by type of transaction and sector (intermediate consumption and social services in kind) and OFF14: public finances by sector and account

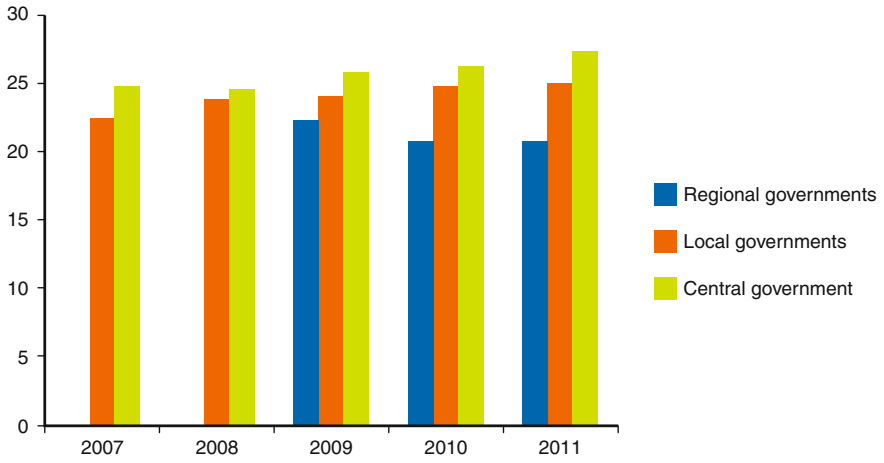

Fig. 6.1 Development in procurement (services only) in per cent of net operating costs, 2007–2011. Regional data are only available from 2009 onwards (Danish Consumer and Competition Authority 2012)

public procurement being centralised through the launch of dedicated procurement organisations operating across the public sector. According to the central government authorities, the main purpose of this re-organisation and general tendency towards a more centralised procurement system has been the achievement of cost savings (Danish Competition and Consumer Authority 2011). These cost savings have been substantial in some areas and have mainly been achieved by means of signing large-scale procurement-framework contracts, which has enabled the public sector to exploit economies of scale in its procurement policies. The role of using public procurement as a tool to stimulate innovation has, however, until recently been subject to little policy attention.

The main organisation in the Danish public-procurement market is the National Procurement Organisation (SKI), which is a public-procurement unit jointly owned by the Danish Government (55 % of the shares) and Local Government Denmark—the interest organisation of local governments in Denmark—which owns the remaining 45 % of the shares. SKI is a non-profit organisation, which has

been in operation since 1994 with the purpose of providing public-procurement framework agreements that can be utilised by local and national authorities. Today, SKI has made contracts with approximately 850 suppliers through 48 framework agreements and it provides services to more than 32,500 public organisations. This means that most public organisations use the framework agreements offered by SKI, although not to the extent required to fully utilise the cost-saving potential in these agreements (Larsen et al. 2006).

As a supplement to the non-binding framework agreements of SKI, in 2006 the Danish Government launched Statens Indkøb (the Government Procurement Unit). In contrast to SKI, the Government Procurement Unit provides a binding procurement system at the central-government level. The first set of binding procurement contracts concerned relatively standardised services such as computers, printers and office supplies, but a broader span of tasks and services has subsequently been included, such as cleaning, travelling, servers, telephones, IT-consultants etc. Until now, the Government Procurement Unit has been developing six phases of public procurement, in which the supply of contracted goods and services has gradually been extended. The activities of the unit have never been evaluated by external organisations, but the Government Procurement Unit claims to have achieved major cost savings through its large-scale framework agreements. It is, however, doubtful if any substantial innovation has been achieved through this procurement programme, because the focus has mainly been on cost effectiveness and exploiting economies of scale by signing binding procurement agreements on behalf of all central government departments and agencies.

More recently, though, the Danish policy debate on procurement has begun to focus more on the use of procurement as a demand-side tool to stimulate innovation. In contrast to the privatisation and marketisation initiatives of many liberal-conservative governments during the past decades (see, for example, Osborne 2010), it is perhaps somewhat surprising that in Denmark public-procurement-for-innovation policies have largely been advocated by left-wing (Social-democratic and Socialist) parties. For example, the center-left-wing government, which is currently in office, has launched a procurement-policy paper and a government programme with the aim of further supporting the development of green-tech solutions and innovative products by more actively using public-sector procurement as a demand-side tool (Danish Government 2011).

Another recent initiative in the Danish public-procurement-for-innovation policy is the concept of Public–Private Innovation Partnerships (PPIs). In contrast to PPPs, which are utilised in the Danish construction sector (and only on a small scale compared to e.g. the UK), these PPIs are more informal types of partnership agreements suitable for the procurement of new goods and services within the welfare sectors, such as health, eldercare, rehabilitation, education, and so forth. At the current moment, PPIs are strongly encouraged by the Danish government through dedicated pools of money to support the development of PPI projects (Weihe et al. 2011). An independent report issued in 2011 for the Nordic Council of Ministers noted “that a change of the procurement rules is not necessary, but

that clearer guidelines and precedence on the actual working and interpretation of the rules are needed" (Weihe et al. 2011: 21).

The focus on how the public sector can stimulate innovation has thus been increasing over the past 2–3 years, and just recently, a web-based guidance tool for PPIs has been launched to support local and regional authorities in the formation of innovative procurement projects (see www.opiguiden.dk). The PPI guide provides a number of articles as well as a dialogue forum, where best practice within key subjects such as legal status, the organisation and financing of PPI projects can be shared. What sometimes leads to some confusion, though, especially when Danish innovation policies are discussed in the context of EU innovation policy, is that PPIs have some features that diverge from the generic justifications for using public procurement as a driver for innovation. A central point with using public procurement to promote innovation is that it works as a demand-side tool. Compared with other supply-side measures such as R&D subsidies and tax incentives, this makes public procurement a different policy tool. Although PPI projects certainly include user-producer interaction, the demand aspect is not always clear.

A private supplier may gain a lot of experience if given the opportunity to have their new product tested in an user environment, say in a hospital ward. A hospital may also learn about what solutions are available on the market. The mechanism does not, however, emphasise the difference between the hospital asking for a solution to be developed to solve a certain problem or the supplier offering a solution already developed but yet untried. Another difference is that PPI projects typically do not put much emphasis on the actual procurement of innovation. Hence, although "public and private actors collaborate in order to develop new and innovative solutions (for example, welfare technologies)" (Weihe et al. 2011), experiences from the first PPI projects in Denmark illustrate that public–private collaboration often ends before innovative products or services are actually being procured by the public sector. The lack of more widespread policy initiatives was illustrated in a recent review of the Danish innovation system, which also noted that "Potential areas for the development of public procurement policies should be explored and assessed according to their potential to deliver innovation which is also accompanied by market growth opportunities" (Crasemann et al. 2012: 20).

6.4 Public-Procurement Policy and Innovation

6.4.1 Main Characteristics, Policy Types and Institutional Set-up Regarding Innovation and Technology

Characteristic for the Danish system of innovation, as well as the Danish innovation policy discourse, is a focus on existing trajectories and current opportunities and threats. Lundvall and Borrás (2005) provide an example from the nineteenth century when Denmark's corn export was threatened by competition from Russia and the US. With the guidance of the pastor and philosopher Grundtvig (1783–1872),

through the establishment of folk high schools, farmers where educated and encouraged to take responsibility for themselves. Out of this movement came the establishment of local diary cooperatives that utilised newly developed separator technology. This provided new opportunities for Danish farmers to export butter and other animal products. Following Lundvall and Borrás (2005), although the state supported this development by establishing The Agricultural University in Copenhagen, the role of the social non-government mobilisations was then and is still today an important feature of the Danish innovation system.

Although Denmark houses some large multinational companies, such as Danfoss (thermostatic valves and industrial automation) or Maersk (shipping and offshore) and also R&D-intensive firms in the pharmaceutical sector, e.g. Novo Nordisk, most firms in Denmark are SMEs relying on incremental innovation in low or mid-tech areas. It is therefore, following Lundvall (2002), not likely that the Danish innovation system will render radical innovation. Related to this is also a strong tradition in Doing, Using and Interacting (DUI-mode) innovation rather than Science, Technology and Innovation (STI-mode) innovation (Jensen et al. 2007). According to these authors the DUI mode can be thought of as a shop-floor innovation style frequently relying on tacit experience-based knowledge, while the STI mode builds on codified 'scientific' knowledge.

The cooperativism, traceable back to the days of Grundtvig, is a central feature of the current Danish innovation system. Denmark, largely due to its small size, has evolved as a negotiated economy, which refers to the "tradition for working out broad compromises between stakeholders in business, politics and public life in to. The consensus-seeking behaviour is rooted in a special sort of collective learning taken place when all participants know, that their chance of success in international business critically depends on the degree of domestic unity" (Maskell 1996: 8). This tradition is also visible in the Scandinavian participatory innovation tradition, which is particularly strong in Denmark and puts much emphasis on user involvement and consensus (Greenbaum and Kyng 1991; Buur and Matthews 2008). Maskell pushes this general point further by talking about a village mechanism:

> All firms in the sector will usually be organised in at least one association or guild with nationwide coverage, with its own publications or newsletter and with annual or more frequent meetings. Many of the managers will share the same background and have received the same education, and most will have participated in some sort of joint activity on the local, the regional or the national level. Within the region the knowledge of each other is even higher and no major incident in a line of business passes unnoticed (Maskell 1996: 12).

This institutional mechanism has several advantages, and it is utilised by Maskell (1996) to explain the performance of the Danish economy in the past. It is not the purpose here, though, to scrutinise further if this institutional feature has turned against Denmark and become a negative lock-in effect in a globalised economy. Relevant for our purposes here are the communication-enabling effects that Maskell's analysis identifies as an advantage, i.e. the 'interorganisational' competence that is one of the features of the Danish institutional set-up. As noted

by Maskell, "The interorganisational competence includes the routines and conventions that make the economic system function without much fuss and with accordingly small transaction costs…", which are essentially endogenous culturally agreed rules of behaviour indicating "that this is the way we do things, and nobody needs to give it a further thought for the time being" (ibid, p. 13). What can be seen as a negative effect of these well-established routines is the tendency of 'iron-caging' (DiMaggio and Powell 1983), i.e. that a social system tends to converge and any opportunistic or deviating behaviour is punished by the collective. This would postulate that when change is required due to changes in the external environment, no one will make the first change unless everyone agrees to make these changes as well.

This theoretically derived pattern is also evident in the ways in which public-procurement-for-innovation policies have evolved in Danish policy making. One of the first surveys of EU member states found an absence of explicit ambitions to develop further innovation in relation to public procurement (Edler et al. 2005). If one looks at a recent survey on the evolution of policies concerning the use of pre-commercial procurement, this picture has changed rather radically within the past few years (European Commission 2011). According to this survey, Denmark has now developed policies on a level that put the country in a group with Finland and Hungary and ahead of Sweden, which is usually regarded as a country that has put much emphasis on the use of public procurement as a means of stimulating innovation (European Commission 2011).

A recent interesting initiative on the sub-national level is the Laboratory for Public Private Innovation (OPI-lab) project. Coordinated by the Region of Southern Denmark, it involves representatives of all five Danish regions and has received a € 6.5 million funding for the development of demonstration projects and best practice that may inform public procurement of innovation practice in the future (OPI-lab 2011). Projects within the OPI-lab framework mainly focus on the health-care sector. One example is a project devoted to the development of so-called intelligent hospital bathrooms. Furthermore, several 'co-creation' workshops have gathered different stakeholders in order to collect new ideas. These workshops generated an array of ideas, for instance concerning the use of smartphones. It was suggested that smartphones could be used to retrieve patient data, to localise nurse staff and patients, as a remote control of equipment and as a key-card. Another set of recommendations concerned the use of different kinds of sensors and Radio Frequency Identification (RFID) technologies. Some of these ideas were selected for further development. Another example is a project taking as a starting point the patient process. Here the focus was on patient-data sharing and the attempt to set up one common contact point that can be utilised by patients to get in contact with any care provider. The most central outcome of these projects appear to be new ideas that could be incorporated in future innovations. But the specific mechanisms for procurement of these innovations might not be as clear. There is, however, a project called "the Task-force", which to some extent addresses this issue. A central objective with this project is to understand the legal aspects of procuring the innovations that are generated in PPI projects.

There are thus indications of a gradual change towards more emphasis on the use of public procurement as a demand-side innovation policy tool, which constitutes an interesting scenario for the coming years. If some degree of consensus regarding the role of public procurement as a demand-side instrument is established, Denmark might in fact be able to move rather quickly towards the new innovation paradigm, although some hindrances may also be foreseen, as further discussed below.

6.4.2 Drivers and Hindrances of Policy Developments

There are two main drivers for paying attention to public procurement as a demand-side innovation tool in Denmark. The first is the current economic situation, as described above, raising concerns regarding future growth and the ability to maintain an universalistic welfare state. In the context of poor developments in competitiveness and economic performance, there is broad policy consensus among Danish policy-makers that new ways of securing competitive advantage in a global economy are needed. Secondly, like any other EU member state, Denmark has also been affected and inspired by the policy discourse evolving on the EU level, where particularly the EU Commission has been actively advocating for a more active use of public procurement as an innovation stimulus.

What can be seen as barriers are to some extent similar to other member states. Examples of such problems are risk awareness and lack of experience among public procurers. Recent studies on the most southern region in Denmark, Southern Jutland, discussed some perceptions on the possibilities among procurers regarding the possibilities to use public procurement as a means to create innovation (Hjaltadóttir 2011; Pérez 2011; Greisen 2012). Among the views reported in these studies were fear of making a mistake that would render complaints, difficulties in relation to write good specifications, and a general view of the Directives as complicated. Also reported, however, was an awareness of how to address and overcome these barriers. Interviewed procurers perceived that the public sector needs to push the demand for innovation further, establish networks between buyers and suppliers, and in general enhance capabilities to procure innovation (Hjaltadóttir 2011; Pérez 2011; Greisen 2012).

These findings illustrate the claims in recent research regarding the importance of endogenous institutional levels. Most barriers concern less literally legal matters. Instead, issues such as procurement skills, project management and resource allocation need to be looked into in order to gain success, which is also in line with recent research (e.g. Rolfstam 2009; Rolfstam et al. 2011). Another challenge in this context is the tendency to emphasise the supply-side and thus downplay the role of the public sector as an intelligent customer capable of formulating demand for innovation. This is discussed further in Sect. 6.4.3.

6.4.3 Development of a National Innovation System vis-à-vis Developments in Public Procurement

The Danish traditions described above regarding cooperativism and interaction have also shaped the ways in which interaction between the public sector and private firms occurs in Denmark. To understand these ways one needs to understand the difference between public procurement as a demand-side tool and other forms of interaction, where, for instance, the supplier is the driver of the innovative work. The former takes as its starting point a situation where the public customer describes a problem ideally in terms of the functions or effects intended to be achieved. The role of the supplier becomes to apply its knowledge and skills to solve the particular problem, and innovation occurs as interacting learning by the problem owner and the solution provider. The established pattern in the Danish innovation system is much more based on relatively open partnerships, commonly referred to as 'public–private innovation'. The typical example of public–private innovation is when, for instance, a nursing-home opens up its facilities, for instance a ward, for a private firm to try out a product under development. Frequently different types of designers, anthropologists and other experts are involved to develop knowledge. These partnerships may be very useful for the firm to gain understanding of the use context as they provide interactive learning between the developers and future users—critical experiences that will help to improve the final product. What is problematic, if these interactions are compared in the light of the demand-side aspects of public procurement, is that they relatively seldom lead to a commercial transaction.

This difference leads sometimes to confusions, especially when Danish innovation policy is discussed in an international comparison. What from a Danish perspective is common knowledge might not correspond to observers relying on assumptions inspired by practices that evolved elsewhere. This phenomenon is also noteworthy in relation to innovation policy. If too much attention is paid to 'learning', and the actual transaction, i.e. that innovation becomes procured and diffused, is ignored, the situation might become sub-optimal. A central aspect of demand-side policies must be that procurements eventually are realised, in order for suppliers to get returns of investments that can be reinvested in further innovative activities. Another consequence of this discrepancy in understandings is seen in attitudes towards mainly the EU Directives for public procurement, as reported by Weihe et al. (2011) and discussed above. The frustration becomes understandable if seen as a clash between diverging phenomenological standpoints. Public–private innovation, understood as a well-established endogenous practice which did not originally evolve as an act of procurement but as an act of interactive learning, is now exposed to a legal framework developed specifically for procurement. The informal interaction patterns, which are a central part of the Danish business culture, have some features that may be mismatched with the built-in ambitions of the EU Directives for public procurement, to safeguard

transparency, prevent fraud and stimulate competition (Martin et al. 1997; European Commission 1998).

6.4.4 Sector-Specific Developments

In Sect. 6.3 some central public agencies were outlined that work with public procurement, SKI and the Government Procurement Unit. These agencies are, however, mostly driven by cost-saving rationalities, and their main activity is to set up framework agreements that can be utilised by other public agencies. The advantage of these activities is that they save redundant work, for instance on the municipality levels, as municipalities can draw on already existing framework agreements instead of individually negotiating contracts for the same products. The role of these central procuring units in terms of rendering product innovation has, however, been relatively modest, which is also expected. The kind of procurement these agencies could potentially contribute is of a more consolidating type, where standards and labelling are useful tools for removing, for instance, less environmental-friendly products from the market (see Rolfstam 2012a). The utilisation of this potential, however, is yet to become an explicit target for these agencies.

Even if a central policy discourse on using public procurement as a means to stimulate innovation has emerged recently, it appears instead that the most advanced initiatives can be found on agency levels and in particular the regional level. One noticeable example is the Danish health sector, where the interest for public procurement of innovation has been rapidly growing over the past few years, with the OPI-lab initiative as one example, as discussed in Sect. 6.4.1. Furthermore, the potential in public procurement has gained attention as a way of addressing the demographical challenges and in particular render innovation within health technologies. As the regions are the most important actors in the provision of health care, it is also natural that they would play an important role for the development of public procurement of health-tech solutions.

Another emerging focus area is within green and sustainable technologies. One could argue, though, that the drivers for sustainability follow a sector-specific rationality and not so much innovation policy-rationality understood as an exogenous stimulus stemming from the EU level. The emphasis on public procurement used as a demand-side innovation tool has diffused through initiatives made on the EU level (see Rolfstam 2009 for a review). The ultimate goal is to sustain competitive advantage in a global economy. Sustainability, on the other hand, is to a larger extent driven by genuine endogenous processes, with very little emphasis on any strategic concerns for innovation policy in general. Although these rationalities meet, for instance, in the debate concerning to what extent public procurement could be utilised to stimulate development of sustainable technologies, the underlying drivers are essentially different (see Rolfstam 2012b for an example of a clash between public-procurement rationalities and sustainability).

6.4.5 Outcomes of PPfI Policies

In spite of growing policy focus and the promotion of public-procurement-for-innovation policies in Denmark, systematic evaluations and assessments of the outcomes of PPfI initiatives are generally rare. This is not least so because of the novelty of the policy area, which means that so far few lessons have been drawn from PPfI initiatives. During the past two to three years, though, a few systematic assessments of outcomes of innovation partnerships have been made. In 2011, a research report financed by the Danish government and carried out by independent researchers evaluated the experiences made with PPI projects in the five Nordic countries of Denmark, Sweden, Norway, Finland and Iceland (Weihe et al. 2011). The report evaluated three Danish innovation partnerships from, respectively, the health, eldercare and education sectors. Although preliminary, because the innovation projects had only been operational for a short time-span, the report concluded that innovation partnerships had promising perspectives in terms of developing solutions for the public sector while offering private companies new market venues and growth opportunities.

The purpose of the Culinary Food Project was to develop, test and commercialise novel hospital food products in collaboration between regional health authorities, public and private hospital kitchens and private producers of various food products. The project was a PPI between Region Zealand VIFFOS (National Competence Centre for Food and Health) and a number of private partners. The project was launched in 2008 and ran until 2010, when an evaluation was completed at four hospitals. The evaluation suggests that this specific innovation project was a success because new food products were actually developed and sold to hospitals. At the same time, patient satisfaction with the food alternatives at the four hospitals increased. Moreover, for the participating private partners, the project provided an opportunity for establishing a test laboratory for new food products, which could be evaluated by kitchen personnel and end users.

Similar findings were reported in the context of a study devoted to identifying best practices for pre-commercial procurement for the European Union (Turkama et al. 2012). The study included two Danish cases, one project devoted to developing the hospital bed of the future. This was set up as a competitive dialogue between several suppliers and stakeholders. The other case concerned the development of a patient briefcase, a communication device that would enable communication with health-care staff without requiring the patient to be physically present at the hospital. Both cases appear to have been rather successful, with both projects rendering some experiences. The project that applied the competitive dialogue drew attention to the importance of being open to new ways of working, the ability to collaborate with other partners and the willingness to change initially established materials. One challenge in the project was, however, to go from a learning stage to a procurement stage. In the patient briefcase, developers faced challenges at the up-scaling stage. At the time when the product was ready to be

diffused to hospitals other than the site where the initial development had taken place, there was a shortage of funding. There were also some legal uncertainties that had to be cleared out before the product reached a commercial stage.

6.5 Conclusion

Being a late adopter of privatisation and marketisation measures, Danish policy-makers have only recently begun to focus more on public–private collaboration and the utilisation of public policies for innovation as a demand-side tool. In that respect, Denmark is currently moving away from a state of no policy for public procurement of innovation. In spite of the initial modest focus on public-procurement-for-innovation policies, recent developments have moved Denmark to a relatively strong European position when it comes to policy developments and concrete initiatives such as PPIs. On the national level, it thus appears that Denmark is gradually moving towards a policy-for-all-seasons approach to public procurement of innovation.

Examples of innovation projects are most visible within the health-care and social-service sectors. This also makes sense taking into account the demographic challenges Denmark is facing in the coming years. The kind of innovations also appears to align with the industrial structure characterised by mainly smaller firms creating their competitive advantages on incremental, low-or mid-tech innovations. The extent to which the PPI projects within the health-care and social-service sectors actually are in accordance with the underlying idea of public procurement of innovation policies is, however, difficult to determine. Important drivers for innovation in this type of projects are oftentimes the sector-specific challenges and, to a smaller extent, a more explicit focus on the use of public procurement per se as an instrument to achieve the intended innovation. As many of these developments are still in their infancy any concluding statements concerning the success or otherwise of these endeavours can at this stage only be preliminary.

The chapter has drawn on some characteristics of the Danish innovation system that will probably play a part in determining the outcome of these new ambitions. One central component is the negotiated economy characterised by a rather interactive consensus-striving system. Related to this general cultural property of the Danish system is the well-established way of public–private interacting, where learning and dialogue with users is emphasised, which may sometimes pose a hindrance to the actual procurement of new inventions. If Danish policy-makers will be able to find a way to implement public procurement of innovation practices in line with current EU policies, the country will probably be very successful.

One challenge ahead might be the already established public–private-innovation concept that somehow has become the equivalent to public procurement of innovation. This is an important issue to the extent that it is important to distinguish between supply-side policies and demand-side policies (Edler and

Georghiou 2007). The tradition for supply-side instruments is well established in Denmark. The well-established principles built in the PPIs are a case in point. Another example is the Danish national Advanced Technology Foundation with an annual budget of DKK 600 million. Here the applier submits a proposal for co-funding for development of high-tech projects, proposals that are evaluated by experienced industrialists. Another programme, the Danish programme for user-driven innovation, is managed by the Danish Enterprise and Construction Authority. This funding instrument also operates from the supply-side.

If policy-makers in Denmark wish to embark on the international policy discourse emphasising the role of the demand side, other complementary instruments should be considered, where the starting point for awarding funding should be a real need. It should involve the search for the universally best solutions, and not be limited to what Danish suppliers currently can deliver. With a public agency in the driver's seat of the process, if managed properly, this would increase the chances of not only achieving minor improvements of already existing products, but more radical innovations. Whether public procurers are ready to take this role in the Danish negotiated economy remains to be seen. The challenge ahead for Danish innovation policy-makers is thus to find the balance between institutional adoption of these new ideas without violating established endogenous institutions. This can probably only happen if the negotiated economy as a whole agrees that this is what needs to be done.

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Chapter 7
Estonia

Public Procurement, Innovation and "No Policy" Policy

Veiko Lember and Tarmo Kalvet

Abstract Estonian innovation policy has been developing rapidly since the mid-2000s, but supply-side measures dominate, and systemic public procurement of innovation exists only in some unimplemented policy documents—a situation dominated by noninterventionist neo-liberal values and inertia in the politico-administrative systems, described as a "no policy" policy. Nevertheless, public procurement has been successfully applied in the ICT domain and has achieved moderate success in defence. In order to support modernisation of the private sector, a more generic policy targeting innovation in public procurements has gained interest. Several important challenges remain, including changing the dominant culture of the public-procurement community, which avoids risk-taking and exhibits weak administrative capacities. We propose applying public procurement of innovation to selected sectors. The Estonian case study offers an unique opportunity to understand the potential of and possible barriers to encouraging more comprehensive public procurement of innovation policies within a liberal catching-up context.

7.1 Introduction

Estonia, with a population of 1.4 million, is a Baltic economy in Northeast Europe that re-established political and economic independence from the Soviet Union in August 1991. Since then, Estonia has undergone wide-ranging liberalisation of its

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trade and capital markets. In order to facilitate technology transfer, managerial skills improvement, and more effective market competition, large-scale privatisation was undertaken and mostly completed by 1995. Today, Estonia is an integral part of cross-border production networks, which operate in the Baltic Sea Region (Kalvet and Tiits 2014). Estonia has often been considered by many as one of the successful, if not the most successful, Eastern European catching-up economies (e.g., European Bank for Reconstruction and Development 2000). At the same time, others have expressed concerns (Tiits et al. 2003, 2008; Drechsler et al. 2006) regarding the seriousness of the challenge to turn domestically led growth into export-led growth and to increase the competitiveness of Estonia's enterprises in global markets.

The rather peculiar catching-up context, existing competitiveness challenges, and tight integration with the Baltic Sea Region form a background that to a large extent determines the viability and applicability of specific innovation and industrial—or more generally, developmental—policy tools in Estonia. Public procurement has up to recent years been off the radar of explicit development policy in Estonia, although one can find many instances (e.g., information and communication technologies or ICT) where public procurement was successfully used for innovation. More recent plans, however, indicate an emerging interest in exploiting public procurement as an explicit element of national innovation policy. This chapter explores the role of public procurement in Estonia's economic development and analyses the rationale behind it. The Estonian case study offers a way to understand the advantages and possible pitfalls of introducing more comprehensive public procurement of innovation (hereafter PPI) policies into a catching-up economy.

7.2 Overview of the Economy, Innovation Policy, and Governance

7.2.1 Economic Context

Estonia, similar to the vast majority of other Central and Eastern European (CEE) countries, began implementing reform policies in the early 1990s that emphasised liberalising markets, dismantling trade barriers, stabilising wages and prices, containing public deficits, minimising the tax burden, and introducing a strong market orientation in all socio-economic sectors. The government rapidly handed over as much decision-making power as possible to the private sector. Liberalisation was an elegant antithesis to an earlier all-embracing state-controlled system and was met with great enthusiasm (Tiits et al. 2008).

A specific feature of the Estonian economy has been a heavy reliance on foreign direct investment (FDI). The economy experienced rapid inflows—facilitated generally by the ICT-based techno-economic paradigm and the dominance of

Washington Consensus type policies (Kattel et al. 2010)—that was related to Estonia's proximity to the Nordic countries, its low burden of government regulation, a low level of corruption, and a permissive business environment (see Table 1.4 in Chap. 1). As a result, in terms of economic growth and welfare, Estonia was able to catch up with the developed industrial countries (see Tables 1.1 and 1.2 in Chap. 1) by applying new technology and knowledge imported from those countries. Estonia's progress was also due to government promotion of ICTs, which resulted in broad up-take of ICTs, both in the public and private sectors (Kalvet 2007; World Economic Forum 2011).

However, the Estonian economy has been and remains structurally dominated by traditional sectors with relatively low levels of value-added on average, like transportation, furniture, and paper products. These sectors dominate with respect to both employment and exports (Tiits et al. 2003, 2008; Varblane et al. 2008). These sectors are also the ones wherein Estonia is most specialised compared to the average employment profile of other European economies (Christensen et al. 2012: 9). Major weaknesses in the Estonian economy are mainly caused by underdeveloped business strategies and low levels of clustering. Other major hindrances to further development include the limited quantity of qualified labour and minimal R&D investments by businesses (World Economic Forum 2011).

7.2.2 Innovation System and Policy

Over the last two decades, Estonian innovation policy has undergone major changes with three identifiable stages. The 1990s saw a so-called no-policy approach. In the beginning of the 2000s, a linear approach was adopted. From the mid-2000s the linear approach moved towards a modern innovation policy approach targeting innovation-system failures.

Dismantling the inherited Soviet production system started in the 1990s. Innovation policy at that time had no policy-making support. Additionally, Estonian reforms in R&D were typified by a "shock without therapy" approach (Radoševic 1999), leading to big losses in R&D supply channels and their absorptive capacities (Drechsler et al. 2006).

In the late 1990s explicit R&D and innovation policies appeared, encouraged in part by the looming EU accession. Scientists were, however, almost the only proponents of R&D and innovation policy. This approach was closely related to science-based innovation, assuming a more or less linear correspondence between scientific discovery and innovation performance. Most of Estonia's local industries were simply excluded from these considerations (Polt et al. 2007). Similar omissions took place in other CEE countries (Radoševic and Reid 2006).

From the early 2000s, the EU started to influence Estonia's economic development policy (Suurna and Kattel 2010) because innovation became a central concept in politics and policy-making in most EU countries (Soete 2007),

including the less-developed member states of the EU and Estonia (Török 2007). There was a considerable change in Estonian innovation policy with second wave of EU structural funding that started in 2007 (part of the EU Cohesion Policy that represents the single largest source of financial support at EU level for investment in growth and jobs): a more active role was expected from the state; innovation became strongly linked with the private sector; and more emphasis was put on addressing innovation system failures.

Although the second half of the 2000s was the period during which the PPI idea emerged on the European innovation-policy agenda (Edler and Georghiou 2007), innovation-related public procurement failed to make an entry on the Estonian policy agenda. Partly, this reflected the weak position that demand-side innovation-policy measures had (and still have) at the European level (ibid). But, PPI was also affected by Estonian domestic policy, where the main focus of the newly introduced R&D and innovation policy was on strengthening the systemic linkages via supply-side measures, like R&D infrastructure development, support to competence centres and the centres of excellence, and provision for R&D grants.

The evaluations that have addressed the performance of the R&D and innovation policies (e.g., Reid 2003; Reid and Walendowski 2005; Polt et al. 2007; Christensen et al. 2012; see also Kalvet 2010 for synthesis) generally share the conclusion that "national policy has risen to the level of good international practice in a very short time, especially in terms of strategy formulation, design of policy instruments and policy learning activities" (Polt et al. 2007: 41). However, researchers also emphasised that more focus should be put on increasing the number of enterprises benefiting from R&D and other innovation-support instruments. One of the main challenges is the achievement of an appropriate balance between research and innovation-policy measures. The governance of innovation policy was seen as ineffective and inadequate at creating expected synergies with regard to coordination among authorities or different but related measures that were planned or managed by different ministries (Karo and Kattel 2010).

In Estonia, the acquisition of equipment and machines remains the most important source of innovation (Statistics Estonia 2010). The number of world-class or close-to-world-class research-intensive companies is rather small—about 50–100. These companies fall generally into the following sectors: ICT, electronics, biotechnology, energy, environment, nanotechnologies, and the chemical industry. The number of internationally competitive companies with limited research but strong development capacity is estimated to be in the hundreds. They fall into the following sectors: ICT, financial intermediation, electronics, chemical industry, manufacture of transport equipment, dairy industry, and manufacture of metal as well as non-metallic mineral products (Gabrielsson et al. 2007).

Out of all the Estonian sectors, only the ICTs have strong linkages among related sectors—software developers, telecommunications, banking, wholesale and retail trade, and governmental structures (Kalvet et al. 2002; Högselius 2005; Kalvet 2012). The R&D personnel employed in financial intermediation (where innovations in Estonia are largely ICT-based) and in ICT-related activities

accounted for 49 % of the total business-sector R&D personnel in 2010, making ICT a knowledge and development-intensive sector (Statistics Estonia 2012).

In sum, during the past two decades, Estonia has managed through wide-scale liberalisation and macro-economic stability to attract a considerable amount of FDI to the country. These funds have led to some export-driven economic growth, but the growth has been dependent on a limited number of companies. Many of those companies have formed weak or no linkages with the Estonian innovation system. Companies face competitiveness challenges due to their low-levels of technological innovativeness. State support provided thus far has not generated system-wide positive impacts. It is against this background that the current idea of PPI is gaining interest within current R&D and innovation policymaking in Estonia.

7.2.3 Governance

Although public procurement has now found its way to the innovation policy debate in Estonia, the actual uptake and implementation of PPI has remained very modest. This is partly related to the general structure and institutional set-up of the Estonian polity, the development of which has mostly been influenced by a different set of ideas than the ones behind PPI.

Ever since Estonia started its comprehensive political, economic, and social reforms in the beginning of the 1990s, the government relied heavily upon the ideas and values common to neo-liberal ideologies. The results of parliamentary elections repeatedly continue this trend. With few exceptions, the right-wing pro-market parties have dominated government coalitions throughout the past two decades, affecting the choices made within different policy domains and institutions (for innovation policymaking, see Karo 2010) as well as the reactions to internal and external shocks (e.g., on the latest financial and economic crisis, see Raudla and Kattel 2011). Consequently, members of a rather unified politico-administrative elite share a common worldview (see Drechsler 2004) and dominate policy-making processes in almost all domains. The EU played a balancing role here by imposing somewhat different principles on the Estonian governance system, either via regulation or structural funds. This includes, among other things, more direct state interventions in regional, labour market, or innovation policy domains but also more explicit involvement of social partners in the policymaking processes (on regional development policy, see Raagmaa et al. 2013; on innovation policy, see Kalvet 2010; Suurna and Kattel 2010). However, as the main social stakeholders (trade unions, employers and businesses associations, and civil society) have a weak actual policy influence, their involvement in economic policy has remained consultative rather than substantial (Tiits et al. 2003; Thorhallsson and Kattel 2012). Overall, the principles guiding initial policy paths in the beginning of the 1990s (strong liberalisation of markets and limited state intervention into the economy) have not been altered during critical junctures or within

the social institutions themselves. Rather, the policy path shows restructuring alongside the initial dominating ideas. Thus, one can clearly identify Estonia as having a liberal market economy with weak corporate or developmental structures (Raudla and Kattel 2011; Thorhallsson and Kattel 2012).

The policy-making processes over state policy-making in Estonia are characterised by a dominant central government and with local governments having a weaker influence (Raagmaa et al. 2013). Central government ministries are rather independent from the actual implementation of their policies and rely heavily on semi-autonomous public agencies for policy implementation. The decentralised and fragmented central government structure has no strong horizontal policy institutions, and the policy coordination capacity remains weak between ministries and policy domains as well as between state and society in general (OECD 2011; Sarapuu 2011).[1] The weak coordination capacity is especially apparent with relation to science, technology, and innovation policy. No central unit is responsible for coordinating the crucial domains of economic development, and different policy domains have all developed distinct intervention logics and policy cultures.

7.3 Public Procurement

7.3.1 General Indicators

Public procurement in Estonia, both in terms of main indicators as well as in institutional set-up, closely follows the patterns of an average EU country. As of 2010 the estimated total public-sector expenditures in Estonia on works, goods, and services (i.e., general public procurement market) was EUR 2.8 billion, which equalled 19.4 % of the country's GDP (see Tables 7.1 and 7.2). Although fluctuating in absolute numbers, the relative share of government procurement to GDP has been steadily growing over the past 5 years and is comparable to the average level of the EU member countries. A five-year average indicates that, out of general public-procurement spending on works, goods, and services, only 74 % of the government's purchasing budget is reflected in the Estonian Public Procurement Register.[2] This leaves one-quarter of government expenditures that are spent outside the direct reach of the procedures laid out in the Public Procurement Act and, thus, the respective EU Directives.

[1] An exception includes the strong horizontal role of the Ministry of Finance in fiscal policymaking.

[2] The register is the exclusive medium for publishing all public contract notices above national thresholds and procurement reports (extended contract award notices) above €10,000. All contracting authorities and entities are obliged to publish all respective notices in the register (for more details, see Lember and Vaske 2009).

Table 7.1 Total public procurement in Estonia (in EUR billion) (European Commission 2011; Estonian public procurement register https://riigihanked.riik.ee/lr1/web/guest/index. Accessed September 2012)

2006–2010	2006	2007	2008	2009	2010	Average
National accounts[a]	2.3	2.8	3.0	2.9	2.8	2.8
Public procurement register	1.4	1.2	1.6	4.2[b]	1.8	2.0
Tenders electronic daily	1.0	1.1	1.3	1.2	1.5	1.2

[a] National accounts data reflects a broad estimation of actual government procurement in terms of government intermediate consumption, social transfers in kind related to expenditure on products supplied to households via market producers (payable), and gross fixed-capital formation (European Commission 2011). This also allows measurement of procurement of goods and services that fall outside the regulation of the European public procurement directives (e.g., defence, purchase of land, below-threshold procurements), i.e., purchases not reflected by the national public-procurement register

[b] Reflects a large number of long-term health care contracts that were signed in 2009

Table 7.2 Public procurement in Estonia and the EU (European Commission 2011; Estonian public procurement register https://riigihanked.riik.ee/lr1/web/guest/index. Accessed September 2012, authors' calculations)

Years 2006–2010	Country	National accounts (% of GDP)	Public procurement register (% of GDP)	Tenders electronic daily (% of GDP)
2006	Estonia	16.9	9.0	7.2
	EU	17.4	–	3.2
2007	Estonia	17.4	7.3	7.0
	EU	17.6	–	3.0
2008	Estonia	18.6	11.3	8.1
	EU	18.1	–	3.1
2009	Estonia	20.8	29.2	8.3
	EU	19.9	–	3.6
2010	Estonia	19.4	12.4	10.6
	EU	19.7	–	3.7
Average	Estonia	18.6	13.9	8.2
	EU	18.5	–	3.3

Compared to other EU member markets, the Estonian public-procurement market is more open: using a five-year-average, government contracts that were advertised at the EU level via Tenders Electronic Daily (TED) amounted to 8.2 % of GDP (or 44 % of total public procurement)—two and one-half times higher than the EU average (Table 7.2).

The Estonian public procurement market is dominated by construction-, health-, and transport-related contracts, which total 82 % of total registered public purchases and equal to 13 % of GDP (Table 7.3). The Estonian government purchase market is dominated by state-owned enterprises and public legal bodies (autonomous public agencies, incl. Estonian Health Insurance Fund), which were responsible for 42 % of the total government procurement market (2010), followed

Table 7.3 Average public procurement spending in Estonia[a], 2007–2010 (Estonian public procurement register https://riigihanked.riik.ee/lr1/web/guest/index. Accessed September 2012, authors' calculations)

CPV divisions	EUR million (€)	Registered public procurements (%)	% of GDP
Construction work	956	41	6.4
Health and social work services	594	25	4.0
Transport equipment and auxiliary products to transportation	129	6	0.9
Architectural, construction, engineering and inspection services	100	4	0.7
Transport services (excl. waste transport)	91	4	0.6
Medical equipment, pharmaceuticals, and personal care products	58	2	0.4

[a] *CPV* common procurement vocabulary

by central government (36 %) and local government (17 %) spending (Ministry of Finance 2011).

7.3.2 Institutional Settings

Estonia represents one of the countries that have undergone a rapid change in their public-procurement system in the past two decades.[3] In the Soviet-type planned economy there was no regulated public procurement as such. Therefore, beginning in 1991, the system had to be built from scratch. Today, the Estonian public-procurement institutions are fully harmonised with the EU Public Procurement Directives. Through the EU, Estonia is one of the signatories to the World Trade Organization (WTO) Government Procurement Agreement (GPA).

One can identify five main development phases of the public-procurement system in Estonia since World War II:

1. 1940–1991: Soviet era, where no private markets existed and thus no public-procurement institutions (conventionally understood) either.
2. 1991–1995: Chaotic era, where no coherent public-procurement institutions were present.
3. 1995–2000: Reform era, which started with the adoption of the first version of the Estonian Public Procurement Act in 1995, using as a basis the model law of the United Nations Commission on International Trade Law (UNCITRAL) (Lamvol 2002). This period was characterised by major institutional reforms towards adopting the then dominant international best practice (which emphasised transparency and technical efficiency), but where public procurers

[3] This subsection builds partly on Lember and Vaske (2009).

still enjoyed a great deal of discretion in using the procurement instruments in accordance with their specific (e.g., technology) goals (see below for ICT procurements). Generally, public procurement was neither used as a conscious developmental policy nor a hidden protectionist policy tool (for the latter, see Kilvits and Purju 2009). This meant that openness and non-discrimination principles were incorporated into the Estonian public-procurement system as the only guiding principles from the outset and consideration of conducting interventionist public procurement was never developed.

4. 2000–2007: EU era I. The first public-procurement act and other institutions mirroring EU requirements were established in 2000. During these years the WTO GPA and the EU single-market-inspired ideas were directly incorporated into Estonian law. This was also the period when innovation policy was developed, largely influenced by EU principles and funding. Although PPI emerged on the European innovation-policy agenda around then, an innovation-orientated public-procurement approach did not enter Estonia's innovation-policy agenda.
5. 2007–present: EU era II. The Public Procurement Act adopted in 2007 marked the end of the transformation period for harmonising the Estonian public-procurement system with that of the EU. The new EU legal procedures designed to promote innovation through procurement were incorporated into Estonian law (for instance, competitive dialogue, functional specifications). Although no major institutional changes or systematic policy reforms regarding innovation-conducive public procurement has taken place since 2007, the first signs of increased interest emerged at that time. Uncoupled from general public-procurement policy developments, this interest was evidenced, for example, through the continuing implementation of an R&D procurement program in the defence sector (introduced in 2001) and by the incorporation in 2007 of the principles of public demand and procurement as part of the Estonian Research, Development and Innovation Strategy 2007–2013. It was not until 2011, though, when the Ministry of Finance, the central policymaker in public procurement, announced that it planned to start investigating the possibilities of using public procurement for the sake of innovation.

Compared with other developing and transition countries, Estonia has been referred to as a successful public-procurement system reformer (Hunja 2002). According to the Global Competitiveness Report, Estonia's public-procurement system is perceived by the business community as above average in all categories for public-procurement systems in developing countries (Evenett and Hoekman 2005). One could argue that the success was due to the need to build the public-procurement system from scratch, along with strong external pressure from international donors like the EU and WTO for implementing the reforms adopted (Hunja 2002; Evenett and Hoekman 2005).

The perceived success of Estonia's public-procurement system should be understood in the context of the EU and WTO frameworks, which have played a major defining and shaping role. Transparency, openness, and non-discrimination

form the ideational background of Estonia's public-procurement system, and, in turn, these qualities formed the basis of the government's consumption policy. It also means that innovation, industry, or development-related ideas consistently and historically played marginal roles in the previous two decades of government procurement policymaking.

Apart from the image of a positive reformer, previous studies (e.g., Lamvol 2002; SIGMA 2003, Raudla 2007) point to several policy problems, such as the existence of formalistic and bureaucratic obstacles, unclear monitoring mechanisms, and problematic implementation (i.e., abnormally high use of least-competitive tendering processes and ineffective balance between transparency and cost-effectiveness). Although some of the problems have been solved over time, others still persist. The following peculiarities characterise the current Estonian public-procurement system:

1. *Decentralised with some centralised aspects*. The Ministry of Finance is the central body responsible for public-procurement policy, but its role is limited to regulation, monitoring, advising, and training. The actual procurement decisions and implementation processes are fully decentralised, meaning that every ministry decides upon and is responsible for its own and its subunits' procurement matters. The same holds true for local governments. Some governmental agencies exist that offer services used for centralised procurements (e.g., public real estate development). In general, centralised public procurement takes place ad hoc. Decentralisation leads to lack of coordination and cooperation within the decentralised procurement system, unexploited economies of scale, and episodic and ineffective supervision (Lember and Vaske 2009).
2. *No professional standards for procurement.* Estonia lacks an uniform group of procurement professionals in the public sector and a professional certification system. Moreover, most of the public tenders are carried out by officials whose main duties lie outside the area of public procurement (State Audit Office 2004).
3. *Narrow procurement training system.* The existing training courses are overwhelmingly biased toward legal aspects and only vaguely touch upon strategic and management issues. This may partly explain, for example, why more innovation-friendly procurement methods are rarely used (e.g., in 2010, 22 tenders were implemented as a competitive dialogue out of a total 5,946 tenders[4]). At the local government level, 50 % of officials admit that they need additional training in procurement issues (State Chancellery 2006; for a case study on welfare service contracting, see Lember and Kriz 2010). Similar problems exist at the central level (State Audit Office 2005; Lember 2006).
4. *Public authorities are more constrained than their EU counterparts.* Estonian procurement law traditionally provides national sub thresholds for contracting authorities that are lower than in other EU member states in order to increase

[4] Source: Estonian Public Procurement Register https://riigihanked.riik.ee/lr1/web/guest/index (accessed 30 April 2012).

transparency and control of public expenditures. From 2008 onward, these thresholds were lifted to EUR 40,000 (goods and services) and EUR 250,000 (construction works and concessions) but remain approximately between 4 and 20 times lower than the respective EU thresholds. This means that public authorities in Estonia are somewhat more constrained by the EU and WTO GPA regulations than other countries.

7.4 Public Procurement of Innovation and Policy-Making

7.4.1 Estonia as a Case of "No Policy" Policy

Against the backdrop of the socio-economic context, economic policymaking traditions, and the public-procurement system in Estonia, it is no surprise to find that there are no traces of systemic use of public procurement for supporting innovation or industrial development (see also Izsak and Edler 2011). Although cases where public procurement has led to innovation do exist, public procurement has not been employed in general as a conscious and coordinated policy tool for achieving wider social and economic goals. There are no major pro-active policies elaborated at any level. Some developments have occurred with regard to environmentally friendly public procurement, but the impact of this policy is yet to be evaluated.

Examining PPI policy approaches as discussed in Chap. 2, Estonia can be classified as a country with a policy of "no policy". Moreover, barring a few exceptions, demand-side innovation-policy instruments have been generally off the official developmental policymaking radar. While *Knowledge Based Estonia*: *Estonian Research and Development and Innovation Strategy* 2007–2013 states that

> in order to strengthen the state's role as a catalyst, the decision criteria applied in public procurements have to be more diversified and the participation of such enterprises in public procurements, which offer innovative products and services, should be supported (Riigikogu 2007);

and for the first time it is claimed explicitly in the *Estonian Information Society Strategy* 2013 that

> State orders constitute a considerable part of the ICT sector's turnover. However, in public procurements the determining factor usually tends to be the price, which is why the private sector often lacks motivation to offer the best solutions. By becoming a smart customer, the public sector can, in addition to meeting its own needs better than so far, contribute to the development of competitive products and services that could be marketed abroad (Government of Estonia 2006: 10);

these unimplemented claims remain symbolic statements of intent at best.

Currently, those governing the research, development, and innovation system have acknowledged PPI as a measure that could facilitate structural changes in the

Estonian economy. Within the public-procurement policy domain, however, innovation is not considered a relevant goal. In fact, innovation is hardly ever mentioned in Estonian public-procurement policy debates or documents. General public-procurement policymaking (coordinated by the Ministry of Finance) is separated both from innovation and economic development (Ministry of Economic Affairs and Communications) as well as from R&D (Ministry of Research and Education). No horizontal cooperation and coordination mechanisms exist between public procurement and other relevant policy domains. Neither a visible political nor organisational leadership exists. As a result, no dedicated civilian innovation-oriented public-procurement policies have been launched within the innovation, R&D, or overall economic-development policy domains.

Despite this context, innovation-related public procurement and other demand-side measures have not been entirely absent in Estonia. Public procurement (similar to other demand-side measures[5]) has been occasionally employed for the development of innovative solutions in specific sectors and on an organisational level. Recent examples are found in the government's purchase of electric cars and development of the supportive infrastructure[6]; in the field of ICT, where public purchasing of tailor-made solutions is a common practice; and, to a lesser extent, in the defence industry.

7.4.2 Public Procurement for Innovation in ICT

It is widely agreed that Estonia has had remarkable success in promoting a technology-based information society and in implementing e-government solutions (Kalvet 2007; United Nations Department of Economic and Social Affairs 2008: 81; Dutta and Mia 2009: 187).[7] For example, Estonian achievements are notable in e-voting, one of the most ambitious fields of application for e-government: Estonia has implemented remote Internet-based voting in several nationwide elections since 2005 (for an overview, see National Electoral Committee 2009). It was also the first country in the world to have mobile positioning in commercial use and one of the first to have 112-emergency calls linked with a mobile positioning system that can determine the origin of each call (Rannu 2003).

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[5] Such other demand-side innovation policy initiatives included private demand for energy-efficient housing and wind-energy support. Energy efficiency of housing was driven both by EU funding (see Kalvet 2011) and wider CO_2 quota trading schemes. Support for wind energy was part of the EU CO_2 emission reduction policy. Of interest here, these measures were examples of what public-policy literature calls coercive policy transfer—that "… involves one government or supranational institution pushing, or even forcing, another government to adopt a particular programme" (Dolowitz and Marsh 1996: 344).

[6] See www.elmo.ee (accessed 30 June 2012).

[7] This subsection builds on Kalvet (2012).

Existing empirical studies confirm the importance of systemic interplay among the telecommunications sector, banking, wholesale and retail trade, and governmental structures that have been identified as the important drivers of the Estonian ICT-sector innovation system. Most importantly, the government's affection for novel technological solutions has had a positive effect on a number of public-sector initiatives (Kalvet et al. 2002; Högselius 2005), and this has mostly taken place in the form of PPI in ICT.

Studies show that enthusiastic and visionary civil servants have been behind the development of information systems in the public sector, although a very pragmatic approach can be observed in Estonian e-government development: it is based more on development-driven strategies than on strategy-driven development. This means that some central information systems and applications have been developed by technocrats without the existence or guidance of respective policies and action plans (Kalvet and Aaviksoo 2008: 52). Such developments have been supported by a favourable legislative environment towards ICT. Another very specific feature is related to the fact that stable and sufficient funding was provided for ICT expenditures for the period 1993–2005 (excluding personnel-related costs, ICT expenditure has been about 1 % of the total state budget). Next to the procurement of ICT hardware, these funds were used for the development of e-government solutions. A large share of Estonian e-government development work was accomplished outside the public sector and can be characterised as instances of PPI. Not only direct procurement was carried out, but some of the purchased products or services are used widely by other end users for the introduction of other related innovative products and services, helping drive the clustering among innovation-system actors even further. Other success factors have been the high competency levels of local suppliers, and the contributions of "ethical hackers" (Kalvet 2009, 2012).

7.4.3 Public Procurement of Defence R&D

Defence is one of the few sectors where the government of Estonia has launched a dedicated PPI program with a strong emphasis on innovative and R&D-intensive solutions. The first time the Estonian Ministry of Defence contracted for R&D was in 2001. By 2010, more than 50 projects had been funded with a total value of EUR 6.5 million. The projects have targeted basic and applied research, R&D up to the prototype stage, as well as ready-to-use equipment. This included technologies like unmanned aerial and ground vehicles, portative analyser of chemical warfare agents, and an improvised, explosive-device neutralizer (Jermalavičus 2011). A study has found that these R&D projects have "made little or no impact on the capabilities or the performance of the defence organization" (ibid, p. 6). However, research by the authors of the current chapter, based on desktop analysis and also interviews with representatives of contractors and Ministry of Defence, suggests that several positive spill-overs had emerged, in terms of new technology capabilities and commercially

viable prototypes for the universities and private companies involved. This suggests the existence of behavioural additionalities, an important concept in evaluating the impact of a support instrument on innovation (see OECD 2006). Still, the overall effect of the Estonian defence R&D procurement program so far has been limited. Reliance on supply-push rather than carefully specified user needs (i.e., military), weak user-provider linkages (defence forces involved only formally), low level of coordination and technology capacity in government, involvement of a limited number of companies (mostly universities with no commercialisation initiatives), and nonexistent attention to market creation or business opportunities are all reasons why the effects were limited.

7.4.4 Implications of the No Policy Approach

Although systematic policymaking that would link public procurement and innovation has been and is missing in Estonia, one should not underestimate the impact of existing government purchasing practices on innovation in the private sector. Recent studies on Estonia demonstrate that a public-procurement system is capable of producing innovative solutions leading to market upgrades (though modest in most cases), even in the absence of an explicit innovation-oriented policy support (Lember et al. 2011a; Lember and Kalvet 2012). In an international comparison Estonia is placed 25th among 142 countries in the category of government procurement of advanced technology products by the Global Competitiveness Report (WEF 2011).

Recent study shows that one-third of Estonian public-sector suppliers that had innovated during the past 4 years claimed that the public sector has had at least some influence over their product and process innovations, whereas about two-thirds of the companies claim that public-sector influence was nonexistent. Companies that have benefited from public-sector contracts in terms of innovation are those mostly delivering tailor-made solutions (e.g., in areas of engineering, special construction, programming). At the same time, the share of R&D-intensive firms and organisations in the Estonian public-procurement market is almost nonexistent (0.5 % in 2010), evidencing the low impact of the current public-procurement system on fostering R&D-based innovations. Moreover, delivering goods to the public sector in Estonia seldom assumes or leads suppliers to cooperate with R&D organisations or with each other. It is, however, noteworthy that half of the companies acknowledging the positive role of the PPI report that it has helped them to get other contracts in public as well as private sector markets. (Lember and Kalvet 2012)

In spite of the modestly positive influence of the no-policy regime on innovation, the prevailing perception of organisations that have received public contracts is that the existing institutional framework is counterproductive towards innovation for the following reasons:

1. Price-dominated procurement practices, where no incentives are left for innovative or complex solutions;
2. Overuse of open procedures that squeezes out innovation and misuse of innovation-friendly procedures (e.g., competitive dialogue), where cost and not design determines the outcome of tendering;
3. Weak technology competencies and market knowledge within the public sector, coupled with limited willingness to invest in preparatory stages (e.g., creating technical specifications in ICT or allowing substantial market consultations before formal bidding in almost every field);
4. Using the logic of annual state budgets (as opposed to multiyear-based budgeting for procurements), which leads to unrealistic deadlines, a mismatch between available funds and the quality of solicited solutions, and a short-term view instead of long-term partnerships (ibid).

Consequently, the perception of the organisations supplying the public sector was that an overall lack of demand existed for innovative solutions. In some technology-intensive fields (e.g., software development), decreasing innovation-orientedness has led to a diminishing interest in public projects. Many local leading ICT companies increasingly see public tenders merely as a substitute for coping with the (current) decline in private markets. Such developments are even more perplexing as Estonia has been generally successful in undertaking innovation-related procurements in ICT: as described above, it was mainly via public procurement that the important innovation-related linkages among the software developers, R&D organisations, telecommunications, banking and governmental structures were created. Developments in ICT illustrate how important the institutional environment surrounding PPI was to Estonia in the 1990s when public procurement for ICT-related innovation took place. Overall public-procurement regulations were in their formative stages, with specific regulations allowing rather extensive discretion for acquiring new technologies crafted to regulate ICT-related procurement. With the introduction of the first Public Procurement Act and the organisational framework of the Reform era of 1995–2000, more emphasis was put on transparency and technical efficiency; however, innovation-related procurements were perceived as possible and were still in practice. With a further focus on the values of transparency and technical efficiency from 2000 onwards, discretion in the conduct of public procurement diminished. As a result, the innovation aspect became much more marginalised. Today, even if innovative procurement can be carried out under the Public Procurement Act, it is seldom practiced in ICT, due to the dominance of (and overemphasis on) other values within the procurement system[8] (Lember and Kalvet 2012).

In sum, PPI (and to some extent demand-side innovation-policy measures in general) remains a missing element in the overall innovation-policy mix in Estonia

[8] Some public procurers have admitted in interviews that innovation-related risks are tried to be avoided at any cost due to the increasing threat of being accused for corruptive behavior (Lember and Kalvet 2012).

(see also Christensen et al. 2012). Sporadic cases with positive value added (incl. growth in exports, enhanced market capabilities, technological upgrading) do exist in Estonia; however, the current state-of-affairs seems to suggest that innovation-friendly public procurement under the no-policy regime is too haphazard to allow the rise of any systemic positive effects.

7.5 Drivers of and Hindrances to PPI Policy Evolution

By 2012, PPI was formally acknowledged as a potentially useful innovation policy tool within the R&D and innovation policy community in Estonia (Government of Estonia 2006; Riigikogu 2007; Christensen et al. 2012). Nevertheless, no widespread policy steps have been taken thus far, and the empirical evidence indicates that under the no-policy framework, public-procurement practices only modestly influence private-sector innovation. Many different factors drive and shape the current policy path.

First, this path may be regarded as a direct consequence of the initial economic and administrative policy choices made at the beginning of the 1990s. Estonia regained its independence at a time of resurgence of the so-called Washington Consensus policy movement. Public-procurement policy was designed and implemented in the past 20 years in accordance to Washington-Consensus-type economic and administrative policy doctrines that assume government non-intervention into market is best and that the state's main role is the creation of a level-playing field for public-sector suppliers. In the light of these dominant economic and administrative policy ideas, the idea of PPI—assuming that state has an active role to play in innovation and economic development—has not been (nor could it have been) seriously considered among the economic or public procurement policy-making communities.

A newly emerged politico-administrative elite was shaped and formed by this ideational background, and its policies continue to resonate today. While claims for changing the prevailing economic policy-making principles in Estonia have been made (e.g., Tiits et al. 2003), the long dominance of the right-wing parties, weak interest groups, and simple polity structures that have no strong players with veto power existing outside of the central government have allowed for continuity rather than change or even meaningful adaptation to changing circumstances.

Second, the initial economic and administrative policy paths taken have been persistent and reinforced through critical junctures (e.g., economic crises, general elections). Reinforcement of these policies constantly supported the accumulation of policy and administrative capabilities different from what would be needed for active PPI. In practice, government demand as a driver of innovation has been to a great extent neglected, and virtually no serious attempts have been made to attain and develop the needed PPI policy skills. The existing administrative culture, routines, and capabilities in public procurement are driven by values other than that of innovation and development. The main principles or values thus pursued

included cost minimisation (as opposed to project effectiveness or efficiency in terms of full life-cycle costing), heavy reliance on open auctions (as opposed to competitive dialogue and other procedures more suitable for interaction, learning, and, thus, innovative solutions), and limited and formal consultation with markets (as opposed to the use of technology foresights and substantial technical dialogues). This policy-making creates a bias toward formalism (i.e., complying with the rules) and a risk-averse culture (compliance with rules is prioritised over a more holistic understanding of the role of the state in procurement). These predilections are further supported by the sporadic training system in public procurement. All in all, the normal operations, standard operating procedures, and accumulated capabilities have created a public-procurement system, where public-sector capacities are better positioned to conduct—as many industry representatives would claim—price wars rather than innovation-oriented public procurement.

Third, a two-fold EU influence exists over innovation and public-procurement policy capacity building. In both fields EU policies have been more or less directly copied within the Estonian system as generally applicable concepts without much adaptation, and this, consequently, led to de-contextualised policy-making. Innovation policymaking is characterised by an existing bias towards support measures for so-called high-tech sectors via supply-side instruments while evidencing a neglect of the role of state-led coordination, public demand, and the most contextually relevant fact that the overwhelming majority of Estonian companies—including main exporters—are active in so-called low-tech sectors.

The EU influence was even more clear-cut in public procurement. By joining the EU, Estonia was forced to fully adapt its internal public-procurement regulations to EU rules. Strategic public procurement as well as state-led development policies were out of fashion by the time Estonia accepted the EU Single Market legislation, and, as a result, no development phase or innovation-related aspects could have been introduced to internal public-procurement regulation.[9] Even today EU public-procurement regulations incorporate specific innovation-supporting measures; the essence and viability of the nonstrategic approach to public procurement has been questioned neither by the administrative nor political elite.

Fourth, the Estonian experience suggests that developments in innovation and public-procurement policy domains alone fall short in explaining the current level of PPI policy-making. Another important factor is low demand and pursuit of innovative solutions in the public sector. On the one hand, the case of ICT infrastructure and solutions development in Estonia indicated that a general quest for harnessing new technologies for public services must first exist. This was the case with the early and most influential public-sector ICT projects in the late 1990s and early 2000s, when a high level of enthusiasm coincided with both public as well as political support in new ICT solutions. At the same time, the defence R&D procurement program demonstrated that even if specific funding was available for

[9] See Kattel and Lember (2010) for an in-depth discussion on using PPI in the context of developing countries.

PPI, no significant results emerged because of either low level or no public-sector interest in new solutions. Creating a general quest or culture for new technology use is, however, outside the direct influence of innovation or public-procurement policy communities. The general quest for harnessing new technologies is often closely related to the public sector's role in addressing social challenges, which in countries preferring non-interventionist policies is typically modest and implies a low use of PPI.

7.6 Conclusions and Future Paths

During the past two decades, Estonia experienced economic growth mainly driven by the FDI, but economic and technological upgrading of the Estonian economy has remained modest. The main challenge is how to achieve export-led growth and how to increase the competitiveness of Estonian enterprises in global markets, both by the traditional sectors dominating the economy and the emerging science-based sectors.

Policies to support the competitiveness of enterprises have evolved from the no-policy approach in the 1990s to a linear approach in the beginning of the 2000s, and to a more modern innovation policy since the mid-2000s, targeting innovation system failures. The emphasis, however, of Estonian R&D and innovation policies has been on supply-side measures, while neglecting the role of demand-side measures such as PPI.

The government has for the past two decades, in accordance with its dominant economic values, preferred minimalist intervention in the economy and largely did not employ public procurement for ends other than the creation of a level playing field for domestic and international market players. This no-policy approach in Estonia emphasises macroeconomic stability rather than selective state intervention. It also reflects the supply-side orientation of innovation policy. Economic policies of countries, however, rarely fit into one category, and we have documented occasions in Estonia where public procurement had been successfully (e.g., ICT-related public procurement) or moderately successfully (defence R&D procurement) used for innovation. Overall assessment of the no-policy approach is perceived by most market players as not supporting innovation. In public-procurement policy domains, innovation is not considered a relevant goal, while those governing the research, development, and innovation systems see, at least in rhetoric, its potential for advancing innovation. Achieving consensus and incorporating (demand-led) innovation as value will take time and involve working on multiple strategies.

Part of the solution to Estonia's current economic challenges potentially includes explicit PPI policies, particularly to tackle problems like unsophisticated business strategies and minimal clustering. At the same time, the formation of explicit PPI policies alone would be insufficient to contribute to the overall restructuring and upgrading of the economy. This is not only because the current

market structure in Estonia is heavily dominated by sectors that have relatively low levels of value added on average—meaning that the market would encounter significant problems in responding to new, more sophisticated demands—but also because of a strong tendency of the public-procurement community to avoid risk-taking and to prefer off-the-shelf procurement, which provides limited learning and interaction opportunities. Although the Estonian ICT sector has been historically one of the most innovative industrial sectors in Estonia as well as an innovative partner with the public sector, it, too, has seen a diminishing rate of innovation-driven public procurements.

Moreover, the legacies from technology-push linear innovation models, favouring science-based innovation and relying on supply-side policy instruments, have proven to be persistent, which further inhibits the possibilities for quick adoption of PPI as a principle and operational concept. This was shown in the introduction of the defence R&D procurement program, the first of its kind in Estonia. Although formally created as a program to meet the needs of the defence force, it has to a great extent been driven by the interests of the academic community rather than by public-sector demand and has contributed only indirectly to market upgrading.

A decentralised public-procurement system, coupled with a fragmented central government structure and a weak capacity for policy coordination, presents an additional challenge for explicit PPI policymaking. These, however, are crucial factors to be dealt with if generic PPI policies are targeted. The recent financial and economic crisis that hit Estonia particularly harshly has put cutback management rather than strategic public procurement at the focus of public consumption. The crisis strongly reinforced the prevailing values that favour macroeconomic stability over government intervention, making it questionable if and to what extent explicit PPI policy-making is feasible in today's Estonia. Starving an idea of funds and institutional support may well be a means to discredit an idea.

Nevertheless, selective initiatives by sector or technology programs could serve as an useful starting point after which more sophisticated PPI policy initiatives could be pursued. For example, using PPI as an additional instrument to drive innovation processes in the existing national technology programs (networks) in Estonia could open up possibilities for creating "islands of excellence" that, in turn, could serve as reference points to inform further policy action, as the process is decidedly nonlinear and requires constant vigilance and optimisation. Another solution could be strengthening PPI in fields with a proven track record such as ICT. This could be, for example, ICT in general, but especially for encouraging ICT development in sectors where the government's buying power was significant, such as in health care and transportation. With a more selective approach (as opposed to generic PPI policies assuming cooperation across sectors), it would probably be easier to develop the needed policy as well as administrative capacity for conducting innovation-supportive public procurement. Building generic PPI policies within the current Estonian context would probably be more challenging. Selective approaches that detach (in some way) PPI from "regular" public procurement could

also enable policy learning in order to overcome some systematic problems inhibiting PPI in Estonia, such as price-dominated procurement practices, misuse of innovation-friendly procedures, weak technology competencies, and, market knowledge and restrictions emerging from the logic of annual state budgets.

Several challenges raised in this chapter can be attributed to Estonia as a small state, which have, as far as innovation-related matters are concerned, peculiarities such as small markets, low diversification of economic structures, lack of financial capabilities and human resources, low levels of administrative and policy capacity, and the poor management of vested interests (Kattel et al. 2010; see also Lember et al. 2011b). Many of these factors were indeed visible in Estonia. The specific issue of public procurement in small states deserves further research as related both to the preconditions as well as to the outcomes of successful PPI policy.

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Chapter 8
Greece

Public Procurement for Innovation in Greece

Lena Tsipouri and Sophia Athanassopoulou

Abstract This paper analyses the experiences and potential for public procurement targeting innovation (PPfI) and pre-commercial public procurement (PCP) in Greece, which is a country with small internal market skewing actual activities towards light manufacturing, labour-intensive industries and small-firm organisation. This environment is not conducive to PPfI, as there is limited lobbying power and few visible impacts from it. Public procurement is in general organised in a traditional way, respecting the EU Directives but not acting as an industrial policy tool. It is, however, argued that even in such markets diffusion-oriented PPfI and unintentional PPfI can play a beneficial role and create potential benefits from export markets, when co-development of client and supplier is successful, in particular if this takes place early in the technology cycle to allow suppliers to acquire knowledge about specific business procedures and be able to demonstrate systems in operation.

8.1 Introduction

This paper analyses the experiences and potential for public procurement targeting innovation (PPfI) and pre-commercial public procurement (PCP) in Greece. The country is of medium size, the manufacturing sector (in particular high-tech industries and engineering) is undersized, and the national administration is conventional and unwilling to take risks. Greece offered a model of rapid development during its transformation from a traditional, rural economy into manufacturing in the first two post-war decades. Subsequently, national economic policy failed to shift from a low-wage into a knowledge-based economic model, ending up in a

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persistent recession since 2009 and serious financial constraints. Since the outbreak of this crisis, budget constraints have significantly affected the potential for new public investments.

In order to better position the role that PPfI can play in countries that lack the basic features of sophisticated demand and supply, it is important to distinguish two dimensions of the procurement for innovation.[1]

1. *The character of the procurer*: The procuring organisation may be the end-user of the product resulting from the procurement (direct procurement), or the procuring agency may serve as a catalyst, coordinator and technical resource for the benefit of other end-users, not itself.
2. *The novelty of the product and its position in the innovation cycle*: The type of innovation required from the supplier may, at any point of the innovation cycle, be associated with risks. The earlier the procurement takes place in the technology life cycle, the higher are the risks. The early phases, when radical innovations are needed and procurers buy completely new-to-the-world products, are referred to as *developmental or creation-oriented PPfI*. Conversely, *adaptive or diffusion-oriented PPfI* occurs when the innovation needed for product or system procurement is incremental due to specific requirements or adaptations to local conditions. Technology transfer for larger systems is often associated with PPfI. This may also refer to business process and non-technological innovation.

Adaptive PPfI associated with technology transfer and procurement of large systems was attempted before the accession of Greece to the EU, which entailed legal obligations of compliance with internal market rules. There was a period of active industrial policy trying to utilize large procurements as leverage for local manufacturing competitiveness, with local value added being among the criteria for selecting applicants in public tendering in the early 1980s. Procurement was scrutinized for its potential for technology transfer and local production of electrical equipment, in the automotive industry and telecommunications. This policy had limited success and was abandoned in the 1990s. At that time R&D and Innovation (RTDI) policies emerged as a result of EU Structural Funding. They were systematically supply-driven, never engaging in PPfI or similar types of incentives.

In summary, the country lacks the main requirements for engaging in PPfI: a dynamic local production constituting a supply sector willing to push for technological development and sophisticated public demand. As a result neither PPfI nor PCP as such have ever been active policy instruments. Nevertheless, there have been cases in which procurement did play a substantial role for the competitiveness of the local productive sector.

[1] These dimensions rely on definitions used in the papers of Edquist and Zabala-Iturriagagoitia (2012), Fraunhofer Institute Systems and Innovation Research (2005), European Commission (2010).

The objective of this chapter is to present the overall legal and policy environment of public procurement and RTDI policies in Greece and to outline cases in which technological spillovers followed public procurement. It also suggests ideas on how to capture and experiment with the potential for PPfI policies in smaller and technologically less advanced markets. It is suggested that even in countries where the conditions are not favourable and public policy has no explicit PPfI aspirations, careful and unconventional public procurement may be in a position to (intentionally or unintentionally) enhance national and even EU technological development and stimulate competitiveness.

8.2 Country Background Information

Greece is a very atypical Member State of the EU. Throughout its recent economic history the country has developed in growth episodes (Thomadakis 1997), interchangeably outperforming its peers and then falling back again. The small size of the internal market has disadvantaged investments in 'heavy' or 'intermediate' industrial sectors, skewing actual activities towards light manufacturing, labour-intensive industries and small-firm organisation. Economic historians have offered a variety of explanations for Greece's inability to exploit its intermittent—and at times substantial—growth and to develop a manufacturing sector capable of being a source of sustainable wealth creation. Typical barriers were the lack of capital (Zolotas 1926), the inadequacy of human resources (Dertilis 1984), and the deficiency of the internal market combined with the fragmentation of production (Chatziiosif 1993). An alliance developed between a timid and inefficient (occasionally impotent and even corrupt) public administration and private manufacturing firms that exhibited only short-term activism, resulting in what Stavros Thomadakis calls the "politicization of the economy" (Thomadakis 1995). Since the 1980s, when the country joined the EU, one can observe a fatal complacency. The national economic performance has relied on agricultural subsidies complemented with increasing support from the Structural Funds and, more recently, with low interest-rate credit. This unprecedented transfer of resources alleviated the pressure but diverted economic policy and development incentives from restructuring efforts. Hence, in the last three decades economic growth followed an idiosyncratic path alternating between growth and stagnation, but failing structural reforms:

1. The manufacturing sector (excluding utilities), which relied on cheap labour during the Post-World-War-II growth period and peaked in the 1970s, shrank very rapidly from 14.5 % of GDP in 1998 to 12.8 % of GDP in 2005 (NSRF 2006). This shifted profits from manufacturing towards residential construction, shipping and the service sector, in particular tourism, while employment shifted towards the civil service.

2. The limited competitiveness of domestic electrical and mechanical equipment production led to increasing imports and contributed to the contraction of these sectors. Big, competitive companies limited their activities thereafter to construction, processing of primary raw materials and, to a limited extent, to software development.
3. After 1990, the significant net inflows from the Structural Funds were channelled to the construction of infrastructure and to traditional SMEs. Yet, the economy was not restructured to meet the challenges of the knowledge society. Innovation performance did not improve, as is demonstrated by the Innovation Union Scoreboard (European Commission 2012). The most recent growth period was based on a small number of exporting companies, with exports accounting only for 24 % of GDP (in comparison to an EU average of 43.5 %),[2] and on the ostensible prosperity deriving from fund transfers.
4. This artificial prosperity led to an ever-increasing, inefficient public administration, unable to deal with complex challenges. The gradual integration into the European market formally ended any protectionism; public procurement had to comply with EU Directives. Yet, the risk-averse and low-skilled public procurers tended to apply the general rules instead of employing new instruments, such as competitive dialogue opportunities, as these presuppose market maturity.

At the same time, RTDI policies began to emerge. The substantial increase of Structural Funds and the European guidelines to increase ERDF spending in RTDI nurtured new policy developments, which were further reinforced by the adoption of the Lisbon agenda. However, all indicators point to very limited progress towards a more innovative performance.

Since 2000, GERD has stagnated around 0.6 % of GDP, while BERD, which is among the lowest in EU-27, has varied between 0.15 and 0.2 % of GDP. The scientific productivity is significantly better than the economic performance of the RTDI system. Competitive funding has been increasingly strengthened, and the support of R&D and innovation in the business sector ranks higher on the policy agenda. However, virtually all RTDI instruments remain exclusively on the supply side. For a long time, individual grants to companies have been the only direct support to the business sector, followed more recently by grants for university-industry collaborations, plus funding for larger networks that are expected to form the nucleus of future sustainable clusters. The idea of launching demand-side initiatives in order to explore the potential of new markets has never even been discussed.

This exclusive concentration on the supply side is linked to the weak coordination and complex administrative rules of the governance of the national innovation system. The absence of a PPfI discourse comes more as a surprise, since for the

[2] Eurostat, Annual national accounts, GDP and main components. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00110&plugin=1. Accessed June 2012.

largest part of the last decade RTDI policies and centralised public procurement law. In the responsibility of one and the same ministry: the Directorate of Public Procurement while RTDI policy was under the auspices of the General Secretariat for Research and Technology. Both administrations were under the authority of the Minister of Development (2010).[3] Between 2010 and 2012, they were separated because RTDI was handed over to the Minister of Education, but then it was transferred back again as a signal of the relevance given to R&D for economic development.

8.3 Public Procurement Overview

Traditionally, public procurement had been supervised by one Directorate General and implemented by individual procurement departments. It was a rather simple process with price clearly being the dominant criterion. The current economic situation constitutes an unfavourable environment for the public procurement for innovation, in which policy makers see little reason to go beyond the traditional MEAT (most economically advantageous tender) rules. Austerity budgets do not allow for longer-term considerations on competitiveness, as the primary economic objective is to reduce the budget deficit and, last but not least, there are no special interests, be it on the part of the local manufacturing sector (which is shrinking) or of the European market (the Greek market being too small) to push for innovative solutions. Some exceptions can be found in incremental changes in software development, waste treatment and alternative energy sources.

The regulatory framework is in the process of being modernised in the context of the administrative reforms of the Greek economy, but the size and structure of procurement remain unattractive for explicit PPfI initiatives.

8.3.1 The Regulatory Framework

The institutional framework is simple and straightforward. Law 2286/1995, Law 3316/2005 and Presidential Decrees (PD) 60/2007 and 118/2007 regulate public procurement of goods and services in Greece. These Laws transpose the EU Directives 18/2004, 51/2005 and Directive 75/2005 into Greek legislation.

All contracts for product procurement are registered into a Single Procurement Programme, which is approved by a joint decision of the Ministers of Economy, Industry, Energy and Commerce, following a recommendation from the Committee of Public Procurement Policy and Planning. Conversely, contracts for

[3] The Ministry has changed names and responsibilities, but the two administrations have remained under its supervision.

services are not registered into the Single Procurement Programme, but are executed separately by the Contracting Authorities. In the case of combined procurement (goods and services), the distinction between public procurement of goods and services depends on the share of the budget that is allocated for the provision of goods. If it exceeds 50 % of the total budget, the procurement is characterised as procurement of goods.

Three stages are acknowledged:

- the stage of recognition of the needs and of the annual planning of public procurement,
- the tendering phase and
- the implementation of the contract.

Public procurement of goods and services may follow the open, restricted, negotiated procedures or the competitive dialogue. PD 60/2007 defines the minimum thresholds above which EU regulations apply:

- EUR 137,000 (compared to the 162,000 limit by the EC 18/2004) for the public supply and service contracts awarded by contracting authorities listed as central government authorities; in the case of public supply contracts awarded by contracting authorities operating in the field of defence, this threshold applies only to contracts involving specific products;
- EUR 211,000 (compared to the 249,000 limit by the EC 18/2004) for public supply and service contracts not awarded by central government authorities;
- EUR 5,278,000 (compared to the 6,242,000 limit by the EC 18/2004) for public works contracts.

The regulatory framework foresees that in cases of procurement of goods or services "of significant economic or technological value" a different procedure is permissible, whereby a Special Committee convenes upon the decision of the Minister of Finance, the Minister of Development, Competitiveness and Shipping, and the Minister in charge of the organisation that has recognised the need for the good/service. The Committee is composed of representatives from all political parties that are represented in the National Parliament and of at least one counsellor from the respective Territorial Council, the Supreme Court and the Court of Audit. Its mandate is to decide on the procurement procedure to be followed, as well as on the selection and the award of the tender or the cancellation of the process (if necessary). The implementation of a differentiated procedure compared to the standardised process prescribed by EU Directives is justified more on the grounds of public interest (political consensus) and less on qualitative aspects of the procurement itself (Fraunhofer Institute Systems and Innovation Research 2005).

Public procurement of goods and services in sectors of national security and defence is regulated by Law 3978/2011, which prescribes the central regulating authority for this purpose and transposes EU Directive 81/2009 into Greek legislation. The process may include a technical dialogue stage, prior to the launch of

the official tender, whereby the Contracting Authority may consult with other parties with respect to the specifications and the provisions of the contract. This stage may last between 15 and 60 days and can be extended by the Contracting Authority in case of highly complex contracts. Tenders should abide by one of the prescribed procedures: closed procedure, negotiation with publicity requirement, competitive dialogue and negotiations without publicity requirement (only under special conditions).

The public procurement system in Greece is highly fragmented, with various Ministries involved in the decision-making process, depending on the objective of the public procurement contract (goods versus services) and the economic sector that is involved (health, defence, or other):

- the Ministry of Infrastructure, Transport and Networks being responsible for the contracts of public works;
- the Ministry of Finance being responsible for the public contracts for services;
- the Ministry of Development, Competitiveness and Shipping being responsible for public contracts for goods;
- the Ministry of Defence being responsible for public contracts for defence systems;
- the Ministry of Health handling public procurement in the health sector; and
- the Ministry of Interior being responsible for the supplies of the Municipalities and Prefectures (Bodies of Local Governance).

Most tenders take a long time to complete because they often face court appeals at all stages of the tendering process. The existing framework is very discouraging both for public organisations and for private-sector participants and rarely leads to fast contract award. This is especially the case in tenders of high estimated value.

Law 3852/2010 introduced new measures for the control of public procurement processes launched by municipalities. New services agencies were created for the monitoring and supervision of local government entities, and provisions were introduced for the financial audit of costs and expenditures. These reforms are expected to generate savings, informally estimated at about EUR 1.5 billion at the local administration level.

In 2011, a Single Public Procurement Authority (SPPA) was established, in an effort to increase transparency and decrease costs of the public procurement of goods and services (law 4013/2011). The creation of this Authority was included in the provisions of the Memorandum of Understanding between Greece, IMF, ECB and the EU[4] as part of the structural reforms the country has to undergo in return for financial support during the period in which it will be unable to access the international financial markets. It is expected that this body will supervise the different organisations engaged in public procurement and see to the legality of the processes.

[4] Hellenic Republic, Ministry of Development, Competitiveness, Infrastructure, Transportation and Networks. http://www.mindev.gov.gr/?p=3206. Accessed June 2012.

By the same law a Central Electronic Registry for Public Contracts was created for the registry of both applications and contracts handled by public-sector organisations, except for contracts related to national defence and security. The Registry is operating under the auspices of the Ministry of Development, Competitiveness and Shipping.

The tasks of the SPPA include[5]:

- the harmonisation of national legislation on public procurement with EU directives and recommendations;
- the coordination of Ministries and other public or private authorities awarding such public contracts;
- the rationalisation of public procurement practices between different awarding authorities and the suggestion of specific legal and regulatory provisions to the appropriate Ministers for the smooth operation of the public procurement system;
- the provision of mandatory opinion on draft regulations with respect to public contracts;
- the issuance of guidelines related to public contracts and the submission of recommendations to competent authorities;
- the provision of recommendations in favour of competent authorities that opt for negotiation procedures in public procurement contracts above the EU thresholds;
- the publication of binding/non-binding tender documents or draft contracts, in cooperation with the Contracting authorities;
- the ex-proprio-motu investigation of information/data related to tenders/awards and execution of public contracts;
- the intervention in litigations related to public contracts;
- the maintenance of a national database of public contracts;
- the representation of Greece in European and international organisations and fora related to public contracts and the cooperation between European and national bodies in the exchange of views, information and data related to the national strategy, the legal framework and the procedures for the tender, award and execution of public contracts.

The SPPA has to prepare an Annual Report and submit it to the Chairman of the Greek Parliament within the first three months of the year.

The creation of SPPA is expected to:

- better coordinate public procurement strategy at a national level: monitoring of the needs of public organisations by a single organisation leads to better planning of the tenders by the most appropriate bodies;
- provide a better audit trail of the needs of the public sector;

[5] Hellenic Republic Ministry of Regional Development and Competitiveness. http://www.mindev.gov.gr/wp-content/uploads/2011/01/Enimerotiko_Simeioma_Dimosies_Symvaseis1.doc. Accessed June 2012.

- facilitate and encourage the participation of interested parties in the tendering processes;
- create healthy competition in tendering processes, in accordance with the principles of transparency and equal treatment;
- comply with national and EU rules with respect to public procurement;
- lead to improvements, additions, revisions of the existing legal framework regulating public procurement of goods and services in Greece.

Moreover, a new National System of e-procurement is expected to enter into pilot testing in the first half of 2013 for procurements of a total contract value higher than EUR 60,000. The e-procurement project will cost the Greek government about EUR 10 million, but is expected to lead to about EUR 300 million of annual savings for the public sector. The tendering time is expected to decrease from the current average of 400–700 days to an average of 200–350 days. According to the initial design, the pilot testing phase of e-procurement was intended for the first half of 2012. It is expected that in the second half of 2013 this process will become mandatory for all public-sector organisations.[6]

8.3.2 The Size of Public Procurement in Greece

Public-sector expenditure in Greece accounts for more than 50 % of GDP and is larger than in other EU Member States.[7] However, this expanded role of the state is rather one-way, disbursing salaries and transfer payments, while its purchasing power is not activated in the same way as in other Member States.

Based on the latest available statistics (2010), public procurement of goods and services amounts to 11 % of GDP and has decreased in the last few years. Only 22 % of such procurement is actually tendered internationally and published in the Official Journal of the European Communities (Table 8.1).

8.3.3 The History and Potential of PPfI

In the early 1980s, after the accession to the EU but during the transition period when infant industry protection was still permissible, the share of local value added was one important criterion for the selection of tenderers. During this period national industrial policy attempted to use public procurement to stimulate engineering and transport means, in particular through the procurement of the

[6] See http://www.express.gr/news/finance/596732oz_20120503596732.php3. Accessed June 2012.

[7] Eurostat, Total general government expenditure % of GDP. http://epp.eurostat.ec.europa.eu/tgm/table.do?tab=table&init=1&language=en&pcode=tec00023&plugin=1. Accessed June 2012.

Table 8.1 Public procurement/GDP (Eurostat last update 6 March 2012)

	Advertised in OJEU/GDP (%)	Total/GDP (%)[a]
2001	4.10	13.45
2002	5.21	13.44
2003	4.41	12.90
2004	3.72	10.42
2005	4.90	9.67
2006	5.60	11.31
2007	3.50	12.07
2008	2.80	12.02
2009	3.70	12.46
2010	2.40	10.91

[a] Based on own calculations from Eurostat

telecommunications and power utilities (Vaitsos and Giannitsis 1994). Programmatic agreements for a limited period of time were signed between the major utilities and local providers. This policy was pursued with high ambitions and in a large array of, at the time, promising areas of telecommunications, automotive and electrical equipment. This policy had limited success. While no systematic evidence is available, the reasons for its failure are attributed partly to the lobbying of importers and partly to a disappointing policy of picking winners. A specific case of this period is reported in Sect. 8.4 below.

Although there are no official statistics exclusively produced and publicised for PPfI in Greece, a manual search on the Central Electronic Registry and the electronic records kept by the General Secretariat of Research of the Ministry of Development, Competitiveness and Shipping revealed contracts that might have been of a PPfI nature, had procurers had such intentions. The contracts dating from 2005–2011 seemed to be of a total value of about EUR 6.5 million for the Central Government. The majority of these projects were related to ICT-sector projects, as shown in Table 8.2. However, this statistic might not be representative, as the disclosure of public contracts is not mandatory. Additional tenders that might be of relevance for PPfI are launched by utilities and regional/local authorities. As they are decentralised, no aggregate figures are available.

8.4 Public Procurement Policy and Innovation

The reluctance to adopt an explicit PPfI policy can be traced back to the usual reasoning identified in the literature (i.e. risks and misalignment of incentives). In addition, the lack of lobbying on the part of industry (i.e. the small number of large Greek companies and the lack of interest from other European companies due to

Table 8.2 Tenders which could have taken a PPfI form in Greece (Central Electronic Registry, General Secretariat of Research of the Ministry of Development, Competitiveness and Shipping)

	2007	2008	2009	2010	2011	
Ministry of Economy and Finance-Software equipment				1,440,330	158,877	
Athens Pireaus Electric Railways-Optic telecommunication systems		788,375				
Ministry of Development-Software equipment	741,647	1,800,150				
Aviation General Staff-Software equipment		183,737				
Ministry of Agricultural Development-Software equipment		443,375				
National Centre for Emergency Care-New technology communication material	150,590					
Peloponnese District Health Management-Software equipment	102,432					
Attika District Health Management-Software equipment	414,853					
Central Macedonia District Health Management-software equipment	180,069					
Total	1,589,591	3,215,637	0	1,440,330	158,877	6,404,435

the small size of the Greek market), coupled with insufficient public-administration skills, were not much help to reverse this picture. Competitive dialogue has hardly ever been used. Notwithstanding, large Greek companies consider the lack of extensive PPfI on the part of the Greek government a major opportunity for building up innovative capabilities, taking into account that the manufacturing sector is small and the state utilities are its major clients for large-scale systems. This tendency is even more strongly pronounced in the case of the enhancement of the Information Society, which is supported by the National Strategic Reference Framework (NSRF).

Framework contracts that have emerged within this context may provide opportunities for suppliers to come up with innovative solutions. These contracts are assigned through the normal public procurement process upon a generalised scope of work that becomes specified further through an informal dialogue between the contracting parties during the execution of the contract.

8.4.1 The Idea of Programmatic Agreements Before the Adoption of the EU Directives

Greece adopted a development role in the 1980s before its accession to the EU, and at that time did use public procurement as a leverage instrument for industrial policy, but has abandoned it ever since.

A typical example of this practice was the public procurement process followed by ELVIL, a subsidiary company of the Hellenic Industrial Development Bank (H.I.D.B.) and the Greek Telecommunications Organisation (OTE) for the creation of a turn-key plant. The process included the bid for both the plant and the product it was to produce: electronic switching centres that were able to connect at least one million subscribers. ELVIL was created in 1978 in order to supervise the project management.

The Greek political authorities and the telecommunications administration identified the need for the product fairly early. The translation into functional requirements was originally entrusted to a company founded just for this purpose and in particular to its board composed mainly of academics in the fields of telecommunications and economics. Although EU directives on telecommunications public procurement did not apply, the bid was open to international tender, as local companies had neither the necessary skills nor the size to produce the required product.

Three major areas of competition were suggested to prospective bidders:

1. The local value-added content in the production of the proposed plant that had to include a package of raw materials, components, education and services.
2. The productive capacity of the production plant that had to be higher than the needs of the local market; exports could be promoted under the responsibility of the foreign supplier.
3. Know-how transfer that had to be ensured through the development of local RTD activities, which ideally would form part of the corporate strategy of the supplier.

Two suppliers were finally selected that offered alternative, comparable technologies; each in a joint venture with foreign transnational providers of switching technologies. However, there were substantial delays in the process, since re-evaluations attributed to political sensitivities delayed the project by almost a decade (Tsipouri 2000; Edquist et al. 2000).

8.4.2 Coupling Public Private Partnerships (PPPs) with PPfI

In Public–Private partnerships (PPPs) PPfI can be easily introduced, provided that both partners accept to share risks. In 2005, PPP legislation in Greece became aligned with EU legislation (L.3389/2005). The procedures for contract awards are

either open or restricted. In the case of complex contracts, the process of the competitive dialogue or the negotiated procedure may be applied.

Typical PPP contracts that have been implemented or are in progress in Greece after the introduction of L.3389/2005 (fire stations, schools) do not entail innovative characteristics. However, one de-facto PPP project that was realised even before the explicit legal framework was introduced in Greece was the building of the Rio-Antirrio bridge in Patra in 1988, linking the Peloponnese with Continental Greece (European Commission 2010). The new bridge provided an alternative to ferries, which became a bottleneck as traffic grew from 2 million passengers and 60,000 cars in 1973 to 7 million passengers and 3.5 million cars, respectively, in 2003. The bridge was to be about 2.5 km long, but the morphology was highly problematic as the waters were deep and the ground prone to earthquakes. The construction cost was EUR 750 million.

The project started with intelligence gathering through conferences and stakeholder discussions in the mid-1970s, followed by a first call for technical proposals on the feasibility of the link in 1980. Political delays allowed reservations to be expressed, suggesting a very high technical risk because of the seismographic morphology (the highest in Europe), the quality of the soil at the bottom of the sea (too soft to carry the bridge) and the strong streams in the gulf. The combination of these conditions was considered too risky. However, in 1986, the first CSF provided the opportunity to modernise Greece's infrastructure. The government reintroduced the idea and launched a call to hire a technical advisor to decide whether a bridge or a tunnel would be more appropriate and to advise on the tender specifications. An international call for tenders followed in 1988.

Political delays and the lack of willingness to take risks delayed the project's implementation. As it was clear that the technical and financial risks were too high to be taken on by the Greek government on its own, the venture could only be financed as a Build-Operate-Transfer (BOT) project. This increased the legal and political risks because there was neither a legal framework nor any precedent of such a contract in the country. Hence in 1991, a decision was made to cancel the initial tender and to launch a new one including the PPP nature and the BOT clauses. In the new tender special emphasis was given to the response of the bidder indicating ways to face technical, financial and legal risks. After a new formal tendering, the 'provisional' contractor was finally selected in 1994, six years after the launch of the initial tender.

Arguably, it was easier to build the bridge, in spite of the technical problems and novelties encountered, than to make the decision to build it. In order to mitigate that risk, numerous committees were convened in addition to appointing technical and financial advisers, an independent technical controller and a work supervisor. Still, the project faced significant technical, organisational and financial risks, but the result was highly appreciated, and the French contractor gained radical new knowledge that allowed the company to become the global leader in building bridges in deep, seismic waters, using the technology tested in Greece, and to gain subsequent contracts in Japan. In the EU this project is currently considered as one of the 14 major European transport projects.

8.4.3 The Notion of Unintentional PPfI

Despite the lack of an explicit PPfI strategy, certain large procurements that were launched in the context of modernising the Greek economy had significant unintentional PPfI features:

Customs software. The Greek company Intrasoft International gained an international competitive advantage due to the low-budget procurement of the Greek Customs Authority. The procurer wanted to resolve a specific problem linked to the coordination of national customs. As the small scope of the contract was hardly of interest to large international players, the Greek company won the bid in a competitive call and, in the period 1995–98, developed an integrated customs information system which allowed the supplier to gain insight into EU customs regulation and practices.

In reality the procurement was a co-development of client and supplier, since the original Terms of Reference were rather imprecise, as the customer had no experience in the field. With their acquired knowledge about the specific business procedures and the reference of the first small national project, the company was in a position to bid and win a large European contract to monitor transit trade in the EU in 1998, followed by a more complex upgrade contract in 2003. These contracts were much larger, and fierce international competition had to be faced. After that, the Greek company became a globally recognised leader in the field and installed similar systems in different countries. As the demand exceeded its capacity, the company had to join forces with IBM to serve the markets of SA Asia: IBM was the tier-1 vendor, whereas the system was always a joint project between Intrasoft and IBM. Meanwhile, the system is used in 40–50 countries worldwide.

Tax systems. As the capabilities of Intrasoft International grew, it gained another national procurement contract for the national tax system. The procurer this time was the Ministry of Finance, which had a good understanding of its needs and launched a call with precise specifications and functional requirements. Intrasoft entered the market at a rather late stage (as did the Greek government which was slow in modernising its tax collection procedures). Yet, this offered an unexpected advantage, namely that the company was able to develop technologically more modern and efficient systems than those in pioneer countries (such as the UK, for instance). This enabled the supplier to bid for similar, small contracts beyond the national border.

Social security. Intrasoft International won a major procurement contract from the National Social Security organisation for the development of a national pensions system. The large size of the project, addressing the needs of 7 million insured people (primary and dependent), and the state-of-the-art software tools provided Intrasoft with a deep knowledge of the social security market. Although lack of training, resistance to change and in some instances the influence of anti-modernisation lobbies (driven by corruption or nepotism) resulted in a poor performance of the system, the supplier received the necessary reference and could

replicate a similar system in Moldova and more recently won a bid for the automation of the Kenyan Social Security System.

Intralot, a company that specialises in the running of lotteries, has also largely benefitted from a national tender in software development. The company has become one of the world leaders in its niche. While often doubt was cast on the initial tenders it had won, Intralot has developed into a leading supplier of integrated gaming and transaction processing systems, innovative game content, sports-betting management and interactive gaming services to state-licensed gaming organisations on the global market. Established in 1992, with 5500 employees today, Intralot is one of the very few Greek companies that are growing and profitable in an increasing worldwide market. Its advanced know-how in the development of cutting-edge products was built on its initial success in winning the national tendering for the lottery sector.

Conversely, it proved practically impossible to go beyond the MEAT procedure for the **Public Power Corporation** (PPC), one of the major procurers of high technology equipment in the country that is willing to adopt PPfI. PPC, a public company with a majority public shareholding, has every interest in having a pool of innovative suppliers at its disposal, which are able to rapidly provide new solutions. In many cases SMEs were in a position to offer such solutions, partly by incorporating radical innovations in cooperation with HEIs. Several attempts were made at using technical specifications and new tendering techniques, but they encountered significant resistance, ending up with court appeals against the process every time new paths were tried. The only uncontested clause beyond MEAT has been the time of delivery.

One lesson that can be drawn from the selected cases above (actually including the PPP of the Rio Bridge) is that what is known as PPfI in the literature may indeed be a result of premeditated policy and public procurement targeting potential dynamic spillover effects; however spillovers may also be generated without procurers directly envisaging or even expecting them. In this case traditional public procurement unintentionally becomes PPfI.

8.5 Lessons and Future Developments

Two main lessons can be drawn from the Greek case:

1. Relatively small markets, where there is no interest from either the local manufacturing sector or a modern and sophisticated administration are unlikely to produce developmental PPfI. Moreover, attempts to artificially impose such policy tools bring with them the risk to end up with resistance to change.
2. Even in countries where the conditions are not favourable to exercise explicit PPfI, there are cases in which procurement may generate, even if not envisaged, significant innovations, technological and non-technological, due to a deep knowledge of the business model. If this procurement and the knowledge

derived occur at an appropriate stage of the innovation cycle of larger systems, the benefit for the supplier may be significant. This unintentional, diffusion-oriented PPfI can be elaborated into an explicit tool in such markets and play a crucial role in their economic development.

The analysis of the Greek market points to significant obstacles in the development of PPfI, which are probably shared by other small and technologically less advanced countries. They need to be at least partly addressed so that unintentional PPfI can turn into an intentional and more frequently used tool. These hindrances are located in the public administration, on the part of both the procurement and the innovation-policy administrations.

On the procurement side, the lengthy tender procedures with court appeals at every stage of the process are a main barrier causing deviations from the standard processes. Procurers that are willing to take more innovative approaches are discouraged (as pointed out by the PPC experiences), knowing that their ambitions will end up failing to meet their technological targets and delaying the actual procurement. Streamlining and speeding up the procurement process is a prerequisite before asking procurers to undertake new initiatives. The recent reorganisation of the procurement system suggests that such a rationalisation process has been triggered.

However, even with a more rational system, it is unlikely that procurers will jump into competitive dialogue and negotiating procedures. The lack of willingness to undertake risks in project implementation, which dominates conventional procurement thinking, and the lack of skills to decompose procurement act as barriers in countries much more apt to launch tenders for innovation. These barriers can be overcome only with active RTDI policies, able to both inspire new thinking and to impose development policies, but also willing to invest in the risky elements of PPfI. This can take the form of directly matching procurement budgets with innovation policy funding or by guarantee schemes to eliminate the risk of technological and market failures. Two kinds of skills that are entirely missing in the Greek market at the moment, but are not very frequently encountered elsewhere either, are needed in this case: the skills to calculate risk premiums to organise a sound guarantee scheme and, most importantly, the skills to identify the appropriate moment in the life cycle of emerging large systems, where gaining business knowledge and references of success can help companies to become outward-oriented and to conquer global markets.

This approach calls for new thinking, new behavioural patterns and political backing, which is unlikely to be obtained in a country loaded with scandals and nepotism. A public debate and parliamentary discussions (copying similar exercises in the UK, see House of Lords 2010) are needed to overcome the initial inertia.

But the crucial lesson that gives rise to high ambitions for future developments in countries like Greece is that, although Greek public policy did not intentionally employ PPfI targets in the last few decades, there have been few but remarkable procurements that did contribute to building capabilities on the contractors' side,

helping them to gain access to international markets. Such processes typically refer to the modernisation of the public sector through new software development and the integration of complex business solutions. In fact, in many cases it did not occur to the procurers (not explicitly at least) that their procurement might act as leverage for the competitiveness of the national economy. The terms of reference did not address new functionalities in any typical way, and they never referred to any type of radical innovation. However, when they were introduced, they became diffusion-oriented PPfI because of their timing, with significant advantages for individual suppliers across Europe. The selected cases that have been outlined above are prime examples of suppliers gaining substantial knowledge: the French company acquiring technological know-how on building bridges on seismic ground, and the software developers for customs and betting learning about the business and organisational aspects of the process, providing them with a 'first movers advantage' in both instances.

Considered an integral part of modernisation, such systems are expected to be introduced both by countries lagging behind in economic terms but also by more advanced countries which are locked in in outdated technologies because they adopted similar systems at a much earlier stage. Accumulating knowledge and a reference through the Greek public procurement system, the latter has been a major opportunity for some of them to grow and become international players in lead markets (Edler and Gheorgiou 2007), even though they entered the market at the stage of take-off. In that sense one may argue that what was initially considered classical, off-the-shelf public procurement has turned out to include innovative business and organisational elements and has led to the strengthening of suppliers in emerging markets. In certain cases these markets can prove to be real lead markets. Thus, the Greek experience may be called ***unintentional public procurement for innovation***. Its success depends on the timing of its adoption, the relevance of references for the new market and the ability of the supplier to expand aggressively and timely on an international scale, either independently or through targeted international joint-ventures.

8.6 Conclusions: The Case of Unintentional PPfI

Although no explicit PPfI policies have been implemented in Greece, except in the context of local value-added, increasing industrial and technology-transfer policies before the country acceded to the EU, procurement policies and individual procurement cases were observed. This section analyses and investigates the extent to which they can be considered PPfI. The aim is to reveal certain features of interest for the country itself, but also for PPfI in general, in particular related to Member States of similar size and technological maturity:

1. For a short period of time in the past industrial policies with features similar to PPfI were applied. They constituted a mix of national infant-industry

protectionism and an aspiration that this would give the protected companies the opportunity to innovate and conquer export markets. Although not an explicit lead-market policy, this approach generated an increase of product and software exports with incremental innovations, often of an organisational and business-model nature rather than technological innovation. This policy was abandoned and could not be replicated in the 1990s. With a different emphasis and adapted processes it could have been reintroduced when the EU public procurement directives changed, but it did not.

2. After the transposition of the EU Directives, procurers did not intentionally introduce any PPfI. Still, several cases proved to generate unintentional PPfIs: sometimes because the Greek authorities moved early into a new technology (customs software), others because of special circumstances (the Rio-Antirrio Bridge financed by PPP) and still others because of the availability of new and better technology than the one that had locked in pioneers at the time the Greek government went into a tender.

These observations from the Greek market, however idiosyncratic they may be due to the recent financial distress, lead to certain conclusions on the role that PPfI can play for diffusing and adapting innovation. They are suggested as an inspiration for innovation policy for smaller, technologically less advanced Member States. The latter tend to automatically refrain from PPfI-type policies because (in addition to the general problems associated with PPfI) they consider such demand-oriented instruments a luxury for countries and companies able to address radical technological changes and capture global markets.

The underlying hypothesis of this section is that PPfI may well occur in countries where procurers are reluctant to adopt such an explicit policy, but it does so unintentionally. This leads to the next challenge: What can occur and succeed unintentionally, may well have better chances to occur, proliferate and succeed intentionally. This, in turn, can pave the way both for procurement and innovation policy. While neither procurers nor innovation policy makers are willing to risk their budgets or smooth operations to organise PPfI, this type of policy may be hidden, but it exists.

The problem with the unintentional PPfI is that it not only lacks support but that even after it succeeds it remains unacknowledged. We know that it has mainly occurred in large software projects, complex infrastructure, alternative energies and waste treatment. We also know that it is the combination of appropriate timing and the available technology at the time that can help to adopt incremental innovation and to better understand business processes. It should follow that when these features are present, procurers are recommended to investigate the potential of an explicit PPfI and to obtain direct support from demand-side innovation budgets, either in the form of grants combined with the procurement or as guarantees for costs over and above MEAT.

Such initiatives lead by no means to any kind of hidden protectionism. Procurements may support local SMEs when under the threshold. Ultimately, if local SMEs or even larger companies enter markets, this reinforces their competition

with incumbents. For larger projects, diffusion-oriented PPfI will be the subject of international tenders.

A final practical remark is to beware of over-enthusiasm. Sometimes one observes that certain theoretically-founded policy recommendations become fashionable and thus overstretched and misinterpreted. This should not happen with PPfI, despite its recent emergence as a promising instrument for the Lisbon agenda and European competitiveness. The largest share of public procurement can be served with off-the-shelf solutions, and it is right to keep the MEAT criterion as a safeguard of public money. PPfI is appropriate in exceptional cases, for which selection skills and a conducive environment are necessary. It is time to build them up.

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Chapter 9
Hong Kong Special Administrative Region

The Hong Kong Experience with Public Procurement for Innovation

Erik Baark and Naubahar Sharif

Abstract The key principles of Hong Kong Special Administrative Region Government guidelines on procurement adhere to the general spirit of the World Trade Organization Agreement on Government Procurement. Moreover, the government has not been particularly keen to promote innovation, and it has only been during the last decade that explicit, but limited, innovation policies have come into existence. Nevertheless, some public organizations have found a need to use innovation to improve services and operational efficiency, and thus have launched projects that required innovation in both technology and management, and in which a strong hand in demand management was necessary for successful implementation. This chapter discusses the case of the Octopus Card project initiated in 1994 by the public Mass Transit Railway Corporation against a backdrop of procurement and innovation-policy history in Hong Kong. The chapter describes how successful public procurement of an innovative RFID smart-card system for transportation fees led to a widespread diffusion and diversification of business activity related to RFID cards. The conclusion is that public procurement to support innovation can be successful in Hong Kong, and the effects of the current lack of active policies to encourage demand for innovation represents lost opportunities to enhance the competitiveness of the economy.

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9.1 Introduction

Recently, stimulating innovation through the implementation of procurement policies from the 'demand side' has attracted increasing attention from policymakers and academics (cf. Aho et al. 2006; Cunningham 2009; OECD 2011; Iszak and Edler 2011; see also Chap. 1). The fundamental rationale for such a focus on public-procurement policy lies in the idea that governments can both act as 'lead users' to stimulate innovation (von Hippel 1986) and improve the effectiveness of public-services delivery through innovation. As 'lead users', governments can not only stimulate the potential for innovation through the articulation of demand (Edquist et al. 2000), but they can also help create domestic markets (and sometimes also international markets—an example of which we discuss below), reduce transaction costs for innovative solutions, facilitate the establishment of standards, act as exemplars encouraging private-sector demand, and stimulate the effective diffusion of innovations (Edquist et al. 2000; Georghiou 2006). There is considerable promise, then, in public-procurement policy as a tool for stimulating economic growth and for generating socially desirable innovations such as environmentally friendly technologies (see Chap. 2).

The Government of the Hong Kong Special Administrative Region (hereinafter referred to as 'Hong Kong', 'the Government', 'HKSAR' or the 'HKSAR Government') remains committed to following the guidelines provided by the World Trade Organization's Agreement on Government Procurement (WTO GPA) and did not systematically enact policies to promote innovation until the return of the territory to the People's Republic of China (PRC) in 1997. Hong Kong's ostensibly laissez-faire economic policies have not utilized public procurement as an instrument of innovation promotion. Nevertheless, in some cases procurement on the part of public organizations has stimulated technological and organizational innovation, as we mention below.

In the remainder of this chapter we first describe, in Sect. 9.2, the economic and policy background that informs our discussion of public procurement for innovation and then in Sect. 9.3 discuss Hong Kong's public procurement policy in its own right, with particular attention to the role of the Innovation Technology Fund (ITF). In Sect. 9.4 we discuss public procurement as it relates to innovation and competition policy. We follow this with a detailed description of the innovation-generating Octopus smart card project initiated by the Mass Transit Railway Corporation (MTRC). In Sect. 9.5 we draw some lessons from the Octopus experience, followed by discussion of potential future developments regarding public procurement for innovation. Section 9.6 concludes the chapter by considering the broader implications of the preceding discussion.

9.2 Recent Economic Background

In recent years Hong Kong has made progress towards regaining its traditional position as the key transit point for the exchange of both goods and services between China and the international economy. Sophisticated and reliable intermediary services occupy a key role in maintaining this status, and Hong Kong's future apparently turns on the capacity of its intermediaries to maintain a considerable share of business within Asia and between it and the global economy (Meyer 2000: 247). As a trade hub linking China with global markets, Hong Kong's position in Asia has been unrivalled.

As we have noted, however, technological innovation has not been an important element of Hong Kong's developmental experience, and the few studies that have addressed the issue have emphasized the laissez-faire policies that have characterized the industrialization process in Hong Kong (e.g. Hobday 1995). Hong Kong's entrepreneurs have been adept at exploiting available technology, but they have not generally carried out research and development (R&D) for the purposes of creating proprietary technology on their own (Davies 1999). Technological innovation has therefore only recently begun to attract serious attention in Hong Kong, when the government in 1998 launched a new strategy in pursuit of knowledge-intensive economic growth.

The Hong Kong story makes a fascinating tale of how what was a barren rock 150 years ago has emerged as a dynamic and vibrant world city. In reality, Hong Kong's phenomenal economic growth has transpired over a shorter period covering the last four or five decades. Nevertheless, the foundation was laid over a longer period.

Early twentieth century. Studies of Hong Kong's economic development in the early part of the twentieth century have shown that a combination of informal institutions and state initiatives supported industrialization there, relying primarily on small-scale manufacturers linked in familial or ethnic networks and connected with expanding markets for relatively low-technology products in China, Southeast Asia and Europe/US (Clayton 2000). Official British colonial history, reflecting primarily the perspective of the Major British 'Hongs' or trading houses, which had little commercial interest in manufacturing and instead emphasized the promotion of the entrepôt trade, has largely neglected the growth of such industries in Hong Kong (Loh 2002).

The Cold War period—1950s to 1970s. The overthrow of the Kuomintang (KMT) regime of General Chiang Kai Shek in 1949 by the founders of the current government of the People's Republic of China led to an exodus of about one million Mainland Chinese to Hong Kong. The people of Hong Kong, including its migrants, thus grew up and developed in a community that had Chinese roots but a British administration. These migrants, in turn, accelerated the establishment and growth of manufacturing industries that further expanded Hong Kong's traditional role as an entrepôt. In the face of the declining power of the KMT in China, Shanghai textile barons transferred enormous amounts of capital and managerial

expertise in textile manufacturing to the colony (Wong 1988). Today it is estimated that more than half of Hong Kong's more than seven million citizens are descendents of post-1949 migrants.

The opening of China—1980s and 1990s. Given Hong Kong's singular position as a British Crown Colony on the doorstep of the most populous country in the world, politics naturally shaped its innovation system significantly. In this respect the two most significant events around 1980 were the modernization program that the late Chinese leader Deng Xiaoping promulgated in 1978 and discussions between the Chinese and British governments that opened in 1982 over the future of Hong Kong. The latter negotiations ended in 1984 with the signing and ratification of the Sino-British Joint Declaration stating that Hong Kong (HK) would become a Special Administrative Region (SAR) of the People's Republic of China and that Hong Kong's capitalist system and 'way of life' would be preserved for 50 years. The 'one country-two systems' framework under which Hong Kong is presently governed was subsequently enshrined in the 'Basic Law,' the present constitution of the HKSAR.

From Crown Colony to Special Administrative Region. As Hong Kong approached its return to China in 1997, it was proudly boasting that no other society had more experience in investing and producing in China. Indeed, since the mid-1980s Hong Kong has been the largest source of foreign direct investment in China, and although the exact figures are impossible to determine, various statistical sources estimate that Hong Kong's contribution to realized foreign investment in China comprised by 1994 about two-thirds of the total (Berger and Lester 1997: 5). It is on this basis that Enright et al. accurately describe how Hong Kong's historical role as a city of departure from China has laid the foundation for a reverse flow of business investments during the 1990s not only back to Hong Kong, but also to Mainland China through Hong Kong. They claim that this has "helped Hong Kong become the de facto capital of the 50 million or more overseas Chinese who today play such an important role in the economic modernization of the Asian region and in the reconstruction of China's market economy" (Enright et al. 1997: 7).

The economic impact is considerable, since overseas Chinese investors—often Hong Kong companies or investors operating out of Hong Kong—now employ at least 10–11 million people in China. It is equally important that the migration of production facilities to the Pearl River Delta in many ways represented growth, rather than decline, in Hong Kong's engagement in manufacturing; for political reasons such growth was, however, categorized as outside the territory, even if it was, from a historical perspective, a reintegration into Chinese markets. This has also benefited the service industries in that most of the migration spurred further growth and increased the sophistication of producer business services (Tao and Wong 2002). In establishing and upgrading these networks, Hong Kong firms have exploited their traditional strategies of imitation and followership, while emphasizing the development of organizational know-how rather than formal research and development for new products. In summary, since the handover, Hong Kong and China—the Pearl River Delta in particular—have entered a phase during

which economic and political ties between the two have strengthened and the scope for collaborative innovation has widened.

Historically, Hong Kong government policy has revolved around the principle of what was called 'positive non-intervention', or *laissez-faire*, taken to mean that the function of the government is primarily that of creating the infrastructure to enable market opportunities to be exploited by entrepreneurs (Ma 2011). While some view this attitude as a myth, it largely held true until 1998 with respect to Hong Kong's innovation system, and it still appears to shape significant elements of the political context for industrial policy in the territory (Fuller 2010).

Our point of departure for this chapter is the premise that Hong Kong is now entering a new economic development phase in which it has to contend with the rising technological superiority of China, especially the rise in technological capabilities and sophistication of the Pearl River Delta region, with which Hong Kong enjoys close cultural and economic ties.

In light of the return of Hong Kong to Chinese sovereignty and the Asian financial crisis of the late 1990s, the territory must further leverage its unique position as a gateway that provides high-value-added services to global production chains linking China to global markets. This task requires an increase of the R&D intensity of many economic sectors and a strengthening of innovative activities in the private sector—all of which can be effectively aided by appropriate public-procurement policies. While the Hong Kong government has adopted a more proactive approach to maintaining and further developing its competitiveness, public procurement for innovation has not commanded nearly enough attention.

Because of Hong Kong's success in competing primarily on the basis of cost, actors in Hong Kong, including most notably the colonial government, historically have not thought of innovation as a means to enhancing economic development. In fact, Hong Kong's manufacturing firms can trace their origins to the opportunistic exploitation of a geographic land-space by Mainland Chinese immigrants, particularly textile barons from Shanghai (fleeing the Communist regime), who transferred start-up capital and managerial expertise to the colony from the 1950s through the 1970s (Wong 1988; Hollows 1999). These Shanghai industrialists concentrated on low-cost manufacturing in the labor-intensive textile and clothing industries and relied on the British trading houses in Hong Kong, with their established links with international export markets, to export their products globally (Tsui-Auch 1998: 9).

Technological sophistication had little to do with establishing Hong Kong's manufacturing firms. Over time, as these manufacturers began encountering labor-supply and space limits, they found an escape route with the opening up of China that began in 1979. Hong Kong's entrepreneurs, because of their unique linguistic and cultural familiarity with the Pearl River Delta region and the Guangdong province, could easily leverage the abundant labor and land resources there to offset the disadvantage of heightened labor costs, allowing them to continue their model of export-led growth that featured minimal investment in R&D. Meanwhile, a successful model of Chinese business was flourishing vigorously in Hong Kong while controlling a large manufacturing base in the Guangdong province.

This organizational model, featuring Chinese family businesses, superimposes a paternalistic management structure onto a network of social and economic relationships connecting firms of many sizes (Redding 1990). In establishing and upgrading their organizational model, Hong Kong firms exploited their traditional strategies of imitation and followership while emphasizing the development of organizational know-how rather than formal R&D for new product development. The bulk of R&D expenditure by private firms in Hong Kong is devoted to redesigning and improving existing products as well as to making them easier and cheaper to produce. In other words, process innovation has often taken precedence over product innovation in Hong Kong's industries.

Still, in spite of its reputation, Hong Kong has always controlled many crucial elements of the economy, including land supply, housing policy and exchange rates. In financial markets—an area that is vital to Hong Kong's economic wellbeing—the government has introduced increasingly strict regulation in response to the recent economic crisis without hindering the expansion of Hong Kong's role as a major international financial center (Goodstadt 2010). For example, Hong Kong has never allowed unrestricted allocation of land resources because the government has always monopolized land ownership and strictly limited the supply of land for sale. Moreover, that almost half of Hong Kong's population live in public housing built and administered by the Hong Kong Housing Authority (ironically advertised as the epitome of laissez-faire policy in Housing Authority documents) shows that the Government has occasionally been more than willing to interfere in a sector of vital public interest (Smart 2006). It is interesting to note that several decades of initiatives meant to privatize public housing have largely failed, and that the government seems to have at best a half-hearted interest in privatizing public housing, even if similar initiatives in other countries have proceeded at a steady pace (Ho 2004).

9.3 Public Procurement Overview

9.3.1 The World Trade Organization's Influence on Government Procurement

Under its procurement policy the HKSAR Government, when buying goods and services, is guided not directly by the light of innovation, or even by the need to promote innovation per se, but rather by the twin policy objectives of achieving best value for money and fair competition, irrespective of the impact on innovation. Rather than being guided by innovation, then, Government procurement is based on the principles of public accountability (to the legislature and to prospective suppliers), value-for-money (taking into account in its tender evaluation not only competitiveness in price but also compliance with users' requirements, the reliability of performance, whole-life costs, and after-sale support, where applicable), transparency (to encourage better understanding amongst suppliers

and contractors), and open and fair competition (all tenderers are provided with the same information as they prepare their bids).

On 20 May 1997, Hong Kong acceded to the World Trade Organization Agreement on Government Procurement (WTO GPA).[1] The key principles of the HKSAR guidelines on procurement adhere to the general spirit of the WTO GPA. According to the policy statement on the Government's official website, the administration is "committed to providing equal opportunities for domestic and foreign suppliers and service providers, participating or competing in Government procurement. This means that contracts for supplying goods or services to the Government of the Hong Kong Special Administrative Region are awarded through open, fair, competitive and transparent procedures. No favours. No discrimination" (Treasury Branch 2012).

The policy is further reinforced by the stipulations of the Basic Law of the Hong Kong Special Administrative Region of the People's Republic of China (Article 110) and the Public Finance Ordinance. The government procurement process is therefore governed by the Stores and Procurement Regulations issued by the Financial Secretary under the Public Finance Ordinance. These Regulations are supplemented by Financial Circulars issued by the Secretary for Financial Services and the Treasury from time to time. The procedures laid down in these Regulations and Circulars are fully consistent with the provisions of the WTO GPA. The Stores and Procurement Regulations cover all stores purchased or acquired on behalf of the Government, excluding land and buildings, as well as services performed by contractors for and on behalf of the Government, including construction work and engineering services.

Within this framework, government procurement exceeding HK$1.43 million in value for goods and general services and HK$4 million in value for construction work and engineering services is normally conducted through open and competitive tendering procedures so as to achieve best-value-for-money. Limited or restrictive tendering procedures are, in line with WTO GPA provisions, permissible only under specified exceptional circumstances. In cases in which the nature of a contract (such as one that is time critical or one that requires particularly high levels of skill and proven reliability) dictates that tenders must be invited from qualified suppliers/contractors, selective tendering or prequalified tendering may be used.

According to Hong Kong Census and Statistics Department data, the Government spent HK$142.924 billion on public procurement in 2009, representing 2.4 % of GDP, HK$146.966 billion in 2010, representing 2.8 % of GDP, and HK$149.553 billion in 2011, representing 1.8 % of GDP. Therefore, while the dollar sums spent on public procurement have been increasing in absolute numbers, as a proportion of Hong Kong's growing GDP public procurement has fluctuated and shown a net decrease. The main sectors involved in public

[1] Prior to joining the WTO GPA, Hong Kong had been a signatory to the Agreement on Government Procurement negotiated under the General Agreement on Tariffs and Trade (GATT).

procurement include the following: chemicals, electrical equipment, furniture, machinery, medical supplies, medicinal and pharmaceutical products, office equipment and computer hardware and software, paper and wood products, photographic and audio/video equipment, road vehicles, scientific and laboratory equipment, telecommunications equipment, and textiles and garments.

9.3.2 Main Administrator of the Government's Procurement Policy

The Government Logistics Department (GLD) is Hong Kong's central public procurement agent. The GLD maintains a stock of essential items which it pays for from an advance account in the first instance and then recovers the costs later from end-users (when they draw the goods from the GLD). The GLD also purchases, through allocated bulk contracts, a wide range of items commonly used by Government departments and many non-government organizations. User departments can draw their requirements directly from the contractors against the allocated bulk contracts on an as-and-when-required basis and pay for the stores from their own accounts. The GLD remains the contracting party and provides contract administration services throughout the contractual period. The GLD further acts as the purchasing agent for specific stores and equipment required by user departments and a few non-government organizations. User departments rely on the GLD for expertise in sourcing, tendering, negotiations, and contract administration. Goods purchased by the GLD on behalf of user departments vary widely, and include aircraft for the Government Flying Service, electronic parking devices for the Transport Department, arms and ammunition for the Police, chlorine for water treatment plants, and even gases for medical and industrial purposes.

Construction services are procured by individual works departments that operate under the general supervision of the Development Bureau. The Development Bureau gives general guidance and technical advice on tendering procedures. Finally, services procured by the Government also include financial and management consultancy services as well as other types of service contracts. Typical service contracts tendered by the Hong Kong Government apply to janitorial services, property management, management of parking meters, and the operation of transport and waste-management facilities.

9.3.3 Competition Policy

There is no international standard or consensus as to what is the best approach to achieve competitive advantage for enhancing economic efficiency and the free flow of trade. Many economies operate under competition laws, but they differ

widely in terms of scope of control, enforcement mechanisms and remedies. Other economies, meanwhile, are free of legislative influence altogether. Whether or not it makes sense to have a competition law depends heavily on the characteristics, development history, motives and socio-economic background of a given economy. For Hong Kong, a small, externally oriented economy, which is highly competitive and free, the Government has, for a long time, seen no need to enact an all-embracing competition law. That said, in order to maintain overall consistency in the application of its competition policy, the Government has provided, since 1998, an over-arching competition policy framework through its competition policy statement. That statement has been, until now, reinforced with sector-specific measures. A closer look at the Statement of Competition Policy (promulgated in May 1998) shows that the principles stated—minimizing interference with market mechanisms, maintaining a level playing field, fostering confidence in system fairness, and reducing uncertainty—are the underlying features of Hong Kong's general economic policy, whether or not competition is promoted or hindered. To that end, the principles embodied in the Statement and Hong Kong's approach towards anti-competitive practices in general should have no impact on public procurement for innovation. Even in terms of practices the Statement intends to restrict, it is clear that public procurement for innovation is minimally impacted. Among the business practices that the Statement suggests warrant further examination are price-fixing (increasing purchasing costs), bid-rigging, sales and production quotas (which increase costs and reduce choice and availability to purchasers, impairing the economic efficiency of free trade), joint boycotts (which deprive boycott targets of supply or choice), and unfair or discriminatory standards among members of a trade or professional body (which deny newcomers a chance to enter or contest in the market).

If innovative firms have been treated unfairly in competition for government procurement contracts, the Statement should protect them. Yet in practice it is not so much that the incumbents who typically receive government contracts play unfairly or overtly discriminate against smaller (or local) players, but rather that some combination of their size, track records and familiarity with government requirements means that newcomers find it difficult to make inroads into the public-procurement sector. Indeed the Statement clearly says as much: "the Government further recognizes that scale of operation or share of the market per se does not determine whether a business is anti-competitive or not. The determining factor is whether a business, through abusing its dominant market position, is limiting market accessibility and contestability and giving rise to economic inefficiency or obstruction of free trade to the detriment of the overall interest of Hong Kong. Each case has to be examined on its own". While all this may seem entirely fair and justified on paper, in practice public procurement for innovation is not promoted by the Government's competition policy. Nowhere does the pursuit of short-term economic efficiency—the overriding theme in the Government's stance towards competition—leave room for promoting innovation through public-procurement policies.

Since the formulation of the Statement, the Competition Policy Advisory Group (COMPAG) developed, in 2003, a set of guidelines to supplement the Statement in order to provide objective benchmarks and principles by which to assess Hong Kong's overall competitive environment, define and tackle anti-competitive practices, and ensure the consistent application of Hong Kong's competition policy across sectors.

9.4 Public Procurement and Innovation Policy

9.4.1 Drivers of and Obstacles to Integrating Innovation in Public Procurement

Two factors chiefly facilitate the development of public-procurement policies in Hong Kong. The first is the signing of closer economic partnership agreements with countries around the world. The first such closer economic partnership agreement was signed with New Zealand on 29 March 2010 and came into effect on 1 January 2011, further opening up the public procurement market for both Hong Kong and New Zealand. Such agreements set out Hong Kong's commitments on government procurement (which are generally consistent with those under WTO GPA).

The second, even more general, facilitator of public procurement in Hong Kong is the Independent Commission Against Corruption (ICAC). The ICAC was established on 15 February 1974, with the enactment of the Independent Commission Against Corruption Ordinance. The Commission is independent of the civil service, and the Commissioner is answerable directly to the Chief Executive of the HKSAR. The ICAC is committed to fighting corruption through a three-pronged strategy of effective law enforcement, education, and prevention to maintain Hong Kong's status as a fair and just society. The ICAC comprises three functional departments: Operations, Corruption Prevention and Community Relations. Within the Corruption Prevention department, the Commissioner has a statutory duty to examine the practices and procedures of government departments and public bodies and to secure the revision of methods of work or procedures, which may be conducive to corrupt practices. The ICAC conducts detailed studies of the practices and procedures of public-sector organizations and assists them in the effective implementation of corruption prevention measures. As of the end of 2010, nearly 3,400 reports had been issued by the ICAC. Of these, 72 were reported in 2010, with the reports covering areas such as law enforcement and public procurement. The ICAC ensures that public procurement policies in Hong Kong are fair, and that the policies are implemented without discrimination or the influence of corruption. The effect of the ICAC on integrating innovation in public procurement is that it facilitates public procurement insofar as it ensures that procurement is executed according to standard procedure, eliminating suspicion of bias or favoritism.

Ironically, some of the principles that guide the Government's procurement decisions (outlined earlier, in Sect. 9.3) hinder small and medium-sized enterprises (SMEs) from providing innovative solutions to the government. In particular, the Government's three principles of public accountability, value-for-money and open and fair competition place SMEs at a disadvantage in the competition for public-procurement contracts. The principle of being publicly accountable to the legislature and to prospective suppliers means that the Government is more likely than not to select providers of goods and services who can demonstrate a strong track record in their fields. Such a practice inherently discriminates against young, new and innovative enterprises which are unable to demonstrate a strong track record. Indeed, if such companies have just started their operations, they have no track record at all.

All of this conspires to favor large, well-established companies (which are more likely to be less innovative and more prone to organizational inertia). The principle of value-for-money has a similar impact because of its emphasis on the reliability of performance, whole-life costs, and after-sales support. Such features are often not demonstrable by younger, innovative companies that nevertheless may possess the capacity to meet the government's procurement demands. Furthermore, smaller enterprises are unlikely to possess in-house testing and manufacturing facilities that further raise the cost of producing their otherwise innovative products. Consequently, basing their tenders on price alone makes them less competitive as compared with larger, incumbent firms. Finally, the principle of open and fair competition, while laudable on paper, can in fact be a hindrance when it comes to nurturing local innovation and R&D. If Microsoft is treated on an equal footing as a newly emerging software startup entrepreneur in Hong Kong, it is easy for the larger, international player to command a greater market share (at the expense of the local enterprise) even though the spillovers of selecting the local enterprise may be far greater and the positive knock-on effect incalculable if the local company is chosen in favor of the international player.

9.4.2 Recent Initiatives to Promote Innovation Through Procurement

The Hong Kong government's interpretation of the WTO GPA approach has often tended to emphasize the concept of "best value for money" to the degree that there exists a perception among suppliers that the procedures do not favor innovative solutions. For example, a survey of ICT-sector firms conducted in 2007 by a member of the Legislative Council in Hong Kong indicated that almost 40 % of respondents disagreed or strongly disagreed with the statement "Do you agree that sufficient emphasis is placed on bidders' innovativeness for SOA-QPS tender contracts?" (Industry Survey… 2007).

This is a problem for innovation that is further compounded insofar as nearly all R&D projects that Hong Kong funds through such instruments as the ITF are designed to bring technology only to a pre-commercial stage—with the expectation that the technology would easily be licensed to local or overseas industries for commercialization. Under such circumstances, innovations funded by Government have seldom reached a state at which they represent "proven" technologies, let alone the lowest-priced alternative. The Innovation and Technology Commission has therefore attempted to support the commercialization of technologies developed in Hong Kong by various means, for instance by encouraging industry co-funding of R&D projects (either 10 % or 50 %). But the most significant initiative, which resembles instruments employed for procurement for innovation in other countries, is the "Public Sector Trial Scheme" launched by the ITF in 2012. This scheme aims to provide "follow-on" funding support for trials in public agencies of technology that has recently been developed under an ITF project grant. The ITF will then provide a further sum (equivalent to a maximum of 30 % of the original ITF grant) for prototype production and trial. The criteria for applications include the following: the applicant should either be a designated public research institute which has undertaken the ITF R&D project, or the company owning the intellectual property of project deliverables (Guide to … 2012). Applicants for this type of support should also attach a letter indicating that they have already obtained the approval and support of a public-sector organization—a government department or an organization such as the Mass Transit Railway (MTR) or the Hospital Authority. However, trials may also be conducted with a public-sector organization outside Hong Kong.

The Scheme has been in operation for only a few years, so it is difficult to assess its overall impact on the diffusion of innovative technologies. But the Innovation and Technology Commission has listed three areas in which procurement procedures appear to have been successful in promoting innovation: LED traffic lights, e-learning pilot schemes, and developing radio-frequency identification (RFID) technology. In the case of replacement of road traffic signals with LED traffic lights by the Transport Department, the procedures of prequalification and tender were explicitly utilized to engage suppliers through the collaborative development of technical specifications for LED traffic-signal equipment, in view of the upcoming LED traffic-light retrofit project. Thus, "[s]uppliers needed to invest considerable amount of resources in order to enter the market. They had to modify their products so that these were compatible with existing traffic signal equipment in Hong Kong. These technical modifications dealt with elements such as the number and layout of LED bulbs on the Printed Circuit Board, filters and reflectors design, control circuit adjustments to meet day and dim mode requirements as well as power consumption requirements and fault detection functions of the traffic controllers. Suppliers took generally between 9 months to one year to go through the modification and pre-qualification process." (UNEP 2012: 33).

The Government has also promoted the development and use of RFID systems for workplace automation and operational efficiency at the Customs & Excise Department, the Correctional Services Department and Radio Television Hong

Kong. In addition, a range of technologies have been tested for the Hospital Authority and the Hong Kong Council of Social Service, such as a handy device that community nurses use when on home visits and an RFID Tags and Management System for tracking newborn babies in hospital.

9.4.3 A Successful Case Study of Procurement for Innovation: Octopus Cards

One of the most prominent examples of innovation grounded in public procurement in Hong Kong is the development and diffusion of the Octopus card system. The Octopus card is a rechargeable, contactless stored-value smart card that is used by 95 % of people in Hong Kong aged 16 to 65 for traveling, shopping and dining without the inconvenience of coins. It has become the world's busiest smart-card system for payment of transportation and other costs, with the system handling over 11 million transactions a day, valued at over HK$110 million (Octopus Holdings Limited 2012). The system has evolved into a business that facilitates monetary transactions not only for public transportation but also for retail sales and services, self-service facilities like vending machines, and access control systems in schools and residential blocks.

The development of the Octopus card was initiated by the MTRC in 1992. The MTRC was a public corporation owned by the Government (subsequently privatized in October 2000 with its listing on the Hong Kong Stock Exchange, but with a majority of shares still held by the Government), which operated a network of underground and aboveground urban rail lines in Hong Kong. It had already implemented a system of recirculated magnetic plastic cards for pre-payment of tickets on the MTR lines, including a stored-value card to which it was possible for customers to add value. However, the study undertaken in 1992 indicated that a contactless smart card would provide an appropriate platform for convenient and effective payment of transport fees. The emerging technology of RFID chips and the promise of smart-card systems (which had been successfully tested technically in otherwise unsuccessful attempts by banks and credit-card agencies to use contactless cards for payment transactions) provided the impetus to develop a new, dedicated card system for public transportation.

In order to implement the development and procurement of the new smart card, the MTRC persuaded a range of public and private transport operators in 1994 to form a joint-venture company, Creative Star Limited, which became responsible for awarding development contracts and subsequently the operation of the Octopus system. The five transport operators that joined this venture were the MTRC, the Kowloon-Canton Railway Corporation, the Kowloon Motor Bus Company, Citybus, and New World First Bus. The first two were corporations owned by the Government, while the last three are private firms. From the beginning, this project

was thus a public–private partnership in which the government was active in promoting the development and use of a new technology (Taraszkiewicz 2009).

Creative Star Limited, which was renamed Octopus Card Limited in 2002, issued a contract valued at US$55 million for the development of the system to the Australian firm ERG Limited, a company that designs and implements integrated automated fare-collection systems, now owned by VIX Technology. ERG Limited software engineers cooperated closely with engineers from Hong Kong transport corporations in designing the physical and software dimensions of the system (Li 2008). These tasks included the design of the smart card, card readers, add-value machines and the information and communications system that runs the service on a computer center and a clearing-house system. The contract for the production of the Octopus smart cards that contained the integrated circuits was subsequently awarded to Sony and Mitsubishi Corporation (Chau and Poon 2003). The system underwent extensive development and testing during a three-year period and was finally launched in September 1997, with 3.5 million cards prepared for the initial launch.

It is interesting to note that the MTRC—at that time wholly owned by the Hong Kong Government—ensured that there would be a major captive market for the card from the moment it was launched. On the one hand, the cost of car ownership in Hong Kong is so high that the vast majority of the population relies on public transportation to get to work. On the other hand, the MTRC created demand by mandating that all current holders of magnetic-strip stored-value cards, which had grown significantly in popularity, had to exchange their current magnetic-strip cards for new Octopus smart cards within a window of a few months. This direct-conversion approach left regular users with no alternative but to buy a new card quickly; however, the approach also happened to create a run on the cards since many people wished to own several cards (Chau and Poon 2003). The card also became extremely popular because it could be utilized on trains as well as other forms of public transport such as busses and ferries (it is not uncommon for many in Hong Kong to complete a trip by travelling on a combination of public-transport services such as bus and MTR). Because it is contactless, the card reduced the time taken to enter the MTR railway stations significantly and thus facilitated the flow of passengers, which was especially evident during rush hours.

Needless to say, the Octopus card's introduction led to considerable savings in transaction costs for the transport companies, since 60 tonnes of coins were previously collected and counted on a daily basis, which represented as much as 0.8 % of company revenue. Without the presence of a major captive market in the early stages of the use of the card, it is doubtful that a consumer base large enough for the convenience of the cards to have such an impact, much less for the benefits to extend beyond the MTRC, would have been attained by any other service provider—public or private.

After its initial success as a transportation-fee payment option, Octopus Holdings Limited has sought to extend the range of services offered, moving into the business of micro-payments and identity cards. It secured a license to operate as a deposit-taking company (more or less equivalent to banking) from the Hong

Kong Monetary Authority in 2000, installed Octopus readers in more than 10,000 retail outlets from over 4,000 service providers—representing a wide range of sectors such as fast-food chains and restaurants, convenience shops and supermarkets—and thus became a payment intermediary for a wide range of transactions. The company has also developed an automatic recharge system linked to bank or credit-card accounts, which provides a safe option for the convenience of adding up to HK$250 from such accounts if the amount on a card runs into debit. In other words, the Octopus card is becoming an extremely popular version of an e-cash system—in a market in which other major e-payment operators such as Mondex and Visa Cash have struggled to reach a significant customer base.

While the innovativeness of the Octopus smart card was firmly grounded in public-procurement efforts, its subsequent diffusion can be attributed to the benefits of its being appreciated by consumers, which in turn has led to other public and private service providers joining into offer their services with payments made via the card. Octopus-related innovations have included not merely the technical artifacts of cards and readers but also the development and diffusion of an advanced information and communication system to support safe and rapid payment transactions. The search for innovation has extended to business models that have fundamentally altered the micro-payment environment for consumers in Hong Kong. The Octopus card is, for instance, increasingly used for identification purposes and selective-access systems. Several major hotels issue Octopus cards that are not only coded as keys for entry to hotel rooms, but which also carry a small sum making it ready for use (and re-charging) on transportation lines and in micro-payment shops. The gradual evolution of the Octopus system and its usage is depicted in Fig. 9.1.

Equally noteworthy is that these innovations have led to a new sector for the export of services from Hong Kong. Since 2003, Octopus has successfully assisted relevant authorities in The Netherlands and Dubai to develop and implement smart-card systems. Octopus is also helping transportation authorities in Auckland, New Zealand, build a multi-modal ticketing system for public transport.

Another possible consequence of the success of the Octopus system is that innovation of a range of logistic systems using RFID technology has become extremely popular in both public and private organizations in Hong Kong. Thus the Hong Kong Hospital Authority decided in 2007 to test a system using RFID technology as a means for facilitating asset tracking and management of medical devices at the point of care, in order to improve patient safety and service quality. The project helped design three systems for trials using mostly mature RFID technology:

- Passive RFID to further facilitate stocktaking of equipment in operation theatres
- Active RFID to enable real-time tracking of medical devices in wards
- Active RFID to streamline the capturing and reporting of high-value assets in hospitals

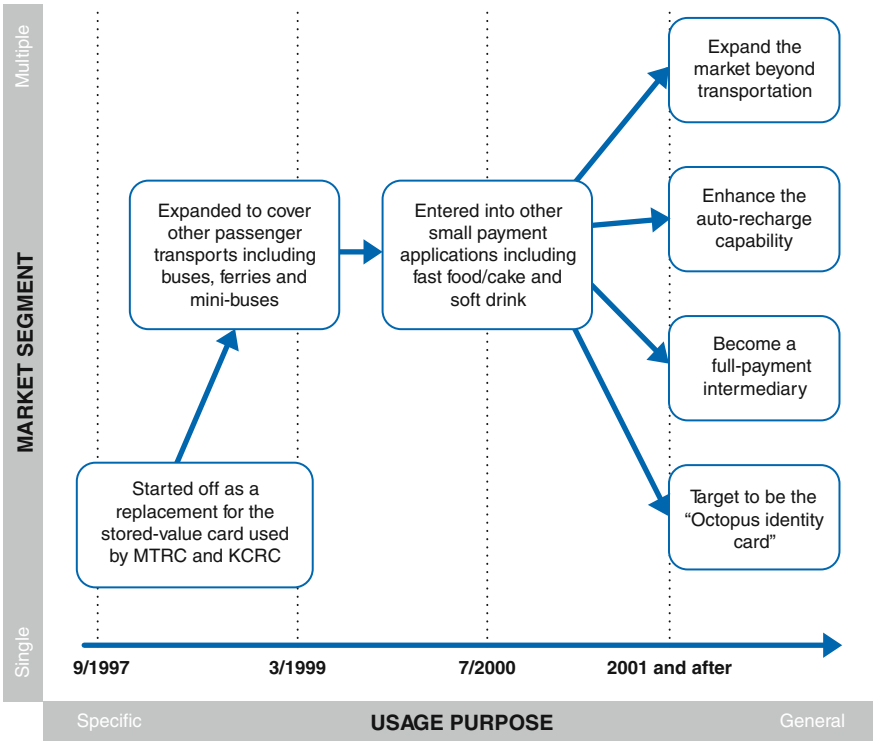

Fig. 9.1 A Chronology of the Development of Octopus Services. (Chau and Poon 2003)

An evaluation of the active RFID system used in wards indicated that a nurse would need only 12 s to locate a tagged medical device on the ward, as compared to between half an hour and several hours or even days of searching the paper-record system or searching for the equipment by physically moving through the ward. Active RFID was also preferred for its proven user-friendliness and tag capability (Hong Kong Hospital Authority 2010).

9.5 Lessons and Future Developments

Given the context of the prevailing ideology that informs policies for innovation and procurement in Hong Kong, it is difficult to imagine that government procurement will be re-designed to encourage innovation in the near future. It is possible to designate this state of affairs as a "no policy" scenario, but to some extent this misrepresents the situation because there are plenty of policy statements that define the scope of support for innovation and procurement—it is just that these policies explicitly focus on institutions and instruments that are designed to

support the *supply* of innovation and the most competitive bids for procurement. For example, most Innovation and Technology Commission programs designed to support innovation are directed towards funding of R&D projects that are considered to be of particular potential benefit to Hong Kong, thus supplying technologies or other intellectual property for private or public organizations to implement; the demand arises primarily from the advice received from academic and private industry representatives in committees or R&D center boards that select projects for funding.

In this sense, the funding of application-oriented R&D by the ITF represents "procurement" of innovative technologies, even if these technologies are expected to be commercialized by private firms. The government is also funding the development of infrastructure—physical infrastructure as well as consultancy services—for the commercialization of innovations in incubation facilities or high-tech industrial estates, such as the Hong Kong Science and Technology Park (Sharif and Baark 2011). In the case of the Digital 21 Strategy, a program specifically set up to enhance Hong Kong's development on the information and communications technology (ICT) front, ostensibly catering to the evolving needs of the Government, businesses and the general public, and sustaining Hong Kong's strengths as one of the world's most competitive economies, key statements mention innovation only in terms of "leveraging our technology infrastructure" and "continued investment in R&D".[2] The procurement of ICT services by the Government is part of an overall initiative that is intended to enhance the development of cyber services (Zhao 2011), and annual government expenditures on ITC have grown from HK$910 million in 1993–1994 to HK$4,729 million in 2011–2012. Nevertheless, the guidelines for government ICT-industry support remains focused on reliable outsourcing of services, promotion of Hong Kong as a data-center hub, and providing funding and infrastructure, without explicit objectives related to the promotion of innovation (Office of the Government Chief Information Officer 2012).

In contrast, public procurement for innovation would normally rely on measures designed to support *demand* for innovation and long-term benefits derived from public expenditures. The absence of such policies in Hong Kong does not preclude public organizations from becoming actively engaged in support of innovation, as the example of the Octopus card demonstrates. The point is, rather, that such examples represent cases that exist in a "grey zone" where the influence of government policies is diluted because semi-public organizations like the MTR have greater freedom to pursue their goals for technological development and improvement of services. Several other semi-public organizations in Hong Kong have been quite strongly committed to implementing the best technology available and even promote innovative solutions. In addition to the MTR, the Hong Kong International Airport Authority has also participated in the early design and

[2] The Digital 21 Strategy was launched by the HKSAR Government in 1998 and has been updated in 2001, 2004 and most recently in 2008. See Hong Kong SAR 2012.

piloting of systems using RFID tags for baggage, which has led to important manpower savings, productivity improvements and overall service enhancement (Nguyen 2009).

In the future, it is likely that public organizations such as the MTR and the Hong Kong International Airport will continue to explore innovative solutions to enhance their services, and universities and research institutes will continue to pursue R&D with public support to generate innovation. It is difficult to determine, without counterfactual evidence, whether current Government policies discourage, or at least fail to encourage, innovation through public agency. However, the cases discussed in this chapter indicate that there is a clear potential for innovations, providing extensive externalities that bring economic benefits and strengthen technological capabilities and competitiveness, undertaken through procurement by public organizations. In our view, the lack of explicit policies and support for such innovation is likely to represent lost opportunities for strengthening Hong Kong's industries and services.

9.6 Conclusion

The preceding discussion shows that the policy environment for innovation and the professed laissez-faire ideology permeating the Government have provided limited scope for utilizing public-procurement policies designed to stimulate innovation. Hong Kong has not explicitly employed such procurement policies to create demand-side incentives for innovation among firms in Hong Kong (or elsewhere, for that matter).

Nevertheless, some public organizations have used innovation to improve services and operational efficiency, and thus (inadvertently) launched projects that required innovation in both technology and management. In many of these cases a strong hand in demand management was necessary for successful implementation. The case of the Octopus project demonstrates several interesting and successful aspects of innovation supported by public procurement. Moreover, the project has led to a diversification of services that has generated its own commercial momentum in Hong Kong and overseas, where innovation has enjoyed sustained success. Projects undertaken by the Hong Kong Hospital Authority employ similar technologies—partly with support from a scheme designed by the ITF to support pilot prototype production and testing—although these initiatives operate on a decidedly smaller scale than that of the Octopus card.

We conclude then by arguing that public procurement to support innovation can be successful in Hong Kong, and it is a pity that the Hong Kong Government so easily ignores the obvious advantages that such demand management could provide in many similar areas and economic sectors.

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Chapter 10
Korea

Public Procurement for Innovation Policy: Korean Experience

Dae-In Kim

Abstract Korea has been characterized as a developmental state with a strong emphasis on industrial policy. After achieving basic levels of economic development, Korea adapted and shifted its attention from industrial policy towards innovation and competition policy in the early 1980s. However, the developmental state tradition remained in various ways, and public procurement for innovation (PPfI) is evident in this context. PPfI is actively implemented particularly in the green industry, and shows the manner in which industrial policy and innovation policy are interconnected. The 'New Technology Products Program' was actively executed in Korea. However, critics argue that this program was more focused on protecting Small and Medium Enterprises (SMEs) rather than strengthening their innovation as such. Separately, despite its potential as a PPfI tool, alternative bidding or design-build bidding was not widely used due to a lack of efficiency and transparency in these procedures. The Korean cases indicate that various objectives of public procurement, such as transparency or short-term efficiency, should be balanced with PPfI policy and a strategic approach to the World Trade Organization's Government Procurement Agreement (WTO GPA).

10.1 Introduction

The Republic of Korea (hereinafter Korea) was renowned for its rapid economic growth and development in the previous five decades. In 1960, Korea's per-capita income was a paltry 1,342 USD, which grew to 19,227 USD in 2008. (Sakong and Koh 2010: 2) Although there are many debates on the factors that led to the success of Korea's rapid economic growth, many researchers have pointed to the

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strong Korean national innovation system (NIS) as one of the important factors (Bartzokas 2008: 5; World Bank 2006: 19). The examples of innovation-policy instruments used included tax incentives, loans, procurement, human-resources development, R&D subsidies and technology information. Among these tools, public procurement has gained more importance recently, because it is viewed as a useful 'demand side' tool for innovation. In this context, this chapter identifies some factors that stimulated and facilitated Korean industries to engage so actively in research and development (R&D) and the role of public procurement in the process. The chapter discusses these issues, with a view to drawing some lessons from the Korean experience.

10.2 Innovation-Related Country Background Information

10.2.1 Characteristics of Socio-Economic Environment

A basic characterization of Korea's economy will set the scene for further discussions.

First, government played a critical role in the economic development process. Korea established the '5 Year Economic Development Plan' in 1962, deploying industrial policies and with active involvement in the economy. And it is due to this that the Korean government has been categorized as a 'developmental state', and this state-driven economic development model has subsequently been called the 'East Asian Model' (Chang 2006: 18). The government's innovation policy can be better understood in this developmental context. This matter will be discussed further in Sect. 10.2.2.

Second, Korea's economy is heavily dependent on trade. In 2007, exports accounted for 45.6 % of GDP, while imports corresponded to 44.8 % of GDP in Korea. (Sakong and Koh 2010: 153) As Korea has few natural resources, the country depends upon imports of energy and raw materials. With the limited size of the national or domestic market, Korea was obliged to find markets in foreign countries.

Korea pursued an export-driven economic policy. At a certain level of economic development, Korea actively concluded free-trade agreements (FTA) with various countries, such as the USA (2010), the European Union (2010), Singapore (2004), Chile (2004) and so on. These FTAs include provisions on government procurement. Korea also joined the plurilateral World Trade Organization's (WTO) Government Procurement Agreement (GPA) in 1994. With these bilateral and other agreements, the expectation was that Korea would increase its access to foreign government procurement markets. Meanwhile, in exchange for access to foreign markets (and because of a non-discrimination doctrine which is applied according to these treaties), in these agreements Korea has limited its policy space

to use various socio-economic policies through government procurement such as set-asides for domestic firms (Kattel and Lember 2010: 369).

However, there are exclusion clauses for SMEs-related direct-contracting (sole-source contracting) or set-asides in Korea's annexes in WTO GPA. Nowadays many socio-economic policies conducted through government procurement are related to SME policy.

10.2.2 Politico-Administrative Regime and Structure

The relationship between developmental state and public procurement needs to be further elaborated. Chalmers Johnson indicated that the existence of a 'pilot agency' was a phenomenon characteristic of a developmental state; the Ministry of International Trade and Industry (MITI) in Japan was a typical reference in the discourse (Johnson 1982: 157). The Economic Planning Board (EPB) played a similar role in Korea.

The coordinating role of pilot agencies, originally the EPB and currently the Ministry of Strategy and Finance (MOSF), has been changed according to each stage of Korean developmental history. The EPB, in its formative years, was powerfully charged with the policy-coordinating role in Korea. However, this dominating role within government reduced incrementally over time, and nowadays there is competition among various ministries. But this coordination tradition still remains, and the MOSF can be evaluated as the most powerful ministry within the government even today. This is the reason why the brightest students who pass the high official exam, which is called 'Haengsi', aspire to enter into MOSF.

Public Procurement Service (PPS), which is the centralized procurement agency in Korea, has a close relationship with EPB, now MOSF. PPS has been officially affiliated to EPB (MOSF), and in many cases, high officials in EPB (MOSF) held the presidency of PPS. MOSF usually establishes the public-procurement policy, which is then executed by the PPS. In this context, public procurement in Korea tends to reflect industrial policy, which is conducted by MOSF.

Peter Evans, a developmental state theorist, explains that 'embedded autonomy' is a crucial point which differentiates 'developmental state' from 'predatory state'. In a developmental state, the state manages economic policy based on the autonomy of bureaucracy, but this autonomy is not conducted in isolation but in close relationship with society. Korea has been judged as a typical example of this 'embedded autonomy' (Evans 1995: 58).

However, as Evans puts it, this embeddedness only occurred between public officials and a small group of large enterprises' managers. Critics point out that voices of workers or SMEs were not well reflected in the economic policy of the government. With enhanced democratization in Korea, there are high expectations for wider participation of workers and citizens.

From the 'embedded autonomy' perspective, public procurement in Korea can be evaluated as contributing to widening the scope of dialogue. Not only large

companies, the so-called 'Chaebol', but also SMEs have many opportunities of participating in public-procurement policy dialogues. However, there are also critics of this close relationship between government and SMEs in public procurement. Details on this matter will be dealt with in Sect. 10.3.3.

The current Constitution, which was adopted in 1987, represents a full-fledged democracy. The Constitution institutionalizes the curtailment of presidential powers, strengthens the power of the legislature and provides additional clauses for the protection of human rights. In particular, the Constitution created an independent Constitutional Court, and this Court is playing a vital role in making Korea a more democratic and free society.

This active role of the Constitutional Court has also directly influenced public procurement. For example, some parts of the debarment clause in the 'Act on the Contracts in which the State is a Party' were confirmed unconstitutional by the Constitutional Court in 2005.[1] This shows that government-policy tools through public-procurement law can now be checked by the Constitutional Court.

10.2.3 Characteristics of National Innovation Policy

The Korean Science and Technology (S&T) policy was initiated in 1966 with the establishment of the first government-research institute (GRI), the Korea Institute of Science and Technology (KIST), and the formation of the Ministry of Science and Technology (MOST). In the 1970s, several more GRIs were established and S&T Promotion laws were enacted. This period is characterized as the 'imitation' phase of its development, with Korea establishing an S&T system to catch up with foreign technologies (OECD 2009: 173).

Government R&D investments have increased significantly since the early 1980s, when Korea's S&T policy shifted its focus from technology learning to technology development, which was the so-called phase of 'imitation to innovation' (Kim 1997: 85). The Ministry of Science and Technology launched the National R&D Program in 1982, and other ministries also initiated R&D programs. The Ministry of Commerce and Industry introduced the Energy Industrial Base Technology Development Program, and the Ministry of Information and Communication launched the Information and Communication Technology Development Program. These programs strengthened industrial R&D by providing private industries with opportunities to cooperate with the public sector. The public-procurement program was introduced in 1981 to promote demand for new technology products developed by SMEs (Chung 2011: 338–339).

The main features of the innovation policy portfolio are summarized in Table 10.1.

[1] The Constitutional Court of Korea, Hun-Ka1, 30 June, 2005.

Table 10.1 Korea's innovation policy portfolio (Bartzokas 2008: 15)

	National R&D programs	Infrastructure and diffusion	Institutional support	Incentives
Objectives	To develop core industrial technologies	To enhance intermediary functions and to fill the gaps among innovation actors	To nurture GRI and to strengthen GRI's research capabilities	To induce or assist private enterprises' technology-development activities
Tools	Ministries' R&D program	Research personnel, technical information, cooperative R&D facilities, regional R&D centers, spin-offs, etc	Funding for GRI's operational expenses and basic research	Tax exemptions, financial support, subsidy for technology development
Effects on industry	To expand knowledge and the technology pool for industrial use	To facilitate diffusion and to make better industry use of technologies	To bring up helpers or partners for industry's technology development	To strengthen industry's own technological capabilities

10.3 Public-Procurement Overview

10.3.1 Regulation of Public Procurement

Korea's basic laws related to government procurement are (1) the 'Act on the Government Procurement Program' (GPPA), (2) the 'Act on Contracts in Which the State is a Party', which is usually called 'Central Government Contracts Act' (CGCA), and (3) the 'Act on Contracts in Which a Local Government is a Party', which is usually called the 'Local Government Contracts Act' (LGCA), and the Enforcement Decrees and the Enforcement Rules of these acts.

The main act, the GPPA, regulates the structure and role of Public Procurement Service (PPS). E-Procurement was managed based on this Act. Methods and procedures for procurement contracts were regulated mostly by CGCA and LGCA. As controlling budgets was crucial in public procurement, this area was traditionally dealt with by public-finance law. For this reason government contracts were provided in the 'Government Budget and Accounting Act' and the 'Local Government Finance Act'. However, nowadays government contracts are provided in individual statutes, separate from these Acts.

The 'Act on Contracts in which the State is a Party' (CGCA) was enacted in 1995, and the 'Act on Contracts in which a Local Government is a Party' (LGCA) was enacted in 2005 (Kim 2006: 79–80).

The influence of the WTO Government Procurement Agreement (GPA) was instrumental in enacting CGCA. Korea tried to join GPA three times during the Tokyo Round, but failed due to developed nations' discontent with the Korean government's annexes, which contained limits on its commitments under the agreement. Korea managed to enter GPA in 1994 during the Uruguay Round. After joining this agreement, CGCA was enacted in 1995 (Kim 2006: 80).

Even after the enactment of CGCA, procurement of local government was still regulated by the 'Local Government Finance Law', which provided that CGCA is applied to the local-government contract with some modifications. Thus, local-government procurement law, in this period, was dependent on central-government procurement law. But as the experience of local-government autonomy deepened, the need for statutes appropriate to local government was raised, culminating in the LGCA enacted separately from the Local Government Finance Law in 2005.

10.3.2 Public-Sector Structure Related to Government Procurement

The Korean procurement system is characterized by a highly centralized procurement system, managed by the Public Procurement Service (PPS). PPS conducts contracting activities for other central or local government agencies. The size of the Korean public-procurement market was 87 billion USD in 2011, equivalent to 8 % of GDP. PPS deals with 30 billion USD, i.e. 35 % of the overall Korean public-procurement market.

The history of PPS is representative of Korean public-procurement history. Soon after the establishment of the Korean government the PPS was created on 17 January 1949 under the office of the Prime Minister. At the time of its establishment, it was named the Provisional Office of Foreign Supply (POFS), and its primary responsibility was to manage foreign-aid supplies. The POFS was a partner of the USA's Economic Cooperation Administration, and contributed to the rehabilitation of the Korean economy and revival of its industries in its early days by managing foreign-aid supplies and collecting payments (Public Procurement Service 2008b: 85–86). This highlights the point that that the creation of the PPS was closely related to economic-development policy using foreign aid.

POFS was consolidated with the Office of Foreign Procurement, and was renamed Office of Foreign Supply. On 2 October 1961, it was expanded to include domestic procurement and public-works contract in its capacity, becoming a central procuring agency attached to EPB. Since then, it has procured vast amounts of goods necessary for the implementation of the government's economic development programs without impediments. It also fulfilled the efficient use of limited financial resources. Indeed, it efficiently coordinated infrastructural development, which acted as a driving force of Korea's rapid economic growth. For example, the

Kyungbu highway, which connects the nations' two largest cities (Seoul and Busan), was constructed between 1968 and 1970 with contract management by PPS. In 1967, PPS took on a new function of stabilizing supply and demand, and prices for major foreign raw materials and basic necessities. With these functions in place, PPS was able to help stabilize the national economy during the international resources crisis of the late 1970s and during the 1997 Asian currency crisis (Public Procurement Service 2008b: 184–185, 228).

Although the 'centralization tendency' has been dominant traditionally, the 'decentralization tendency' has been gradually increasing with strengthened 'local government autonomy' recently (Public Procurement Service 2008b: 13). In this context, many contracting powers of PPS were transferred to local governments with the enactment of LGCA. It was pointed out that if decentralized procurement was successfully established, strengthening the expertise of local-government officers in charge of contracts would be urgently required (Kim et al. 2010: 49).

At the same time, the opposite is also evidenced, that is, 'reinforcing centralization tendency'. In the case of public institutions such as public enterprises or quasi-government organizations, control by central government agencies over these organizations is increasing through the implementation of the 'Enforcement Decree concerning the Operation of Public Enterprises and Quasi-Government Entities' Contracts'. And Local governments are actively involved in the PPS-built e-procurement system (KONEPS) as customers (ibid.).

10.3.3 General Characteristics of Public-Procurement Practice

10.3.3.1 E-Procurement

All PPS contracts are conducted through an e-procurement system. Korea's e-procurement system is evaluated as one of the most advanced worldwide (European Commission 2012: 2). The Korea On-Line E-Procurement System (KONEPS) was established in 2002. Through KONEPS, the entire procurement procedures from tender notice, awarding and contracting to payment are all conducted online. Due to the data exchange linkage with the central-government agency system, KONEPS eliminated the need for the submission of paper documents such as business registration certificates and tax payment certificates. Through the linkage with industry associations, KONEPS also automatically collected information on the bidder for qualification assessment (Public Procurement Service 2008a: 23–24).

The Multiple Award Schedule (MAS) is actively executed in KONEPS shopping mall. The MAS system has been benchmarked from the MAS of the United States and the 'Framework Agreement' in the European Union. There are two stages in MAS contracting. The first stage is enrolling to MAS schedule in

Table 10.2 Contracting method used in PPS

	2007	2008	2009	2010	2011
Open competition (%)	123,762 (42.6)	100,710 (33.1)	121,221 (27.1)	97,664 (25.4)	93,229 (27.4)
Selective competition (%)	385 (0.1)	383 (0.1)	116 (0.0)	366 (0.1)	339 (0.1)
Limited competition (%)	129,060 (44.4)	161,347 (53.0)	269,962 (60.3)	243,204 (63.4)	207,565 (61.0)
Direct contracting (%)	37,349 (12.9)	42,042 (13.8)	56,576 (12.6)	42,587 (11.1)	39,094 (11.5)
Total (%)	290,556 (100.0)	304,482 (100.0)	447,875 (100.0)	383,765 (100.0)	340,210 (100.0)

Unit: KRW 100 million
Public procurement service website www.pps.go.kr

PPS, and the second stage is ordering from custom agencies (Enforcement Decree of the Government Procurement Act Article 7-2). Critics point to a lack of competition in the second stage. Second-stage competition was introduced recently relating to contracts of an amount above a certain threshold (KRW 50 Million).

10.3.3.2 Contracting Type

With regard to domestic contracting, there are four types: Open-competition bidding, limited-competition bidding, selective-competition bidding and direct contracting (CGPA Article 7, LGPA Article 9). For international tendering, there are three types: Open-competition bidding, selective-competition bidding and single-source contract bidding (Special Decree Article 7). This was stipulated in conformity with the WTO GPA. Open-competition bidding is the principal method used. This regulation shows that enhancing transparency and competition is the basic principle in public procurement. Table 10.2 shows the current status of contracting methods in PPS in terms of value and percentages of the total.

The table shows that the ratio of open competition was decreasing, while the limited competition increased. Superficially, this might give the impression that overall transparency and competition were decreasing; however, this needed to be interpreted more carefully.

In Korea, many experts comment that transparency should be balanced with efficiency and value for money. Open competition has merits in mainly enhancing transparency. However, this contracting method has been assessed to be very costly and inefficient. That explains the decreasing tendency of open competition.

On the other hand, the increasing use of limited competition was explained by two elements. First, workable competition between qualified competitors was emphasized for efficiency and value for money. In other words, the quality of competitors making bids rather than the number of competitors was emphasized.

Second, limited competition was widely used for socio-economic objectives. For example, competition among SMEs is widely used in a limited-competition method. In this kind of tendering, only SMEs can be qualified as competitors. With this method, the dual objectives of strengthening SMEs and enhancing transparency was pursued together.

Direct contracting was also used for various socio-economic objectives. Contracting with veterans or welfare associations is conducted through this means. 'Excellent Quality Product', which is a typical example of PPfI, can also be purchased through the direct-contracting method (see Sect. 10.4.1).

10.3.3.3 SME Policy

SME policy through public procurement needs to be explained, because PPfI policy is interconnected with SME policy in Korea. The fostering of SMEs became a nation-wide policy in order to achieve the objectives of the first 5-year economic development plan of 1962. On 27 August 1964, the government announced its intention to give priority to various levels of SME federations established under the 'Small and Medium Enterprises Federation Act'.

Article 108 of the Enforcement Decree of the Public Budget and Accounting Act, as revised on 19 July 1965, recognized that if a product was produced by a member of the SME federation and meets inspection conditions under the provisions of the 'Small and Medium Enterprises Federation Act', the product may be procured through a direct contract with the 'SME federation'. Such a 'Direct Contracting with Federation System' may be considered a good example of public-procurement contracts as used positively for industrial policy (Kim et al. 2010: 25–26).

However, the 'Direct Contracting with Federation System' was criticized for many reasons. Rather than fostering small and medium enterprises, this system was dominated by a few enterprises powerful in the federation, and therefore it did not give rise to innovation in SME. This resulted in many problems, such as weakening of competitiveness, barriers to entry in the government-procurement market for new technology products, unfair allocation, tie-in allocation, delivery of contract products by subcontractors and illegal lending of company names (to secure contracts). Accordingly, in December 2004 the decision was made to completely abolish this system, which was done gradually. By January 2007 it was completely eliminated. To mitigate the shock felt with the abolition of group direct contracting and to foster small and medium enterprises, 226 items were designated as goods for 'Competition among SMEs' restricted to SME bidding (Kim et al. 2010: 37).

Elimination of the 'Direct Contracting with Federation System' was not intended directly to foster innovation. However, this elimination may have contributed to fostering innovation of SMEs indirectly by strengthening competition.

10.4 Public-Procurement Policy and Innovation

Table 10.3 shows industrial R&D and innovation Support Programs in 2005. In this table, the portion of public procurement covered is very limited (0.8 %). This data may give the mistaken impression that public procurement does not play a major role in supporting industrial R&D and innovation. However, 'Procurement' in this table indicates the specific innovation-targeted procurement. Many other SME innovation-related regimes or R&D activities which were supported by subsidies in the initial stage and turned into public procurement in the later stage were not reflected in this table.

In addition to specific innovation-targeted programs, there are many initiatives where preference for certain innovation-led products was widely used. The New Technology Products Program and the Green Growth Program are good examples of this. In the EU, the preference for certain products is strictly limited as this system can prevent competition in the EU internal market. Korea does not have such obligations excluding those imposed by WTO GPA. This different legal situation allows Korea more latitude to use a preference system for PPfI.

10.4.1 Main Programs

10.4.1.1 New Technology Products Program

The most typical example of PPfI policy in Korea can be found in the 'New Technology Products Program'. This program began in 1996 to promote technological innovation of SMEs. Under this program, products of SMEs that obtain certain certificates can be recommended by the Small and Medium Business Administration (SMBA) to all public institutions and governmental procurement units to procure these products with higher priority (Lee 2006: 280; Act on the Promotion of Purchase of Small and Medium Enterprises Manufactured Products and Support for Development of their Market (hereinafter 'Act on the Purchase of SME Products') Article 13, 15). Many certifications based on Acts are connected with this system. These are as follows (Table 10.4).

The Presidential Decree of "Act on the Purchase of SME Products" set that the purchase target of 5 % of each public institution's SME product purchases should go to New Technology Products. (Article 13) This target was increased to 10 % in 2009; however, the real performance is below target presently (Table 10.5).

To support this system, various tools are used, including the creation of a marketplace or mall. First, the 'Exclusive Excellent Quality Product Shopping Mall' was built within KONEPS which is managed by PPS. Each customer agency could purchase Excellent Quality Products certified by PPS very easily through this shopping mall. As Korea is equipped with a very centralized e-procurement system, KONEPS covers not only central and local government agencies but also

Table 10.3 Industrial R&D and innovation support programs in Korea (2005) (Chung 2011: 339)

Category	Programs		Budget	
	Number of programs	% of all programs	USD millions	Amount of program budgets
Tax incentives	17	6.6	1,480	15.9
Loans	15	5.8	3,402	36.6
Procurement	2	0.8	394	4.2
Human resources Development	29	11.2	106	1.1
R&D subsidies	77	29.7	3,253	35.0
Technology trade	8	3.1	61	0.7
Technology transfer	33	12.7	225	2.4
Technology consultancy	27	10.4	44	0.5
Legal assistance	29	11.2	34	0.4
Technology information	22	8.5	294	3.2
Total	259	100.0	9,296	100.0

Table 10.4 New technology products related certifications

Name	Agency in charge	Related act
Excellent performance certificate (EPC)	Small and medium business administration (SMBA)	Act on the promotion of purchase of small and medium enterprises manufactured products and support for development of their market
Excellent quality product certificate	Public procurement service (PPS)	Act on the government procurement program
New products certificate (NEP)	Ministry of knowledge economy (MKE)	Act on the promotion of industrial technology
New technology certificate (NET)		
Good software certificate (GS)	Ministry of knowledge economy (MKE)	Act on the promotion of software industry

Presidential decree of act on the purchase of SME products article 13

public enterprises and national or private schools as customers. Therefore, SMEs with certified Excellent Quality Product(s) can get many marketing opportunities through this shopping mall (Table 10.6).

Second, SMBA manages the Public E-Procurement Information Center (http://www.smpp.go.kr). Through this center, each public institution can access useful information on SME products including New Technology Products. Therefore, New Technology Products also enjoy marketing opportunities.

Third, in order to open up overseas sales channels, English product catalogs for Excellent Quality Products are published and distributed to foreign embassies

Table 10.5 Public institutions' new technology products purchase performance

Years	Total purchase (A)	SME products purchase (B)	New technology products purchase (C)	% (C/B)
2007	92,035,230	19,301,019	1,370,526	7.1
2008	100,936,401	24,205,227	1,680,848	6.9
2009	122,284,642	22,430,194	2,078,455	9.3
2010	104,399,702	18,297,408	1,366,942	7.5
2011	99,849,393	19,950,442	1,683,529	8.4

Unit: KRW 1 million
Public E-procurement information website www.smpp.go.kr

Table 10.6 Excellent quality product

	2007	2008	2009	2010	2011
The number of designated items (aggregate)	310 (2,055)	204 (2,359)	264 (2,558)	316 (2,874)	211 (3,085)
Amount purchased by PPS[a]	7,007	90,011	11,486	11,232	10,404

[a] Unit: KRW 100 million
Public procurement service website www.pps.go.kr

located in Korea. In spite of this support, some limitations were found in this system. Customer agencies were hesitant to purchase New Technology Products. One of the reasons was the burdensome investigation task of establishing the price for purchasing New Technology Products. SMEs were not satisfied either, as obtaining the certification was costly. To address these problems, support for investigation of original price fees and New Technology Products certification fees were introduced in 2010 [SMBA Website (www.smba.go.kr)].

10.4.1.2 Industrial Technology Development Program

The public and private R&D partnership program, called the 'Industrial Technology Development Program' is another important PPfI policy in Korea. The Minister of Knowledge Economy manages the 'Industrial Technology Development Program' in consultation with related ministries to implement the innovation plan efficiently. 'Industrial Technology' includes the following. (Act on the Promotion of Industrial Technology Innovation Article 11 Section 1):

- Manufacturing-based technologies, technologies for parts, materials and equipment or facilities, which are a common basis of industries;
- Promising future technologies in the field of industrial technology;
- Technologies related to process innovation, green manufacturing, environmental equipment;
- Engineering and system technologies;
- Energy and resources technologies;

- Aviation and space-industry technologies;
- Knowledge-based service industries (design, brand, and standard) related technologies;
- Technologies related to regional innovation;
- High technologies;
- Information and communication technologies;
- Linked technologies needed for the commercialization of already developed industrial technologies;
- Market-oriented fusion technologies, which combines various technologies; and
- Other technologies designated by the Minister of Knowledge Economy.

The list above shows that the 'Industrial Technology Development Program' mainly deals with large-scale technology development, and the subject of this program is quite focused and targeted.

The Minister of Knowledge Economy can conclude agreements with the research institutes, universities or other institutions to execute the 'Industrial Technology Development Program'. In this case, the Minister of Knowledge Economy can provide managing research institutions with all or part of the expenses incurred in the execution of the program (Act on the Promotion of Industrial Technology Innovation Article 11 Section 2).

In order to facilitate the commercialization of developed technology, the Minister of Knowledge Economy may execute the following programs. (Act on the Promotion of Industrial Technology Innovation Article 15):

- Commercialization and fostering of new technology;
- Fostering of specialized organizations and professional human resources supporting commercialization;
- Promotion of sale of products to be manufactured by commercialization;
- Subsequent technology development and vitalization of financing; and
- Vitalization of loans secured by technology.

Commercialization of Code Division Multiple Access (CDMA) is a good example of the public and private R&D partnership program. The CDMA development program was funded and supported by the Ministry of Information and Communication (now integrated into MKE) during 1991–1995. The world-premiere commercialization of this technology was made possible by this program. With the success of this program, Korean IT enterprises, such as Samsung and LG could get competitive in the cellular-phone industry globally (Oh 2002: 12).

It should be noted that the CDMA development program was conducted before WTO GPA took effect in Korea. Therefore, there was no obstacle to using this kind of program. However, after joining the WTO GPA, this kind of program would have to be managed within the limitations of this treaty.

Table 10.7 Green product purchasing

	2009	2010	2011	2012
Purchasing goods (A)	156,453	142,249	148,823	165,593
Purchasing green products (B)	20,243	18,365	30,381	40,142
% of B/A	13	13	20	24

Unit: KRW 100 million
Integrated information network for green purchasing in public sector website www.green.pps.go.kr

10.4.1.3 Green Technology Product Program

Green technology is an example of PPfI in a specific industry. The heads of public institutions are required to actively promote the formulation and implementation of plans, data surveys, education, publicity and training of human resources necessary to promote the purchase of green products. In principle, the heads of public institutions should purchase green products when they intend to purchase any product (Act on the Promotion of Green Products Article 3, 6).

The Minister of Environment formulates basic plans for encouraging the purchase of green products, following consultation with the heads of the relevant central administrative agencies every five years. But this is after undergoing review by the Central Environmental Preservation Advisory Committee (Act on the Promotion of Green Products Article 4).

Beginning in February 2010, the 'Public Procurement Minimum Green Condition Product' program went into effect to encourage green technology development by reflecting the environmental factors (standby power, energy consumption efficiency, recyclability, etc.) in the procurement specification and allowing only suppliers meeting the specification (Kim et al. 2010: 292–293). The program explains the rapid increase in the percentage of green-products-purchasing (See Table 10.7).

To facilitate green purchasing, PPS developed the 'Integrated Information Network for Green Purchasing in Public Sector'.[2] This center provides PPS-registered green-product information and green certified-product information in cooperation with the relevant agencies and certification agencies.

An example of green purchasing can be found in the hybrid-automobile case. Korean public institutions purchased hybrid automobiles since 2004. Since then, the number of public institutions' purchase of hybrid automobiles has risen from 285 in 2005 to 368 in 2006 and 850 in 2007. In the early years of hybrid-automobile development, many parts were imported from other advanced countries; however, with the increase in public institutions' purchase, Korean automobile companies such as Hyundai Motors have been able to reduce this by enhanced innovation capability in hybrid-automobile production (Byun 2007: 22). In this case, Korean

[2] See www.green.pps.go.kr (accessed March 2013).

automobile companies' international competitiveness has been combined with the hybrid-automobile purchase policy of the Korean government.

10.4.1.4 Alternative Bidding and Design-Build (Turn-Key) Bidding

'Alternative Bidding' refers to a bid for construction work in which an 'alternative design' is permitted together with a bid by the original design. 'Design-build bidding (Turn-key bidding)' means a bidding for designing and building is conducted in combination. 'Alternative bidding' and 'design-build bidding' are applied to large construction contracts which are above KRW 30 billion by estimated price (Presidential Decree of CGCA Article 79). In theory, these types of bidding can contribute to the enhancement of design capability in large construction. This, 'alternative bidding' and 'design-build bidding', was intended to strengthen innovation and technology development based upon dialogue between the procuring agency and construction enterprise.

When 'alternative bidding' or 'design-build bidding (Turn-key bidding)' is applied, the head of each central-government agency or the public official in charge of contracts requests the Central Construction Technology Review Committee to review the eligibility of the relevant design and make an assessment of the design score. In this case, the Construction Technology Review Committee examines the technical feasibility and notifies the relevant head of each central government agency or the public official in charge of contracts of the document specifying the eligibility of design and the marks scored by the design (Presidential Decree of CGCA Article 85) (Table 10.8).

Alternative bidding or design-build bidding is viewed as contributing to enhancing the technical capabilities of the construction industry. For example, Korean construction enterprises were awarded USD 292 billion in contracts in the foreign construction market after fierce competition with other foreign companies, and turn-key projects covered 76.5 % (USD 223 billion) of these awarded contracts. Enhanced technical capabilities of Korean enterprises were enabled through experiencing alternative bidding or design-build bidding in the domestic procurement market [Ministry of Land, Transport, and Maritime Affairs Website (www.mltm.go.kr)].

However, alternative bidding or design-build bidding was criticized due to a lack of efficiency and transparency in these procedures. The awarded price was too high in comparison to the lowest price award, large firms had a tendency of oligopoly and collusion, and SMEs enjoyed little chance to win these contracts. Concern has also been expressed about the lack of transparency in the Central Construction Technology Review Committee's review process (Anti-Corruption and Civil Rights Commission 2010: 9).

Table 10.8 'Alternative bidding' and 'design-build bidding' in civil engineering project

	2001	2002	2003	2004	2005
Design-Build Bidding	1.81	2.91	3.12	3.07	4.88
Alternative Bidding	1.36	2.00	3.09	2.58	2.45
Total	3.17	4.91	6.21	5.65	7.33

Unit: KRW 1 trillion (Lee et al. 2005: 4886)

10.4.1.5 KOSBIR

The Korea Small Business Innovation Research Program (KOSBIR) was started in 1998 and modeled on the Small Business Innovation and Research (SBIR) program in the United States. It aimed to foster SMEs' R&D by requiring 14 agencies in various areas (including state owned-enterprises) to allocate certain proportions (5 % in 2012) of their R&D budgets to help SMEs develop technologies (SME Research Institute 2008: 1).

In order to promote the technological innovation of small and medium enterprises, the Administrator of the SMBA should implement the following assistance projects (Act on the Promotion of Technology Innovation of Small and Medium Enterprises Article 9).

- Necessary funding for technological innovation;
- Feasibility studies on technological innovation projects;
- Assistance in technological innovation caused by demand;
- Commercialization of the outcomes of technological innovation;
- Guidance of management and technology for technological innovation;
- Fostering technological innovation-oriented small and medium enterprises;
- Assistance in attaining foreign standards for industry, safety, etc. and improving quality;
- Projects to assist the informatization of small and medium enterprises;
- Projects to assist academic-industrial cooperation such as joint projects conducted by industry, academia and research institutions on developing technology; and,
- Other matters necessary to promote technological innovation.

As shown in Table 10.9, the SBIR budgets are increasing incrementally. Despite this increase, some limitations are indicated. First, as the nature of R&D is different according to each agency, setting the 5 % target as a uniform measure is not desirable. Second, financial status rather than technological capacity is more important in the evaluation procedure, but this practice should be changed into focusing more on technological capacity (SME Research Institute 2008: 61–62).

Table 10.9 Total R&D and KOSBIR budget

	2000	2001	2002	2003	2004	2005	2006	2007
Total R&D budget (A)[a]	41,388	53,433	56,102	50,109	53,987	66,656	80,580	89,621
KOSIBIR budget (B)	4,358	5,478	5,596	5,822	6,624	8,275	8,717	9,770
B/A	10.5	10.3	10.0	11.6	12.3	12.4	10.8	10.9

Unit: KRW 100 million (SME Research Institute 2008: 25)
[a] Total R&D budget of agencies which are involved in the KOSBIR program

10.4.2 Drivers of Policy Developments

From the above observations, the following drivers for the PPfI policy-making in Korea stand out. First, the strong commitment of Korean government to strengthen the role of science, technology and innovation (STI) can be judged as a main driver of PPfI. For example, green growth and related public-procurement policy are strongly supported by the Korean government and especially by the President. The Committee on Green Growth was established directly under the President, and the Global Green Growth Institute (GGGI) was founded to support Green Growth globally. This example shows that if the innovation-policy initiative is supported by the highest officers in Government, it can help create an innovation-friendly environment in the public sector. Of course, if this initiative is not based on sound grounds and is pursued with political self-interest, it can also lead to destructive results. There are intensive debates on the green-growth policy of the Korean government, but it is too early to evaluate the success or failure of such policies in Korea. However, it is clear that appropriate embeddedness or cooperation between state and society and control of power are essential in order for the developmental-state-type PPfI policy to be successful.

Second, PPfI policy is closely related with industrial policy-making, especially SME policy. The 'New Technology Products Program' is a typical example of the integration of PPfI and SME policy. There can be critics on this regime, as it narrowly focuses on SMEs and hinders the overall PPfI Policy implementation. However, other regimes related to large companies, such as design-build bidding and alternative bidding, are complementary to the SME-focused PPfI policy. Public procurement also supports the international competitiveness of the large Korean companies as in the hybrid-automobile case.

Third, strong IT infrastructure is another driver of PPfI. Korea has one of the world's highest rates of broadband penetration and is rolling out one of the world's most advanced mobile communications networks. For example, Korea's strength in its e-government system (including e-procurement) enables information-sharing on 'Excellent Quality Products' among ordering agencies and facilitates the purchasing of these products.

The Korean e-procurement system (KONEPS), operated by PPS, was developed by Samsung, which is a renowned ICT enterprise. This shows that strong ICT industries contributed to the e-procurement system. However, e-procurement does not only follow the private companies' best practices. Through the development of

the e-procurement system, various security systems were developed, and this influenced the private e-commerce security system. This shows that public procurement can motivate innovation in the private sector.

Fourth, a centralized public-procurement system can be indicated as one of the important drivers for PPfI. As a centralized procurement agency, PPS covers a large portion of public procurement in Korea and can conduct procurement somewhat neutrally. This system enables some degree of coordination in PPfI policy-making. As the 'Excellent Quality Products Program' is among the initiatives that are connected with various ministries' innovation policy and PPS, it has an important coordination role to play. Thus, aggregated knowledge and expertise in PPS has been and still is a milestone for PPfI development.

Although there are debates on the strengths and weaknesses of the centralized public procurement system, and worries regarding the possibility of large corruption in a centralized procurement system, the coordination role demonstrates that from a PPfI policy-implementation perspective, a centralized procurement system has merits.

Fifth, the time to enter into WTO GPA and other public-procurement-related FTA was prudently chosen. Korea entered into these agreements after achieving basic economic development. The CDMA development program, which was renowned for its success, was managed before Korea joined the WTO GPA. After joining the WTO GPA, the Korean government has relied on strategic use of the exclusion clause for SMEs.

Finally, embeddedness, namely the cooperation relationship between public and private, is another important factor in PPfI in Korea. The success of CDMA policy was made possible by the active participation of private enterprises who formed a technological group with common interests in CDMA (Oh 2002: 121). Although there were trials and errors, SME's access to PPfI policy also contributed to widening the embeddedness.

10.4.3 Future Tasks for Policy Development

There are a number of future tasks for Korean PPfI policy development. First, various mechanisms of PPfI should be well coordinated. While KOSBIR and 'Excellent Quality Products' are all SME-related PPfI policies, there was no coordination between these two mechanisms. KOSBIR is managed by SMBA, while the 'Excellent Quality Products' program is managed by PPS. As was already mentioned, PPS, as a centralized procurement agency takes some coordination role in PPfI. However, there are limitations to this coordination role, since various ministries have a tendency to retain PPfI policy-implementation power. Fragmented jurisdictions and lack of coordination among these are main challenges to PPfI policies in Korea.

Second, the relationship between SME policy and PPfI policy should be appropriately interconnected. Most of the PPfI policy in Korea is implemented in

Table 10.10 Purchase before technology development

	2004	2005	2006	2007	2008	2009	2010	2011
The amount of budget[a] (A)	40	200	160	300	400	450	600	600
The number of project (B)	40	87	154	230	254	261	318	332
Average budget per projects (B/A)	1.0	1.1	1.0	1.3	1.6	1.7	1.9	1.8

[a] Unit: KRW 100 million
Small and medium business administration website www.smba.go.kr

the context of SME policy. When the SME policy focuses on 'protecting SMEs' rather than 'strengthening competitiveness of SMEs', it can lead to disastrous results in public procurement. The failure of the system of 'Direct Contracting with SME Federation' may be a case in point. PPfI should not be used as a tool for making private enterprises dependent only on the public sector as a customer (Lee 2006: 303).

Third, the focus of each PPfI program should be clarified more. In the case of the 'Excellent Quality Products' program, critics state that more emphasis is laid on 'quality improvements' rather than 'strengthening innovation' (Lee 2006: 292; The Federation of Korean Industries 2011: 16).

Fourth, not only 'purchase after technology development' but also 'purchase before technology development' should be dealt with in balance. Critics state that the amount of 'purchase before technology development' was relatively small in comparison to that of 'purchase after technology development' in Korea (Byun 2007: 28) (Table 10.10).

Fifth, PPfI should be balanced with overall public-procurement objectives, such as transparency or efficiency. In theory, alternative bidding and design-build (turn-key) bidding can be useful tools for PPfI that are not limited to SMEs. However, in practice, due to a lack of transparency and efficiency, there is a critique that alternative bidding and design-build bidding is not viewed as useful PPfI tools in Korea. This situation contrasts with the EU's experience, in which the competitive dialogue procedure is considered an important PPfI tool.

10.5 Conclusions

Based on the above observations, Korea's PPfI policy can be classified into two categories One is the SME-specific PPfI policy (New Technology Products Program and KOSBIR) and the other is PPfI policy, whose application is not limited to SMEs (Industrial Technology Development Program, Green Technology Products Program, Alternative Bidding, Turn-key Bidding). Among these two categories, SME-specific policy has been more noticeable in recent years because of the historical background of PPfI policy in Korea.

Korea's PPfI policy was initiated in the early 1980s, when Government's policy focus shifted from 'industrial policy' to 'innovation and competition policy'.

However, a strong developmental tradition still remained in PPfI policy, which was not limited to SMEs. However, Korea's accession to the WTO GPA in 1994 and various FTAs in the late 2000s limited Korea's use of public procurement as a tool for strengthening domestic enterprises. As setting aside SME is one of the exclusions negotiated by Korea in the GPA, it is actively using this exclusion for PPfI policy.

From Korea's PPfI experience, some implications can be drawn. First, well-designed e-procurement and a centralized procurement system can strengthen PPfI. For example, Korea's strength in its e-procurement system, which is conducted by PPS (centralized procurement agency), has enabled information-sharing on 'Excellent Quality Products' or 'Green Technology Products' among customer agencies.

Second, various mechanisms of PPfI should be well balanced and coordinated. Korea focuses more on setting aside SMEs rather than strengthening SMEs during the procedure of procurement (tendering, awarding, contract performance), and more on 'purchase after technology development' rather than 'purchase before technology development.' Striking the right balance among various PPfI mechanisms will be a most important challenge not only for Korea but also for other countries.

Third, PPfI should be balanced with other public-procurement objectives, such as transparency, efficiency and competition. Lack of transparency and efficiency of alternative bidding and design-build (turn-key) bidding suffocates its potential as a PPfI policy tool in Korea. PPfI should not be misused as a tool for 'protecting' SMEs.

Finally, the time to enter into WTO GPA and other public-procurement-related FTA should be prudently chosen, as these treaties can be to the detriment of each country's PPfI or industrial policy. Even after joining these treaties, exclusion clauses should be strategically used.

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Chapter 11
Sweden

Public Procurement of Innovation in Sweden

Max Rolfstam and Robert Ågren

Abstract Sweden is often thought of as a country with a strong tradition for using public procurement as a means to stimulate innovation. Early on, Sweden recognized and developed procedures for using public procurement as a technology-development tool. After a period where emphasis was put on this aspect of public procurement Sweden dropped many policy initiatives within this field. This was in part due to neo-liberal movements during the 1980s which in interaction with a distributed institutional setup led to the removal of incentives for a procuring authority to engage in public procurement of innovation. Another contributing cause was poor policy guidance from the academia upon Sweden's accession into the EU, which spread apprehension among procuring authorities. It is not until the last few years that Sweden has started to reengage in public procurement for innovation policy, by using predominantly government authorities to engage in public procurement for innovation, and by issuing guidance on the topic.

11.1 Introduction

Sweden is frequently considered to carry a historical legacy when it comes to applying public procurement as a tool to render innovation. The reasons for this view are empirical as well as scholarly. Several of the early examples of cases cited in current debates where public agencies have acted to formulate demand for private-sector innovation are Swedish. One volume dealing with a particular

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procurement technique, technology procurement, was essentially a Swedish initiative (Edquist et al. 2000). Several PhD theses have also evolved within the Swedish context (Westling 1991; Hidjefäll 1997; Fridlund 1999; Rolfstam 2008). In the 1980s, some work was conducted that from a Swedish perspective could perhaps be seen as the starting point of this evolution (Granstrand 1984; Granstrand and Sigurdsson 1985).

Even if Sweden today holds knowledge and capabilities to perform rather complex public-procurement-of-innovation projects, there are reasons for challenging the general view of Sweden as a strong country in this field. A more balanced view has to take into account that countries, in Europe and elsewhere, have been as active or even more successful in applying public procurement as an innovation-policy tool. The level of activity within this field appears to have declined in Sweden over the last few decades. It is only in the last few years that more explicit centrally coordinated actions have been executed to stimulate the use of public procurement as an innovation-policy tool. To some extent this evolution is consistent with the general neo-liberal winds that prevailed in the last few decades and affected most countries. Perceptions relating to Sweden joining the European Union in combination with rather poor policy advice from academia play a part in making Sweden the current runner-up when it comes to recent developments of policies and best practice. In this chapter we will suggest how a rather distributed institutional set-up in Sweden creates particular needs for future developments of policies. Future policies for public procurement as a tool for stimulating innovation will probably rely on centrally coordinated activities that take into account endogenous initiatives.

11.2 Country Background Information

The way policy evolves and diffuses is affected by the decentralised institutional set-up. Sweden holds three levels of institutions with legislative and political power. Sweden is governed by the national parliament (Riksdagen), and the executive power is held by the government (Regeringen) elected by the parliament. Further, the country is geographically divided into 20 county councils and 290 municipalities. Both these institutional levels are governed by publicly elected councils and hold minor legislative and major executive powers in their own right.

The power of the parliament is limited to a legislative power, which means the parliament can only govern by enacting laws. Laws have to be generally applicable, hence a lex in casu, i.e. a law for a particular situation or case, is not, generally, seen as constitutional (cf. Strömberg 1999). The executive power is provided to the government either through laws or the government's general competence to provide provisions on the implementation of laws. Within this competence the government can issue provisions regarding a public authority's purpose and priorities by handing out instructions in the form of ordinances. However, there is no power granted to the government to regulate the organisation,

work routines or the execution of the authority's assignments. Neither is there a general competence for the government to override decisions made by an authority. Thus, public power in Sweden is exercised on several institutional levels which to a large extent are independent of each other.

This institutional set-up means that the national level has relatively few means to directly affect practice on sub-national levels. Thus, the competences and traditions regarding public procurement of innovation are unevenly distributed. In the mid-2000s, for example, the Swedish development of public procurement of innovation in general was described as 'scattered' (Edler et al. 2005). Although competence to perform rather advanced procurement projects existed among certain public agencies, these 'competence cells' were rather endogenous in character. Some public agencies have built state-of-the art knowledge on how to use public procurement of innovation, while others have not put much emphasis on this issue. However, although this basic institutional structure has not changed, there is an increased level of activity seen in the last few years initiated to promote different aspects of public procurement of innovation.

11.3 Public Procurement Overview

There prevail some uncertainties concerning the values of public procurement. The statistics are scarce, and sometimes the figures given are based on estimations. The annual value of public procurement in Sweden is estimated at SEK 400–600 billion (Statskontoret 2010). This would suggest that public procurement amounts to 15.5–18.5 % of GDP (Bergman 2008). In 2008 and 2009 public procurement by the national authorities amounted to SEK 159.8 and 161.4 billion respectively. (Ekonomistyrningsverket 2010). Public agencies on the sub-national levels, county and municipality, also including public companies, contribute to the remaining amount, making sub-national procurement more important, at least measured in monetary means.

Counting CPV-codes in TED, and thus counting procurement notices above the thresholds, procurement contracts accounting for 2.8 % falls within the construction and built-environment sector and 2.6 % related to road and railroad construction. Cleaning services account for 1.6 %, property insurance 1.2 %, IT consultancy services 1.1 % (Swedish Competition Authority 2011). The average number of bidders is 4.4 for all contracts (Swedish Competition Authority 2012). As can be seen in Table 11.1, most initiated procurement processes are either done by municipalities or by public corporations, both are bodies out of reach from direct control of the national Swedish government and the parliament.

Table 11.2 shows that most published procurement procedures are those below threshold, and that among the directive compliant procedures, the open procedures are, not surprisingly, dominant (Swedish Competition Authority 2012).

Estimative statistics suggest that 49 % of all procurement awards are made by considering the most economically advantageous tender, and 33 % use lowest

Table 11.1 Distribution of procuring authorities and number of procurement procedures published, 2010 (Adapted from Swedish Competition Authority 2012: 16)

Type of authority	N procurement procedures	Percentage of total
Municipalities	7,812	42
Public firms	4,804	26
Authorities	3,808	20
Counties	1,471	8
Other	858	5

Table 11.2 Number of published procurement procedures 2010 (Adapted from Swedish Competition Authority 2012: 13)

Procedure	N procurement procedures	Percentage of total
Simplified procedure (i.e. open procedure below thresholds)	13,525	72
Open	4,326	23
Negotiated	440	2
Selection procedure (i.e. restrictive procedure below thresholds)	310	2
Restricted	136	1
Competitive dialogue	8	0
Negotiated without advertisement	3	0
Design competition	2	0
Other	8	0

prices in awarding contracts; 18 % of the tender notices have not stated award procedure (Swedish Competition Authority 2012). Nevertheless, a survey on procurement projects conducted by the Swedish Transport Administration shows that the authority procured road-construction projects by using a design-bid-build delivery method in 80–90 % of the projects during 2006–2010. In the same timeframe 70–90 % of the tenders were awarded to the bid with the lowest price. In between 8 and 25 % of the cases the authority got alternative solutions, but in only 6–12 % of the projects an alternative solution was accepted (Olander et al. 2011b). Thus, the conclusion has to be that tender notices do not actually represent the reality regarding award procedures.

11.3.1 National Public-Procurement System: Characteristics of National Public-Procurement Policy

Before Sweden's accession to the European Union in 1995, the public-procurement system was based upon a value-for-money (VfM) approach. Government authorities did have an obligation not to discriminate against suppliers from other countries (following the international general agreement on tariffs and trade). However, there

were only a few legal remedies provided for when the authorities overstepped those rules. Almost all municipalities had invested a voluntary set of rules for public procurement, trying to ensure proper use of taxpayers' money. There were no specific remedies available for suppliers, but there were some possibilities for citizens to question the legality of a purchasing decision if funds were misused. The focus of the VfM approach did carry over to the implementation of the public-procurement directives (93/37/EC) upon the coming entrance into the European Union. Thus, the resulting law [Lag (1992:1528) om offentlig upphandling, The Public Procurement Act] stated "Procurement shall be executed by using those possibilities for competition which exist, and otherwise be conducted in a commercial manner, tenderers and tenders shall not be treated extraneously" (authors' translation). Nevertheless, in national case law VfM was given little attention, especially in the later years of the law's life. Rather, the courts preferred to interpret the paragraph as a codification of the basic principles laid down by the treaty and the EC court: the principles of non-discrimination, openness and transparency, equal treatment, proportionality and mutual recognition. During the implementation of the newer directives (2004/18/EC, 2004/17/EC) a more literal approach was taken (Lag (2007:1091) om offentlig upphandling for the classic directive and Lag (2007:1092) om upphandling inom områdena vatten, energi, transporter och posttjänster for the utilities directive), and thus the wording of the directives have led the public-procurement system in Sweden to be directed more towards the goals of the directives (promoting the common market, and to some extent reduce corruption), and thus, the VfM direction has been largely unregulated ever since.

A Swedish inquiry dealing with public procurement of innovation was released in 2010 (SOU 2010). The rather substantial document includes a review of how public procurement has been used over the years in Sweden; legal matters, risks, and also pre-commercial procurement is given much attention. Three areas identified as having special potential for public procurement of innovation in Sweden are infrastructure, healthcare and environment. It cites the well-known cases of development pairs between Swedish public agencies and private companies that evolved in the 20th century and the role technology procurement has had in Sweden in the past. The inquiry also concludes that the institutional set-up is different today than it was in the past. This is discussed below.

Until 1970 toll barriers on most foreign-industry products were used to give preferential treatment to national enterprises. From this followed a need to ensure that national industry could keep up with the world's technological developments. This development created an incentive for public authorities to actively help and promote national industry sectors in order to satisfy its own needs (SOU 2010). During the same time a transformation of the public sector took place in Sweden. Swedish authorities have gone from a high level of in-house production of support services to an out-sourcing strategy. Public authorities, such as the government telecommunications agency and the national railroad transportation agency, among many others, have been incorporated and lost their legal monopoly on the market. Some have even been sold. Another current trend is to let government services, such as healthcare, compete with privately run alternatives. Consequently, today,

the government does not need to build nationwide telecommunications networks itself, nor does it need state-of-the-art locomotives, thus the fundamental drivers for innovation have been changed. Also the purchasing power that, e.g., the national telecom agency could utilise on a monopolistic market in the past is not available any longer—gone are also the incentives to do so.

The inquiry distinguishes between innovation-friendly public procurement and innovation procurement. The former notion essentially underscores the ambition to make all public procurement open to supplier innovations. In other words, a procurement process should not be restricted to considering mature, well-known products only, but should also enable suppliers to propose innovative solutions. Innovation procurement, in the understanding of the inquiry, corresponds to the Swedish understanding of technology procurement. One could argue that this distinction also reflects a conservative expectation regarding the extent to which public procurement can be used as a strategic instrument for 'grand challenges'. This modest role has also been brought forward in the literature. Promoting innovation-friendly procurement practises in general is seen as a more realistic ambition than thinking of public procurement of innovation as a strategic policy tool (Uyarra and Flanagan 2010).

The inquiry also addresses pre-commercial procurement. This is an 'approach to procuring R&D services' (European Commission 2007: 2), aiming specifically to bridge the gap between scientific knowledge and the market through the application of public demand-pull, which has been introduced at the European level. The inquiry proposes that pre-commercial procurement should be regulated in Swedish law. The main justification for this proposition is legal. Pre-commercial procurement is not explicitly regulated in the Swedish public procurement law, and it may in some cases fall under the research exception in the directives. When the research exception can be invoked, the procurement process would still be governed by primary EU law and the fundamental principles of public procurement would apply.

New regulation would ensure compliance with primary law and, the inquiry argues, make the pre-commercial procurement process more predictable for the procuring authorities. It is unclear if any considerations in relation to policies striving towards enabling innovation have been made in the process leading to this recommendation. What is noteworthy is, thus, that the inquiry proposes to regulate an area which today is, to some extent, outside the scope of the directives. Nevertheless, the Commission has taken a similar view introducing an innovation partnership procedure in its reform proposal for new public procurement directives (European Commission 2011a).

It is not clear if the inquiry's suggestions will lead to actual legislation, and there is a new inquiry looking into the public procurement legislation. The aim of the new inquiry is to evaluate the current legislation from a VfM approach, while taking into account environmental and social issues. Innovation is not explicitly mentioned in the instructions for the inquiry, but it does state a desire to extend possibilities for SMEs to grow through public-procurement contracts (SOU 2011).

11.3.2 Regulation of Public Procurement and Implications to Innovation

Swedish public-procurement law is defined by the Swedish membership in the European Union. The European Union can affect member states through formulation of regulations, decisions, directives, recommendations or opinions. Public procurement in the EU is regulated through primary law (through the treaties of the European Union) and through secondary law, predominantly in the form of directives. Like regulations, directives must be complied with, but it is laid upon the (concerned) individual member states to transpose, i.e. implement, them according to their own choice within the time period, as specified in the directive. Directives are distinct from recommendations and opinions, which have no binding force at all. In the case of public procurement, the European Union thus adopts the subsidiarity principle, which reflects an ambition to avoid top-down governance from the European level. As a consequence, even if the outcome presumably is the same for all EU member states national procurement law may be organised differently in different EU member states. Sweden has chosen to regulate areas which are not explicitly covered by the directives such as procurement below the EU-set thresholds and so-called B services. The regulation of these tendering procedures follows the same fundamental rules which are applied in the directives; however, rules for publishing notices and choice of procedures are simplified. Thus, those additional rules do not affect possibilities to conduct public procurement for innovation.

Another law which may affect public-procurement-of-innovation policy is the Law of System for Consumer choice (Lag (2008:962) om valfrihetssystem). This law is applied to B services within health and social care and within employment services. The law allows for public authority to procure contracts with suppliers of these services and thus creating concessions for providing health and social-care services to citizens. However, instead of procuring one concession holder, every supplier who meets the set requirements is allowed to enter the concession system. A citizen can freely choose any supplier within the system to provide the service needed, for example primary healthcare. This practice somewhat limits the possibility for the responsible public authority to exercise purchasing power in order to enforce policy ambitions, such as innovation policies. On the other hand, it may facilitate market-driven innovation instead, driven by user needs, or at least consumer-choice rationalities.

The regulation on government-sourcing coordination (Förordning (1998:796) om statlig inköpssamordning) requires every government authority to use procured coordinated framework agreements whenever possible. Those framework agreements are generally of high value, wielding immense purchasing power. However, due to the nature of the collaboration, those agreements have to include needs from all government agencies, and thus are not suitable to deliver particular needs for one single agency. While this practice could prove to be a useful tool to conduct public procurement of innovation due to the incentive power of high value

contracts, it could also hamper innovation due to inabilities to find communalities within all government agencies which have bearing on a specific policy, such as innovation. Nevertheless, due to the distributed character of Swedish political institutions described above, this may prove to be a tool for implementing national policies on public procurement of innovation.

11.3.3 Public-Sector Structure Related to Government Procurement

Although centralised policies promoting the role of public procurement as a means to stimulate innovation have been relatively modest, some recent initiatives might change this general picture in the future. Four public agencies on the national level perform some kind of support to public procurement in general. The Swedish Competition Authority (Konkurrensverket) is the overseeing authority on public procurement. The Legal, Financial and Administrative Services Agency (Kammarkollegiet) has a responsibility to provide guidance on the usage of the public procurement regulations. The Swedish Agency for Economic and Regional Growth (Tillväxtverket), and the Swedish Governmental Agency for Innovation Systems (VINNOVA) (Statskontoret 2010) has some responsibilities to promote innovation in public procurement. All these agencies have initiated different information programmes, funding schemes, support functions etc. where using public procurement as a way of rendering innovation is an explicit component. VINNOVA, for example, was given SEK 24 million for a programme to start in 2011 to promote public procurement of innovation. A dedicated team has been set up with an annual budget of SEK 9 million that works with this issue. One of the concrete actions taken so far is a published call for projects devoted to pre-commercial procurement.

Another example is the project initiated by the Swedish Agency for Economic and Regional Growth. 'Learning public procurement of innovation' (Lärande om innovativ upphandling). This project involved four counties (Västra Götaland, Västerbotten, Skåne, Dalarna. This was essentially an educating project aiming at increasing knowledge about public procurement of innovation in general as well as the involvement of SMEs. (Lärande om innovativ upphandling, undated). Furthermore, a non-government organization, the Swedish Environmental Management Council (Miljöstyrningsrådet), owned and funded by municipalities and regions, has an assignment to provide guidance on environmental and social considerations in public procurement. Attempts have also been made to use public procurement in practice to generate innovation. In what was called technology procurement the municipality of Stockholm and the state-owned utility company Vattenfall in cooperation with the Swedish Association of Local Authorities and Regions initiated the procurement of electrical cars, with the expressed purpose of providing a market for commercialisation of electric vehicles.

The above examples indicate that activities related to promoting the use of public procurement as a means to stimulate innovation do exist. Funding has been made available, knowledge is diffused, and concrete attempts have been made to apply these ideas in practice. However, given the administrative structure in Sweden, as described above, the promoting agencies do not have any power to enforce policy. They are left with more indirect tools such as providing funding or knowledge, as described above.

11.4 Public-Procurement Policy and Innovation

11.4.1 Main Characteristics, Policy Types and Institutional Set-Up

Sweden is often claimed to have strong traditions in using public procurement of innovation. One could argue, at least on a general level, that Sweden has evolved from an emphasis on public procurement of innovation as a technology-development platform, through a 'no-policy policy', to the current state where an increasing number of examples of a 'policy-for-all-seasons policy' can be found. Examples of the former are the development pairs that prevailed in the past (Fridlund 1999). Such close collaboration existed between the Royal Board of Waterfalls (Vattenfall AB) and ASEA (later ABB) in the 20th century, where the public agency provided the necessary willingness to take risks associated with the development of innovative technology (ibid. 1999). The important role played by public telecom operators in the 1980s to stimulate innovation in telecom in a similar way is also well-known, not only from Sweden but also Finland (Palmberg 2002; Berggren and Laestadius 2003).

One tell-tale sign of the competence that existed early in Sweden is provided in a public inquiry from 1976 (SOU 1976), where the Technology procurement committee (Teknikupphandlingskommitéen) proposed a model similar to the recently introduced pre-commercial procurement proposed on the EU level. Technology procurement was envisaged to consist of four steps.

1. Initial planning, where functions were specified and budget frames were established, and forecast of expected technological developments without intervention.
2. Feasibility studies where different technological solutions were identified and evaluated, and where possible interaction effects of cooperation with other public authorities were to be identified.
3. Procurement of prototype development aiming at clarifying uncertainties, finalising technical specifications and setting performance criteria.
4. Based on decisions under 3: A full commercial procurement project was to be conducted under regular forms for procurement.

Although this model must be understood as a technology-policy instrument of the time, as compared to the current innovation-policy understanding of pre-commercial procurement, it is still noteworthy that the Swedish discourse predates the current European one by some 30 years.

The current state of 'policy for all seasons' is seen in the adoption of 'innovation-friendly' procurement, not only by the inquiry discussed above (SOU 2010), but also by VINNOVA. This notion reflects the underlying idea that all public procurement in any sector could become 'innovation-allowing'. The application of this principle would be straight-forward and reduced to a matter of specification. Even for the procurement of well-known goods and/or services innovation could be allowed by applying functional specification in the tender call. As different from tender calls applying detailed technical specification, which typically work to restrict suppliers' possibilities to come up with any creative solutions, the application of functional specifications would at least allow suppliers to submit alternative solutions not known to the procurer. The same general pattern emerges if one looks at the projects currently funded by VINNOVA's programme on pre-commercial procurement underway (from 2012 and onwards). These projects seek to create innovation in e.g. meals for the elderly, design of entrances to meet the need of the handicapped, innovation in clean-tech, innovation in robotics to assist elderly people in their everyday lives. They are all essentially procurement projects devoted to satisfying intrinsic needs, where the role of any generic innovation-policy rationales is relatively weak. Also, although many of these projects deal with health-care issues the call itself is open to any entity operating under the public-procurement rules.

11.4.2 Drivers and Hindrances of Policy Developments

Taking into consideration that public procurement was a rather well-established demand-side innovation instrument in the past, Sweden's response to current policy development within the EU has been rather slow. In a survey conducted by the European commission on policy developments on pre-commercial procurement Sweden was not among the leaders (European Commission 2011b). Rather, Sweden ended up in the third category (out of four). The members of the third group ("Working on framework") reported having explicit plans to start PCP pilots and/or that they had started working on identifying national or regional support schemes for PCP. This is a somewhat modest position in light of the fact that Sweden is considered a country with a strong tradition of using public procurement as a means to stimulate innovation. This heritage may be one reason to expect some catching-up in relation to the development of policies and practices for PCP.

To some extent the current state can be explained by the rather distributed power structure in the country, as discussed above. In comparison to e.g. UK and Denmark, lower institutional levels have much more freedom to act. To a larger

extent activity stems from endogenous drives rather than being a response to instructions from the national government. One should, however, note that the transition from a state of no policy has just recently begun. Even if central policy-making could have had an impact, the lack of policies promoting public procurement as a means to stimulate innovation is probably a more important factor.

One explanation for the relatively modest policy development is that Swedish policy makers have acted based on misinformation from academics. Instead of providing advice on how to find new ways of procuring innovation in the new institutional set-up characterised by the liberalisation and the Swedish membership in the EU, policy makers have been led to pay attention to the alleged 'tensions' in the Directives that would inhibit possibilities for procuring innovation (Edquist et al. 2000). This has nurtured what could be described as a relinquished culture in the public sector justifying inactivity. For what sane procurer would engage in innovation if 'science' says it is prohibited by the Directives? The academic community has thus helped to stall a policy development which, given earlier traditions, could have sustained Sweden's position as one of the leaders, instead of the current situation where Sweden is one of the runners-up.

11.4.3 Development of the National Innovation System Vis-a-Vis Developments in Public Procurement

Persson (2008) outlines some formative moments that have paved the way for the current innovation policy-making in Sweden. Following this author the first major technology policy initiatives emerged in the 1940s with the establishment of the Swedish Technical Research Council (TFR) in 1942 as the first formative moment. TFR was one of the first Swedish research councils providing direct funding for research projects mainly initiated at the technical universities in Sweden. In the 1960s and early 1970s came the industrial policy offensive, which according to Persson (2008) is the second formative moment. Much emphasised was the importance of government intervention. These were the times of mission-oriented agencies (Benner and Sandström 2000). In 1969 the Ministry of Industry was established, and the Board for Technical Development (STU) was established in 1968. This agency took over responsibilities from an array of organisations including TFR, which was closed down the same year. STU became the main instrument for Swedish technology policy and included a part of project-funding, low interest loans and also technology procurement (Persson 2008). STU did, however, only support public technology procurement connected to the public authorities' affairs and needs, while general innovation support was restricted to low-interest loans covered by guarantees from the borrower and state aid (SOU 1976). During the same period some sector-based authorities were created to promote academic research but also industrial sector-based technology development. One of these authorities was the state committee for construction research

(Statens råd för byggnadsforskning). They supported technology procurement through project-funding and low interest loans, in order to offset risks occurring in technology procurement projects. One example where public technology procurement was supported was a municipality programme promoting elderly living standards by, among other measures, providing pre-procured elevators for retrofitting in buildings (Jande et al. 1988).

The focus on research on the built environment was not coincidental. During the European post-war era, Sweden had a lack of available labour, and at the same time there was political pressure to improve and modernise living conditions (Eriksson 1996). To avoid a transfer of labour from the, at the time, lucrative export industry a government inquiry concluded that the regeneration of the Swedish housing stock had to be carried out without an increase usage of labour, thus creating a need for increased efficiency and a higher degree of industrialisation in the construction sector (Dalén and Holm 1965). It was in essence a tailoristic approach to public governance which was taken. Nevertheless, a public inquiry (SOU 1968) stated that the creation of rational construction projects had to be driven by the industry rather than by the government. But in order to still promote the policy of industrialising the construction industry, the inquiry suggestion was to create larger and dominant public land lords who could use their sourcing power to promote the policy. There was a tendency to drive innovation with closed systems in a design-build delivery system. Using closed systems larger contractors could compete employing internally developed production methods as a competition tool. The public client could then 'outsource' the responsibility for higher industrialisation to the larger contractors (Eriksson 1994). The motivation for the public clients to drive this development came from beneficial loans provided by the government (SOU 1971). In 1991 STU merged with some other agency to form the Swedish National Board for Technical and Industrial Development (NUTEK). NUTEK set out to increase relevance in academic research by fostering academy-industry coalitions (Benner and Sandström 2000). One central aim for NUTEK was to connect academic research to Swedish industry, where the starting point was the competence in existing industrial structure (ibid.).

The third formative moment is connected to the neo-liberal policy discourse of the last decades of the 20th century, which helped to discourage further development of public procurement as an innovation policy instrument. Any actions made relied on assumptions drawn on mainstream economics and non-intervention ideas. On the European level the Public Procurement Directives were designed to prevent nationalistic, protected and (therefore) inefficient procurement and instead promote the creation of a common European market (Cox and Furlong 1996). Similarly, (Gavras et al. 2006: 70–71) argue that the EC Directives were stressing regulation rather than strategy, the free market rather than interventionist orientation, European rather than national competitiveness, competition rather than protectionism, equal opportunity rather than collaboration and learning, and competitive markets rather than public-sector monopolies (see also European Commission 1998; and Martin et al. 1997). Sweden was no exception to this general trend, and as in many other places, intervention in the market economy

was not in fashion. Over these years deregulation, liberalisation and privatisation of public companies were central elements in Swedish policy, especially during the right-wing government in power from 1991 to 1994 (Persson 2008). There were even academics who tried to explain the lack of strategic concern in public-procurement practice with what they perceived as 'tension' in the Procurement Directives (Edquist et al. 2000). During this time period a public inquiry (SOU 1997) stated that technology procurement should not be used as a 'policy for all seasons' but rather as a technological development platform to meet public authorities' demands and to meet public goods such as social and environmental targets. The inquiry further suggests that local and regional authorities need to be informed concerning available opportunities for technology procurement, although initiative has to be taken directly by the local authorities with local political support (SOU 1997).

What could be seen as a fourth, or a current formative moment relates to the establishment of the National Agency for Innovation System (VINNOVA) in 2000. VINNOVA is the agency behind the most recent initiatives to promote public procurement of innovation, and has also increased its visibility on the EU level in the last few years. This is, however, a relatively recent adoption in light of the development on the EU level where the interest in public procurement of innovation awakened through the Lisbon agenda goals. For the EU, public procurement rendered interest over a decade ago, being identified as a tool to increase competitive advantage in a global economy (European Council 2000; European Commission 2003; European Commission 2005; Edler et al. 2005). Although public procurement has historically been a tool utilised within energy (see below) in Sweden, the adoption of public procurement as a means to stimulate innovation in Sweden has got a slow start. Nonetheless, while stimulation effects in general are explicitly mentioned as a positive effect in the latest public inquiry regarding public procurement for innovation (SOU 2010) there are no policy recommendations expanding the reach of public procurement for innovation beyond a technology-development platform. And, as in earlier cases (SOU 1997), policy suggestions are focused on enabling public authorities to implement innovation procurement rather than requiring them to implement innovation aspects in public procurement.

11.4.4 Sector-Specific Developments; Commonalities and Differences Between Sectors

Essentially without the generic concern for innovation as a way of sustaining competitive advantage in a global economy, but to promote development of energy-efficient technologies, the Swedish Energy Agency (Energimyndigheten) has for many years used technology procurement as a way of provoking market transformations of more energy-efficient products. These procurement projects

have mainly been catalytic rather than aiming at satisfying the procurer's intrinsic need (Neij 2001; Rolfstam 2012a).

The Swedish Transport Administration (STA) has had a similar responsibility to use technology procurement in order to create innovation in the transportation sector, as is the case with the Swedish Energy Agency. This has led to project such as the ISA project (intelligent speed adaption). In other respects the STA has first and foremost tried to promote innovation by using a design-build delivery method. The construction of Tjörnbron (the Tjörn bridge) was conducted through a design-build method, with special focus for the tenderers on delivery time (Westling 1982). However, more general policies have also been applied to the sector. In 2003, what was then the Swedish National Road Administration and the Swedish National Rail Administration started in a joint-effort FIA, Change, in the civil engineering sector, with the expressed purpose to increase efficacy in the sector, extended research and education efforts, and with the articulated intent to increase diffusion of knowledge and research throughout the industry (Swedish Transport Administration 2012).

In a government inquiry (SOU 2009) several factors promoting increased efficacy and innovation were identified. One conclusion was that public procurement of civil engineering projects needed to be more open to new production methods. It was also suggested that an increased use of design-bid-build and design-build-operate contracts would strengthen the sector's innovation system. Another suggestion believed to strengthen innovation was to consider risk allocation between contract parties more carefully in order to secure an optimal allocation of risk to the party which has the possibility to affect risk outcome.

In another inquiry regarding productivity enhancements in the civil engineering sector (SOU 2012), the same recommendations have been preliminarily put forward. In one report commissioned by the inquiry it is suggested that the civil-engineering innovation system is driven by endogenous drivers, i.e. great care is being taken in order to 'do things right' but there is less concern as to whether exogenous factors 'do the right thing' (Eriksson et al. 2011). One proposed remedy is to use other contract arrangements which support innovation and give incentives for innovation or spread risks (Eriksson et al. 2011). In another report commissioned by the inquiry similar conclusions have been drawn, emphasising not only the contract arrangements but also extensive specifications as a barrier for innovation (Olander et al. 2011a). Further, since the beginning of 2012, there has been an explicit regulation in the instructions for the authority to use its client role in order to promote productivity, innovation and an effective market. The provision explicitly mirrors the already present provisions for the Swedish Energy Agency.

One interesting idea concerns destructive public procurement of innovation, where the whole purpose is to remove from the market undesired components or products (Rolfstam 2012a). One example of such 'constructive' destructive procurement are the activities carried out by the Jegrelius Institute for Applied Green Chemistry (Jegrelius 2010). This is an institute connected to the Region Jämtland County Council in Sweden, which works to remove hazardous chemicals in healthcare products through public procurement of innovation. One project that attracted

attention was devoted to developing a PVC-free blood bag. The project essentially attempted to replace a hazardous chemical component of an already existing product. The project included a feasibility study, the formation of a purchaser group that was eventually able to come up with a specification of a PVC-free blood bag. The project also put a lot of emphasis on surveying the market for options as well as scrutinising the possibilities given by the prevailing institutional framework. As the procurement project concerned a medical device, not only the EC Procurement Directives were considered, but also standards and laws regulating medical devices. The project did not render a new product on the market, but concluded that technology procurement is a less useful tool for products that require a relatively long time to reach the market (Jegrelius 2010).

11.4.5 Outcomes of Policies

As indicated in the previous section, many of the procurement activities seen in Sweden are built on two pillars, the traditions from the past to use public procurement as a means to develop new technology, and current sector-specific policies and intrinsic needs. The procurement skills that exist in different sectors or agencies also typically reflect the context. They are specialised and could be viewed as an extension of the rationalities of a particular public agency or sector (for a discussion on rationalities see Gregersen 1992; Rolfstam 2012b). Procurement experts in the energy sector, for instance, would be driven primarily by rationalities that would render energy-efficient and sustainable solutions, not 'innovation' in general. Although certain relatively open funding schemes have emerged in the last few years these exogenous and centrally coordinated initiatives have, at least up to this point, played a relatively limited role. Given the institutional set-up in Sweden this is probably a situation that will prevail. In order for centrally coordinated programmes to be successful, an institutional match between national-level programmes and more endogenous rationalities as prevailing in specific public agencies must be achieved. Open calls, such as the VINNOVA call for pre-commercial procurement discussed above, might therefore turn out useful.

11.5 Lessons and Future Developments

The analysis of policy development in Sweden made above exhibits some 'dissonance'. In subsequent public inquires the political ambition to implement public procurement for innovation as a technology-development policy seems to be expressed. However, examining the actual execution of projects and initiatives and the creation of policy instruments seems to be directed towards using public procurement as a 'policy for all seasons'. This can be seen in the notion of 'innovation-friendly' procurement, which is a policy that does not go further than

stressing the possibility to allow innovative solutions in any tender call. This might be explained by the decentralised administrative, legal and political characteristics of Sweden. In order to understand this dissonance it might be clarifying to examine power relationships between the policy creators and the actors implementing policies by realising public-procurement projects (Haugaard 2010). Given the decentralised state of Sweden, it is hard to enforce a national innovation policy for public procurement, requiring actors to act in accordance with the policy, using a *power-over* perspective. Instead, a *power-to* philosophy has been applied. The policy shifts from promoting innovation by introducing a R&D policy in the 1940s, a focus on sector-specific technology development support during the 1960–1970s. During the 1980–1990s no governmental programmes were set up, and the last remaining incentive programmes were decommissioned, due to the view that the market should create its own innovation system. Supporting the market was seen as supporting innovation in the neo-liberal era. In the new millennium, general programmes have been put forward, and authorities have been given the task to actually support innovation within the authority's sector. The political intentions voiced in public inquiries have, during the entire period, been static in that they voice a need for government support of innovation on a general level in order to enable market growth through innovation and to use innovation procurement, primarily pre-commercial procurement, in order to satisfy governmental needs or public goods more efficiently. This could be interpreted as shifts in political approaches to power rather than shifts in the view of the role of public procurement in innovation policy. During the post-war tailoristic era, government intervention was seen as necessary, and maybe even desirable, to enforce policy. A lack of legal possibilities to enact *power-over* instigated advanced incentives and risk-offset programmes, enabling procuring authorities to implement technology procurement. During the neo-liberal formative moment, there was no significant change in political views on public procurement expressed in public inquiries, nevertheless looking at results from this period can be described as a 'no policy' policy. The absence of policy regarding the use of public procurement as a tool for promoting innovation suggests the neo-liberal winds might been affecting the national governmental view of *power-to* rather than innovation policy. During this time no incentive programmes were set up, and procuring authorities had to assume all risks involved with innovation procurement. In the latest, and maybe current, formative moment, *power-to* is approached from a perspective of emancipation, trying to enable procuring authorities to conduct innovative procurement by providing tools and knowledge. This is done by suggesting changes in law, not to allow for innovation but to make the possibilities explicit. New governmental agencies (Ekonomistyrningsverket, Trafikverket) get explicit "role model" instructions, other agencies (KKV, Kammarkollegiet) get the responsibility for issuing guidance documents for the actual procedures of public procurement of innovation. Then again, public procurement as expressed in political documents has not changed, only the view of power on how to implement those policies seems changed. In retrospect, one can see that the well-known development pairs cited in the literature (Fridlund 1999) are driven to a large extent by endogenous

factors within state-monopolies rather than a public-procurement-for-innovation policy. There are exceptions as with the express technology procurement of the school computer Compis (Kaiserfeld 2000), but this procurement initiative was not successful in its policy goals.

11.6 Conclusions

In academic literature, Sweden has been known as an example of a country with an innovation policy encouraging technology development, and well-known technology pairs have been cited in narratives on Swedish public procurement of innovation. While historically there have indeed been technology-procurement policies in Sweden, especially during the 1960s and 1970s, a closer look on the policy development since the end of the second world war unveils different modes of innovation policies developing over the years. On the national level, policy development has, prima facie, been going from technology procurement, passing 'no-policy policy' and ending up in a renewed use of programmes promoting public authorities' use of public procurement as a driver for innovation. This is to some extent a development that is consistent with other countries. However, the political intention as described by public inquiries has since the sixties been more expressed as a 'policy for all seasons', a policy to support innovation on a general, national level without expressed sectors in mind. This has probably been caused by the Swedish legal set-up of administrative institutions, which prevents far-reaching national regulation of administrative institutions. Nevertheless, during the 1960s there were advanced incentive schemes provided by the government to encourage innovation, or rather to encourage an increase of efficacy in certain sectors. Nonetheless, those incentives were primarily directed towards the endogenous needs of those sectors, such as lack of labour. Though the political discourse on innovation never changed, the incentive schemes went out of political fashion, which resulted in a period of perceived 'no-policy policy'. The official rhetoric did encourage a need for innovation-supporting programmes, but no programmes for innovation were put in place. Nevertheless, efforts were made to enable public agencies to carry out innovation procurement. Eventually some programmes were established, e.g. VINNOVA, rendering a more engaging or active policy. This development can be explained by the legislators' lack of operative power, they can enable and promote innovation, but they cannot require authorities to actually carry out innovation procurement. The consequence has been that public authorities have often carried out public procurement for innovation in order to cover endogenous needs, but not promoting procurement in general or to cover exogenous needs. Even so, there are several examples where authorities have carried out projects not necessarily covering endogenous needs. One example of this is the Jegrelius Institute for Applied Green Chemistry, which promotes sustainable innovation. It would seem that the Swedish lack of national policy enforcement has led to an increased importance of the regional innovation system with regional drivers for its

development. If this evolution continues, public procurement will hence continue to target intrinsic needs either defined from within the procuring public agency or within the specific sector, which is probably something that will increase chances for success in future procurement projects aiming to render innovation.

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Chapter 12
UK

UK Public Procurement of Innovation: The UK Case

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Abstract This chapter provides a review and assessment of public procurement of innovation in the UK. Public procurement of innovation has long been of significant policy and research interest in the UK, but particularly so in the last decade. Accordingly, a host of initiatives and reports have been introduced aimed at mobilising the use of UK public procurement to support competitiveness and innovation. Despite conflicting objectives in procurement policy and a recent shift in focus towards efficiency in government spending and away from innovation, the UK case has been widely used as an international exemplar. The chapter is structured as follows: First, the context for the wider practice and governance of public procurement in the UK is introduced, including broad statistical evidence of the breadth of public procurement expenditure in the UK. Against this background, we provide a description of key policy initiatives designed to embed public procurement in the innovation policy portfolio of the UK. As examples, we provide some short case studies to explore the reach and limitations of the policy approaches and instruments used. We finally provide some conclusions about the recent development and foreseeable future use of innovation procurement in the UK. In particular, we question the level of dissemination and impact of some of these measures.

12.1 Introduction

Until the financial crisis brought it to an abrupt halt in 2008, the economy of the United Kingdom had experienced a decade and a half of growth which was marked by an increasing dominance of the service sector, particularly knowledge-intensive

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business services. Despite current rhetoric about rebalancing the economy towards manufacturing, high- and medium-tech manufacture account for the lowest proportion of output in any OECD economy (BIS 2011). The service-oriented structure of the British economy partly explains a lower-than-average BERD at around 1.6 % of GDP and falling. Nonetheless the UK has a strong position in some high-tech sectors, notably pharmaceuticals and aerospace. A relatively open economy and a high-quality science base make it a favored destination for mobile international R&D investment, receiving the highest share of internationally funded Business Expenditure on R&D (BERD). The national innovation policy approach has traditionally focused upon capitalizing the science base through support for collaborative R&D as well as the provision of grants and advice to small firms. These activities have been complemented by the provision of infrastructure such as the national measurement system.

Public spending as a percentage of GDP in the UK has risen rapidly, from 35 % in 2000 to 39 % in 2007 and to 45 % in 2010 (HM Treasury 2010a: 62). Against this backdrop, it is unsurprising that successive governments have sought public sector efficiency reforms, often with innovation as a recurring theme. Reforms have involved over 20 reorganizations of central government, with the establishment of 'arms-length bodies' (NAO 2010), and a drive towards outsourcing and commissioning of public services to the private and voluntary sectors. At the same time the dominance of public demand in sectors such as health, transport and social services means that there is significant potential for incentivizing innovation through procurement in these areas.

This chapter provides a review and assessment of public procurement of innovation in the UK. The UK is an interesting case to study in this area for several, mutually interconnected, reasons. Firstly, the UK has been a 'first mover' in the promotion of policies and initiatives seeking to stimulate innovation through procurement, as well as addressing the modernization of the procurement function more generally. Despite certain policy tensions, issues around implementation and a recent change of direction away from innovation, the UK case has become widely used as an international exemplar. Secondly, the UK has pioneered the application of a range of mechanisms such as Compulsory Competitive Tendering, private finance initiative (PFI) and other public–private partnership (PPP) models for the delivery of public services. Thirdly, as a result of the extent of private and third-sector involvement in the delivery of a wide range of public services, the UK public sector services industry (Julius 2008) is generally considered to be one of the largest and most developed in the world.

The chapter is structured as follows: after setting the scene for the wider practice and governance of public procurement in the UK, we next describe the extent to which public procurement has become a part of the innovation policy portfolio. With the aid of short case studies we explore the reach and limitations of the policy approaches and instruments used and draw conclusions on why the desired level of dissemination and impact has yet to be achieved.

Table 12.1 Public expenditure on current and capital procurement, 2006/07–2010/11 (in £ millions) (HM Treasury 2012, Table 5.3)

	2006–07	2007–08	2008–09	2009–10	2010–11
Gross current procurement	164,584	174,505	187,751	195,916	191,633
Gross capital procurement	34,205	39,134	42,267	44,739	46,456
Total gross procurement	198,789	213,639	230,018	240,655	238,089
Total public sector expenditure on services	523,062	555,210	603,354	642,210	665,287
Gross procurement as % of total expenditure on services	38 %	38 %	38 %	37 %	36 %

12.2 Public Procurement in the UK

12.2.1 General Indicators

Government procurement has grown rapidly in the UK in the last two decades, although establishing the precise scale and nature of public procurement is problematic due to measurement and definitional issues. UK public bodies spent around £238 billion in 2010/11 on procurement of goods and services (see Table 12.1). Public procurement expenditure accounts for 35 % of UK total public expenditure on services and approximately 16 % of GDP, and has increased in parallel to public expenditure during 2006 and 2011. Such changes can be explained by the growth of public expenditure in areas such as health and by an increase in the use of outsourcing and contracting-out of government services and public–private partnership arrangements (Dey-Chowdhury and Tily 2007).

We can further draw a distinction between current and capital procurement. Current procurement corresponds to recurring spend on goods and services that are consumed in the process of providing public services, whereas capital procurement refers to purchase of fixed assets such as buildings and large-scale IT projects. Current procurement accounts for more than 80 % of public procurement in the UK.

Figure 12.1 shows the proportion of public procurement undertaken by central and local government in the UK. Local authorities are responsible for 33 % of public procurement while central government ministries, non-ministerial departments, devolved governments and the National Health Service (NHS) are responsible for the remaining 67 %.

Figure 12.2 shows the breakdown of procurement by departmental groups in 2007–2008 and in 2010–2011, and highlights how two departments, the Department of Health and the Ministry of Defence consistently dominate public expenditure in goods and services. The combined spend of these two departments corresponds to 58 % of central government's procurement and 37 % of total public procurement.

A more detailed categorisation can be observed in Fig. 12.3. The Public Sector Procurement Expenditure Survey (PSPES) conducted by the Office for Government Commerce (OGC) categorizes government spending according to different public-sector supply market areas. The 2011 PSPES analysed £86.8 billion of

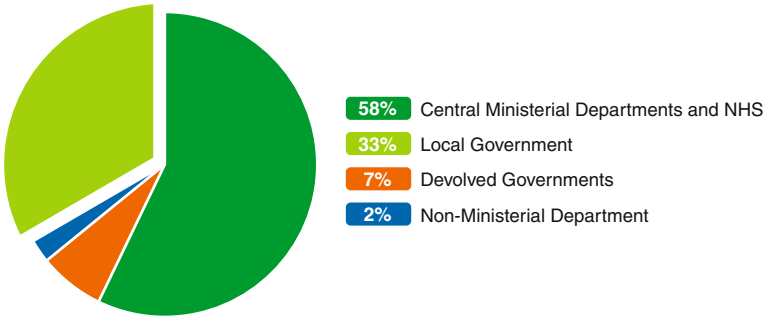

Fig. 12.1 Procurement by central and local governments (Public Expenditure Outturn Updates, 25 February 2010)

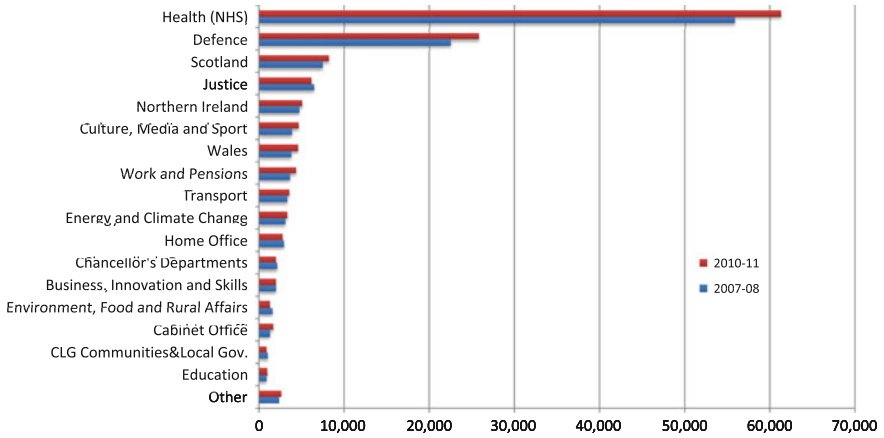

Fig. 12.2 Total (capital and current) procurement (£million) budget by department (HM Treasury 2012, derived from Tables 2.2 and 2.3 and expressed in 2012 prices)

expenditure by central government organizations and English Local Authorities (and excluding NHS). The data suggests that construction, social care and professional services are the biggest areas of government expenditure.

The economic importance of public procurement for the UK economy was highlighted in 2008 by the 2008 UK 'public services industry (PSI) ' Review[1] (Julius 2008). According to the Review, the revenues of the sector totaled £79 billion in 2007/8, generating £45 billion in value added and employing over 1.2 million people. Health constituted the largest sub-sector of PSI spending, totalling £24.2 billion in 2007/8, followed by social protection (£17.9 billion), defence (£10.1 billion) and education (£7.3 billion). Julius (2008) further reported

[1] The Public Services Industry is defined as 'All private and third sector enterprises that provide services to the public on behalf of Government or to the Government itself' (Julius 2008: i).

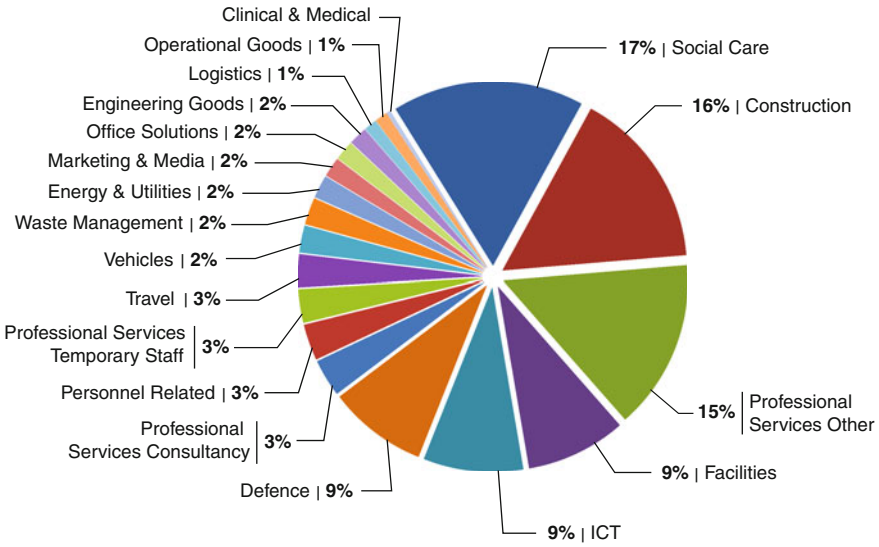

Fig. 12.3 UK government expenditure by categories (OGC 2011)

a growth rate in the industry of almost 130 % during the period 1995/6–2007/2008, albeit with a slower growth towards the end of the period, with the fastest growing sectors including education, environmental protection and health.

12.2.2 Governance of Procurement in the UK

Public procurement in the UK is governed by the Public Contracts Regulations 2006 (for England, Wales and Northern Ireland) and the Public Contracts (Scotland) Regulations 2006. These Regulations implement into UK law the European Commission's Directive on public procurement (2004/18/EC), adopted in March 2004.[2]

The United Kingdom has a semi-centralised public procurement structure. Contracting authorities (government departments and agencies, local authorities, devolved administrations and non-departmental public bodies) are responsible for their own procurement. They are supported by a procurement landscape which comprises a plethora of organisations performing legislative, audit and improvement roles in relation to public procurement. Many of the structures in place have been the result of reforms undertaken to modernise public sector procurement. The National Audit Office (NAO) was set up in 1983 to replace the former Exchequer

[2] Unless otherwise indicated, the chapter will concentrate on public procurement in UK central government, (English) local government and (English) National Health Service.

and Audit Department in its role of scrutinising public spending on behalf of the UK Parliament. The NAO provides financial audits of all government departments and agencies as well as other public bodies. Its work includes producing practical procurement guidance, representing the UK on EU procurement policy and improving professional procurement skills through the Government Procurement Service. Following publication of the 1999 Gershon Review on *Civil Procurement in Central Government,* the Office of Government Commerce (OGC) was established to lead a programme of central government procurement reform. Since then, the OGC has been an independent office of HM Treasury tasked with providing policy standards and guidance on best practice in procurement, and facilitating collaborative procurement to deliver better value for money. OGC works with central government departments and other public sector organizations. It also has a partial remit in other parts of the public sector such as Local Authorities and Higher Education Authorities, and no remit in defence-related procurement activities. Since 2010, the OGC is part of the new Efficiency and Reform Group (ERG) in the Cabinet Office, created to promote government efficiency and public services reform. The ERG brings together expertise from different parts of Cabinet Office, HM Treasury, Directgov, OGC and Buying Solutions.

Within the ERG, the Major Project Review Group (MPRG) is in charge of reviewing procurement projects across the public sector that are particularly complex and high value-added and assessing their viability. Also within the ERG, the Gateway Reviews are mechanisms set up to monitor the progression of procurement projects, and which are mandatory in central civil government for procurement, IT and construction projects. At the local level, Gateway Reviews are conducted by the Local Partnerships (local government's project delivery specialist, previously 4 ps). Local Partnerships provide support in the form of guidelines, training and sharing of best practices to local authorities in relation to the funding and the different stages of development, procurement and delivery of PFI projects, as well as other complex procurement projects.

The Department for Communities and Local Government (DCLG) is the government department responsible for local government policy in England. Its remit includes ensuring local service delivery and efficient use of resources. Local Authorities are responsible for their own procurement decisions, subject to public procurement law. Local Government Improvement and Development (formerly IDeA) supports improvement and innovation in local government, for instance through the Regional Improvement and Efficiency Partnerships programme (which has a procurement workstream).

The Audit Commission is the independent body responsible for ensuring value for money in English local government. Its remit includes raising standards in financial management and financial reporting; encouraging continual improvement in public services such as housing, health, criminal justice and fire and rescue services and promoting high standards of governance and accountability. The

Audit Commission produces value for money reports for local public services as well as reports on a wide range of local government issues and local government briefings.[3]

Finally, a number of professional and trade bodies are also, to different degrees, involved in training and the improvement of government procurement, including the Chartered Institute of Purchasing and Supply, but also the voluntary network of the Society of Procurement Officers (SOPO) in local government, and the Chartered Institute of Public Finance and Accountancy.

Separate arrangements are in place in Scotland, Wales and Northern Ireland. The Scottish Procurement directorate is responsible for the development of national procurement strategy, policy and guidance in Scotland. A number of Centres of Expertise are in place representing sector-specific interests, and a Policy Forum identifies areas of existing procurement policy where there is a need for further guidance and/or training (Scottish Government 2008). Procurement is a transferred matter also for Northern Ireland and Wales, with similar arrangements and structures, even though it falls within the scope of UK Regulations (which cover England, Wales and Northern Ireland).

The procurement landscape in the UK has been described as "inefficient, fragmented and uncoordinated" (HM Treasury 2009: 21), comprising around 44,000 public sector buyers, including schools, local authorities, housing associations and social care organisations, police forces, NHS trusts, central government departments, agencies and non-departmental public bodies (NDPBs). Furthermore, more than 50 Professional Buying Organisations (PBOs) operate in the UK at the sub-regional, regional and national levels, working along geographical and sectoral lines. Many PBOs at the local level grew out of local authority purchasing consortia and generally serve schools, fire and rescue authorities and often the police (DCLG 2009). The largest PBOs are the Government Procurement Service (GPS, previously OGC Buying Solutions), the NHS Purchasing and Supply Agency (NHS PASA) and the PRO5 (collaboration between Local Authority buying consortia). Created in 2011, Government Procurement Service now forms part of the ERG Group within the Cabinet Office, together with the OGC. GPS provides services, technical support and advice to organisations to enable them to achieve value for money in their commercial activities. It also develops UK-wide framework agreements, which are a set of pre-tendered contracts with a range of suppliers from which customers can purchase goods and services.

Successive government reviews, guidelines and reforms have been directed at further modernising the UK public sector and increasing efficiency in procurement. For instance, the focus of the 2004 Gershon Review was on greater efficiency to facilitate better services. Gershon (2004) identified efficiencies that could be realised within the public sector's back office, procurement, transaction service

[3] In 2010 there had been plans to disband the Audit Commission, however, as of summer 2012 it still was in operation, and discussions were still underway http://www.audit-commission.gov.uk/aboutus/future/Pages/default.aspx (accessed July 2012).

and policy-making functions, as well as in other frontline public services. More recently, the *Transforming Government Procurement Strategy* (HM Treasury 2007), launched as part of the 2007 *Comprehensive Spending Review*, also sought to raise procurement standards, develop the skills of procurement professionals, drive value for money through collaborative procurement and improve the delivery of major projects. Following the publication of this strategy, the OGC kick-started a series of Procurement Capability Reviews, intended to look in detail at key elements of procurement capability in central government departments. Each department subsequently developed and implemented an Improvement Plan. Finally, the *Operational Efficiency Programme* (OEP) aimed to further achieve efficiency savings through collaborative procurement and improvement in other areas such as property-asset management (HM Treasury 2009).

At the local level, in 2000 an independent taskforce led by Sir Ian Byatt reviewed the state of procurement skills and practice in local government in England. Research conducted for the taskforce (Byatt 2001) highlighted important corporate capacity constraints in local government. Among the taskforce's recommendations were a better alignment of procurement and best practice; the development of a corporate procurement function; building more procurement capability; better management of risks; greater use of e-procurement; and improved regulations and legislation (Byatt 2001). These recommendations led to a national procurement strategy (ODPM 2003) and the creation of the Centres of Procurement Excellence in 2004, one for each of the nine English regions. The aim was to promote excellence in procurement activities and to carry out procurement tasks, such as the development of framework agreements and new procurement vehicles for local government. The Centres were subsequently replaced by the Regional Improvement and Efficiency Partnerships (RIEPs) as a result of the *National Improvement and Efficiency Strategy* launched in 2008 by the Local Government Association (LGA) and the Department for Communities and Local Government. The focus of the strategy was to join up local and national improvement and development priorities and streamline and devolve resources to meet those priorities (LGA/DCLG 2008). The nine RIEPs were created in April 2008 through the merger of the Regional Improvement Partnerships and the Regional Centres of Procurement Excellence. The 2009 *Roots Review on Efficiency Arrangements in Local Government* (DCLG 2009) further recommended a stronger role for the RIEPs, a greater balance of attention and resources given to efficiency considerations, improved availability of contracts information and better supplier engagement. As part of these efforts towards rationalisation, there is an emphasis on the utilisation of 'procurement hubs' and regional collaborative procurement to achieve economies of scale (DCLG 2009).

In parallel, local government has undergone a number of reforms to enable greater autonomy in local decision-making (particularly as set out in the 2006 *Strong and Prosperous Communities White Paper* (DCLG 2006). The white paper recommends a move away from a narrowly defined approach to service delivery and towards a 'commissioning' role (including needs identification, planning, sourcing, delivery and performance management). It recognises that local authorities increasingly act as strategic commissioners of services rather than

providers of services themselves. Among other things, it recommends 'smart procurement' and the use of competition in local government service markets. The strategy '*improving the strategic commissioning of public services*' further notes that good commissioning "is much more than just procuring services" (CBI/LGA 2008: 5). Changes in public service delivery also imply increasing reliance on strategic partnerships and greater engagement with community and voluntary organisations to design and deliver public services.

12.3 Public Procurement Policy for Innovation in the UK

12.3.1 Public Procurement of Innovation: Ten Years of History (2003–2012)

The use of public purchasing as a deliberate tool to promote technical innovation is not a new debate in the UK. For instance Williams and Smellie (1985) note how 'enlightened' public purchasing policies were a concern since the early sixties and were raised in reports by the Advisory Council for Applied Research and Development (ACARD) in the 1970s and 1980s and also included in Government Accounting guidelines by 1989.[4] Subsequently, the expansion of procurement in the context of the privatisation agenda of the 1980s and 1990s and the procurement modernisation agenda kick-started by the Gershon Review in the late 1990s provided additional fertile ground for this debate. The early 2000s witnessed a renewed impetus in this policy agenda, with the launch, both in the UK and elsewhere in the European Union (Edler and Georghiou 2007), of a host of initiatives and strategies aimed at mobilising the use of procurement to support competitiveness and innovation. This section focuses on this particular period.

A key reference to the potential of procurement to stimulate innovation can be found in the former Department for Trade and Industry's 2003 report *Competing in the Global Economy: The Innovation Challenge* (DTI 2003). The report was concerned with how to increase the UK level of productivity and position in a context of heightened global competition. The report called for the public sector to boost innovation and to achieve the vision of the UK as a key knowledge hub in the global economy. In this context, the report stressed the vital role that public procurement could play as a lever for stimulating and enabling supplier innovation. One recommendation of the DTI report was therefore to develop new procurement guidelines designed to make government a more 'intelligent customer'.

In response to the DTI report, the OGC published the report *Capturing Innovation* (OGC 2004) with suggestions on how to encourage innovation from government suppliers. It listed key 'barriers' preventing the public sector from fully 'capturing innovation', including inadequate early warning, risk aversion, and

[4] we are grateful to Colin Cram for this comment

client capability shortfalls in the public sector. To address them, the report proposed a framework for action throughout the procurement and contract lifecycle and highlighted that the greatest potential for innovation arises from involving suppliers early, namely when programmes and projects are being shaped; and in the formulation of procurement strategies.

Innovation and market shaping was also the focus of the *Kelly Review*. As part of the Chancellor's Pre-Budget Report of November 2002, the OGC was asked to consider what steps could be taken to increase competition and long-term capacity planning in markets where government had significant purchasing power. A report led by Sir Christopher Kelly was produced in 2003 together with an action plan (OGC 2003). The OGC's Kelly Programme was launched as a result, informed by a number of key principles, namely increased competition, more responsive markets, greater security of supply and reduced dependency on a limited group of key suppliers. Construction was the first 'Kelly Market' analysed, leading to a series of recommendations to improve procurement in the sector, followed by a similar analysis for municipal waste.

Similarly, the *Cox Review on Creativity in Business*, commissioned by the Chancellor of the Exchequer before the 2005 Budget (Cox 2005), aimed to examine ways in which UK business productivity could be enhanced by drawing on its creative capabilities. Chapter 7 of the Review was dedicated to 'using the power of public procurement'. The Review noted that, despite much progress in shifting the policy agenda, change in procurement practices remained an important challenge, a difficulty compounded by the fragmented nature of procurement in the UK. Among the recommendations of the Review were to: allow more discussion pre-specification, adopt a more holistic approach to project needs, improve purchaser capability and consider the impact of purchaser decisions on supplier capability. Finally, it recommended that the Audit Commission and the NAO should monitor whether innovative solutions are being considered in procurement decisions rather than 'lowest-cost, least-risk response to a narrowly defined need' (Cox 2005: 39).

The 2007 *Sainsbury Review on Science and Innovation Policies* was tasked with examining the role of science and innovation in helping the UK more successfully compete with emerging economies. It highlighted the importance of demand-side factors such as procurement in encouraging innovation. The Review encouraged the government to deepen the *Transforming Government Procurement* agenda to improve procurement capability. It also recommended the use of outcome-based specifications as part of forward procurement programmes. Finally, it noted that a pre-commercial scheme that is focused on SMEs (SBRI, see Sect. 12.3.3) should be reformed. In particular, it recommended a greater engagement by departments, which should specify up-front the technological areas in which they would like to see projects performed, would fund necessary R&D service to get solutions developed and subsequently would purchase those solutions (Sainsbury 2007).

The 2008 *Innovation Nation* White Paper built on the Sainsbury Review and highlighted the potential of harnessing the power of public sector spending for innovation. It noted that "procuring innovative solutions has tended to be a low priority" (DIUS 2008a: 23), mainly due to a risk-averse culture, difficulties in

defining what constitutes innovation in procurement terms and a capability shortage among procurement professionals. It now made concrete operational suggestions. For example, it proposed that each government department should develop an Innovation Procurement Plan (IPP) as part of its commercial strategy, detailing how they will embed innovation in their procurement practices and seek to use 'innovation procurement' mechanisms. To this end a guide to driving innovation through public procurement was produced in 2009. An outcome of the Innovation Nation White Paper published by the Department for Business, Innovation and Skills (BIS) was the development of an Innovation Procurement Plan (IPP) by every government department (see Sect. 12.2.3.3).

The strategic importance of public procurement for the UK economy was again highlighted in the *Public Services Industry Review*, conducted by DeAnne Julius for BERR (now BIS) in 2008. The report highlighted how the 'public services industry' represents a significant part of the economy, and identified areas potentially inhibiting its development, including skills shortages, lack of a level playing field and the high cost of the procurement process (Julius 2008). In order to address these shortcomings, a number of recommendations were provided under the headings 'long term commitment', 'clear and consistent objectives', 'competitive neutrality', 'partnerships', 'commissioning skills' and 'bid costs'. The report also highlighted the benefits of a 'mixed economy' model of provision where public, private and third sectors compete to provide the best service in a given area.

As mentioned in Sects. 12.1 and 12.2, the UK has extensively applied delivery mechanisms such as PPPs and PFIs for the provision of public sector infrastructure. PFI investment has been used for the delivery of some 900 new public facilities, including hospitals, schools, water treatment, waste management infrastructure, etc. The early application of these vehicles partly explains the much more extensive adoption of procurement procedures such as competitive dialogue vis-à-vis other countries (Treumer and Uyarra 2012). A review of the use of competitive dialogue in the UK (HM Treasury 2010b) indeed suggested a wide use of the procedure and noted that "where it is used appropriately …, the Competitive Dialogue procedure has been a positive addition to the procurement spectrum". However, it warned of its application in projects that were not particularly complex, suggesting that contracting authorities in the UK may view competitive dialogue as the default process (except for straightforward procurements) rather than utilising the full range of procurement procedures. Further, it identified instances where contracting authorities lacked the resources, capabilities, leadership and prior preparation needed for the delivery of competitive dialogue, resulting in delays and additional costs.

The potential of SMEs to contribute to innovation and better value for money through ensuring better access to public sector contracts was the focus of a review

[5] Improving access by small and medium-sized enterprises (SMEs) to procurement contracts was also the focus of the Better Regulation Task Force/Small Business Council Report 'Government: Supporter or Customer?' in 2003, which was taken up by the DTI and the OGC.

led by Anne Glover for the Treasury in 2008.[5] The *Review on Accelerating the SME Economic Engine* (Glover 2008: 5) set out to assess the barriers for SMEs to access public sector procurement, noting that "improving SME participation in public procurement is best achieved by making the market work effectively to allow SMEs to compete effectively for contracts". It therefore recommended that opportunities be transparent, procurement processes as simple as possible, and that a strategic approach to procurement be adopted that encourages innovation and gives SMEs a fair deal as sub-contractors. The Review called for a more strategic approach to procurement from small firms through outcome-based specifications, more accessible subcontracting opportunities and better reporting of the value of SME contracts.

A number of additional agendas, besides innovation and SME growth, have been linked to the government procurement policy in the UK, particularly during the Labour Government (up to 2010), for instance in relation to using procurement to improve sustainability. The UK *Sustainable Development Strategy*, published in 2005, already made the case for harnessing public sector purchasing power to transform the market for goods and services with lower environmental and social impacts and achieve the government's goal to be among the EU leaders in 'sustainable procurement' by 2009. The UK government's *Sustainable Procurement Action Plan* described actions to be taken collectively by government and individually by Departments to achieve that goal.

The coalescence of multiple policy agendas under a single procurement umbrella has led to a critique of excessive fragmentation and potential confusion (Uyarra 2010). Giving evidence to the House of Lords Science and Technology Committee (House of Lords 2011: 13), some of the authors of this chapter noted that "the problem lies in the implementation of all those intentions and report recommendations. The complex and changing procurement landscape and the 'overcrowding' of the 'policy through procurement' agenda has, over time, resulted in a proliferation of guidance and reports which can be confusing, even contradictory, to procurers". The use of procurement to address *multiple* agendas was for the first time made explicit in the *'Policy through Procurement Action Plan'* (OGC 2010), announced in the 2009 Pre-Budget Report. The procurement policy priorities included in the action plan were SME development, skills training and apprenticeship and carbon reduction. In addition, it stresses that "public authorities will need to be innovative in their procurement practices and engage suppliers in developing innovative, high quality and cost-effective solutions to the delivery of works, services and goods." (OGC 2010: 1). The development of the Policy through Procurement (PtP) agenda was to be monitored through a set of key performance metrics such as the value of contracts placed with SMEs or the number of apprenticeships supported. The PtP agenda has, however, been discontinued since the Coalition Government took office.

12.3.2 Procurement for Innovation Under the Coalition Government

With the change of government to a Conservative-Liberal Democrat coalition, the approach to public procurement has considerably shifted to a focus on efficiency in government spending, with innovation no longer an explicit goal of public procurement policy. In August 2010 a review on government efficiency was published, led by Sir Phillip Green. The report noted that the government was failing to leverage its scale and identified a number of inefficiencies associated with government procurement, including large differences in prices for similar basic commodities, multiple contracts with the same major suppliers by different departments at different prices, etc. Such inefficiencies were, according to the Review, due to poor and inaccurate data, inconsistent commercial skills across departments, the government acting as a series of independent departments rather than as one organisation and the lack of a clear mandate for centralised procurement (Green 2010).

Since the *Efficiency Review*, efforts have been undertaken by the government to streamline and centralise public procurement for common goods and services. One of the first actions introduced by the new government was to carry out a series of negotiations with the 50 largest suppliers of the government, which led to savings of around £800 million. Following this, the Cabinet Office appointed a Chief Procurement Officer and a network of Crown Commercial Representatives to manage relationships with major suppliers holding a portfolio of contracts across central government, in order for the government to act as a strategic 'single' client (Cabinet Office 2011).[6]

Following the *Efficiency Review*, Frances Maude, Minister at the Cabinet Office, announced a *Lean Review* aimed at uncovering "wasteful practices and unnecessary complexity in the procurement process and to suggest actions to rectify them" (Cabinet Office 2011: 3). The Review, published in February 2011, focused on problems associated with long lead times, resourcing and processing costs of complex government procurements. It considered that overcoming these challenges required upskilling of procurement and commercial professionals, the allocation of resources to complex procurement projects, and the effective sharing of 'best practices' across government departments. Giving evidence to the House of Lords (2011), Frances Maude noted that the procurement process was overly burdensome: "the very process-heavy approach to procurement has resulted in massively highly specified tender documents with prequalification that has been very demanding". The objective of the Efficiency and Reform Group was therefore to develop a simpler approach, "where the overwhelming objective is to procure effectively and with an emphasis on value for money".

Following the *Lean Review*, several initiatives were announced including a series of recommendations to reduce the length of procurement processes and a

[6] Cabinet Office, Government Appoints Chief Procurement Office to Cut Waste, 19 April 2011; Cabinet Office, Supplier Representatives to Cut Costs for Government, 13 April 2011.

commitment to award 25 % of contracts to SMEs. In order to fulfil the latter aspiration, new measures followed to improve access of SMEs to public sector contracts. They included the launch of a new contracts finder website advertising all opportunities over £10,000, the appointment of a Crown Commercial Representative for SMEs, and a mandate for a single, simplified PQQ for all main commodities (and the elimination of PQQs for central procurements under £100,000). In addition, and in order to improve procurement competences, the government launched an interchange programme to allow civil servants to get commercial experience and bring private-sector expertise into the public sector.

The 'one year on' (Cabinet Office 2012) progress published by the government in March 2012 reported that the share of central government direct spending with SMEs was expected to double from 6.5 % in 2009/10 to 13.7 % in 2011/12 (up to 14.5 % if indirect spending is considered). Commentators have however raised doubts about the accuracy of these results given the lack of reliability of SME procurement statistics.

Concerns have been expressed about the governments' overwhelming objective to promote efficiency and the seemingly secondary objective of pursuing innovation. The emphasis on innovation is linked to more efficient procurement processes, competitive markets and the aggregation of demand to leverage purchasing power by more commercially-minded procurers. The expectation is that this would naturally lead to innovation, in other words that it would "ensure real value for money from the extra investment going into public services and, as a by-product, would stimulate far more innovation within industry". Along these lines David Willets, Minister of State for Universities and Science, acknowledged in a speech: "it's vital that the public sector uses that purchasing power effectively. There is a lot more that we can do here both to back SMEs and to back innovation.[7]"

The House of Lords 2011 enquiry into *Public Procurement as a Tool to Stimulate Innovation* questioned the compatibility between the efficiency agenda and the promotion of innovation. Some evidence was provided that innovation may indeed conflict with short-term savings targets. Luke Georghiou thus stressed that demands for efficiency "could take us to the lowest common denominator and towards off-the-shelf goods rather than innovative ones" particularly considering that the "entry cost of innovations tend to be higher than when procuring an established product or service" (House of Lords 2011: 31). Frances Maude was, however, more positive about the complementarity between achieving savings and innovation, noting that: "in order to drive the much better value for money that is essential in the current fiscal climate we need to enlist innovative solutions … that is a kind of basic proposition that we have to articulate clearly much more vividly than we have done thus far" (Ibid: 32).

Procurement of innovation has received more attention in the context of industrial policy and the government's growth agenda. The *Growth Review* published in November 2011 (HM Treasury/BIS 2011) recognised the role of

[7] 'Science, Innovation and the Economy', 9 July 2010, Royal Institution, London.

procurement in shaping markets, and the Business Secretary of the Coalition Cabinet Vince Cable recently stated that "across many sectors, from health and transport to education and defence, the public sector can play a vital role as a first customer for innovative products and services.[8]" The accompanying economics paper to the *Growth Strategy* (BIS 2011) made the case for the public sector acting as an intelligent and demanding customer, and highlighted its potential for "enabling innovative solutions to effectively address social challenges and improve service delivery, supporting the development and growth of innovative businesses and stimulating wider economic growth" (BIS 2011). The main report, however, resorts back to the lack of efficiency and excess bureaucracy, which works against "a competitive market by locking dynamic and innovative SMEs out of many government contracts". It further restates the government objective to develop a more competitive and transparent procurement system.

Recent controversies such as the closure of the Bombardier plant in Derby[9] have forced the government to articulate a response in relation to "the best way to balance short term cost considerations with longer term value for money and industrial competitiveness".[10] Vince Cable noted that the UK government had not traditionally fully considered how "public sector spending shapes markets and influences supply chains" and had been "too transactional, short-termist, risk averse and costly" in implementing European Union procurement rules, whereas "our key competitors in Europe, to varying degrees, view procurement as an integral part of their industrial strategy." The government, he argued, should shift the emphasis in procurement away from excessive formalism and legalism, and should instead act as "a responsible customer, developing a collaborative and considered long-term relationship with our supply chain". In particular, he highlighted potential business opportunities for UK industry in the strategic infrastructure sector such as rail, with projects such as High Speed Rail, and in energy, particularly nuclear.

It is also interesting to note that the reform agenda kick-started by the Coalition Government has concentrated on central government procurement. No clear strategy or roadmap has been adopted to extend reforms to the rest of the public sector. Giving evidence to the House of Lords (2011: 142) Frances Maude noted: "we will not seek to mandate how local government procures. … We will be quite mandatory about central government … but we will not seek to impose that on local government nor on the increasingly mixed economy in the NHS." The House of Lords (2011: 42) concluded that "The Government's laissez faire approach to the dissemination of best practice in procurement from central to local government

[8] The role of science, research and innovation in creating growth, By Vince Cable, 8 September 2010, Queen Mary University of London.

[9] In July 2011, an announcement was made that more than 1,400 jobs were to be cut at Bombardier, the UK's last train manufacturing plant, in Derby. Job losses were announced after Bombardier lost the £3 billion contract to supply 1,200 carriages for the Thameslink route, a contract that was won by Siemens of Germany.

[10] By Vince Cable, Secretary of State, 26 October 2011, The Ideas Space, Policy Exchange, 10 Storey's Gate, Westminster, London, SW1P 3AY.

appears to be overly optimistic" and recommended that a system of dissemination be put in place to share examples of procurement of innovative solutions across central and local government as well as mechanisms to assess its effectiveness.

12.3.3 Some Key Mechanisms and Initiatives

One key feature of public procurement in the UK has been the design and introduction of specific policy schemes to deliver on the innovation agenda. We single out four initiatives: the innovation procurement plans (IPPs), the reformed Small Business Research Initiative (SBRI) scheme, Forward Commitment Procurement (FCP), a new scheme to link private and public demand (Private–Public Procurement Compacts), and the Department of Health's Innovative Technology Adoption Programme (iTAPP).

Innovation Procurement Plans

As mentioned in Sect. 12.3.1, the development of IPPs was a commitment in the 'Innovation Nation' White Paper (DIUS 2008a) under the Labour Government. The aim was to give ministries "an opportunity to fundamentally think about their procurement practices and to consider how these might be improved or used to drive innovation" (DIUS 2008b: 3) and to "[set] out how departments will embed innovation at the heart of procurement practices". The IPPs should provide a good indication of the types of activities being carried out by departments to obtain innovative solutions; and a plan to embed processes for the procurement of innovation in their procurement procedures. An IPP development document was produced in May 2010, building on the original IPP guidance, to update on recent developments and suggest areas for departments to focus on when revising their Plans. The initial IPPs were valuable to a certain degree in identifying the extent to which innovative procurement is already effectively embedded into current practices. However, overall the plans did not demonstrate how departments would use procurement to really drive innovation through specific opportunities. Furthermore, the quality of these plans has been described as widely varying; the House of Lords Committee report (2011) further highlighted a lack of measurable objectives, which made it difficult to assess whether the department had delivered its stated objectives. To this end, the Coalition government decided to discontinue the requirement for IPPs as part of the wider programme of reform of government procurement.

The Small Business Research Initiative

An example of experimental procurement policy is the UK Small Business Research Initiative (SBRI). It was first established in the UK in 2001 to increase access of small and medium-sized enterprises (SMEs) to public sector procurement, and to support the procurement of R&D with a potential to procure the innovation

generated in the R&D contract. SBRI was modelled on the Small Business Innovation Research Programme (SBIR), which was introduced in the USA in 1982 to stimulate and support technological innovation. The first phase of the UK initiative (2001–2007) was widely regarded as far less successful than the American model (Connell 2009; Bound and Puttwick 2010). In April 2008, the SBRI was re-launched, administered by the Technology Strategy Board (TSB), the UK innovation agency, as part of its portfolio of policy tools designed to support industrial innovation and promote economic growth. This new SBRI was not limited to SMEs.

The TSB had a broad ambition with regards to SBRI; it was designed to stimulate outcome-oriented innovation as well as to procure R&D. By enabling the public sector to access novel ideas and companies (including SMEs) through a risk-managed mechanism, the SBRI would provide access to lead customers and a route to market, whilst supporting follow-on investment through the validation of ideas (Glover 2012). The total cumulative spending of the SBRI between 2011 and 2012 was £60 m.

The SBRI has two main roles[11]; the first role can be described as 'Operational Effectiveness' and involves the government acting as a 'lead' customer for new products and services. This modality represented roughly two thirds of the calls and around 50 % of the SBRI spending in the financial year 2011–2012. Departments such as the Ministry of Defence (MoD) and the Department of Health (DoH) have been the main clients for this action. Departments have tended to run the competitions and review processes themselves, with the TSB acting as facilitator. This would, in principle, ensure the necessary context-specific skills and understanding of the problem for which procuring an innovative technology delivers the solution.

The second role is to support 'Strategic Objectives', i.e. to provide a route to market for innovations that support broad policy objectives, with the solution developed through SBIR providing opportunities for the market more broadly.[12] In this mode departments, such as the Department for Environment, Food and Rural Affairs (Defra) and the Department of Environment and Climate Change (DECC), would run competitions for innovations that support their policy objectives. In this role, the SBRI would drive the process, articulate the call, conduct the assessments and support the award process. The projects under this second modality have tended to be smaller, with the exception of the 'Retrofit for the Future' initiative, which ran 5 projects at a cumulative value of £18 million. Retrofit for the Future was run in conjunction with DCLG to identify innovative solutions to reduce carbon emissions and energy use in the existing social housing stock.

In a typical SBRI process, a departmental client would invite firms to tender with innovative solutions to a specified problem. The SBRI supports the department to articulate their problem. In Phase 1 (on average £60,000 per successful application),

[11] The UK model, in contrast for example to the model used in the Netherlands, did not apply SBRI for the purpose of technology transfer and the application of emerging technology, see EU Commission 2010: 8–9.

[12] Interview TSB.

applicants may be proposing competing or complementary solutions. Phase 2 (an average of £325,000 per successful application) of the programme then enables applicants to further develop their innovative solution through the creation of a prototype or alternative testing of the idea. The TSB estimates that approximately 40 % of Phase 1 competition winners will successfully progress to Phase 2. This approach helps to maintain diversity in the innovation process and prevents the government from 'picking winners'.

With its SBRI scheme, the UK appears to be at the forefront in Europe when it comes to pre-commercial procurement, with other countries following the UK example (Izsak and Edler 2011). Some have argued that the scheme fills a gap in the UK innovation policy toolbox and that it should be rolled out much more broadly (see e.g. House of Lords 2011: para 126 and 127). However there are no statistics available on how many competitions have led to new products being procured by departments. To date, there has been no external evaluation of the SBRI scheme, which would be essential to better understand the conditions under which the scheme and its two modes can exert their effects in a truly systemic way.

The scheme also faces challenges. As it is administered by the TSB, the willingness of other departments to apply the scheme, to buy into its logic and to ensure that the innovative solutions developed through the SBRI initiative are actually procured by departments and agencies, or advertised as part of strategic policy delivery, is critical. For the SBRI initiative to have maximum impact under the UK agency model, departments are required to take a strategic and holistic view of their objectives, to identify where innovation is needed and to engage strategically with industry. This is particularly difficult in complex, multi-layered organisations such as the NHS, where procurement is decentralised and fragmented, and uptake is therefore erratic.

Forward Commitment Procurement

Forward Commitment Procurement (FCP) is a procurement model introduced in 2006 designed to satisfy future outcome-based needs instead of purchasing for the immediate perceived needs. Initially conceived as a tool to address market failures in the area of environmental innovations (Defra 2006), it has subsequently aimed at delivering efficiency savings in other areas like healthcare. The purpose of the scheme is to resolve the problem that arises when an organisation requires a product or service that is either not available on the market or is too expensive to purchase. Therefore, the main feature of the FCP is the early communication with the market and the *credible* commitment to the market that solutions, should their prototype fulfil the requirements, will then be ordered and bought.

FCP consists of three stages (identification of need, market engagement, and procurement; see Fig. 12.4). In the first stage, the purchasing authority signals to the market the need for innovative solutions to a particular problem in a Prior Information Notice. The notice defines the requirements in terms of particular performance outcomes. A second stage consists of engagement with potential suppliers, followed by a formal procurement stage. Such procurement may

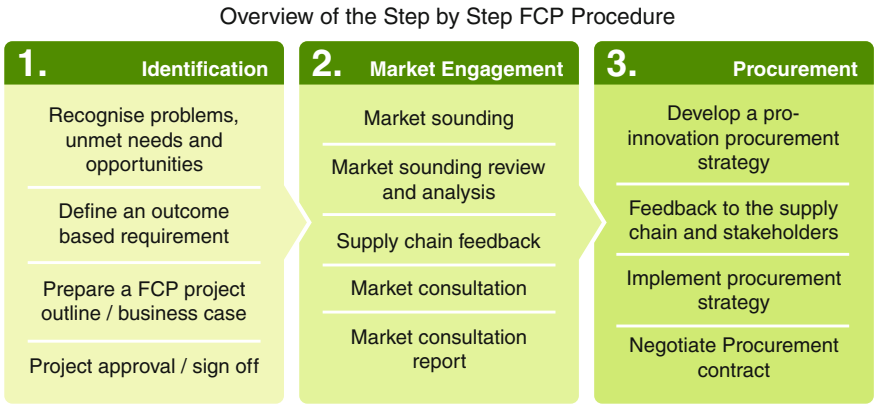

Fig. 12.4 The FCP procedure [BIS homepage. (http://www.bis.gov.uk/assets/biscore/innovation/docs/f/11-1054-forward-commitment-procurement-buying-innovative-solutions.pdf)]

incorporate a forward commitment, namely an agreement to purchase the developed solution at a price that is commensurate with its benefits.

Through these stages, FCP is used to make the market aware of government needs and requirements. The objective is to buy solutions that meet these needs once they are available and their functionality demonstrated, at a price that is proportionate to their benefits—this is known as forward commitment (BIS 2011). This helps to lower the level of perceived risk associated with investing in innovation by increasing the confidence that there will be a market for the product or service once the solution is proven.

One well-documented example of FCP is the procurement of zero-waste mattresses by HM Prison Service (HMPS), which used the model to procure a solution that prevented disposal of mattresses and pillows into landfill. Importantly, the FCP process made the organisation's unmet needs visible to the market, thus demonstrating a credible demand. This increased confidence that there would be a new market for the new product or service once it was proven, which influenced the investment by developers and suppliers to come up with innovative solutions. HMPS was able to use the information gathered through a market sounding and supply chain workshop to inform their procurement strategy and choose the most appropriate contracting approach. As a result, a 'zero waste' mattress was developed, the benefits of which were reduced turnover due to innovative new covers, eliminating the need for clinical waste disposal, and no contribution to landfill with end-of-life mattresses recycled into useful products instead. Most importantly, it brought about significant cost savings estimated to be around £5 million over the life of the contract.[13] Other projects developed following this methodology include

[13] For more details, see: http://www.bis.gov.uk/assets/biscore/corporate/migratedd/publications/c/cs02_hmps.pdf.

the procurement of ultra-efficient lighting at the Rotherham NHS Foundation Trust, with a solution that involved biodynamic lighting enabling energy consumption and maintenance savings of 30 and 88 % respectively. The FCP initiative has not yet been evaluated. Evidence of impact stems from a number of good practice cases in the UK and abroad.[14] but there is no evidence of the extent to which such practices have become embedded in public sector procurement.

Public–Private Procurement Compacts

In spring 2012 the Department for Business, Innovation and Skills (BIS) launched another pilot scheme labelled Procurement Compacts.[15] The idea of this scheme was for large public and private organisations to join forces to buy products and processes that help reduce the carbon footprint of private and public actors. Organisations would not only bundle their demand, but also develop joint roadmaps of future demand, sending clear signals to the industry in order to both induce the generation of new innovations and to accelerate the diffusion of new products and services.

A first pilot of this new initiative was launched in the areas of transport, catering and biomethane. Again, the idea was to sound out suppliers in the market as to what innovative ideas were there in the pipeline that could contribute to the carbon reduction needs of selected areas, similar to the forward commitment procurement. However, the Procurement Compacts are:

> a statement of commitment of public **and private** sector customers to buy progressively lower-carbon goods and services providing they meet operational needs and can be delivered cost-effectively. This will give suppliers the opportunity to differentiate their offering on the basis of environmental credentials that are valued by the buyer, and represents a forward commitment by customers for low-carbon alternatives. The Procurement Compacts provide a means to bring together and make visible a previously fragmented demand for lower-carbon goods and services in a way that provides a strong and credible 'direction of travel' message to suppliers from some of their major customers, thus stimulating providers to align their supply chains to low to zero carbon objectives. (Prince of Wales Corporate Leaders Group/BIS 2012: 13 highlighted by the authors)

The signatories of the Procurement Compact commit themselves to changing their buying behaviour, i.e. to increasing the sustainability standards in their purchases, and to introducing the carbon targets explicitly in future requests for quotes. As of summer 2012, it remains to be seen how those compacts deliver and if the idea spreads towards new areas. However, the Procurement Compacts combine three major elements that could potentially increase the likelihood of innovation generation and diffusion: First, they start with a societal need that is

[14] Including the pilot cases conducted in the context of the EU project LCB-Healthcare as part of the EU Lead Market Initiative, in partnership with nine hospitals across Europe (European Commission 2012).

[15] See http://www.cpsl.cam.ac.uk/Leaders-Groups/The-Prince-of-Wales-Corporate-Leaders-Group-on-Climate-Change/UK-Procurement.aspx.

expressed in concrete demand (reduction of carbon); second, they combine the buying power of the public and the private sector, thereby signalling a breadth of demand that incentivises companies and reducing uncertainty; last but not least, they start and sustain consultations between buyers and potential suppliers.

The Innovative Technology Adoption Programme in Health

When the UK government introduced the Innovation Procurement Plans initiative the Department of Health (DH), responsible for the National Health Service (NHS), under took a range of initiatives to bring innovation and procurement of innovation back into the centre of the NHS strategy. One notable example was the Innovative Technology Adoption Procurement Programme (iTAPP) launched in 2009. The programme was part of a larger agenda around Quality, Innovation, Productivity and Prevention, which placed innovation at the heart of a general improvement across the NHS. iTAPP was an initiative of the DH's Procurement Investment and Commercial Division (PICD) in collaboration with the National Technology Adoption Centre and the medical technology industry. It sought to facilitate the procurement, implementation, adoption and diffusion of innovative medical devices. This programme encouraged NHS-wide adoption of high-impact innovative medical technologies that could increase the quality of care provided to patients, whilst reducing the overall cost of care. The basic mechanism was to invite industry suppliers of health technologies and products to report innovations that could increase quality and reduce cost for the NHS. The iTAPP team then conducted expert reviews involving practitioners (national clinical directors), and produce a long list of technologies which were categorised according to their stage of market introduction and diffusion. This list then became the reference for regional Strategic Health Authorities (SHAs), who subsequently selected those that fit their own regional innovation and improvement agendas. The National Adoption Centre, an organisation to support adoption in the NHS, was commissioned to provide support to the regional actors in the process of adopting technologies on the list.

The iTAPP process is an example of need-driven mobilisation of innovation diffusion, as a co-operation of a sectoral ministry with a specialised agency and a collection of credible experts in order to create visibility and credibility for innovations that contribute to improve services.

12.4 Conclusion: From Intent to Implementation

Against a background of a public service reform agenda, several waves of privatisation and most recently an emphasis on austerity measures and greater efficiency, the use of procurement to stimulate innovation has been a steady subtheme with varying degrees of prominence in the UK. In the past decade the government has published more than 20 documents, including guidance, strategies and White Papers making the case for procurement as an important tool to drive innovation. A steady stream of academic findings and policy statements from

industrial and sectoral bodies has supported the agenda. As we have seen in this chapter, this intent has been matched by a high level of experimentation with a series of innovative policy instruments such as FCP, IPPs, Procurement Compacts and a willingness to import and adapt others, notably the SBRI. With all of this activity the question that needs to be asked is why the real base of activity remains small, with initiatives functioning effectively at a pilot level?

At the core of the answer to this question is the problem of dissemination of good practice. As we have seen the procurement landscape remains highly fragmented with a very large number of points of decision. Despite the emphasis on promoting skills and guidelines, many of these remain beyond the reach of these campaigns, especially in local government and the National Health Service. Many decisions are taken even without professional input from procurers. This fragmentation creates a further problem; when an innovation is successfully stimulated through procurement, it can be difficult to ensure its subsequent diffusion across public sector markets, creating a discontinuity between the triggering of innovation and the broader response to it. The problem is magnified further when the solution has the potential to be applied across different policy domains and ministries. This disconnect between procurement and diffusion reduces the visibility of a wider customer base to suppliers. Lack of diffusion may even result in a problem of over-incentivising innovation by duplicating specifications that have already been met in similar circumstances.

The position of procurement within the wider scope of UK innovation policy is also a matter of interest. As with most countries the historical context was one of supply-side dominance with support for R&D through grants and fiscal incentives being the most visible instrument, along with various networking schemes. Despite declining resources being available for funding of this kind, the locus of innovation policy remained with agencies whose expertise was in these domains. In recent years this has been the Technology Strategy Board. It is not then surprising that a large amount of attention has focused on the SBRI scheme, which falls most easily into the research funding paradigm. To its credit the agency has sought to partner with sectoral ministries in this area and via innovation platforms but the net result is a small share of already small budgets and little impact on the real prize—the multi-billion national spending on procurement of goods and services. There has been some consciousness of these tensions in government. Both the previous government in *Innovation Nation* and the present one with its *Innovation and Research Strategy for Growth* have sought firstly to distinguish innovation policy from research policy and secondly to include the demand side and public procurement in the agenda. In the latter document the agenda is given additional emphasis by the lack of availability of funds in the current economic climate.[16]

[16] In the industrial strategy of the UK Coalition government public procurement that is based on the *Innovation and Research Strategy for Growth* public procurement is still one of the key pillars, but with less emphasis on innovation, and more emphasis on the attempts to better use public procurement for economic effects more generally, shaping markets and supporting supply

Possibly running counter to this impetus is the intersection with the efficiency agenda in public procurement. There are positives for innovation in terms of the drive for simplification. There are reasonable arguments, too, that increased access for SMEs to government contracts will increase the level of innovation. SMEs as a class are not more innovative than large firms but the greater variety and competition that results from wider access is a likely positive force. On the other hand, the aggregation and centralisation of public contracts could lead to their award on a lowest common denominator basis, exclude the niche applications from which innovations often diffuse and reduce the breadth of interaction between suppliers and public buyers, not to mention a reduction in the variety and quality of public service provision.

The termination of initiatives such as the Innovation Procurement Plans after only one cycle also diminishes the possibility that the innovation agenda is embedded across government rather than being carried only by a select group of advocates. The criticism of the IPPs for a lack of measurable objectives highlights a more generic problem, the overall absence of metrics in this area (Edler et al. 2012). Progress in innovation procurement cannot be assessed through any recombination of current public statistics—new and regularised data collection is needed, standardised on an international basis. A reliable method to chart progress on a comparable basis would provide an important stimulus towards realising the benefits in this area. The UK remains a pioneer in this area and much has been achieved but as of summer 2012 a renewed impetus is needed to move from proof of concept to making innovation through procurement a mainstream element of practice in the public sector.

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(Footnote 16 continued)
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Chapter 13
USA

US Technology Procurement in the National Security Innovation System

Linda Weiss

Abstract Despite an influential view of the United States as a neoliberal state with a free market economy, its federal authorities have built the world's most formidable technology development model based on procurement-driven innovation. Rather than a relatively discrete area of activity in which defence-intensive suppliers interact with security-specific procurers, the procurement system has evolved into a series of hybridised structures in which the lines between public and private, security and commerce, military and civilian have been thoroughly criss-crossed. The chapter concludes that US procurement activism and its entwinement of security and commerce is not an industrial policy, but rather a sui generis phenomenon that has emerged from profoundly strategic goals. While this makes it a powerful element in the national innovation system, it also makes it difficult to emulate or transpose to other settings.

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13.1 Introduction

At the core of the US national innovation system lies a complex of federal agencies involved in the Science and Technology (S&T) enterprise. I refer to this S&T complex as the national security state (NSS). While the Department of Defense (DoD) is its chief component—especially where technology procurement is concerned—it is important to emphasise that the NSS is broader than the defence sector. Several other agencies, which emerged during the Cold War in response to strategic geopolitical imperatives and the quest for technological supremacy, also serve security- or defense-related functions. They too form part of this S&T innovation complex (e.g. NASA, DoE, CIA, NSF, NIH, and most recently DHS). Where relevant to my analysis, I shall refer to one or more of these national security components, but especially to the DoD whose role in procuring innovation is unparalleled.

I argue that in response to strategic imperatives and the quest for technological pre-eminence—catalysed by the Cold War and continuing up to the present—the United States has invented a distinctive NSS-driven innovation model that uses more resources, takes higher risks and produces more extensive ('radical' or revolutionary) innovations than any of its competitors. While this model is a result of its embeddedness in security motivations (defence preparedness), over the past thirty years, procurement activism has come to embrace commercial as well as security considerations. Rather than a relatively discrete area of activity in which defence-intensive suppliers interact with security-specific procurers, procurement has evolved into a series of hybridised structures in which the lines between public and private, security and commerce, military and civilian have been thoroughly criss-crossed. This is not, however, a hidden industrial policy—as a popular minority view would have it—for it remains deeply embedded in a strategic logic responsive to geopolitical and structural change.

The story of federal procurement has many chapters, some of which have pejorative outcomes for the economy. Defence contracting, in particular, has often made headline news for waste and profligacy, cost overruns and project failures, as well as a more recent explosion in foreign outsourcing. Stories of bloated Bechtel invoices for non-existent goods provoke public outcries, while tales of $500 ashtrays provide comic relief. The fiascos and failures are not in short supply.[1]

There is, however, another, more productive side to the US procurement story, which is the one I wish to focus on. In this narrative, the federal government acts as a catalyst of innovation and technology development, both by investing in and buying goods, services, and systems *not yet in existence*, and by adapting existing ones to new purposes and end users. This is procurement-driven innovation or

[1] As it transpired, the ashtray was legitimately priced, having been designed specially for submarine use. A 2008 GAO study of 95 major defence acquisition projects found cost overruns of 26 %, totaling $295 billion over the life of the projects.

'technology procurement'.[2] Technology procurement has a distinctive dimension that is not present in ordinary purchasing off the shelf. It targets funding to the development of technologies that will result in a product for an end user. It is thus a *demand*-based instrument to 'pull' new technologies and products into the marketplace through competitive contracts backed by a ready buyer. Tellingly, however, for all its importance in understanding the US capacity for breakthrough innovation, the term 'technology procurement' is absent from the US literature.[3] Most discussions do not differentiate this activity from the more generic 'contracting'—which may explain why its serious analysis as a policy tool for driving innovation has barely begun.[4]

This chapter takes a step in that direction. As an instrument of state power, public technology procurement is of theoretical interest for at least two reasons. First, it offers a prism through which to analyse the American state's transformative capacity. Despite the federal government's lengthy history of involvement in industrial affairs, recognition of its contemporary contribution has been clouded by an ideologically burdened debate in which the state's catalytic role in advancing commercial technology is largely obscured.[5] Procurement-driven innovation brings this 'activist' role to the fore and invites questions that go to the heart of our existing models of capitalism: Just how 'free' or 'liberal' is the American market economy compared with the 'governed-market' varieties represented as its polar opposite? In an era when neoliberal ideology has been dominant, just how 'neoliberal' is the American state?[6]

Second, procurement programmes to finance high-risk technology development and catalyse innovations via the pull of government demand for public (and private) markets have represented a very significant but under-studied area of developmental activity. What are the vehicles for this form of procurement-driven innovation, and how have they evolved in a landscape politically and ideologically hostile to the use of state power for economic advancement? Pursuing such

[2] Interestingly, it is the Swedish researcher Edquist (1995) who has done most to illuminate the use of government technology procurement as a demand-led innovation policy as well as an industrial policy instrument.

[3] The only reference is to private-sector firms procuring technologies deemed necessary for their future product development.

[4] There is a substantial technology policy literature on defence procurement; it focuses largely on the early postwar decades and tends to imply that commercial developments were mostly unintended ('serendipitous spinoffs'). For the counterargument reaching up to the present and including a broader set of NSS agencies, see Weiss (2014).

[5] In this debate, alleged peculiarities of the US policy environment (administrative fragmentation, policy heterogeneity, partisan division, private interest access) are coupled with more general fundamentalist economic and normative ideas about the role that the state *cannot* and *should not* play.

[6] For a discussion of this issue in a broader conceptual and comparative analysis, see Weiss (2010).

questions can reward with a better understanding of the way institutions are modified as actors seek creative solutions to blockages in their social environment.

In addition to these conceptual and theoretical concerns, the evolution of US procurement raises issues that bear on public policy. In particular, can a defence-oriented innovation policy that mixes commercial and security goals be transposed to other contexts? This question is particularly intriguing when one considers the increasingly hybridised nature of the US procurement system, in which public and private, security and commercial structures and resources are intertwined.

The chapter argues that the US approach to government procurement has a distinctive innovation-led character which has promoted revolutionary technologies and laid the foundation for high-technology industry in the post-war period. Moreover, although nested in Cold War defence preparedness, procurement-driven innovation has become more commercially proactive since the 1980s as a result of structural change. Although the national security agencies have been the major contracting protagonists, nonetheless, much technology procurement has been general-purpose (as well as dual-purpose) in nature. Furthermore, since the end of the Cold War, the procurement approach of the national security agencies has been transformed in tandem with the rise of new forms of public–private interaction across the federal system. Beginning slowly in the 1980s but gathering pace after the end of the Cold War, technology procurement has evolved from a security-centric instrument to a commerce-intensive tool with security payoffs. In particular, as the Pentagon struggled to keep abreast of the new and rapidly changing information-intensive technologies, it placed increasing importance on so-called 'dual-use' technologies—military technologies with commercial relevance and, vice versa, commercial technologies with security relevance. More generally, new forms of procurement that pursue commercially relevant innovation for national security missions have emerged in the national security agencies. Commercial viability has thus become the new watchword of public procurement. Although this story is almost totally neglected in the political economy literature, the importance of innovation-led procurement for the US high-tech economy is by now well recognised by governments in Europe and Asia, eager to learn from that experience. Even in Anglophone Britain, the recent campaign to introduce a US-style approach to innovation has had a major influence on UK policy thinking.[7]

I present the argument first in general terms, beginning with an overview of the nature, scope and importance of procurement as a policy tool in the US setting. In the substantive section that follows on from that, I distinguish four main types of technology procurement, relating these to specific sponsoring actors and programmes. Finally, the paper comments briefly on the effectiveness of US technology procurement and its implications in both domestic and international arenas. In undertaking this task, my purpose is not to discuss the many factors that have

[7] See the authoritative report on innovation in the UK by Lord Sainsbury (2007). On European interest in aspects of the US system, see also European Commission (2006, 2008); CBI (2006); Connell (2004).

launched high-technology industries in the United States, but rather to highlight the very substantial yet largely ignored role of public purchasing in that process. Since my aim is to illuminate a neglected dimension of US high-technology leadership, I do not discuss other policies (or indeed business capabilities) that contribute to that outcome. My argument is not that technology procurement is the key to everything, or that its defence rationale is without cost, but rather that it remains one of the oldest and most important levers of innovation and industry development; and that precisely because of its roots in strategic imperatives, it is utilised far more extensively by the US government than by other states.

13.2 Overview: The Power of Government Purchasing

For many policy-makers and analysts inside and outside of government, federal involvement in advancing technology begins and ends with public funding of R&D. But as many analysts of innovation and technology policy now concur, 'R&D investment alone is not sufficient' to bring about innovation or to bring innovations into use (Alic et al. 2003: 16). A vital component in that process is public procurement. As defined in the literature (and at greater length below), technology procurement is equal to the promise by government to purchase newly developed goods and services from the private sector, which it has mostly subsidised through R&D contracts. Think of it as a powerful lever of 'demand pull' because the government both creates the market for the product and finances its development. Contrast this with basic purchasing (or patronage) which occurs when the government gives handsome contracts to companies like Halliburton or KBR to do something that everybody knows how to do already.

Government's appreciation of the power of public purchasing as a developmental tool did not emerge suddenly after WWII. Federal state actors have recognised its potential at least since the nineteenth century when America was the first nation to experience a form of 'total war'. As the North mounted a massive military supply project during the Civil War, the Quartermasters Department, responsible for most aspects of procurement, emerged as the largest, most important governmental institution in America. Together with military engineers and ordnance officers, a small but robust military bureaucracy "helped to develop important new technologies, including interchangeable machine parts…" (Wilson 2006: 36). By requiring mass mobilisation of men and materiel, the war made the United States the forerunner of the mass-production technologies, which would eventually help seed new industries (McNeill 1982).

Two later institutional developments would help to strengthen the developmental role of procurement, the most important of which was the Buy American Act (BAA) of 1933 and its subsequent amendments. By mandating the use of domestic suppliers in public contracting, the BAA established a protective

regulatory framework for nurturing fledgling domestic industries.[8] This was followed by the Berry Amendment of 1941, the non-civilian version of the BAA designed to protect the domestic industrial base by giving preference to domestically produced products and services sourced by the defence sector.[9]

The second related development saw the creation of an institution, the Industrial College of the Armed Forces (ICAF), dedicated to training high-level officials in procurement and industrial policy. Established after WWI, ICAF now trains federal bureaucrats in both military and civilian agencies in strategic industry policy as an integral component of government acquisition; it undertakes field studies at home and abroad and maintains a dual focus on industrial-commercial and military dimensions of security. Its comprehensive industry studies and policy recommendation display an impressive grasp of the comparative strengths and weaknesses of the US industrial base.[10]

As these institutional forms suggest, state actors have long nurtured a keen appreciation of procurement's strategic importance. America's early involvement in mass mobilisation warfare imparted an early lesson in the use and significance of procurement. (In this respect America was arguably a 'first mover'.) The requirements of World War II magnified that perception by generating massive demand for advanced technology and, in particular, new contracting arrangements that shifted financial risk to the state and produced major collaborative initiatives in the production of petrochemicals, pharmaceuticals, synthetic rubber, and not least of course in atomic weapons. However, *it was above all the perception of a powerful and persistent Soviet threat—and the drive for technological supremacy to counter it—that did most to institutionalise US technology procurement as a mechanism for perpetual innovation*.

The point then is that now, as in the past, a good deal of procurement is driven by defence preparedness and its associated national-security sector. But this is not to suggest an unproblematic continuity. Both in scale and scope, the technology procurement complex that emerged after WWII was unlike anything ever seen in the United States, or anywhere else for that matter. For a start, the sheer size of US procurement spending is considerably greater than that of other countries. Federal procurement of goods and services increased by 55 % in the 18 years from 1983–2001 to just under $250 billion. By 2009, the US was spending almost $530 billion on goods and services. More specifically, it is estimated that the United States spends some 20 times more on technology procurement than the EU. Most of the gap is attributed to the larger defence budget; however, even considering *non-defence* (but security-related) sectors—energy and health for example—the United States still spends four times more than the EU on procuring

[8] At the time of its promulgation, however, protection of established industry was the more likely target.

[9] On the foreign policy aspects of the Buy American Act, see Weiss and Thurbon (2006).

[10] All information available from ICAF's website. Industries that ICAF considered vital to national security in 2006 included, *inter alia*, electronics, biotechnology, agribusiness, financial services, IT, manufacturing and health care.

technology, so-called 'R&D procurement expenditure' (European Commission 2008).[11] Moreover, since the scope of public contracting is dominated by the national security mission to sustain technological supremacy, this infuses US procurement with a further distinctive element—namely the quest for transformative or revolutionary innovations (contrasted with the quest for endless novelty or product improvement, so-called 'incremental' innovation).[12]

As well as its scale and scope, there is one further important feature of the postwar procurement system which distinguishes it from other systems—namely the extent to which technology procurement has increasingly embraced (entwined) both defence and commercial goals, most markedly since the 1980s. As we shall see, the conventional demarcation between defence and civilian technologies, commerce and security, which was to some extent applicable to the pre-1980s period, has far less relevance today. The intertwining of commerce and security can be seen, for example, in radically new forms of innovation-led procurement whereby the national security agencies act as venture capitalists, taking equity in private companies to fund the commercial technologies that they eventually seek to procure. The CIA's In-Q-Tel and the US Army's OnPoint Technologies are two such ventures discussed below. More generally, this focus on procuring (dual-use) technologies which can be sold into both public and commercial markets belies any facile continuity with the so-called 'military-industrial complex'.

As mentioned in the introduction, when discussing innovation-led procurement, one must distinguish between two basic categories of public contracting. In the one case, authorities buy already existing products and services—such as paper or PCs or readymade software—off the shelf, as it were. In the other, authorities are acquiring a technology, a product, a service or a system that either does not yet exist or that requires adaptation to a new use (outcomes ranging from lightweight batteries and unmanned vehicles to medical devices, sensors and supercomputers). In these latter cases, R&D, technical change or innovation is required for eventual incorporation into a marketable outcome. Federal agencies call for proposals to work on specified technical items, with a view to commercialisation and acquisition of the end result. Here, 'technology procurement' is the appropriate term. Sometimes also referred to as 'procurement R&D', this involves programmes whose major objective is the creation of products and services for the federal government (acting either as end user or as catalyst for broader general use, discussed below in the context of specific programmes).[13] As such, procurement R&D should be distinguished from 'basic R&D' programmes whose objectives are

[11] Of a total procurement budget of $220 billion in 2009, more than 80 billion was allocated to RDT&E. In deflated 2005 dollars, the DoD has spent a total of $2.117 trillion in technology procurement over the period 1951–2009 (data calculated from National Science Foundation CASPAR website).

[12] See Hall and Soskice (2001) for an application of these different concepts of innovation to different varieties of capitalism. For a critique of their argument as to why the US model of capitalism produces more 'radical' innovation, see Weiss (2014).

[13] For the distinction, see Edquist et al. (2000).

'the advancement of knowledge' (Peck 1985). Based on my examination of past and current programmes, I select from a larger range four distinct but interlinked forms of technology procurement, which are discussed in the next section.

As I shall indicate in more detail shortly, many of the DoD's research and development programmes are in reality primary examples of technology procurement that famously gave birth to revolutionary general-purpose technologies, which in turn produced computers, jet engines, microelectronics and the Internet. Even in pharmaceuticals and (to an important though lesser extent) medical devices, the rise of US firms to global dominance after 1945 was based on federal R&D funding linked to procurement for a price-insensitive market (Mowery 1996).[14] More recently, important cases of technology procurement include a host of energy, environmental, robotic, biomedical and information technologies sponsored by NASA, the DoE, and the DoD (more on this below). The use of federal purchasing power as a lever to drive commercial production of hybrid, fuel-efficient vehicles is an old idea whose time has come. Thus, in early 2011, President Obama directed that all new light duty vehicles leased or purchased by the federal government must be alternatively fuelled by the end of 2015, with the aim of putting one million advanced vehicles on the road by 2015 (U.S. General Services Administration 2011).

Government contracting has also given many American icons their start as global players. It is surely no coincidence that global leaders like IBM, Texas Instruments, EDS, Boeing, General Electric, DuPont, Monsanto, Pfizer, Motorola, SUN Microsystems, and Texas Instruments, to name just a few, found their first most important (or first most demanding) customer in the defence and defence-related agencies, a point observed by the Semiconductor Industry Association with reference to firms in its own particular sector.[15] In the early postwar decades at least, many firms were strengthened as much by learning how to meet the more demanding technological and production requirements of their federal customer as by the pull of price-insensitive demand in a large protected market. Think of the rise of Motorola and other world leaders in the semiconductor industry, which gained their start as beneficiaries of the national security state's massive procurement of semiconductors during the Cold War.

In considering how procurement drives innovation, a number of studies offer insights concerning specific high-technology sectors. Technology policy specialists, Mowery and Rosenberg (1989) conceptualise the role of government procurement as an infant-industry tool operating through market or demand pull; they observe that the defence sector provided a constant and plentiful source of demand for products and services whose technological level was far greater than that initially demanded in civilian markets. In certain sectors—aerospace, computers, and

[14] On the development of targeted programmes for medical devices like the Artificial Heart Program and the interaction of NIH with industrial firms and their engineering teams, see Foote and Bartlett (1992).

[15] The Semiconductor Industry Association (2008: Table 1) has produced a table showing how historically the U.S. Government has played "a crucial role in electronics technologies".

semiconductors, in particular—procurement-driven technological change drove uptake in the civilian economy. As a major defence contractor, Boeing, for example, deployed the knowledge gained in building bombers and tankers for the US Air Force to aircraft manufacturing in its civilian division; breakthroughs achieved in turbine engines and airframe technologies for the Airforce's Dash 80 prototype helped it tool up for the 707, the first successful jet airliner for long-haul travel (Alic et al. 2003; Kjelgaard 2007). More generally, as technology learning improved in these sectors and volume production drove down costs, more private investors grew more willing to fund the industrial R&D required for commercial applications.

For precisely these kinds of reasons, a number of technology analysts contend that US technology procurement has played a more important developmental role than 'basic R&D' spending (Nelson 1982; Borrus 1992; Ruttan 2006). For example, federal procurement induced large increases in private R&D investment that "may have accounted for as much as 50 per cent of demand-driven growth in U.S. industrially funded R&D during 1979–1984" (Mowery 1994: 42, reporting the findings of Lichtenberg). As a rough measure of its importance in spending terms, technology procurement or 'procurement R&D' consumes the lion's share of federal funding (c. 62 % of total funding, mainly for defence, space, and energy compared with 3 per cent for basic research according to 1980 figures).[16] By way of contrast, the share of total funds for *basic* R&D was more than four times greater in the UK, France and Germany. Although organised according to somewhat different categories, more recent National Science Foundation figures show a similarly disproportionate R&D spending distribution over a 10-year period, indicating a strong bias in favour of the more applied R&D (US National Science Foundation, various years).

In sum, the funding data suggest that the bulk of US R&D is innovation intensive, aimed at creating and commercialising new technology. Similar findings apply to the US university sector, which, knowledgeable insiders argue, has been mischaracterized as performing chiefly basic research (Crow and Tucker 1999).

13.3 Reorienting the US Procurement Complex: Forms, Programmes, Actors

Procurement is often seen as a practice whose developmental relevance rarely exceeded the confines of the so-called 'military-industrial complex'. The reality is more complex. A good deal of innovation has increasingly taken place in companies that are neither prime contractors nor traditional suppliers to the government. Whereas in the early decades, the relative size of both the government market and its R&D spending were sufficiently large to attract such firms to work on defence and defence-related projects, by the 1970s, this leverage was

[16] Peck (1985: 1).

diminishing. In order to (re-)attract innovative firms to work on federally funded technology projects, federal agencies have therefore increasingly sought to emphasise the importance of general purpose ('dual-use') applications—innovations that can be sold into both the federal and commercial marketplace.[17] It is important to stress this strategic point in order to understand why the NSS has become more commercially proactive, since it is diametrically opposed to the claim that the US pursues a 'hidden industrial policy'.[18]

As a result of structural change, geopolitical shifts and budgetary pressures, the evolution of technology procurement has given rise to new and mixed funding arrangements as well as new synergies between commerce and security: federal agencies now readily conceive technology procurement as serving dual markets from the outset. I distinguish four different forms of procurement-driven innovation, depending on the primary funding source (and risk bearer) of technology development on one hand, and primary or final end user (customer or market) on the other.

13.3.1 Government Sponsorship for the Government Market

This form of procurement—conventionally associated with the more traditional 'military-industrial complex' of the Cold War era—involves public sponsorship of the development of new, or the adaptation of existing, technologies to meet the mission requirements of end users in the federal agencies. The resulting products have been numerous, ranging from computers and jet engines to satellites and semiconductors to vaccines and medical devices.

Up to the 1980s, the defence and defence-related agencies—chiefly DoD, NASA and DoE—paved the way for new commercial industries in aerospace, biotechnology and the ICT complex of computers, software and semiconductors by speeding the introduction of new technologies to defence and commercial applications. In the case of aircraft and aerospace, the relationship between defence and commerce has been an intimate one. NASA's precursor, the National Advisory Committee on Aeronautics, was established to research, design and test aircraft for both military *and* commercial aircraft. Even in the 1990s, government's concern with the European challenge to US leadership in wide-bodied commercial aircraft production led NASA and the Air Force to extend their procurement activities to virtually every aspect of commercial aircraft technology development (Ruttan 2006: Chap. 3).

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[17] I elaborate this argument in Weiss (2014).

[18] For example, changes in the relative size of the procurement market (dwarfed by commercial markets by the 1970 s) and in federal R&D spending (overtaken by private R&D outlays by the late 1980 s) start to diminish the enormous leverage that the federal government once exercised in terms of 'market pull'. Building 'commercial viability' into technology development projects from the outset thus becomes an increasingly important tool with which to re-attract innovative companies to work with the NSS.

In the microelectronics sector, there is broad agreement that the role of the military in driving the development of computer, semiconductor and software technologies was paramount (Flamm 1988; Mowery and Langlois 1996; Utterback and Murray 1997; Ruttan 2006). Although meeting mission goals remained the pre-eminent motivation, commercial applications of the technology were generally encouraged in the form of 'spinoffs'. In catalysing the formation of a semiconductor industry, the US Army Signal Corps, for example, subsidised engineering development and constructed manufacturing plants, promoted development of military and commercial applications, and purchased the resulting equipment that integrated those applications (Ruttan 2006: Chap. 5). DARPA, too, played a major role in developing microelectronics and information technologies, and, although not an acquisition agency, worked with defence contractors to shepherd their integration into military equipment (Van Atta and Lippitz 2003: 72). The developmental importance of technology procurement is underlined by the Information Technology sector's formative experience, whose firms needed neither venture capital nor stock markets in the early stages of Silicon Valley. Instead, federal acquisition programmes provided firms not only with ample R&D funding, but also "protection from foreign competition" and "huge volumes of guaranteed sales on a cost-plus basis" (Crouch 2005: 135). Chief among these firms were the producers of advanced semiconductor chips like Intel, Fairchild Semiconductor, National Semiconductor, among others, which were founded to produce chips (for military and commercial uses) with government contracts. In addition, the procurement policy of second sourcing in semiconductors in order to avoid becoming dependent on a single supplier encouraged diffusion of knowledge and the entry of new firms. Well into the 1970s, federal demand for increasingly powerful computers fuelled the market for semiconductors. Having cut their teeth producing customised chips for military and related applications, semiconductor firms soon moved to mass-produced chips (DRAMs) as commercial markets took off.

In the case of computers, federal authorities demonstrated a mindfulness of their broader commercial (and 'spin around') importance, even while motivated by defence concerns. At the very start of their involvement in the development of computer technology, and in contrast to their military counterparts in Great Britain or the Soviet Union, "the US armed forces were surprisingly anxious that technical information on this innovation reach a broad industrial audience" (Mowery and Langlois 1996: 949). The Office of Naval Research (ONR), for example, organised seminars on automatic programming throughout the 1950s. The DoD took the lead in sponsoring computer technologies because commercial firms such as IBM and NCR remained reluctant to invest in what they saw as high-risk projects with uncertain markets. But after years of channelling R&D support for the fledgling industry to the university sector, the DoD added the inducement of procurement. By committing to purchase a business-oriented machine in significant numbers (50 out of anticipated sales of 250), the Pentagon influenced IBM to create the IBM 650, the world's first mass-produced computer, an experience not dissimilar to that of other US computer companies (Flamm 1988; Schafer and Hyland 1994).

The rise of a US computer industry was therefore not a 'serendipitous' defense spinoff, as is sometimes claimed: Although military funding targeted specialised defence requirements, the DoD saw the importance of a broad industrial base that could supply its continuing needs and encouraged its development through a range of technology procurement projects, not least for computers. University faculty and graduate students constructed the first electronic digital computers under government contracts; and Pentagon managers, who understood how much the new technology depended on a substantial research and industrial infrastructure, took early steps "to ensure that technical information on computers reached the widest possible audience" (Alic et al. 2003: 37).

By creating a large commercial market for computers, the IBM 650 in turn provided a strong incentive for software development to suit its architecture. Development of a commercial software industry, however, owed less to procurement (highly customised for military purposes) and more to a DoD created infrastructure for training programmers and advancing the new discipline of computer science (complemented by early NSF funding of computer purchases by universities). In this sector, military R&D channeled to the university sector was accordingly more important than procurement for industry development (Mowery and Langlois 1996: 958).

In a rapidly changing sector like information technology, however, the payoffs from military procurement generated in the early stages of industry development diminished over time. As the pace of technological change intensified, and the commercial industry grew large and diverse, defence's highly specialised applications often fell behind the commercial technology. In some cases, defence-intensive companies could no longer deliver state-of-the art technology. In the semiconductor industry, for instance, lengthy acquisition processes and government specifications meant that by the time technologies were procured and integrated, they frequently lagged behind the most advanced commercial standards (US National Research Council 1996: 166).

During the 1980s, an influential view was emerging that military applications would need to rely more heavily on 'spin-ons' from the commercial sector. By the end of the 1980s, the old procurement model of the military-industrial complex was in crisis. The demise of the Soviet Union, pressures on the federal budget and the rapid advance of commercial technologies challenged US officials to push for new technology acquisition strategies which would privilege dual-use technology developed by the commercial sector. An important study by John Alic and his colleagues (1992) examining the pros and cons of a defence-based procurement system captured the new thinking of the time and offered a robust rationale for what would be officially termed a 'dual-use' strategy (though its practice, as these authors recognise, had begun much earlier).[19]

[19] On the creation of a dual-use biotechnology sector linked to the conversion of the biowarfare programme after the Vietnam war, see Hurt (2006).

Endorsed early in the Clinton administration, a dual-use technology policy sees national security and economic strength as 'mutually reinforcing goals'. The new orientation has two aspects. The first is a shift from a defence- and security-centric activity to one that builds commercial considerations into technology procurement. Will this be an orphan product with no market outside the defence-related sectors? Under dual-use, for example, 'defence-unique' products are no longer desirable and are indeed discouraged: to be developed 'only where necessary'.[20] The new norm for the DoD is "to make use, wherever possible, of components, technologies, and subsystems developed by commercial industry". The second aspect is the adoption of new forms of technology procurement, some with commercial and government markets in mind, and some which rely in part or entirely on privately funded R&D, shifting more of the investment risk to the business sector and leveraging its capabilities and resources. The success of this acquisition strategy requires R&D efforts to "nurture technologies and capabilities that will continue to be advanced through industries' efforts to remain *competitive in commercial markets*". This 'commercial leveraging' strategy shifts the DoD from reliance on specialised suppliers serving only the defence market to heavier reliance on commercial suppliers (and in some cases cost-shared development); the goal is still to create strategic or military advantage, but the means of achieving that is to nurture and leverage commercial capabilities, making commercial viability a central criterion of government support.

Two important examples of the *reorientation* of the national security state in support of commercial goals are the myriad of commercialisation projects pursued, first, under the Small Business Innovation Research (SBIR) program by the national security agencies (dominated by DoD) and, second, through the hybrid Venture Capital (VC) firms run by or for the CIA, the US Army, and the DoD.

13.3.2 Government Sponsorship for Government and Commercial Markets

The SBIR program. The SBIR program plays a much more significant role in the procurement-innovation complex than its relatively low profile would suggest. Described as "the world's largest seed capital fund", the SBIR is one of the most proactive venture-capital organisations in the United States—unusually so for a public-sector initiative. According to the SBA website, since the first investments were made in 1983, the SBIR program has funded 130,000 early-stage projects and provided more than $34 billion to technology development in young firms. For a programme that spends some $2.5 billion per annum procuring technology, the fact that it has attracted so little scrutiny from the scholarly community (Gompers

[20] All citations in this paragraph from National Research Council (1996: 158, *emphasis added*).

and Lerner 2004: 309) is all the more surprising.[21] While the private venture-capital industry is widely viewed as the investment bedrock for innovative US firms, the reality is that American entrepreneurial companies turn extensively to the SBIR to fund technology development projects. Indeed, of the $4.2 billion invested in high-risk technology development in 2009, SBIR provided 60 % of the US total. Seen in this light, SBIR provides a significant source of capital for *high-risk technology development*, concentrating investments at the riskiest early stage of innovation (from proof of concept to production of a prototype).[22] Aimed exclusively at American high-technology firms, awards take the form of procurement contracts for the development of technologies that federal agencies see as linked to their priorities, hence with a strong focus on commercialisation. The programme provides 100 % funding for the development of a technology, and once commercialised, the promise of a market for that technology or product (ideally with the federal agency involved). Established in 1982, the SBIR has its origins in a period of public debate about the threat to US technological pre-eminence and perceived loss of industrial competitiveness, sparked in part by the rise of new competitors Japan and Germany. Its aim was to foster the development of US-owned high-tech companies (with up to 500 employees) producing innovations for both federal and commercial markets.

The programme provides—in two phases—100 % funding for technology development up to the point of commercialisation (phase three). In the first instance, the funding agency will call for proposals, which it evaluates on the basis of technical merit, the firm's qualifications and commercial potential. Agencies make regular solicitations for proposals, generally defining the topics of interest, although agencies also seek stimulating ideas from the private sector. Procurement notices are thus often expressed as high-level problems to be tackled, seeking ideas from proposers, rather than specifying technical solutions to be followed at the outset. Dedicated SBIR conferences are staged bi-annually by individual agencies to create an ongoing dialogue between public and private sectors.

As an interagency programme (in which Defense and Health have the largest presence), there are some agency differences, mainly in the use of external versus internal evaluation, broad versus focused topics, and type of award (contract versus grant). The Navy, for example, (the largest recipient of SBIR funding among the Services) usually invites proposals three times per year targeting specific technical topics, which are internally evaluated for eventual contract awards. Phase I of the program funds investigation of the feasibility of the technology (up to $150,000 for approximately 6 months). To reach Phase II (up to $1 million for two years to develop and explore the commercialisation potential of the technology), the firm must show the technology is useful for the commissioning

[21] Lerner's 1999 study is an important exception to the dearth of scholarly analysis in the first two decades of the program's existence. Even today, such studies are virtually non-existent in the political-science and political-economy literature, which has been slow to recognise the program's existence, let alone its significance.

[22] Data are drawn from the SBA website and SBA-related database: www.inknowvation.com.

agency *and likely to have wider commercial application*. While all DoD SBIR programs are primarily mission oriented, they emphasise the company's need to market its technology to both military and commercial markets.

In Phase III, 'from laboratory to the marketplace', assistance takes the form of raising venture capital or direct funding from non-SBIR sources, plus the procurement inducement of a large public market for the technology. The programme is highly oriented to performance. Firms which make it to Phase I through a rigorous selection process have six months to show proof of concept; if they make it through Phase II successfully developing the prototype, (achieved by more than 40 % of funded firms, a high success rate), they are deemed good bets for private and public investors (for example, the VC firms run by the CIA and Army, discussed shortly).

It is this third phase of the programme that completes the procurement cycle. In the words of one prominent authority speaking from the Navy's standpoint, 'SBIR is all about Phase III'.[23] By making the acquisition community, systems commands and programme executive officers responsible for defining the bulk of the topics for solicitations (only 12 % come from the S&T community), the Services seek to create a 'pull' mechanism that will link technology outcomes to commercialisation and acquisition; and to ease this transition, each of the Services have created Technology Assistance Programs.

As mentioned, firms which make it through the first two phases of funding have proven technologies. To bring these to market—Phase Three—they need financial support. The SBIR program cannot do this. The company can receive either government or private-sector funds, but no longer receives SBIR funding. Instead, production efforts are supported by other funding, either from the DoD, the federal government, prime contractors or the private sector. More than this, typically the DoD or NIH will broker the meetings in which technology firms from the SBIR program are brought together with potential financial supporters, thus adding a critical networking function.

The promise of a procurement market in the government sector—in the first instance—is underwritten by an SBIR Policy Directive which states that "whenever practicable, an innovation or technology developed by an SBIR business will be used by the government"; the Directive also requires the SBA "to report to Congress every instance when a small business creates an innovation or technology under the SBIR program, and yet the government goes to another business to develop and produce it" (National Research Council 2004). For such firms, access to the procurement market is guaranteed for up to ten years under a special contracting arrangement, without the requirement to enter competitive bids. So, not only are high-technology firms funded to develop the technologies for which they may not otherwise have obtained funding; they are also given an open door to the federal market once their products have been developed.

[23] Deputy Assistant Secretary of the Navy, McGrath, cited in Wessner (2007: 61).

Importantly, the SBIR status achieved through reaching Phase III not only gives the firm preferential entry to the federal market but also sends an important signal to investors that the product is a viable investment. In effect, the SBIR underwrites early stage investments and brings them to a point where there is proof of performance and a ready market for the technology, thus attracting the more risk-averse private VC investor.

Since Congress elevated 'commercial' viability in justifying SBIR's 1992 reauthorization, several NSS agencies have regularly publicised SBIR success stories arising from their programmes. If one googles "SBIR Success Stories", there are at least 50,000 results (some of which are obviously redundant). 'Success' is measured in terms of innovative products reaching the market. Even the military Services publish 'Commercialisation' (or 'innovation') booklets on an annual basis. All three services advertise SBIR success stories from their programmes. Significantly, 'success' is measured in terms of military *and* commercial applications. The US Army prominently displays on its SBIR website the names of hundreds of firms producing for both government and civilian markets, along with their technologies and sponsors.[24] The Navy boasts SBIR successes in its detailed publications, describing for each story the technology developed by the small business and its applications, its military and commercial significance, company information and a description of the SBIR investment and follow-up revenues. It claims on its website that "the SBIR program has become one of the most effective technology development programs in the government and has earned the respect of those in the scientific, small business, and academic communities across the nation." These claims find support in regular surveys and programme assessments conducted by the National Research Council, which find that selling also into the non-government market has become a notable feature of the programme.[25]

Many SBIR-backed firms, having grown and prospered through their continuing relationships with sponsoring agencies, are now leading companies in their field. Physical Optics Corporation, for example, since its founding in 1985, has received more than 1,000 awards totaling more than $360 million (from DoD, DoE, NIH, NASA, NSF and DHS), taken out more than 90 patents and spawned six major spinoffs which themselves took root in SBIR contracts.[26] Just as there is no limit to the number of procurement contracts an SBIR-backed firm may receive, so there is no limit to the number of awards. SBIR stars Amgen and Genzyme in biotechnology and Qualcomm in communications, which altogether currently employ a total of 44,000 people, benefited from multiple awards in their early start-up phase. Qualcomm, which gained its start with SBIR funding in 1986, received 12 SBIR awards totaling $1.6 million (from the Navy, Air Force and

[24] See US Army SBIR program: http://www.armysbir.com/commercialization/comm.htm#.

[25] See for example, the regular NRC assessments conducted under the editorship of Charles Wessner.

[26] POC's website lists as its funding sources the following agencies: DoD (Army, Navy, Air Force, DARPA, DHS, HSARPA, Special Operations Command, NIMA, MDS, DTRA, OSD-DD&E and CBC) and DoE, NIH, NSF, NASA and DOC (NIST Advanced Technology Program).

NSF) when it had about 35 employees. Indeed, many of today's leading firms have roots in the SBIR program for once a firm enters the commercialisation phase, no limit is placed on firm size.

In sum, SBIR furthers the aims of the NSS by funding the development of small start-up companies that develop promising and targeted technologies. It helps its graduates secure further development funding and product markets. Its endorsement strengthens the likelihood that graduate companies will secure preferential contracts from government and commercial sources. Its funding leverages further finance in the form of angel investing, bank loans and ultimately IPOs. As a catalyst for commercial innovation, entrepreneurship and company formation, SBIR's place in the NSS high-technology portfolio would thus appear to be significant.

Government Venture Capital Funds. One of the most striking examples of the transformation of the national security agencies into high-technology procurement entrepreneurs is their entry into Venture Capital (VC) undertakings. Shrinking security budgets after the collapse of the Communist threat gave rise to an innovative model of technology procurement and a new government-industry partnership that straddles commerce and security. Federal agencies—both in the CIA and the military—have emerged as leading promoters of venture capital and high-technology spin-off enterprises that produce commercially important technologies with security relevance.

Lest there be any confusion as to their procurement role: "Most federal venture capital funds want the companies they invest into eventually become government contractors so they will pass on their technology to agencies" (Palmer 2006). Figuring prominently in this context is the highly successful Venture Capital fund, In-Q-Tel, run by the CIA. Conceived in the mid-1990s, In-Q-Tel was created to identify and invest in leading-edge technological solutions that serve national security interests. Founded in 1999 by a group of private citizens at the request of the Director of Central Intelligence, this nonprofit enterprise has invested in more than 150 companies. Most specialise in commercial applications of information technology that supports intelligence functions (for example, scanning and sensor devices, geospatial services, development of complex search engines, analytical software, communications and information infrastructure).

In-Q-Tel's average deal flow has been at least as high as, and sometimes double that of, the typical VC firm (which may complete a dozen deals in any one year); such investments are estimated to range in value from $500,000 to $4 million. Six years into its operation, In-Q-Tel's annual budget had grown from about $27 million to $60 million (Lacy 2005). Once the technology is ready, the Agency contracts separately to acquire and transition it to the relevant users. Success in pulling in technologies has earned the Fund continuing Congressional support and established it as a model for other federal agencies which have gone on to create different versions of the CIA's equity investment arm (notably the Army's On-Point Technologies, and the DoD's Rosettex Venture Fund which has been expressly created by the Rosettex Ventures Group to develop and commercialise technologies for DoD and the Intelligence Community).

The Army's new procurement vehicle is inspired by rather than directly modelled on the CIA's VC firm. OnPoint is described on the Army's website as "a strategic private equity investor with a mission to discover, invest in and support companies at the intersection of Army and commercial marketing needs."[27] It focuses on mobile power and energy for the soldier, with "a primary mission to facilitate finding and creating dual-use products—products addressing the needs of commercial markets that will also meet the needs of the individual soldier…" The Fund's targeted investment areas include nano solar power, fuel cell devices and portable battery technologies. As a non-traditional procurement mechanism, On-Point triangulates between small companies and their potential customers, which are often prime contractors already contracted to the Army's programme managers to supply a product (Wessner 2007: 65).

While the rationale of these procurement vehicles is security-driven, the modus operandi is often commerce-intensive. As such, these hybrid institutions straddle the conventional 'public–private' divide associated with the traditional procurement model; in philosophy and practice, they breach that divide by combining public and private purpose with commercial and security interests. As funding models, they do not involve R&D funding programmes and do not provide grants. Rather the venture funds invest in companies directly, taking equity positions. They are also different from a conventional technology-procurement agency since they are not setting in advance the technical goals to be achieved but investing directly in companies with promising commercial technologies which have the potential to meet agency missions.

A 2001 review of the In-Q-Tel venture by an independent panel encapsulated the 'national security state' reorientation in posing the question: "What is wrong with existing government technology procurement processes and why do we need to experiment with something that doesn't follow traditional approaches?" (BENS 2000): 7. This question was raised not as a criticism but as a preamble to pointing out the inadequacies of the pre-existing procurement system. VC procurement is thus a big departure from the days of the so-called military-industrial model. In this new approach, smaller younger entrepreneurial companies are the focus. Although traditionally more marginal to the government market, these firms' relationship with a public-sector investment firm opens new opportunities. Once the technology is developed and tested, the agency may not only purchase the product but will also take pains to find other markets for the technologies it funds by matching up the company with other parts of the federal government. As an In-Q-Tel President put it, "By working with In-Q-Tel, we can match them up with at least part of government—the intelligence community—and give them some access to other parts of the government" (cited in Hardy 2003). The Venture Capital firms thus provide an entrée to the federal market; but investing in commercially viable technologies is now a key criterion of support. As In-Q-Tel's then President explained:

[27] US Army, OnPoint Technologies: http://www.onpoint.us/about-us/index.shtml.

> We don't want them building in anything that's just intended for the government…That tends to leave an orphan product and that doesn't contribute to a company's success (cited in Hardy 2003).

An intriguing question nonetheless arises from the potential conflicts of interest that a hybrid entity like In-Q-Tel is bound to encounter. How would its managers respond when they see an emergent technology whose commercialisation might undermine US strategic advantage? Would they seek a way to keep it secret on behalf of the intelligence community and forego the broadest commercial returns? Anecdotal evidence would suggest as much, indicating a delicate dualism in the fund's role, although Congressional reporting requirements and the constant public scrutiny of the fund's activities would limit opportunities for secrecy.[28]

Regardless of potential conflicts, the advent of 9/11 and the subsequent vigorous re-emphasis on national security has brought this hybrid form of technology procurement into its own, speeding the quest for innovations and amplifying the federal market for the private sector's products. In this context, it is the smaller, younger entrepreneurial companies which are the focus of the new procurement approach. As security-related devices (e.g. sensor and scanning devices) lend themselves more readily to civilian translation than military technologies, commercial gains from the new 'security-industrial complex' are likely to equal or exceed those of its 'military-industrial' cousin.[29] The rise of private VC firms dedicated to 'homeland security' is one indication.

VC procurement is thus one of the more recent departures from the days of the so-called military-industrial model. Once the desired technology is developed and tested, the agency may not only purchase the product but also act as a networking node—taking pains to find other markets for the technologies it funds by matching up the company with other parts of the federal government and prime contractors. NSS Venture Capital initiatives also provide an entrée to the private capital market, as three recent Google and IBM acquisitions illustrate: Keyhole (the company that developed the software now known as Google Earth), @Last Software, and SRD software all had their start as In-Q-Tel portfolio companies.

13.3.3 Shared Risk for Government and Commercial Markets

The Department of Energy—a civilian agency with significant national security functions—identifies as one of its strategic goals "strengthening U.S. economic competitiveness", which it sees as integral to achieving its broad national security

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[28] Indeed, in an interview, former CEO, Gilman Louie, reported that his fund had put more than 100 technologies into the intelligence community, adding that "Some of them you know, while other technologies we don't broadly advertise" (Cooper and Kanellos 2005).

[29] In 2004, public–private security spending was anticipated to exceed $1 trillion by the next decade (Mill 2004: 44).

mission. Unlike the defence and space agencies, however, the DoE is not strictly speaking a procurement agency since (with the important exception of its national laboratories, which have stewardship of the nuclear stockpile)[30] it is not an end user of the technology. To compensate, the energy agency has developed a 'technology procurement' strategy to speed the introduction of new energy technologies into the marketplace. Indeed, the DoE is the only agency to deploy the term 'technology procurement', which it defines as "a method for speeding technology introduction … to 'pull' new technologies and products into the marketplace through competitive procurements backed by large-volume buyers."

The approach involves working closely with actual or potential buyers to understand their needs and organising large-volume purchases for the new products in order to reduce the risks to manufacturers. The agency will typically undertake several steps, which involve developing technical specifications for new products in consultation with buyers and potential manufacturers/suppliers of the technology; issuing a competitive solicitation to potential manufacturers/suppliers, requesting their bids to supply new products meeting the specs; selecting one or more winning suppliers from those bids and entering into basic ordering agreements that specify under what terms and prices target buyers can purchase new products; and promoting the winning products to maximise purchases and help build self-sustaining markets. For this purpose, it operates several targeted procurement programmes, all on a cost-shared basis. One is aimed directly at the consumer market (Building Technologies Program); the others (under the Federal Energy Management Program) conceive the federal procurement market as the test bed and platform on which manufacturers can launch their products into the private sector.

Under the Building Technologies Program, the approach typically involves procurement of demonstration units for field testing and technology refinement, and includes promotional efforts to build a strong market in collaboration with utility associations. On the strength of this testing and refinement, ultimately a technology procurement will be developed, leading to commercialisation of the product.[31] One of the earlier initiatives under this programme led to the creation of a new industry in water heaters. In a cost-shared arrangement, the DoE funded development of 'the first successful heat-pump water heater', an appliance that requires only half the electricity of conventional resistance heating. DoE funded two small companies for market development, demonstration and testing of a heat-pump water heater (the DoE contributing $334,000 and the companies $200,000). Several utilities committed to purchase and install a minimum of five models for testing and systematic data collection and in response to the test results, the two companies proceeded to

[30] DoE's three national security labs—Sandia, Lawrence Livermore and Los Alamos—undertook a $5 billion procurement programme for supercomputers to manage the nuclear stockpile (the Advanced Simulation and Computing Initiative). I discuss this important case of dual-use technology procurement and its major commercial impacts in Weiss (2014).

[31] DoE, "Building Technologies Program": http://www.eere.energy.gov/buildings/emergingtech/.

manufacture the heater, paving the way for other companies to enter production, thereby creating a new industry.[32] Other successful federally sponsored demonstrations have led to the introduction of a high-efficiency refrigerator-freezer, to improved solid-state lighting ballasts, to advanced oil burners and to an advanced motor-compressor for refrigeration. New consumer goods successfully brought to market this way include refrigerators, rooftop air conditioners for federal and private sectors, clothes washers, subcompact fluorescent lamps, and several other energy-efficient products, some currently under way.

Under the Federal Energy Management Program (FEMP), the Department targets procurement of equipment and renewable energy technologies for use first in the federal market. Since the federal government (primarily the DoD) is the world's largest volume-buyer of energy-related products and services, spending upwards of $10 billion annually, it has the leverage to "drive the market for energy-efficient, renewable energy, and water-conserving products".[33] Core projects are undertaken with the assistance of private-sector financing and expertise and include biomass, non-food biofuels, solar power, solar thermal and geothermal power, photovoltaics, wind, smart grids and advanced batteries.

Like defence before it, energy security is the new rubric under which the state's transformative capacity is finding new expression. The latest chapter in this story is the creation of ARPA-E, a civilian version of the Defense Advanced Research Projects Agency (DARPA) housed in the DoE. ARPA-E is envisaged as a new programme tasked with "the mission of rapidly developing and commercializing transformational clean energy technologies". As conceived, ARPA-E seeks to emulate DARPA's organisational model in order to speed energy R&D into market-ready technologies, under the rubric of promoting the nation's energy security.[34] To that end, the DoE is currently collaborating with the DoD under a Memorandum of Understanding in order to spearhead the drive to develop a battery of renewable energy industries, using DoD's vast domestic installations as a critical test bed and procurement market for the new technologies.

13.3.4 Private-Sector Risk for Government and Commercial Markets

A relatively new form of technology procurement shifts most of the up-front costs of innovation onto the private sector by running prize competitions that target specific products intended to serve security and civilian markets. Although prizes

[32] The larger manufacturers who initiated production state they did so as a result of the DoE test data. See Savitz (1986: 102).

[33] DoE, Federal Energy Management Program: http://www1.eere.energy.gov/femp/program/equip_procurement.html.

[34] US House of Representatives, Committee on Science, Space and Technology (2007).

for innovation have a long history, their revival by the federal government is recent.

The aim of the competitions—currently practised by the DoD, NASA and the DoE—is to catalyse innovations that can meet mission needs without having to bear the costs of development and possible failure. Teams must be led by a US citizen; competitors must fund their own R&D, and the sponsoring agency pays out prize money (i.e. a subsidy) only if there is a winning technology product. As procurement agencies, both the DoD and NASA offer a ready market for the successful products; prize money may be sourced internally (DoD/DARPA's Grand Challenge) or privately, as in the case of the NASA's Centennial Challenge. In the case of the defence agencies (specifically DARPA and the Army), provision for industry development is an integral component in evaluating the success of the competitions, while for NASA developing a commercial space industry is one of the explicit goals.

The incentives are generous enough to invite competitive innovation. DoD can offer up to $10 million in prize money per year. Its Research & Engineering (DDR&E) Prize launched in July 2007 offered a $1 million prize for Wearable Power innovations (and two runner-up prizes valued at $500,000 and $250,000). In line with one of the technologies targeted by the Army's SBIR program, DDR&E's current goal is to produce a light power source that can be used by troops to power GPS systems, radios, and the like. Again, the end point is the purchase of the product by the Army.

DARPA's three Grand Challenges since 2004 offered between $10 million and $20 million in prize money and required teams to build an unmanned vehicle capable of driving in traffic and performing complex maneuvers in difficult terrain over several hundred kilometers. In its report to Congress, the DARPA Prize Authority stated that the competition was essentially a 'software race' and that its impact would be immediate and long-term across a broad array of technologies, leading to rapid advances in the areas of sensors, navigation, control algorithms, hardware systems and systems integration. Apart from advancing militarily relevant technologies, "the competition format stimulated interest and excitement in a problem area important to DoD, broadened the technology base, and strengthened U.S. capability to develop autonomous ground vehicle technologies" (DARPA 2006: 13). In financial terms, it is estimated that for less than $20 million, DARPA's 'investment' returned $135 million.

It would be easy to dismiss such competitions either as half-hearted efforts by governments to do innovation on the cheap or as what you do when you don't have in-house developmental capacity. But this would miss an essential formative effect of the technology challenge. As one DARPA director explained, the competitions play a critical role in breaking through the ideational barriers that often define what is/is not technically feasible: "Our job is to take the technical excuse off the table, so people can no longer say it can't be done." Thus, the immediate aim of the Grand Challenge was not to produce an unmanned vehicle that the military could directly mass produce; it was to mobilise the engineering community to tackle the problems that need solving before that stage can be reached. DARPA conceived

the competition-cum-race as a way to deliver an array of "inventions that provide building blocks for a qualitatively new class of ground vehicles that can carry goods, plow fields, dig mines, haul dirt, explore distant worlds—and, yes, fight battles—with little or no human intervention." So large is the potential of autonomous vehicles that it has been likened to that of the Internet.[35]

In the longer run, of course, 'Transitioning' the technology to the marketplace is viewed as the ultimate measure of success of any procurement scheme, including that represented by such contests. As the DARPA report (2006: 13) observed, "Technology developed for the Grand Challenge is expected to be available for both FCS [Future Combat Systems] and commercial systems, such as those manufactured by General Motors, another key Red Team sponsor." While some vehicle owners have transitioned the technology to conventional military applications,[36] new applications are also being developed in the broader procurement communities of national security and homeland, including remote infrastructure patrol and inspection, boundary patrol and automated runway clearing.

Having set demanding standards, DARPA could describe the 2007 event as "truly groundbreaking" and pronounced the race "a resounding success". As Scientific American had remarked of the earlier 2005 event, the Challenge "has concentrated the minds of researchers, blown open the technological envelope and trained a whole generation of roboticists" (cited in DARPA 2006: 13). If correct, many technological breakthroughs, if not new industries, are likely to be advanced by this and similar ventures ('wearable power' being one such recent DARPA Challenge).

NASA'S Centennial Challenge. NASA's programme, Centennial Challenges, established in 2005, is another departure from standard technology procurement. Similar to the DARPA contests, NASA's programme awards cash prizes for innovations that have potential application to the performance of the agency's space and aeronautical activities. Under this scheme, instead of seeking innovative equipment in the standard way—by soliciting proposals for a technology procurement contract—NASA specifies its technical goals for the contesting teams but leaves open the means for achieving them. In each challenge, multiple teams test various approaches to reaching a certain goal. According to the programme manager, "As multiple teams succeed or fail in going after a challenge, the competitive process will distinguish between those technologies that can be imagined and those that can be practically developed" (cited in Dickey 2004).

By using prize competitions, NASA seeks to catalyse the innovations that will make space travel easier, cheaper and commercially viable—prizes (currently up to $250,000) to make a more dexterous spacesuit glove, manufacture super lightweight materials for spaceflight, produce beamed transmission systems for power supply, etc., for human settlement on the moon. Seven such Challenges

[35] Material for this paragraph is drawn from Gibbs (2005).

[36] For example, Oshkosh Truck Corporation has transitioned the technology to the Army's Unmanned Ground Vehicle designed to transport critical supplies. See DARPA (2006: 14).

have been announced since 2007, and according to NASA's website, future challenges are likely to focus on special batteries, autonomous drills, extreme environment computers, precision landers, micro-reentry vehicles and the like. The much larger ambition behind these innovation challenges is to make human missions throughout the solar system sustainable and bring forth the development of a commercial space travel industry. Procurement of the final product is the end point of these competitions, but the process involved en route to that outcome is one that shifts the risk to the private sector (and subsidises the winner).

Following Congressional approval of 'H Prize' funding for hydrogen-fuel related technology, the DoE has similarly joined the move to procurement contests as a supplement to its current portfolio of energy technology procurement programmes, discussed earlier.

In sum, innovation-driven procurement has shifted from being a largely security-centric activity—with both direct and indirect commercial payoffs—to an increasingly commerce-intensive undertaking, one that builds commercial considerations directly and explicitly into the procurement criteria. Procurement for the NSS can no longer be conceived as an undertaking in and of itself, detached from the commercial outcomes of the mainstream economy (as if that were ever an accurate understanding). The US approach deliberately breaches the commerce-security divide by building in the marketability of technologies right from the start of the procurement process and, in some instances, by shifting some of the costs or sharing the risks with the private sector.

13.4 Conclusion: a *Sui Generis* Hybrid Model of Innovation

I have argued that the United States has developed a distinctive capacity for driving innovation through the lever of public procurement. Procurement is a powerful instrument for growing new technologies, products and services, for developing new markets and ultimately new industries, and the federal government has played a catalytic role as first major customer and launch market. A significant part of the annual federal procurement budget (and well over $1 trillion if you add in the sub-federal budgets) is devoted to technological innovation—the pursuit of projects that go far beyond the mere purchasing of items off the shelf. This is not peanuts by any stretch. Yet, with the exception of a small number of studies by technology analysts, the state's role as procurer of innovations—rarely distinguished conceptually from 'contracting' in general—remains a relatively neglected field in the social science literature. In view of its critical importance in the US context, and not least the attention that Britain, Europe and China have been paying to the US approach, its neglect by scholars of international political economy is all the more perplexing.

My account also opposes a conventional minority view which claims that US defence spending supports a covert form of industrial policy. Careful inspection supports quite a different, more complex argument. Based on a much larger research project, my findings show that the NSS pursues technological pre-eminence in order to sustain US primacy, not to gain competitive advantage. A key point, however, is that sustaining technological primacy has become more challenging in light of structural changes to the US economy (and not least the strategic emphasis on quality over quantity of procurement items). Thus, in order to support its national security objectives and in response to structural changes, the NSS has increasingly had to play a more direct and proactive role in stimulating commercial innovation—chiefly to attract innovative firms reluctant to work on national security projects. As we have seen, one such incentive has been to build 'commercial viability' into NSS programs for procuring technology. While this dual focus has important consequences for commercial industry, it is both misleading and simplistic to view this as an industrial 'policy'—whether labelled 'de facto', 'hidden' or 'incoherent'. Indeed, for reasons already elaborated, the American procurement system is best viewed as *sui generis*, hence unlikely to be of wider relevance, much less readily adaptable.

I draw one further conclusion, which bears on the nature of US economic governance. From a theoretical perspective, America's national security state has seeded a robust transformative capacity, the exercise of which over the past two decades or so has crossed the military-civilian divide. The role of the federal government in procurement-driven innovation remains mostly motivated by strategic missions but is no longer confined to a defence-intensive military-industrial complex. In response to exogenous pressures, federal authorities have reoriented the national security state, making the relationship between *mission* achievement and *commercial* success purposefully symbiotic. This symbiosis has produced a *hybridised* procurement model, in which military and civilian, security and commerce, public and private functions increasingly overlap and intermingle. By the same token, however, the emergence of a hybrid procurement-driven innovation complex means that it is untenable to characterise the United States as a liberal market economy. The analytical implication is clear: the American state is no simple 'neoliberal' state: conventional wisdom and administrative fragmentation notwithstanding, federal authorities have demonstrated a considerable capacity for governing the market for innovations.

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Chapter 14
How Governments Support Innovation Through Public Procurement: Comparing Evidence from 11 Countries

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Abstract This final chapter summarizes the main findings from the 11 country chapters presented in the book. We categorize the current public procurement of innovation (PPI) policy practices and explore the factors behind policy developments. Although countries have followed rather different paths in PPI policy-making, we detect a certain general PPI trajectory over the past three decades—while during the industrial policy era up until the 1980s public procurement was mostly used to induce new technologies and entire industries via direct public technology procurement programs as well as R&D procurement, the emerging policy consensus puts an emphasis on more holistic ideas and sees public procurement as a more generic tool in promoting innovation. We conclude, however, that today there is no single dominant policy approach governments follow and that the actual PPI policy measures implemented are still cautious and indirect rather than substantial and direct, and that the very process of public procurement plays a far more modest role in the actual implementation of PPI policies than expected.

14.1 Introduction

The introductory chapter (see Sect. 1.2) outlines that this book stems from two main research questions. Our focus is, first of all, on exploring the evolution and development of innovation-relevant public procurement policies in different country and regional settings and, secondly, on analyzing the evolution and development of the various policy solutions in wider institutional contexts. In this chapter we address these questions by synthesizing empirical evidence from the country case studies presented above. As the evolution of public procurement of

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Table 14.1 Framework for mapping factors shaping PPI policies (Authors' elaboration based on Christensen and Laegreid 2007, Pollitt and Bouckaert 2011, Verhoest et al. 2010)

Analytical level	Institutional factor
International pressures	Normative (administrative, economic and innovation-policy paradigms), regulatory (trade), economic (globalization) pressure
Socio-economic environment	Economic background and development (market capabilities), national innovation system
	Polity (state structure, political system and preferences)
Policy context	Public procurement system and values
	Public procurement of innovation support institutions

innovation (hereafter PPI) policies in every country is embedded in a specific institutional context, it becomes inevitable to understand the factors affecting the institutionalization of PPI policies.

To analyze the findings from the country studies, and taking into account the fact that public procurement is one of the state's basic administrative functions at all levels, we use a modified and simplified framework widely used for comparative analysis of administrative policy-making in public administration and public policy studies (see Christensen and Laegreid 2007; Pollitt and Bouckaert 2011; Verhoest et al. 2010; but also Chap. 1). We develop and apply the framework to the context of PPI and analyze the impact of various environmental and institutional factors on the evolution of related policies in the 11 countries covered in the book. More specifically we will base the overview on three analytical levels: international pressures, country-level socio-economic factors and policy-level factors (Table 14.1). After summarizing the situation in PPI policies in various countries, we will first explore how the depth and spread of such policies—as well as similarities and differences in policy-making—is affected by international pressures. This includes globally competing ideological and paradigmatic principles (for instance, neo-liberalism vis-à-vis innovation policy thinking) and international regulatory and trade regimes (such as World Trade Organization's (WTO) agreement on public procurement, bi- and multi-lateral trade agreements). Second, we will analyze how PPI policy evolution is influenced by the general economic background and the developmental stage as well as national innovation systems of a country. This is complemented by insights into state structures and political preferences. Third, we will look at the effects of policy contexts—the general public procurement system and values as well as formal and informal support institutions towards the actual situation and developments in PPI.

Considering the dearth of previous analyses on PPI policy-making and the fact that the relationship between public procurement and innovation covers a very broad area in public policy-making, the present comparative overview is necessarily cursory and can only provide preliminary insights into the subject matter. Furthermore, due to a lack of adequate data it was not possible to cover many important aspects in the book. For example, in order to assess the potential of PPI, more in-depth studies are needed to explore the structures of the public

procurement markets and how they correspond to the overall economic structure of a country. Also, currently there are no good indicators available or studies done that would make it possible to evaluate the outcome of various PPI policies.

14.2 Public Procurement of Innovation Policy: A Comparative Overview

Governments have historically pursued very different policies in targeting innovation through public procurement. As argued in Chap. 2, one could expect to see four distinguishable policy approaches in action that use public procurement as a vehicle for innovation: PPI as technology (industrial) development policy, PPI as R&D policy, generic PPI policy (so-called "policy for all seasons"), and PPI as a "no policy" policy. The country cases presented in this volume indicate that governments indeed use a variety of policy measures, often in conjunction with other instruments, and that the initial taxonomy offered in Chap. 2 can be reasonably well applied to describe the past and current PPI policy developments (Table 14.2). Still, the categorization of the policy programs and instruments identified is necessarily arbitrary as pure cases are rare in reality. The next sections give a detailed discussion of each PPI mode in the context of case studies discussed in the book.

14.2.1 PPI as Technology and Industry-Development Policy

Using policy instruments to develop and diffuse new technologies through public procurement has been historically one of the most prominent PPI policy choices by governments, and moreover, it has often had direct bearing on industry development (see Chap. 2). Although somewhat complicated to track down empirically—these kinds of initiatives are often not perceived as related to innovation and/or public procurement policy domains—such policy tools are evident in the countries studied (Table 14.2).

A part of this policy—already widely recognized by the existing literature—aims directly at developing specific new products based on demand identified and articulated by the public sector. Often referred to as "public technology procurement", these policy initiatives are introduced to meet governments' direct needs (e.g., New Technology Products Program in Korea), endorse some socially desired technologies (e.g., market-transformation programs in energy in Sweden and the US) or promote some strategic industry sectors out of competitiveness reasons (e.g., pharmaceutical industry development in Brazil, Priority Industry Capabilities program in defense in Australia).

Table 14.2 Selected examples of innovation-relevant public procurement policy approaches and instruments (Authors based on Chaps. 3–13)

Country	PPI as technology and industry development policy	PPI as R&D policy	Generic PPI policy	"No policy" policy
Australia	Various defense technology projects (since 1970s); High-tech Industry Partnerships for Development (1987); Priority Industry Capabilities Program in Defense (2009)	Defense: Capability Technology Demonstrator Program (1997), Rapid Prototyping, Development and Evaluation Program (2004); Victorian Government's Smart SMEs Market Validation Program (2009)	Promotion of Innovation Principles (in procurement guidelines; establishing communication platforms with industries; targeted training) (2008)	
Brazil	Petrobras Supply-chain; Profarma Inovação (pharmaneuticals) (2008); various technology programs in defense	FINEP	Exclusive and Supportive Regulative Provisions (2010)	
China	Products Catalogue of Independent Innovation for Public Procurement; Listed Energy Efficient Products for Public Procurement			
Denmark	Public–Private Innovation Partnerships in social sector; Laboratory for Public Private Innovation Project (2011)		Best practice sharing via web-based guidance tool for PPIs (2012)	
Estonia		Minor program in defense		Prevalent policy mode
Greece				Prevalent policy mode

(continued)

Table 14.2 (continued)

Country	PPI as technology and industry development policy	PPI as R&D policy	Generic PPI policy	"No policy" policy
Hong Kong		Public sector trial scheme		Prevalent policy mode
Korea	New technology products program; green technology product program; alternative bidding and design-build (turn-key) bidding in construction	Industrial technology development program; KOSIBIR		
Sweden	Market-transformation programs in energy; technology-procurement strategy in Swedish Transport Administration; Vattenfall and the Swedish Association of Local Authorities and Regions procurement program of electrical cars	VINNOVA's pre-commercial public procurement program	VINNOVA's promotion program; Swedish Agency for Economic and Regional Growth. 'Learning public procurement of innovation'	
UK	Forward commitment procurement; Innovative technology adoption procurement programme	Small business research initiative	Innovation-procurement plans (discontinued since 2011); Public-Private Procurement Compacts	
USA	Myriad of programs on federal level (e.g. building technologies program and federal energy management program under the department of energy, In-Q-Tel under CIA etc.)	Myriad of programs on federal level (e.g. SBIR; R&D competitions etc.)		

Some countries have introduced direct legal provisions for supporting new technology via public procurement. For example, Brazil has set an overpricing rate of up to 25 % for innovative local products, whereas in Korea 10 % of each public institution's SME product purchases should go to New Technology Products.

It is important to note that in spite of the rhetorical shift away from industry-support policies towards more generic and horizontal innovation policies, the infant-industry-creation argument at least in policy plans still plays a central role in many of the policy choices presented in the book (especially in areas where the need to sustain domestic technology capabilities is perceived as crucial to tackle social challenges (e.g. security in Australia and USA) or economic development (oil supply-chain in Brazil).

Public procurement programs aiming at supporting innovation and the competitiveness of SMEs and developing environment-friendly technologies play an increasingly important role in many countries studied as well. While not always directly targeting innovation, many of the contemporary SME public-procurement programs do feature strong innovation elements in countries as different as Australia, China, Korea, Sweden and the US. Environment-friendly public procurement involves innovation elements almost by definition and has gained more prominence over the past few years in many countries.

Somewhat less attention has been given in the current literature to the way public procurement is systematically employed as an additional or indirect innovation driver in conjunction with other policy instruments to introduce new technologies or upgrade technology-intensive sectors. The country studies indicate that such indirect applications include various possibilities:

- Motivating (and sometimes forcing) public-sector suppliers (especially Multi-National Corporations (MNC)) to establish innovation and R&D linkages with domestic technology firms in order to qualify for public tenders. As an example of innovation linkages employed in the PPI context, as described in Chap. 3, Australia launched the Partnerships for Development program in 1987, where MNCs bidding for government contracts in strategic industries (e.g., ICT) were encouraged to sign long-term agreements to meet R&D and export targets, in collaboration with local companies. This initially mandatory requirement was replaced by more general guidelines in 2002. One can also find similar practices in Brazil (Chap. 4).
- Identifying and communicating future public-sector capability needs and possible contracting opportunities to the market. These tendencies are most prominent in areas such as defense, security and ICT. Signaling the needs to the industry with the possibility of future procurements is practiced most notably in Australia, the UK and the US, but also in Korea and China. However, in spite of the efforts, industries tend to remain rather skeptical about the progress and effectiveness of such newly introduced practices.
- Using public venture capital funds to invest in technology start-ups capable of becoming suppliers to the public sector. This novel strategy has gained prominence, for example, in the US where the CIA-run In-Q-Tel fund or the Army's

OnPoint Technologies both serve the government needs in the security area (see Chap. 13). On the one hand this particular tendency demonstrates the limits the often cumbersome public-procurement procedures have on calling innovations into existence, but at the same time it vividly demonstrates the continuous importance of the public sector as a launching customer of innovations.

- Matching public technology procurement with other innovation support measures such as R&D grants. This is a theme that will be dealt with in more depth in the next section.

14.2.2 PPI as R&D Policy

Specific R&D oriented public procurement policies are gaining grounds in many countries reviewed in the current volume. Largely influenced by the US experiences with the SBIR program (see Chap. 13), Australia, Korea, Sweden and the UK are among the countries that have adopted their own versions of R&D or pre-commercial procurement schemes. Denmark and Estonia have introduced public R&D procurement on a somewhat smaller scale. In addition to the countries explored in this book, other countries are following the path: Finland, Japan, the Netherlands, Russia and Taiwan, to name just a few (Wessner 2008). Further, the EU is developing its own pre-commercial procurement initiative that would match the alleged US SBIR success.

It can be concluded from the country chapters that public procurement of R&D often needs to balance between technology "pull" and "push", and the link between the public R&D procurement and actual public purchasing of end-products is not always that straightforward (see also Edquist and Zabala-Iturriagagoitia 2012). It is not always entirely clear what is the actual driver of these schemes—whether it is the demand or supply that guides the process and whether public sector actually make use of these schemes itself. In some occasions the link between R&D procurement with eventual procurement and the use of developed products has remained weak (e.g., the Estonian defense initiative, Chap. 7), and it is the technology push from the private and academic actors that actually drives the policy instrument rather than government needs. On other occasions the R&D procurement is directly driven by the government-established demand with a clear purpose for the public sector to eventually use the developed products, e.g. in the case of Australia's defense programs and partly the US SBIR. However, it remains one of the main features of the R&D-oriented schemes that the eventual public procurement is an indirect rather than a direct incentive for providers to carry out R&D work: Under SBIR-type instruments governments are not obliged to buy the developed products, but, as underwritten by an US SBIR Policy Directive "whenever practicable, an innovation or technology developed by an SBIR business will be used by the government" (cited in Chap. 13). Thus, the connections between R&D and actual PPI under SBIR-type schemes tends be determined by the policy practice and administrative routines, which vary from country to country.

In addition, the practice is strongly influenced by the will and capacity of governments to articulate the demand for R&D intensive solutions in a concrete way and by the modus how different parts (or potential future clients) of the public sector are integrated within the policy cycle. If the demand is articulated in broad terms and potential (public-sector) clients are poorly integrated into the initiatives then the role of public procurement as a demand instrument of innovation policy remains weak. At the same time, if public demand is described in a manner that carefully follows the identified needs, the public sector or other future clients are closely integrated into the initiatives and the rate of eventual purchases of the developed products is high, public procurement as an R&D policy can play an important role in a country's overall innovation policy.

Several reasons can be identified why countries' policy practice may differ in R&D-related PPI. First of all, there is a natural uncertainty with regard to technology development, its future trajectories, possible lock-ins and related costs, which, coupled with a lack of expertise in the public sector, may prevent government from signaling and forming a clear demand. Secondly, there can be a strong legacy of relying on supply-side innovation-policy measures, which means that the policy-makers may have a tendency to prefer instruments similar to supply-side support rather than going for clear demand-side tools (see e.g. the case of the UK in Chap. 12). Thirdly, in case of low government policy and administrative capacity, a newly introduced PPI policy measure can be easily captured by well-organized stakeholders (e.g., academic or business communities) and consequently the entire policy may fail to meet its goals (see e.g., the case of the Estonian defense R&D procurement, Chap. 7, or the case of the contracting program with the SME Federation in Korea, Chap. 10).

Nevertheless, the international evidence demonstrates that PPI policy that links institutionalized and public demand-driven R&D to actual public purchasing enables the public and private sectors to engage in close (pre-tender) collaboration that has proven to be a bottleneck of traditional open auctions and restricted tender procedures aiming at bringing about innovation impacts. In this way coordinated public R&D procurement schemes have proven to be useful and effective (not always, though) mechanisms in making the most out of the public-procurement potential to spur innovation.

14.2.3 Generic PPI Policy

A generic PPI policy ("policy for all seasons") approach—aiming at making the innovation dimension a central and explicit part of procurement decisions across the public sector—presents the latest attempt to use public procurement to tackle systematic problems in national innovation systems. Although the generic approaches are not entirely new endeavors for governments (see Chap. 2), governments have in the past few years increasingly brought up this issue and introduced new policy measures to meet the innovation challenges. Examples

include the direct incorporation of innovation-friendly regulative provisions into the legislation (Brazil, China, US), knowledge dissemination and promoting innovation as an important side-goal of public procurement (Australia, Denmark, Korea, Sweden, the UK), establishing communication platforms with industries for pre-selection stages (Australia, the UK), dedicated funding schemes (Sweden) and targeted training (Australia, Sweden).

In most cases the generic PPI policy measures are voluntary (or so-called "soft") in their nature, aiming at altering the prevailing public procurement practice and values rather than at concentrating directly on systemic problems in innovation systems. It is already quite well documented in various case studies in the field, but also in this book, that public procurers are generally risk-averse and tend to be process- rather than outcome-oriented. This is generally considered to be if not innovation-hostile then at least innovation-neutral behavior that is deeply rooted in the currently dominating public-procurement culture.

As the generic policies are relatively new (most date back to late 2000s), no systemic outcomes can be reported yet. However, judging by cases presented in this book, public agencies are in fact hesitant to use such a powerful policy tool even if direct legal support mechanisms are put in place. For instance in Brazil such a specific provision exists in the law that allows to positively discriminate innovative products against non-innovative ones, but this provision has not been employed by public agencies (see Chap. 4). The UK is probably one of the most advanced countries in Europe in promoting generic as well as other PPI policies; however, the practice still lags behind policy ideas (see Chap. 12). Other countries, such as Denmark, even if implementing preliminary schemes, have deliberately avoided providing official PPI guidance for the public sector (see Chap. 6). Perhaps the one outlier here is China that seems to rather aggressively pursue generic PPI policy, but again, no major outcomes can be reported yet as the policy as well as supportive legislation have only just taken effect.

14.2.4 "No Policy" Policy

In all countries studied in the book public procurement is mostly still a matter of auctioning for existing products and services based on the lowest-price criterion. Accordingly, we can argue that the "no policy" policy in PPI is essentially a starting point for all other possible PPI modes in all countries. What differs from country to country is how governments have diverged from the "no policy" policy towards others policy modes, and why they have done so, and how these other modes have changed over time. Yet, there are also countries that prefer to use "no policy" in PPI through their procurement practices.

The "no policy" policy does not make any specific provisions to promote innovation in procurement activities. This does not mean that governments do not pursue innovation-driving public purchases, but it has been a conscious choice of the governments not to develop explicit policies for PPI. Rather, in such cases

governments prefer procurement policies that are efficiency-driven and thus part of a general economic policy landscape where perfect competition is seen as the driving force of innovation. In other words, it is acknowledged that also procurement activities should foster competition in economy and this then should lead to more innovative activity in the private sector. From our case-study countries, Estonia, Hong Kong and Greece clearly fall under this category. In these countries outstanding PPI success cases exist, but the respective governments have not designed specific policy devices to address the innovation potential of public procurement in a systematic way.

What remains one of the problems with the "no policy" policy is that the innovation potential and actual effects remain unnoticed, making learning and best-practice diffusion difficult to happen (see Chap. 8 for this point). Also, concerns have been raised throughout the book if the "no policy" approach stressing only the traditional values of public-procurement is effective towards innovation (e.g., Chaps. 3, 7, 8, 12).

14.3 Factors Driving PPI Policies

Considering the size of contemporary public procurement budgets (see Chap. 1), it may seem almost self-explanatory that public purchasing should be capable of affecting the innovative behavior of supplier organizations. All the countries reviewed in the current book have—in one way or another—recognized that potential, but have, however, followed rather different paths in addressing that issue: the evidence provided in the previous section and throughout the current book shows that the actual policy-making in promoting innovation through public procurement in various countries has been hectic with many parallel trajectories, driven by various logics and pursued through different approaches. And here, as with any other policy field, the choice, implementation, continuity and discontinuity of PPI policies only seldom reflect rationally calculated and planned processes, but rather it reflects the struggles between competing ideas that are nurtured and developed in specific institutional environments.

Nevertheless, we also find that at least on the policy level—especially in policy talk and intentions—we can detect a certain general PPI trajectory over the past three decades. In other words, it follows from the country cases that on a very general level a common trajectory can be identified that characterizes the overall PPI policy-making regardless of specific contexts. While up to the 1980s PPI practice and also theory were dominated by technology and R&D specific activities, in the 1990s there was a rather strong turn towards efficiency through increased competition (that is, less government intervention in PPI practices), and since the 2000s we see a turn back towards an emphasis on innovation in PPI practices through generic PPI policy modes. Figure 14.1 summarizes the general policy trajectory.

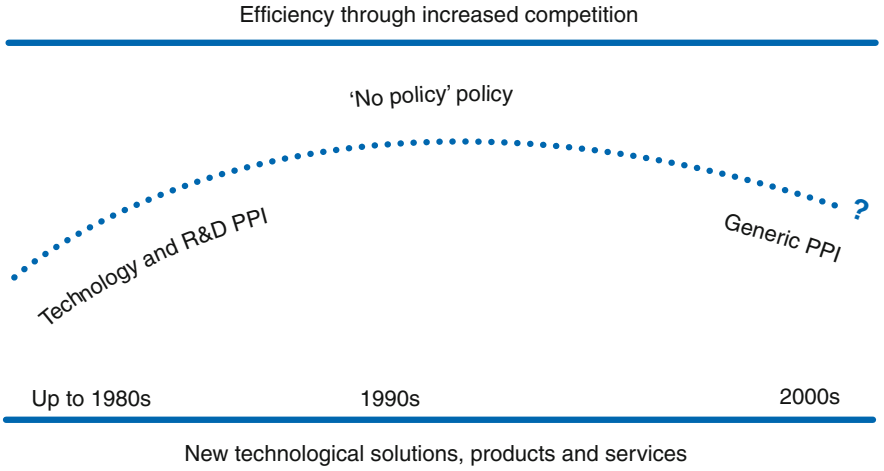

Fig. 14.1 Overall public procurement of innovation policy trajectory (Authors)

In what follows, we outline some of the factors that could have played a role in shaping the trajectories of PPI policies, both overall as well as in the countries studied, based on the framework outlined at the beginning of the chapter (see also Chap. 1).

14.3.1 International Pressures for Isomorphism

The 1990s witnessed a historic move from industrial to innovation policy (see Chaps. 1, 2). This historic move took place at a time when the "level playing-field" paradigm had become a dominant model in public procurement, especially among the developed world. By the 1990s industrial-development-oriented public procurement was more or less equaled with discriminatory procurement and was thus deemed to be counteractive to economic development. These changes took place in a context where the noninterventionist ideas had become a dominant doctrine in overall economic policy-making and affected most of the countries (Soete 2007) and especially small states (Kattel et al. 2010). In addition to the shifted focus towards macroeconomic stability, the neoliberal ideas also heavily influenced the administrative policy-making. With the emergence of the New Public Management (NPM) concept, the quest for a smaller and more business-like public sector gave a strong impulse for outsourcing, which put public procurement at the center of the NPM reforms. Supported by the international trade regime (e.g., WTO GPA, the EU single market), the quest for enhanced short-term efficiency became the single dominant goal for contracting for public works, goods and services, making side-goals such as industrial development or innovation largely irrelevant.

Such **normative pressures**—with a shift in economic, administrative and innovation policy-thinking—has had a strong influence on policy initiatives and created persistent policy paths. Many of the countries covered in the book used to employ a rather diversified set of innovation-related public-procurement policies up until the 1980s and 1990s, which were generally either abandoned or lost in significance in 1990s. This was clearly the case in countries with rather different contexts such as Australia, Brazil and Korea, and perhaps most visibly evidenced in the EU countries, where innovation-oriented public procurement had become almost a "non-issue" by the 1990s. For instance, technology-intensive public procurement used to be a more common and explicit policy measure in Sweden in the 1990s, but decreased in significance after Sweden joined the EU in 1995 (Chap. 11). Similar trends also appeared in Greece (Chap. 8).

At the same time, there are countries like Estonia and Hong Kong which have historically relied mainly on neo-liberal economic and administrative policy doctrines and accordingly have always opted for a "no policy" policy approach in PPI.

The US presents a paradox here: It is generally regarded as being one of the strongholds of neo-liberal thinking and accordingly has never attempted to formulate a state-wide and explicit PPI policy. Nevertheless, the US has been historically—and still is—one of the leading countries when it comes to exploiting public procurement for the sake of innovation. Largely pursued within the sectoral/technology and R&D policy domains and embedded in the national-security state framework, the US federal government has actively implemented various PPI policy measures and has effectively resisted the normative-ideological pressures downplaying government intervention in many public areas (Chap. 13).

In addition to the isomorphic processes in general economic and administrative policy-making, the legacy of innovation-policy doctrines has been another central factor determining PPI policy evolution. The prevailing supply-sidedness in innovation policy-making (instruments such as R&D grants or tax reductions) has simply left the demand-side unnoticed in many countries for a long time (e.g., Brazil, Denmark, Estonia, Greece). In addition, many of today's PPI policy initiatives build on the existing supply-sided capabilities and thinking, which in some cases has created a situation where initially public demand-oriented initiatives fail to introduce proper demand-led incentives and only seldom lead to actual public purchasing of innovations (e.g., the UK's SBRI program, the Estonian defense R&D procurement program). The experience of the UK summarizes this situation well:

> It is not then surprising that a large amount of attention has focused on the SBRI scheme which falls most easily into the research funding paradigm. To its credit the agency has sought to partner with sectoral ministries in this area and with its innovation platforms but the net result is a small share of already small budgets and little impact on the real prize – the multi-billion national spend on procurement of goods and services. (Chap. 12)

The institutional set-up of national public procurement systems has become increasingly similar across countries over the past couple of decades. This evolvement has been in addition to the above-mentioned normative pressures

facilitated by the developments in the **international trade regime**. Public procurement has become an important international trade issue, which has led to increasingly similar public procurement rules and behaviors of public procurers, especially among the signatories to the WTO GPA (41 altogether, the majority being from the developed world; Denmark, Estonia, Greece, Hong Kong, Korea, Sweden, the UK, USA from the countries covered in the current book), the EU member countries (all are signatories to the WTO GPA, but the EU single-market policy is in many ways even more restrictive) and countries that have bi- or multilateral free trade agreements covering public procurement beyond WTO GPA (Australia). Also China—expected to join the WTO GPA soon—is experiencing a strong pressure to change its public procurement rules in accordance to the international trade rules. The international free trade movement has facilitated the establishment of international public procurement standards—building on openness, transparency and non-discrimination—which is also embraced by countries that have opted out from WTO GPA or similar agreements and maintained policy freedom in public procurement (e.g., Brazil).

The convergence in public procurement regulation has taken place at a time when government purchasing was increasingly seen as unsuitable for promoting side policies such as industry or innovation and when some, previously heavy users of PPI, such as Sweden, gradually abandoned the usage of the tool. This has led some commentators to suggest that the current WTO-EU type of public-procurement regulation contributed to the emergence of risk-aversive culture and low use of innovation-oriented public procurement, and subsequently to the decline in active PPI policy-making from the 1980s to the 2000s. The country cases in this book do not indicate that the current formal rules *per se* are responsible for the low use of PPI, but it becomes evident on the one hand that the converging regulations have limited the room for maneuver for countries to pursue PPI policies, and the regulation indeed played a role in creating public-sector culture that is *perceived* as innovation-hostile and on the other hand that today public procurers are better positioned to conduct "price wars" rather than PPI, which assumes cooperation and interaction with suppliers (Chap. 7).

With regard to specific policies, changes in trade regime did affect policy trajectories. Instead of deliberately using public procurement in concert with other innovation and industry policy instruments, more indirect and "soft" approaches have been put forward by governments such as communication of future public-sector needs instead of local-content requirements (see e.g. the Australian experience in Chap. 3). The EU public-procurement rules have been found difficult to adjust to local business culture in Denmark, which heavily builds on informal interactions (Chap. 6). Australia opted out from WTO GPA mostly because of industrial concerns, although today the country's public procurement rules closely follow the international practice due to free-trade agreement with the US. Korea prudently chose the time to enter WTO GPA: it did not join before the basic development level was achieved and the Korean companies were able to compete on international markets (Chap. 10). At the same time, ever since Korea joined

WTO GPA it has limited its strategic procurement policies (including innovation) with what is allowed by the WTO GPA; that is SMEs and R&D procurement. At the same time all countries that pursue the "no policy" policy in PPI (Estonia, Hong Kong and Greece) are signatories to WTO GPA and closely follow the principles of international trade regulation in their public procurement system.

It can be hypothesized that the international trade regulation has been an influential factor behind the recent policy shift from industry-relevant public procurement towards R&D procurement. On the one hand, this shift has been about bridging the demand-side instruments with supply-side innovation-policy measures, reflecting the general tendencies of national innovation policies to support technology push rather than pull. On the other hand, R&D procurement falls outside the international free trade agreements and thus gives the government an incentive to redirect their policies towards public R&D procurement, which leaves them much more room for maneuver compared to purchasing end-products. At the same time this development deepens the existing bias of innovation policy-making towards high-tech sectors. While these developments can be regarded as potentially beneficial for addressing societal grand challenges (e.g., energy, ageing, environmental pollution) by facilitating radical innovations, the greater reliance upon public R&D (or pre-commercial) procurement actually leaves the majority of public suppliers, and consequently entire economic sectors, outside the PPI policy scope.

There are also some counterarguments to the inhibiting role of the current international public procurement regulation towards PPI. One is that the ideological pressure and belief in government failure in the 1990s was so overwhelming that it became virtually impossible for governments to ignore the neoliberal recipes for economic development, and therefore it was the international normative pressure rather than the regulatory framework that was behind the declining interest for PPI. The other is that in spite of the changed ideological milieu and regulative framework, full-blown policy initiatives still took hold in countries with new regulative environment (e.g., US) and sporadic implementation of PPI cases occurred even in countries such as Hong Kong and Estonia, generally reluctant to PPI, meaning that PPI was possible under the new trade regulation.

Third, changes in the international trade regulation have left, paradoxically, public procurement one of the few legitimate tools available for the governments to pursue industrial policy. The developments in the international trade regime have made it rather complicated for governments to employ direct industrial policy measures as they did before the 1980s (Soete 2007) or even before WWII (see Reinert 2007; Chang 2002). Public procurement can be still used by governments as an explicit industrial policy tool when organized as pre-commercial (i.e. R&D) procurement or if a country has opted out from the WTO Government Procurement Agreement (which the majority of developing countries still have); also, it can be used implicitly by benefiting from natural restrictions that exist when entering a country's public procurement market (language, court practice, availability of information etc.) (see e.g. Weiss and Thurbon 2006). Thus, if on the one hand the growing role of international trade agreements may have diminished the

importance of PPI since the 1980s, then on the other hand, the current renaissance of the PPI policy can perhaps be explained by the fact that it epitomizes a policy potential similar to that of the traditional industrial policy.

A separate question is how effective such a policy is considering that since the 2000s we are seeing the emergence of highly specialized networks that operate and source production and knowledge, often supra-regionally or even globally (e.g., Ernst and Kim 2002; Berger and MIT Industrial Performance Center 2006). Such global innovation networks—a globally organized web of complex interactions between firms and non-firm organizations engaged in knowledge production related to and resulting in innovation—calls for additional research on national innovation policy tools.

14.3.2 Socio-economic Environment

Studies on economic development show that division of tasks between **state and society** (including the state's role in economic development), political preferences and state structure (including rate of centralization) are among the factors that are relevant. One could assume that countries more similar to the developmental state concept (as defined, e.g., in Chang 2002) or coordinated market economy (Hall and Soskice 2001) are in a better position to design and implement PPI policies than others as the state's role in steering economic processes and, related to that, the use of public procurement for developmental ends is more likely to be an acknowledged and legitimized practice.

The case studies demonstrate that today the utilization of PPI does not follow clearly identifiable state-society relationship patterns. PPI has been widely implemented in some liberal market economies for a long time (e.g., the US), whereas in other liberal market economies PPI has been either absent (Estonia, Hong Kong) or emerged only recently (e.g., Australia, the UK). Sweden, being an example of a coordinated market economy, was a heavy user of PPI well into the 1990s, but today is allegedly lagging behind some other European countries. At the same time Denmark, also a typical coordinated market economy, has been a rather reluctant user of PPI throughout the last half-century. It is interesting to note that PPI was widely exploited in the East Asian developmental states after WWII (e.g., Korea, but also Japan, see Chap. 2), but to a far lesser extent today (Chap. 9, but also Myoken 2010). China, where the state plays a dominant role in economic development has only recently started to implement extensive PPI policies.

The introduction and continuity of a policy idea often depend on how well it is embedded into politically acceptable (innovation) policy-making patterns, i.e. how well it is coupled with dominant (economic) policy thinking shared by the politico-administrative elite (Block and Keller 2011). The country chapters in the current book show that this is a relevant factor also in PPI policy-making. In the US, the security concerns have made it possible to sustain active PPI policy-making (Chap. 13) and to overcome opposition based on political preferences. Estonian

political leadership has been dominated by parties following neo-liberal ideologies for a long time, and the country has never implemented clear policies for PPI (Chap. 7). Hong Kong has followed a similar path (Chap. 9). In Australia, the recent turn towards more explicit PPfI policy-making emerged when the social democrats took over the cabinet office from the neo-liberal-oriented party (Chap. 3). In the UK, the current surge for PPI took off under Labour but was revised by the coalition of the conservatives and liberal democrats (Chap. 12).

It follows from the cases that the main (and especially the successful) historical as well as currently implemented policy practices are very often driven and enabled by some country-specific **socio-economic challenges** that act as a legitimizing factor for PPI policy-making. The security concerns in the US and to a somewhat lesser extent Australia (see Chaps. 13, 3 respectively), the development of highly dominant industries such as oil in Brazil (see Chap. 4), environmental issues in the Nordic countries (see Chaps. 6, 9) and challenges to the health sector following the demographic developments in Denmark (Chap. 6) are some examples. These features seem to provide governments with a much needed "anchor" for establishing and developing PPI capabilities and a shelter from a changing and unsupportive socio-economic environment. The latter can mean, for instance, a radical change in the ideological milieu or regulative framework. However, these anchors (if present) are usually nurtured in specific, often idiosyncratic, institutional contexts, which in turn influence where the public-sector PPI capabilities reside and are maintained and, thus, how the PPI policy evolves. These domestically idiosyncratic "anchors" make it possible for policy stakeholders to overcome inherent problems of PPI (e.g. high technology, financial and political risks) as well as general public procurement (e.g. multiple goals and conflicting institutional settings). The US public technology and R&D procurement policies (Chap. 13) provide an example here. Driven by security concerns in the widest sense, the current PPI policies have become highly institutionalized over a long course of time and facilitated by a variety of factors: long-term capability accumulation through military practices, existence and constant reinforcement of innovation-friendly values (i.e. inherent quest of the public sector for transformative and marketable technologies), special legal treatment for innovative products (Buy American Act, Small Business Act, incl. open-door access for high-tech companies to federal market if financed through SBIR), and continuing presence of dedicated organizations that provides training (e.g., ICAF) or champions new technologies (e.g. SBIR, In-Q-Tel).

It is interesting to note that although national competitiveness is almost always linked to PPI policy initiatives, the competitiveness challenge alone does not lead to significant PPI policy actions. This can be evidenced from Australia, Denmark, Brazil, the UK and Estonia, which all emphasize the potential of PPI, but have not yet been able to introduce effective PPI policy instruments. Similarly, although the financial and economic crisis could be seen as another "anchor" for pursuing more substantial PPI policies, we do not observe this link to be present. In Australia the largest support packages of all OECD nations was introduced in the beginning of crisis and, as economic stimulus became the driver of economic policy, allocations

to innovation support, including PPI instruments, increased. Nevertheless, this proved to be of limited effect (Chap. 3). In China, the city of Shanghai offered public contracts to technology-intensive companies to shelter these from crisis, however this was again a limited-scale effort. At the same time, the crisis has put cutback management rather than strategic public procurement at the focus of public consumption in Estonia and Greece. In these countries the crisis strongly reinforced the dominant position of macro-economic stability policies over government intervention.

Today innovation policies are operationalized via the concept of a **national innovation system** (NIS)—the most developed theoretical and policy-making discourse about innovation and concepts closely related to it, like clusters and regional innovation systems. As it is the national innovation system within which innovation processes take place, policies related to public procurement can have a direct influence.

Countries with advanced innovation systems (Australia, Denmark, Republic of Korea, Sweden, United Kingdom, USA; see Tables 1.2 and 14.2) generally apply a more extensive range of innovation policy instruments and possess stronger innovation policy governance capabilities. Still, innovation policy support is overall limited to supply-side measures, reflecting the general tendencies of national policies to support technology push rather than pull. Although conscious PPI policy-making has not been important in influencing the overall development of innovation systems on the national level, there is evidence that there has been a positive impact on sectoral innovation systems (e.g., security in Australia and USA, oil industry in Brazil, ICT in Estonia).

It is interesting to note that even in those countries with weaker NIS (such as Estonia, Greece, Hong Kong) there is an increasing interest towards PPI. However, market structure and capabilities of companies matter—firms can be differentiated according to their technological competence (Pavitt 1984)—meaning that their ability to respond to PPI policies probably also differs. The country chapters illustrate that the experience with PPI has been related to PPI as technology (industrial) development policy and PPI as R&D policy and thus assumes the existence of technology and/or R&D-intensive private-sector suppliers. Case studies on Estonia (Chap. 7) and Greece (Chap. 8) show that these countries generally lack the main requirements for engaging in technology-centered PPI—a dynamic local production constituting a supply sector willing to push for technological development—thus calling for further research on this issue.

Related to that, country cases show that the role of industry associations can be important as in some countries they have influenced PPI policy processes (especially in Australia, USA, UK). A similar story lies behind the successful ICT-related procurements in Estonia, where "ethical hackers" pushed the public administration apparatus to procure innovative e-government solutions (Chap. 7). While at the same time a lack of lobbying on the part of industry (i.e. the small number of large companies and the lack of interest from foreign companies due to the small size of the local markets) is generally true for Estonia and Greece (see Chap. 8 for this argument).

Furthermore, asymmetries within government **demand** for innovative products plays another key role in developing PPI policy solutions. As the Brazilian case shows (Chap. 4), if a procurement policy aimed at innovation should emerge, it must take into account the technological asymmetries within government procurement (Chap. 4). This means that different government sectors tend to consume different products in terms of their technological content. As demonstrated also by the example of Estonia, the low-tech sectors tend to be the main government suppliers (Chap. 7). One possible suggestion based on this could be that government should acknowledge the importance of high-tech industry in the overall economic development in a country and re-orientate their procurement policies and practices accordingly. Perhaps a more plausible suggestion, however, could be that government should adapt their PPI policies in a way that would help to upgrade the skills of low-tech sectors. In other words, government—in addition to focusing more on purchasing high-tech solutions—should use more innovation-conducive practices to motivate their main partners, i.e. low-tech sectors, to innovate.

14.3.3 Policy Context

Table 14.2 above demonstrates that public procurement is expected to serve innovation goals in very different ways. What is noteworthy, however, is that programs that directly put public procurement at the center of national innovation policies are not that commonplace as one would have expected, based on the emerging international PPI "hype". Instead, indirectness in PPI policy-making can be observed—in most cases public procurement is used as an indirect or additional innovation incentive that is (often loosely) supplemented to the existing (sectoral) policy instruments (e.g. R&D, energy, SME). Indirectness refers to a situation where a public-procurement contract opportunity as such rather than the procurement process itself is expected to lead to innovation and innovation diffusion. This also means that current PPI policy developments are not always demand-driven, but try to accommodate social needs, supply-side needs and actual public demand. This corresponds to what we have called earlier a "soft public procurement" approach; an approach that embeds procurement-like logic into innovation and industrial policy-making (Kattel and Lember 2010).

When direct PPI policies are implemented, the empirical evidence points to cautious and rather small-scale initiatives and slow progress in transforming policy plans into practice. This is especially evidenced, for example, in Australia, the UK, Brazil and Denmark. Policy statements rather than regulative interventions, voluntary rather than mandatory instruments, sporadic rather than institutionalized support structures tend to prevail in today's PPI policy-making. A slow uptake of PPI can be observed even in cases where dedicated policy institutions and support structures are developed.

For example, in the UK the strong reliance on contracting-out and third-party government in public service delivery has hallmarked public-sector reforms over the past three decades and put public procurement under a constant pressure to deliver the reform expectations. Today, innovation is widely seen among the UK policy players as a crucial element in re-making the public sector and public services, and this has led to very active formal policy-making in combining outsourcing and public procurement with innovation aims. However, the UK case demonstrates that formal policy-making does not automatically lead to widespread implementation, and the actual practice has lagged behind policy plans. The UK experience implies that in addition to "overcrowding" of the "policy through procurement" agenda, the prevailing quest for typical NPM values such as short-term efficiency gains may actually contradict PPI ideas, and thus contribute to the slow diffusion of PPI policy ideas and practices within the public sector (Chap. 12).

Even countries that have opted out from international public procurement regulative frameworks and have rather substantial developmental policies in operation have not been able to champion PPI. For example, Brazil, which is not a member of WTO GPA and enjoys relatively more policy freedom, has given explicit preference to innovative solutions in its public procurement regulation (overpricing rate up to 25 %), but the dominance of regular public-procurement routines, a corruptocentric approach and a lack of personnel with necessary skills inhibit the potential use of PPI (Chap. 4). This somewhat paradoxical situation is well summarized by Thurbon (Chap. 3), who, when analyzing the case of Australia, states that:

> In reality these [innovation] obstacles have little to do with Australia's international trade obligations. The most significant barriers to a more proactive and strategic approach to PPfI in Australia are home grown – and the most entrenched are 'attitudinal'.

Public procurement is a highly institutionalized field, where persistent structures and routines have evolved during the past three or four decades, which, as indicated by many of the country cases, have proven to be difficult to change in accordance to innovation policy purposes. Short-termism and risk-evasiveness are among the influential **values** that were also underlined in the country chapters. The evidence from the country chapters indicates that the current public procurement institutions fail to reward risk-taking that is needed for effective PPI, whereas quest for non-discrimination and transparency together with cumbersome procurement regulation has made lowest-price bidding the safest way to conduct public procurements. Although countries have introduced specific policy measures to promote PPI and assist public procurers to bear extra risks, most of these policy solutions—as indicated above—are yet to prove their effectiveness in changing the dominant public procurement routines and practices.

The introduction of PPI policies has also been influenced by the nature of modern public procurement systems. Although there are some modest centralization tendencies present in some countries, today almost all countries that want to apply PPI policies have to do it in a context of decentralized public procurement systems. This means that not only are the majority of public procurements carried out independently by various public units, but also the state structures are

increasingly detached vertically as well as horizontally from each other. This makes it difficult to introduce change into a public procurement system as one must overcome vast coordination challenges. Also, in such a decentralized system it is more difficult to design robust incentive mechanisms that would accommodate the needs of all different public organizations.

The countries which are often heralded as champions of the most influential users of PPI (such as the US today or post-war Japan) have had explicit institutional structures to support the PPI policy-making. At the same time, the actual PPI policy practice (as opposed to declarative policy rhetoric) that is anchored to context-specific peculiarities hardly lends itself to copy, especially as these structures are not easily at hand for most of the countries planning to introduce PPI policies today. Think only of the security-driven PPI policy-making and related mix of support structures and institutions in the US (see above and also Chap. 13) or public technology-procurement programs in Korea, the implementation of which is facilitated by a highly centralized public procurement system and a central public procurement unit that is a sub-unit to the ministry responsible for economic development (Chap. 10).

14.4 Conclusions

Innovation-oriented public procurement has a long history. The respective policies, and the way public procurement has actually been used to foster innovation, have, however, changed considerably over the past four decades. While during the industrial policy era up until the 1980s public procurement was mostly used to induce new technologies and entire industries via direct public technology-procurement programs as well as R&D procurement, the emerging policy consensus emphasizes more holistic ideas and sees public procurement as a more generic tool in promoting innovation.

The current book maps the latest PPI policy developments in various contexts and analyzes the evolution and development of the various policy solutions in wider institutional contexts. Through the cases of 11 countries with highly diverse economic and social settings, the book points to the existence of a much more nuanced PPI policy landscape than that has been acknowledged in the academic and policy debates so far.

First, there is no single PPI policy approach that governments follow. Instead, innovation is targeted through a mix of various mechanisms. We classified the existing policy patterns as follows: PPI as technology (industrial) development policy, PPI as R&D policy, PPI as generic policy (so-called "policy for all seasons"), and PPI as "no policy" policy. Each of these approaches has its own underlying logic and is shaped by different institutional constraints. What is, however, important is not the classification as such, but the fact that depending on a specific policy instrument, PPI policy-making assumes rather different policy capacities and institutional fit.

Second, in spite of a strong supportive rhetoric worldwide, the actual PPI policy measures implemented are still cautious rather than substantial. With some notable exceptions aside, the countries are still struggling in designing and implementing PPI policies that would be capable of bringing about major innovation effects.

Third, indirectness rather than directness characterizes the currently prevailing PPI policy solutions. This means that the most ambitious policies implemented do not actually use the process of public procurement as an innovation driver, but instead use the opportunity of obtaining public procurement contracts as an additional innovation incentive among other policy instruments. Thus, somewhat paradoxically, public procurers tend to play a secondary role in today's PPI policy developments.

Fourth, most of the introduced PPI policy measures are in fact systemic in their nature rather than pure PPI policy instruments and combine various supply- and demand-side approaches. Many of the current PPI policies tend to suffer from supply-sidedness, where newly introduced measures are built upon the existing supply support structures.

Fifth, sectoral and public organizations' intrinsic rationale, e.g. need for green technologies or new health solutions, rather than innovation policy rationale tends to be the main driver in most countries' PPI activities. This means that today PPI-policy incentive structures are still mostly outside the reach and influence of public procurement as well as innovation policy domains.

These general conclusions should be a source for further activities for both policy-makers and the academic community. We believe that for policy-makers the wealth of experience described in the book should not only be a good source for benchmarking, but it also provides many useful ideas for further policy experimentation. Next to concrete policy instruments (see Table 14.2), the empirical evidence suggests that governments should think of introducing, for example, more targeted PPI-relevant training, institutionalized pre-tender dialogue procedures with industries, explicit legal incentives, coordinated signaling of future needs, more structured information and best-practice sharing, more targeted involvement of low-tech sectors, and dedicated funding schemes.

These suggestions are hardly novel, but what the book demonstrates is that the application of these and other concrete measures may fail to produce the expected results if the wider institutional constraints are ignored. For example, full-blown PPI policy measures addressing the entire public sector may not be the best strategy to start with, as public procurement has over time become a highly institutionalized process that is not only hardly ever driven by innovation motives, but that has proven to be difficult to change. Moreover, public procurement systems tend to be highly decentralized, which assumes a strong coordination capacity from PPI policy-makers. If this fact is ignored, the suggested policy tools can provide only a limited effect. As pointed out by many contributors to the book, more selective and sector-based initiatives that stem from intrinsic policy or organizational rather than innovation-policy needs have served as a useful starting point for PPI. In these cases it is easier to develop the needed policy as well as administrative capacity for conducting innovation-supportive public procurements,

as the motivation for taking the extra risk comes from within the responsible organization. Fields with a proven track-record in PPI could be another starting point for building up the needed policy capabilities.

We identify major normative pressures—shift in economic, administrative and innovation policy-thinking as well as in the international trade regime—that have had a strong influence on the PPI policy initiatives. This mix of pressures has proven to be a fertile ground for the accumulation of public procurement routines and culture that constrain the potential of public procurement in spurring innovation. In this context, as demonstrated by many country cases, the capacity to resist normative pressures and capacity to find room for maneuver within international trade regulation is needed in order to pursue long-term and successful PPI policies.

However, as we also noted, country experiences within the general converging trend tend to be still relatively diverse. It is our understanding that the socio-economic context and especially the changes in it play an important role in shaping the actual PPI practices. This refers to differences in the embeddedness of state and society, socio-economic challenges faced and the overall status of a national innovation system. Here the legitimization of the PPI idea in the local socio-economic context becomes crucial. The legitimization of a PPI policy may be facilitated if it was anchored to widely accepted national or regional challenges (e.g. security, energy, health). But this challenge must be a real challenge where the connection between national need and the role of PPI can be easily perceived. For example, national competitiveness concerns seem not to be the kind of a challenge where the link can be automatically made. It might take much more than abstract challenges to pave the way for substantial and sustainable PPI policy-making.

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