Spurring Innovation-led Growth in Latin America and the Caribbean through Public Procurement

Editors:

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Institutions for Development Sector

Competitiveness and Innovation Division

DISCUSSION PAPER Nº IDB-DP-488

November 2016

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ABSTRACT*

Public procurement accounts for a significant proportion of overall demand for goods and services. Thus, it could be a useful tool for fostering innovation and economic growth. While interest in the use of public procurement as industrial policy is not new, its potential to spur demand for innovative products and services, create incentives for business innovation, and accelerate the diffusion of new technologies has received much policy attention in recent years. The aim of this study is to advance knowledge on the role of public procurement as a demand-side policy instrument in stimulating firm innovation in Latin American and Caribbean (LAC) countries. In LAC countries, public procurement systems account for 20 percent of GDP, which suggests a considerable untapped potential to use public procurement for innovation (PPI) to strengthen their economic position and improve public service provision. The report first reviews the evidence on the implementation and impact of instruments and structures introduced to support PPI in selected developed countries (the United States, the European Union, Estonia, Netherlands, Spain, the United Kingdom, China, and the supranational case of EU procurement policy), identifying useful policy lessons for LAC countries. It then focuses on emerging innovation friendly procurement practices introduced in three selected LAC countries: Brazil, Chile, and Colombia. These countries offer a diverse picture in terms of the institutional path they have followed for the development of public policy for innovation/pre-commercial procurement (PPI-PCP) policies as well as important differences in the level of development of their innovation systems.

JEL codes: O25, O38
Keywords: demand side innovation policy, innovation, Latin America and Caribbean countries, public policy, public procurement

* The authors wish to thank the experts interviewed in the countries studied, who provided valuable insights on the issues discussed in this report. Without their assistance, this report could not have been undertaken. We are also grateful to Clara Weisshaar, who provided valuable research assistance for the country reviews. We also wish to thank the participants of the "Best Practices on Innovation-friendly Procurement Policies in Developed Economies" workshop, which took place in Washington, DC from December 10 to 11, 2015, and the participants and discussants of the "Emerging Experiences on Innovation-friendly Procurement Policies in Latin America" workshop, which took place in Washington, DC on July 14, 2016. Their valuable comments on earlier drafts and inspiring discussions where key for shaping our recommendations. The authors also wish to thank Mr. Javier Davila and his FMP team at the Inter-American Development Bank for their contributions.

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Acknowledgements

The authors would like to express their gratitude to the Inter-American Development Bank (IDB) team, especially Gustavo Crespi and Jocelyn Olivari for their thorough reviews and comments on the report, as well as Javier Dávila for his important input. The participation and comments received during the IDB workshops that took place in December 2015 and July 2016 in Washington, DC were also influential. We are grateful to Clara Weisshaar at the University of Manchester, who provided valuable research assistance for the country reviews.

Finally, the authors benefited from the availability and collaboration of academics, officials, and civil servants who provided valuable contributions in the form of comments and reviews of the various country studies herein. We would like to thank the following people: in the United States, Nicholas Vonortas (George Washington University); in Estonia, Veiko Lember (University of Tartu), Sigrid Rajalo (Ministry of Economic Affairs and Communications); in the Netherlands, Floris den Boer, (Ministry of Economic Affairs-PIANOo), Carla Dekker (Ministry of Economic Affairs); in Spain, Manuel Varela Rey (GAIN), Juan Manuel Garrido (MINECO), Jorge Barrero (Cotec), Neus Colet Arean (Junta Consultiva de Contratación Administrativa de la *Generalitat de Catalunya*), Miguel Ortiz Pajares (CDTI); in the UK, Colin Cram (Mark1), Keith Hodgkinson (BIS); in Brazil, André Tortato Rauen, Fernanda De Negri and João De Negri (Instituto de Pesquisa Econômica Aplicada-IPEA), Cássio Garcia Ribeiro (Universidade Federal de Uberlândia), Edmundo Inácio Júnior (Universidade Estadual de Campinas), Edmund Amann (The University of Manchester); in Chile, Andrés Zahler and Francisca Müller (Ministerio de Economía), Carlos Álvarez Voullieme (Sistema de Empresas Públicas), Martín Ojeda, Darinka Yoli Aravena and Nancy Andrea Álvarez Lahoz (Chilecompra), Pablo Angelelli (IDB), Jaime Rivera (CODELCO), Hernán Vega (Metro), Pedro Vizcarra (Laboratorio de Gobierno); and in Colombia, Julio Fajardo, Marcela Riascos (Colombia Compra Eficiente), Alejandro Olaya and Liliana Zapata (Colciencias), Rafael Puyana (Departamento Nacional de Planeación), and Mónica Salazar (IDB).

INTRODUCTION AND FRAMEWORK OF ANALYSIS

Elvira Uyarra and Jakob Edler, MIOIR

Introduction

Going back at least to Marshall (1920), economists have long emphasized the importance of demand as a driver of innovation. Von Hippel (1986) stressed the role of early users in shaping innovations, since they signal functionality, provide demonstration effects, and often engage in co-creating improvements. According to the EU Innobarometer (Gallup, 2011), market uncertainty is one of the main barriers to innovation in firms, far more important than many of the supply conditions that are the predominant focus of innovation policy intervention (Edler and Georghiou, 2007). In recent years, however, there has been renewed interest in demand-side innovation policies, aimed at improving conditions for the uptake of innovations. This trend reflects the adoption of a broader approach to innovation policy (Edler, 2007; OECD, 2011). Demand-side policies take a variety of forms, including PPI, standards and regulations, lead markets, and user-driven innovation initiatives.

Public procurement accounts for a significant proportion of overall demand for goods and services. In 2013, Organisation of Economic Co-operation and Development (OECD) countries spent, on average, 29 percent of total government expenditure on public procurement (or an average of around 12 percent of GDP). The potential of public procurement to spur demand for innovative products and services, create incentives for business innovation, and accelerate the diffusion of new technologies has received much policy attention of late, particularly in the European Union (EU) (see Aho et al., 2006; Edler et al., 2005; Kok, 2004; Wilkinson et al., 2005) but also across OECD countries (OECD, 2011; Myoken, 2010). For example, the EU's new procurement directives of 2014 incorporate improvements to facilitate innovation-friendly procurement. They include simpler processes for supplier selection, guidance to facilitate involvement of small and medium-sized enterprises (SMEs), mechanisms to allow preliminary market consultations, and a new procedure, "innovation partnerships" between suppliers and the contracting authority to develop a new product or service.

Existing evidence indeed suggests that, in recent years, public procurement has been incorporated into the broader toolbox of innovation policy instruments in many countries. While the use of public procurement of innovation in countries such as the United States, the United Kingdom, Sweden, and China is well documented, more recently other countries are considering its use, including small economies such as Malta and Estonia (e.g., Georghiou et al., 2010), and transitional economies in Central and Eastern Europe (Edler, 2011). Out of the 32 countries surveyed by the 2014 OECD survey on public procurement, more than half (23) reported having a strategy or policy at the central level to support the procurement of innovative goods and services (OECD, 2015).

However, the degree and type of adoption of these policies is very diverse. Lember et al. (2013) reviewed the experiences of several countries (the United States, Brazil, Denmark, Estonia, China, Greece, Korea, Sweden and the United Kingdom) in public procurement of innovation and concluded that the approaches taken in different countries vary considerably. A report on the strategic use of public procurement in Europe (Kahlenborn et al., 2011) also highlighted these differences. They noted that countries such as Finland, Netherlands, Norway, and the United Kingdom stand out as front-runners, with specific programs to promote PPI (particularly pre-commercial procurement activities such as Small Business Innovation Research (SBIR) in the Netherlands and the United Kingdom and other initiatives such as Forward Commitment Procurement (FCP) in the United Kingdom and the Public

R&D Contracts *(offentlige forsknings- og utviklingskontrakter,* OFU) program in Norway, as well as with dedicated institutions (such as those in Finland and Norway).

The aim of this study is to advance knowledge on the role of public procurement as a demand-side policy instrument for stimulating firm innovation in Latin American countries. In LAC countries, public procurement systems account for 20 percent of GDP, which suggests a potential to use PPI to strengthen their economic position and improve public service provision. As Latin American countries are considering the role of demand to encourage innovation, it is relevant to analyze experiences from developed economies, identifying previous basic requirements and useful policy instruments. Specifically, this study aims to: (i) explore the state of the art in terms of the use of innovation-friendly procurement policies; (ii) identify innovation-friendly procurement policies already being implemented in LAC countries; and (iii) develop recommendations on how LAC countries can include public procurement in the innovation policy mix.

These objectives are elaborated in two main Parts. Part One provides an analysis of the state of the art in public policies to encourage PPI. The countries selected for this analysis are: the United States, China, Netherlands, Estonia, Spain, the United Kingdom, and the EU as a supranational organization with jurisdiction over public policies (i.e., PPI instruments under Horizon 2020). These countries not only employ a broad and heterogeneous array of instruments and policies for PPI; each of them is at a different level of development. For example, while the United States and the United Kingdom have been leaders in PPI design and implementation for over a decade (even decades in the case of the former), countries such as Estonia and Spain have just begun to incorporate PPI into their innovation policy mix. These differences highlight the obstacles and best practices at different stages. Furthermore, this selection deliberately includes countries with dissimilar economic, social, and political characteristics and public procurement structures. This has led to the inclusion of countries (such as Netherlands and the United Kingdom) with strong, centralized public procurement agencies and countries with more decentralized settings (such as China and Spain). Improved understanding of the interaction of country-specific characteristics and the corresponding PPI instruments and policies will improve the capacity to design and implement effective and tailor-made PPI solutions for LAC countries. The current potential and recent experiences in PPI in LAC countries is explored in Part Two. This Part aims to highlight good practices and potential risks, drawing from a more in-depth analysis of the initial experiences of Brazil, Chile, and Colombia in PPI-PCP. The three countries have been selected to represent a diverse mix of socioeconomic characteristics, as well as to illustrate emerging experiences in developing PPI-PCP as an innovation policy tool. Other LAC countries, such as Argentina and Mexico, have started to develop specific initiatives in this area and the analysis of their results will be also valuable in the future.

Part One thus consists of six country studies plus a horizontal assessment of European Union policies and programs with regard to PPI, while Part Two examines recent experiences in Brazil, Chile, and Colombia and derives recommendations for LAC countries. For the selected countries we investigate: (i) the underlying rationale behind PPI policies, (ii) the type of policy instruments used to accomplish specific policy goals, and (iii) the implementation of these instruments and an assessment of their impacts. The report describes the policies and debates pertaining to the use of PPI that have taken place in these countries in the last 10 to 15 years, discusses the mix of instruments adopted (following Georghiou et al., 2014), and assesses their goals, design, and (where possible) effects. The initiatives and policies related to defense procurement are excluded from this review, since defense procurement operates under a different and highly specific regulatory framework compared to procurement for civilian use.

The rest of the introductory chapter discusses the framework followed in this study. It first reviews the concept and rationales associated with the use of PPI. It then introduces the

chosen framework for PPI intervention used in the study, followed by a review of the academic and policy debate with regard to the implementation and evaluation of these policies.

Framework of analysis

Rationales

Public procurement is the process of acquiring goods and services by governments, public sector organizations, and state-owned enterprises. The potential of public procurement to spur innovation has been associated with its capacity to create new markets, its ability to pull innovation as a result of the government's purchasing power, and as a testing ground for innovative products (Rothwell, 1984). Empirical studies suggest that the effects of public procurement on innovation are actually greater than the effects of supply-side instruments (Aschhoff and Sofka, 2009; Guerzoni and Raiteri, 2015).

A number of rationales have been put forward to justify the use of public procurement to boost innovation (Edler and Georghiou, 2007). First, given its large purchasing power (actual or potential through centralizing or aggregating demand), the public sector can create a large enough market to counteract the technological and market uncertainties associated with research and development (R&D). By bringing together users and suppliers, public procurement can counteract systemic failures associated with the lack of user-producer interactions, information asymmetries, and communication, which often hinder innovation. Second, the use of public procurement has been associated with other policy objectives related to public sector delivery and with tackling societal challenges such as sustainability and social inclusion (McCrudden, 2004). Public authorities buy innovation to make service delivery more efficient and effective (e.g., by buying the latest information technology systems) and support public policy goals. Finally, policies to support demand for innovation may also be based on the idea of market creation to benefit the local or national industry that supplies the innovation. By acting as a demanding and sophisticated buyer, the public sector can demonstrate the utility of innovative goods or services in wider markets, even the creation of lead markets (Georghiou, 2007).

Definitions

Public procurement for innovation is a government policy instrument whereby a public organization places an order for a product (a good or a service) that does not exist at the time but could possibly be developed within a reasonable period (Edquist and Hommen, 1998). PPI is different from "regular" procurement, which occurs when public agencies buy ready-made products off the shelf, where no innovation is involved. PPI is also different from PCP, which is the public procurement of R&D on innovative solutions before they are commercially available. It is a purchase of an R&D service (up to prototype or limited first batch) based on a need of the agency or a societal need more broadly (with general demand picking up). The two main examples, which are all covered in the first Part of the report, are the SBIR scheme (United States) and the Small Business Research Initiative (SBRI) program (United Kingdom), with a range of other countries (i.e., Netherlands) and the EU itself having now adopted PCP schemes. All schemes have different features but share the basic idea of needs-based R&D competitions, where risks are shared between the firms and the agency. How to categorize PCP and whether to define it as a demand-side measure (Edquist and Zabala-Iturriagagoitia, 2012) or a hybrid form are the subject of debate (Rigby, 2016).

The definition of PPI as the purchase of a good or service that does not exist carries with it an implicit bias toward radical innovation (thus potentially overlooking adoption as well as incremental, process, and system innovation) and an emphasis on the purchasing act (thus

potentially neglecting the influence of other activities in the procurement cycle either before or after the purchase) (Uyarra and Flanagan, 2010). Rolfstam (2013: 1) proposes a broad definition of PPI, as "purchasing activities carried out by public agencies that lead to innovation." Rolfstam's definition acknowledges all kinds of innovations, such as the introduction of a new good or a new method of production, the opening up of a new market, the use of a new source of supply of raw materials, or new ways of organizing industries. It also acknowledges the wider procurement cycle (thus potentially including pre-procurement PCP activities). Implicit in Rolfstam's definition is that PPI includes not only those initiatives that explicitly aim to procure innovation, but also potentially innovations that arise as a by-product of "normal" or general procurement. In other words, it considers innovation-friendly procurement, namely the use of practices and competencies in general procurement that ensure that innovative solutions are not excluded or disadvantaged (Uyarra and Flanagan, 2010). We similarly place PPI along a continuum of interventions, with PCP at one end of the spectrum, followed by active attempts to stimulate innovation (via the use of new measures such as competitive dialogue and forward commitment procurement) to the use of innovation-friendly procurement at the other end.

Public procurement has been further categorized in many ways, depending on what is being procured, why, for whom, how, and for what purpose. For example, and in relation to the strategic intent of PPI, Edler (2013) differentiates between procurement that includes innovation as an additional criterion in tenders (general) and procurement for which innovation is an explicit goal (strategic). With respect to the degree of novelty of the innovation, a distinction is also made between procurement of solutions that do not exist (triggering demand) and procurement of a good or a service that exists in the marketplace but is new for the organization (responsive demand) (Edler and Uyarra, 2013). Along similar lines, Edquist and Hommen (2000) differentiate between developmental and adaptive public technology procurement. The innovations can also vary according to the technical sophistication or standardization of demand (Uyarra and Flanagan, 2010). A further distinction focuses on the end user of the innovation and refers to whether the procuring organization is also the end user of the good or service (direct) or whether it seeks to address other users' needs (catalytic procurement) (Edler and Georghiou, 2007; Hommen and Rolfstam, 2009).

Specifically referring to the rationales and instruments that underpin PPI, Lember et al. (2013) distinguish between four approaches that use procurement as a vehicle for innovation, namely PPI as R&D policy (through the use of, for example, PCP initiatives such as the SBIR in the United States), PPI as technology (industrial) development policy, generic PPI policy (or what they term "policy for all seasons"), and PPI as a "no policy" policy. PPI as industrial development policy (or public technology procurement) is used to endorse socially desired technologies (such as the market transformation program in Sweden), strategic industry sectors such as defense or biotechnology, or direct technology needs of the government (such as the New Technology Products program in Korea). The purpose of generic PPI policy is to make innovation a central and explicit part of procurement decisions across the public sector (Lember et al., 2013). This includes provisions to make procurement more innovation friendly, including regulations, training, communication platforms, and others, which have been incorporated to a greater or lesser extent in most OECD countries. Finally, a "no policy" policy makes no provisions to procure innovation, opting instead for an efficiency-driven form of procurement, under the assumption that perfect competition is the driving force of innovation.

Policy Challenges: Toward a Typology of Intervention

Despite a generalized optimism on the potential of public procurement to spur innovation, the implementation of strategies and initiatives to exploit this potential has lagged far behind policy rhetoric (Edler and Uyarra, 2013; Lember et al., 2013; Uyarra et al., 2013). The relatively slow uptake and lack of evidence of impact of these policies has generated some debate around the barriers and implementation challenges of PPI (Georghiou et al., House of Lords Science and Technology Policy, 2011; 2014; OGC, 2004; Uyarra et al., 2014).

Identified barriers and deficiencies for PPI implementation include the absence of adequate framework conditions; organizational factors, including capabilities of procuring organizations; challenges associated with the identification and signaling of needs; and incentive structures influencing the probability of procuring innovative solutions (Georghiou et al., 2014; see Table 1).

Explanations for slow implementation of PPI have pointed to the lack of a sufficiently supportive legislative framework and regulations. Edquist and Zabala-Iturriagagoitia (2012), for example, note this shortcoming in relation to EU directives. Naturally, procurement systems characterized by low transparency or afflicted by corruption or mismanagement of public resources are less likely to succeed in PPI, and instead erode trust and dissuade honest bidders from competing. In the last two decades, governments in the OECD and LAC regions have sought to reform their procurement systems with the aim of making them more efficient and transparent and guaranteeing sufficient protection against corruption and collusion. Similarly, successive reforms have been designed to improve the quality of the information available to potential bidders, including the development of a single-entry procurement website or platform for public contracts.

Other factors influencing the degree of implementation of PPI relate to endogenous factors (Rolfstam, 2015), such as the absence of sufficient competencies, management skills, and other resources. Compared to normal procurement, encouraging suppliers to innovate requires additional capabilities on the part of the public sector (Rothwell and Zegveld, 1981). This includes commercial skills needed to engage with the marketplace and the development of closer supply relations, and technical skills to evaluate proposed innovative solutions. In both OECD and LAC economies, one key limitation for the inclusion of strategic criteria such as innovation, and other objectives such as the Sustainable Development Goals, is the lack of sufficient knowledge and competencies among procurers (OECD, 2014).

Another barrier hindering innovation results from the frequent failure to signal public sector needs to the market. This may be due to a lack of consensus over priorities, fragmentation of demand, inconsistent definition of needs or changes in policy. Institutional barriers, such as decentralized or “silo” budgets, lack of internal coordination (between the internal end user or those responsible to deliver the service, and the procurers), or appropriate interfaces between the organization, the market, and end users may also hinder the adoption of innovations. Furthermore, many agencies with responsibilities for public procurement operate separately from line ministries or government agencies with a remit to foster innovation.

Fragmentation of demand and/or the lack of a sufficiently innovative supply base can be barriers in small economies and economies without a sufficiently developed industrial base. According to Georghiou et al. (2010), a small supply base and a low level of competition in the home market may reduce the incentive to innovate. Market signaling may also be made difficult by a clack of clarity and competing objectives associated with PPI. Many governments, not least in LAC countries, may be not only subject to increasing fiscal

constraints but also needing to respond to pressing social and environmental demands. This may initially make it difficult to think about adding the extra goal of innovation.

The (lack of) management of risk in public procurement of innovation is another key factor (Aho 2006; Kalvet and Lember, 2010; Tsipouri et al., 2010). The nature of risk in PPI is multifaceted and affects both the procuring organization and the supplier. For the procuring organization, risk is related to the higher entry costs associated with an innovation (and failure to assess the risk of not innovating) and uncertainty about whether the solution can be developed (information asymmetry) and subsequently adopted by the organization. Organizations may struggle to identify and articulate unmet and future needs and may face a mismatch between those who benefit if the innovation is successfully adopted and those who bear the consequences of failure (i.e., procurers, senior-most decision makers). Consequently, procurers may fall back on tried-and-tested solutions rather than try something new. Suppliers, on the other hand, face the risk of not being able to assess the scale of the market and customer needs when making investment decisions.

Along the lines of the barriers mentioned above, and with the procurement cycle in mind, Georghiou et al. (2014) elaborate a policy framework and taxonomy to understand such PPI interventions (Table 1). The framework revolves around a functional approach to procurement, namely the functions that are sought to support the procurement of innovation and the deficiencies they seek to remedy. Such a framework thus distinguishes between interventions seeking to address framework conditions for procurement (including the legislative background and broader governance underpinning procurement processes), measures addressed at improving organizational arrangements and capabilities for innovation procurement, and mechanisms intended to improve the identification, specification and signaling of needs and incentives for suppliers to take up innovative solutions.

The first set of policy interventions seeks to address deficiencies in the environment for procurement, including the legislative framework and governance conditions (e.g. centralization, autonomy) that may favor a lower-cost and efficiency logic in decision making at the expense of innovation and inhibit SME participation in procurement contracts. This set of broad policy interventions would include the introduction of innovation-friendly regulations and governance, and measures seeking to simplify and ease access for tender procedures.

The second set of interventions addresses the potential lack of capacity and resources for innovation-friendly procurement, by developing, for example, high-level strategies to embed innovation procurement in the organization, introducing guidelines, good-practice networks and training to favor innovation, and providing resources toward the additional costs involved in innovation procurement.

In terms of individual purchasing decisions, a third group of interventions would be directed at identifying, specifying, and signaling needs. These include early-stage interventions to demonstrate the potential of an innovation, through pre-commercial procurement initiatives, the use of mechanisms to identify and anticipate need (e.g., foresight), and specific initiatives such as innovation platforms or other means to enable communication with users and suppliers.

Closer to the formal procurement stage, a fourth set of interventions seeks to address specific barriers that emerge in the process of defining requirements and designing selection and evaluation procedures. They would be directed at encouraging the use of innovation-friendly practices, such as the consideration of whole-life cost rather than lowest value, outcome-based specifications, and the inclusion of innovation considerations in the selection criteria. They would also include initiatives seeking to mitigate suppliers' risk aversion through, for example, incentive schemes or insurance guarantees, as well as supplier risk, via forward commitment of purchase or certification of innovation (Georghiou et al., 2014).

Table 1. Policy Measures in Support of Innovation Public Procurement

Policy category	Deficiencies addressed	Instrument types	Examples
Framework conditions	i) Procurement regulations driven by competition logic at the expense of innovation logic. ii) Requirements for public tenders unfavorable to SMEs	i)Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	i) 2005 change in EU Directives including functional specifications, negotiated procedure etc. ii) 2011 proposal in EU to introduce innovation partnerships iii) Paperless procedures, electronic portals, targets for SME share
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High-level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks iii) Subsidy for additional costs of innovation procurement	i) UK ministries Innovation Procurement Plans 2009–10 ii) Netherlands PIANOo support network, EC Lead Market Initiative networks of contracting authorities iii) Finnish agency TEKES meeting 75 percent of costs in planning stage
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning, and procurement function ii) Lack of knowledge and organized discourse about wider possibilities of suppliers' innovation potential	i) Pre-commercial procurement of R&D to develop and demonstrate solutions ii) Innovation platforms to bring suppliers and users together; foresight and market study processes; Use of standards and certification of innovations	i) SBIR (United States, Netherlands, and Australia), SBRI (UK), PCP EC and Belgium ii) Innovation Partnerships and Lead Market Initiative (EC), Innovation Platforms (UK, Belgium); Equipment catalogues (China to 2011)
Incentivizing innovative solutions	i) Risk of lack of take-up of suppliers' innovations ii) Risk aversion by procurers	i) Calls for tender requiring innovation; Guaranteed purchase or certification of innovation; Guaranteed price/tariff or price premium for innovation ii) Insurance guarantees	i) German law enabling innovation demands in tenders; United Kingdom Forward Commitment Procurement; China innovation catalogues (to 2011); Renewable energy premium tariffs (Germany and Denmark) ii) Immunity and certification scheme (Korea)

Source: Georghiou et al. (2014).

Evaluation of Impacts

While the use of PPI has increased considerably in the last years, the evaluation of demand-side policies in general, and public procurement of innovation in particular, has lagged behind (Edler et al., 2012; OECD, 2011). According to the OECD (2015), only a few countries that have a strategy or a policy at the central level for innovation procurement measure the impact of their policy or strategy to foster innovative goods and services. Uyarra (2016) finds that evaluations of PPI are rare and that evidence of impact is rather fragmented and restricted to individual success cases rather than actual impact. Lember et al.'s (2013) review of the experiences of several countries in PPI found almost no evidence of impacts or outcomes from these policies.

By contrast, PCP initiatives have a longer tradition. A number of reviews and evaluations can be found, although very few exist other than U.S. SBIR. Rigby (2016) undertook a review of PCP initiatives in OECD countries and reported uneven findings in terms of their operation and net impacts upon innovation, sales growth, patenting, and scientific

publication. In the United States, Lerner (1999) found that SBIR awardees grew faster compared to non-awardees, but only when other conditions were met (e.g., the presence of venture capital firms). According to Rigby (2016), the U.S. SBIR has yielded a combination of many small returns, many cases of no return, that is, no commercialization of technology development funded and a few cases of significant returns (Rigby, 2016).

The evidence gap associated with PPI (and to a lesser extent PCP) can be partly attributed to the relative newness of the policy and failure to implement many of these initiatives. However, demand-side policies also face specific challenges compared to supply-side innovation policies (grants, tax credits, etc.), for which ex ante and ex post evaluations are well established and implemented. One difficulty associated with assessing the impact of procurement in business innovation is identifying the target group, namely, the population of firms that provide goods or services to or on behalf of the public sector. This is made worse by a lack of comprehensive and reliable comparative data on public procurement (across all levels of government, sectors, and functional areas) and the difficulties in capturing demand-side effects in national innovation surveys (Appelt and Galindo-Rueda, 2016).

Further, it is difficult to establish a clear boundary of demand-side policy interventions, particularly in the case of PPI. The nature of the policy is sometimes difficult to define for the purposes of evaluation (Edler et al., 2012). Since procurement is a multi-objective policy comprising many practices and decisions alongside the procurement cycle, it is difficult to disentangle the effects of its respective aspects. Finally, policies often come in a 'mix,' and their use in combination makes their evaluation challenging (Flanagan et al., 2011; OECD, 2011).

These difficulties notwithstanding, a body of empirical research has aimed to assess the influence of procurement on innovation. Firm or supplier-oriented studies have sought to assess the impact of public procurement, compared to or combined with other innovation policy measures on firms' innovation and R&D expenditure. Such studies draw from innovation surveys or use-dedicated procurement surveys. For example, using data from the Community Innovation Survey (CIS) for Germany, Aschhoff and Sofka (2009) contrasted the effects of procurement vis-à-vis other instruments (regulation, R&D subsidies, and university research) on the innovation activities of German enterprises. Guerzoni and Raiteri (2015) assessed the effect of public procurement and R&D subsidies and found that public procurement not only tends to be more effective than R&D subsidies; innovation effects are also stronger when the two policies interact. Using a dedicated survey of public sector suppliers in the United Kingdom, Georghiou et al. (2013) found evidence of innovation effects of public procurement, particularly on product innovations. Sixty-seven percent of all innovative suppliers admitted that bidding for or delivering contracts to public sector clients has had some impact on their innovation activity. Twenty-five percent of the innovating organizations claimed that all of their innovations were the result of public procurement. Respondents identified some procurement practices as being more conducive to innovation, such as including innovation requirements in the award criteria of tenders, incentives such as profit-sharing contracts, early interaction with suppliers, and the use of outcome-based specifications. There is, however, little evidence available for LAC countries on the effects of public procurement. One exception is the work by Ferraz, Finan, and Szerman (2015) for Brazil. They linked firm data with federal government procurement contracts for 2004–10 and found that winning at least one contract in a given quarter increases firm growth by 2.2 percentage points over that quarter, with 93 percent of the new hires coming from either the unemployed or the informal sector. The study does not shed light on the mechanisms underpinning this impact or the effects in terms of enhanced innovation performance of supplier firms.

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PART ONE: PPI AND PCP IN DEVELOPED ECONOMIES

1. UNITED STATES

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Country Overview

The United States is one of the largest and most technologically powerful economies in the world. Absolute GDP in 2014 was $17.97 trillion, followed by China ($11.39 trillion), and per capita GDP was nearly $50,000, accounting for nearly a quarter of the world's total GDP. With more than 300 million people and a large, lucrative consumer market, the United States is recognized as the most important market for global trade, accounting for 42 percent of the global consumer market (ITA, 2015).

According to the RAND Corporation, the United States is at the center of global innovation, representing 40 percent of total R&D and new technology patents in the world (RAND, 2007). The United States was home to 33 of the the top 100 Business Week's Information Technology companies in the world (ITA, 2015).

The United States has long excelled in innovation. It is the world's premier economy in innovation in a wide range of industries, including aeronautics, automobiles, and defense. Today, the United States faces strong competition on R&D spending from South Korea, Japan, China, and India, which are increasing domestic innovations and market leadership (Savitz, 2014). The United States has a robust regime of intellectual property rights protection and enforcement.

Institutional Network and Governance

The United States has a federal system of government, whereby legislative, executive, and judicial powers are shared between the federal, state and local levels. U.S. states have their own written constitutions, governments, and legal codes, leading to great variations in laws and procedures on property, crime, health, and education.

The United States is a market-oriented and largely private sector-dominated economy, with a predominantly private demand base (with public spending as a share of GDP below the OECD average). Ranking in 11th place in the World Justice Project's Open Government Index 2015, U.S. firms enjoy a high degree of freedom and flexibility in financing, capital development, and decision making (Heritage, 2015; WJP, 2015). On the Global Corruption Index, the United States is perceived as the 17th least corrupt country in the world, according to Transparency International[1] (Heritage, 2015).

[1] https://www.transparency.org/cpi2013/results.

Economic Performance

U.S. foreign direct investment (FDI) has risen steadily, with a 13 percent increase in 2015 compared to the previous year (OECD, 2015a; OFII, 2014). The United States also reports record levels of inward FDI flows. In 2015, FDI inflows increased by 50 percent over the previous year, or $200 billion, driven by improved economic performance and an increase in cross-border mergers and acquisitions (M&As) (OECD, 2015a). Annual GDP growth has been unstable in recent years, slowing to 1.5 percent in 2013 (from 2.22 percent in 2012) and rebounding in 2014 to 2.43 percent).[2]

The United States ranked among the top three countries in global competitiveness rankings in 2015 because of its strong business efficiency and strong financial sector. It has been marked by a strong innovation drive and effectiveness infrastructure (IMD, 2015; WEF, 2015). According to the WEF Global Competitiveness Report, the United States benefits from highly innovative companies, flexible labor markets, and an excellent university system, all of which contribute to U.S. competitiveness.

Key Features of the Innovation System

The United States has long been at the forefront of cutting-edge science, technology, and innovation. In recent years, however, it has experienced reduced growth in R&D and patenting activities. According to the Global R&D Funding Forecast, annual U.S. expenditure on R&D has been steady, at 2.8 percent of GDP, reaching $432 billion in 2013 (OECD, 2016). The key sources of R&D funding are the federal government, industry, academia, and nonprofit organizations, with three-quarters of all research activity occurring in the private sector (Grueber and Studt, 2013). With this, the United States is still the largest in-country R&D spender for domestic and imported goods (PwC, 2015).

Overall, the focus of U.S. science, technology, and innovation (STI) policy is to create jobs, lay the foundations for future industries, and improve economic competitiveness. U.S. policy has a strong tradition of funding leading-edge science and technologies, which then have—often with much delay—become the seedbed for whole new industries (Mazzucato, 2013). The traditional focus of innovation policy, however, has been to create the conditions for innovation rather than favoring specific industries or markets (Edler and Nowotny, 2015). However, in recent years the idea of giving direction to innovation, contributing to solutions to social challenges, and claiming a strong role of the state has gained momentum (National Economic Council and Office of Science and Technology Policy, 2015).

Public Procurement Overview and Legislative Context

Government Market Position

The size of public procurement in the United States has been estimated at around $700 billion (roughly 4.7 percent of GDP) by the U.S. public to contractors in fiscal year (FY) 2011 (Vonortas, 2015). OECD estimates suggest an even larger market, situating government procurement of goods and services at around 26.1 percent of total government expenditure

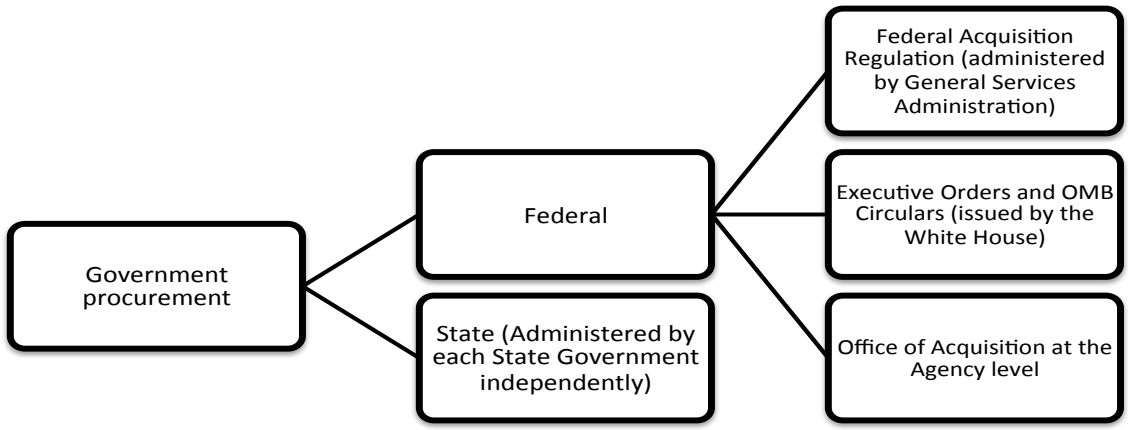
[2] http://www.statista.com/statistics/263614/gross-domestic-product-gdp-growth-rate-in-the-united-states/.

and 10 percent of the country's GDP in 2013 (OECD, 2015b). According to the OECD (2015b), procurement by the federal government accounted for 36 percent of all procurement in 2013, with the remaining 64 percent being spent at the state level. Compared to other countries, the size of U.S. public demand is low—3 percent below the OECD average—and with the exception of Switzerland, no other leading economy has a lower share of public procurement than the United States.[3]

Organizational Structure

Public procurement in the United States takes place at two levels: the federal and the state level (see Figure 1.1).

Figure 1.1: Control Structure of Government Procurement in United States



Source: Vonortas, Bathia, and Mayer (2011).

More than 50 federal agencies are involved in the procurement of goods and services. The biggest federal agencies in terms of federal procurement include the Department of Education, the Department of Energy, the Department of Health and Human Services, the Department of the Interior, and the Environment Protection Agency (Vonortas, Bathia, and Mayer, 2011).

The Federal Acquisition Regulation (FAR) lays out the regulations that inform federal procurement. It provides the procedures and general policies to be followed during the federal procurement process. While the FAR provides procedural rules, agencies have the discretion and flexibility to adapt the FAR to their own requirements.

[3] In line with the remit of this section, we do not cover defense procurement in this chapter, as defense procurement has its own specific regulatory frameworks, secrecy concerns, market structures, and actor networks. Consequently, the practices and procedures of innovation procurement in the defense sector are specific to this context, and to fully appreciate those would necessitate a separate study. Authors who have studied defense procurement have stressed, for example, the role of defense demand for many IT innovations and requests for similar public demand-led programs to tackle grand challenges. In fact, defense procurement of innovative technology or R&D has accounted for a large portion of industrial development in the United States since the World War II. For some considerations on procurement in the defense sector (which is largely dealt with as R&D procurement), see, for example, Mowery, 2010, 2012; and Weiss, 2008).

The White House Office of Management and Budget (OMB) recommends programs and funding levels for programs, monitors programs, and provides procurement policy guidance in the form of orders, circulars, and memos issued by the Office of Federal Procurement Policy (OFPP). The OFPP is responsible for developing and maintaining FARs, coordinating government-wide procurement standards, and giving direction for the development of procurement systems of executive agencies (Robinson, 2007).

The Federal Acquisition Regulatory Council assists in the direction and coordination of federal procurement policy and regulatory activities. It consists of the administrators of the General Services Administration (GSA), the National Aeronautics and Space Administraiton (NASA), the OFPP, and the Secretary of Defense. There are two other Acquisition Regulatory Councils: the Defense Acquisition Regulatory Council and the Civilian Agency Acquisition Council. The Board of Contract Appeals (BCA) resolves contract disputes between contract officers and contractors. Many large agencies have their own BCA.

Agencies typically have an in-house Office of Acquisitions, which provides guidance to the agency on procurement issues by interpreting the FAR, Executive Orders, and OMB circulars and memos. Executive agency heads establish supplementary acquisition regulations and other internal policies and procedures, which are responsible for meeting agency procurement needs and carrying out the FAR.

For example, while the Department of Energy is subject to the FAR for general procurement rules, for its acquisition purposes it has developed its own Department of Energy Acquisition Regulations (DEAR). Similarly, the Department of Education has adapted the FAR to its purpose through the Department of Education Acquisition Regulation (EDAR), and the Department of Health and Human Services has developed its own Health and Human Services Acquisition Regulation (HHSAR) (Vonortas, Bathia, and Mayer, 2011).

Legal Framework for Competition and Transparency

Vonortas (2015) notes that the most important principles in the FAR are cost savings and following competitive processes. Innovation is not a key policy consideration. The most important sections of the FAR in terms of PPI are, according to Vonortas, Bathia, and Mayer (2011), those that set forth the qualifying conditions for vendors (for which there is considerable discretion) (FAR 9.202), define agency needs (FAR 11.002), lay out the requirements of energy efficiency and environmental protection goals in tenders (FAR Subchapter D Part 23.2), distinguish between R&D only and general acquisitions for direct benefit of the government (although the same rules apply to both) (FAR Part 35), and set forth the notion of value engineering as key evaluation criteria to secure “best value” (FAR Part 48).

The regulatory mechanisms described above do not apply to state agencies. Each state government is responsible for developing its own rules and regulations for procurement conducted by state agencies. Vonortas, Bathia, and Mayer (2011) provide an overview of the procurement practices of five states (California, Florida, Maryland, Texas, and Virginia). They did not find, in the respective manuals, guidance and plans issued by the relevant authorities in these states or any specific mention of promoting innovation through procurement activities at the state level. They note, however, that the state of Maryland has a culture of promoting innovation that appears to be embedded in all functions of the

government, including procurement, and that Texas appears to follow the model of federal agencies in using PPI to achieve other social goals, such as energy conservation and environmental objectives.

PPI Capabilities and Rationales

To understand the role of public procurement of innovation (PPI) in the United States, it is important to remember that U.S. innovation (and indeed science) policy is largely mission oriented. This means that many science and innovation policy measures are designed and implemented within domain policies (defense, energy, environment, health, etc.). Thus, innovation policy in specific departments or agencies is less pronounced than in many European countries. Furthermore, traditionally, the orientation of science and innovation policy measures toward specific missions and goals does not necessarily mean that science and innovation policy is demand oriented; rather, missions are still largely supported by supply-oriented instruments (Edler, 2007).

Against this backdrop, the rationale for civilian PPI in the United States has traditionally been twofold. Most importantly historically and still today, as an innovation policy tool, public procurement is clearly focused on the various pre-commercial procurement schemes—Small Businesss Innovation Research (SBIR) initiatives. While not procuring innovation as such, SBIR initiatives are procuring or supporting (through grants) R&D activities of firms to bring innovations closer to the market, based on a defined need of a public agency.

For decades, the SBIR scheme has been the core instrument in terms of pre-commercial PPI. The rationale is threefold. First, it is an attempt to reserve a certain share of the budget for R&D services and innovation of an agency for SMEs. Second, financial support is supposed to bridge what is called the “valley of death” between the research phase and the phase of deploying an innovation in the market. This support is granted on the basis of a politically defined need in an SBIR competition (Rigby, 2016). Finally, it is a means to connect public demand and, as a knock-on effect, private demand, with suppliers, and in so doing increases the likelihood that a public, and subsequently private, demand for the innovation is created. No other major innovation policy initiative uses or supports PPI.

In other policy areas, mainly energy and the environment (Edler, 2007; Vonortas, Bathia, and Mayer, 2011), policies have been designed to support actors to request, absorb, and disseminate innovations to achieve certain policy targets. Next to the SBIR scheme, activities in the energy area are historically the most important. The rationale is that innovation activities must be geared in certain directions, which are politically defined based on societal needs. Public demand for certain solutions orients R&D activities of firms to desired directions and kicks off a broader market for goods and services that also have applications in the private sector. The rationale for supporting PPI rests on the assumption that innovative solutions contribute to policy goals, but that there are a number of failures between supply and demand which limit the effectiveness of demand signals to the suppliers, limit suppliers’ knowledge about demand, and restrict the absorptive capacity and willingness of the demand side itself.

Our knowledge of the ability of agencies in major policy areas, such as energy, the environment, health, and transportation, to mobilize public procurement for their political aims is limited. Case studies of various areas suggest that the levels of activity and success are greatest in the areas of energy and the environment, as public procurement is considered an essential part of the delivery tools for policymakers (Edler 2007; Vonortas, Bathia, and Mayer, 2011). The United States has a long history of demand management programs in the area of energy efficiency that combine public and private demand measures and support public agencies' purchase of energy-efficient technologies (especially the Federal Energy Management Program, or FEMP) with a range of training programs, access to efficient technologies, and exchange of experience.[4] This constitutes an innovation diffusion program. It is less geared toward incentivizing the next generation of innovative technologies.

With respect to government-wide general procurement activities, there has traditionally been a strong focus on delivering value for money in support of public services and policy objectives.[5] As Vonortas (2015) notes, the most important priority for federal procurement is cost savings and ensuring a competitive process. The procurement policies and guidelines provided by OMB do not mention innovation as a possible criterion for procurement or even as a secondary goal of procurement policy. Instead, they cover the following five principles: "(1) strengthen contract management and internal review practices; (2) maximize the use of competition in contracting; (3) improve how contracts are structured; (4) build the skills of the acquisition workforce; and (5) clarify the role of outsourcing."[6] Even the Memorandum of the Chief Acquisition Officer on "achieving better value from our acquisition"[7] focuses entirely on the need to achieve lower prices rather than better performance, for example, through innovation.

Therefore, with respect to the awareness and capabilities of procuring agencies on buying innovation more generally, there is only limited evidence on the capabilities of procuring agencies to conduct procurement in ways that are conducive to spur and absorb innovation. Interviews and document research suggest that there is scant awareness of the need to spur innovation through procurement, and there are institutional bottlenecks for buying innovations in the public sector. There is no analysis of general procurement capabilities across the country in relation to innovation, as there is, for example, for the United Kingdom (Edler et al., 2011; Uyarra et al., 2014). However, at the federal level, the United States has become much more aware of the need to train procurers across the country to improve effectiveness and efficiency in procurement.

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[4] http://energy.gov/eere/femp/energy-and-water-efficient-products. For a historic account, see Brown, Wilson, and Franchuk (1994).

[5] See, for example, the various guidelines in the Office of Federal Procurement Policy (https://www.whitehouse.gov/omb/procurement_index_other/topics), and the President's memorandum on federal procurement https://www.whitehouse.gov/omb/procurement_index_gov_contracting/

[6] https://www.whitehouse.gov/omb/procurement_index_gov_contracting/, accessed November 8, 2015.

[7] www.whitehouse.gov/sites/default/files/omb/assets/procurement_memo/Achieving_Better_Value_from_Acquisitions.pdf , accessed November 8, 2015.

There is a broad program to help procurers improve their practices.[8] Recently, a network of public procurement managers was established. It appears, however, that the primary content of training relates to the effectiveness and efficiency of procurement processes. Innovation is addressed in terms of innovation in the procurement process rather than procurement for more innovative outcomes. In short, there is no indication from searches on agency webpages or from the existing literature on PPI in the United States that innovation in what is procured is a major concern. Innovation does not appear to be a tender criterion; nor is there guidance on innovation procurement at the federal level (Vonortas, 2015).

Recent initiatives, however, while still small-scale, indicate a growing awareness of the need to push the purchase of innovative goods and services in public procurement.

Key Policy Developments and Initiatives in PPI

Overview of Recent Public Procurement and Innovation Policy Developments

To understand developments and trends in policy on PPI, it is important to distinguish between PPI and pre-commercial procurement (PCP) through the SBIR approaches. As a distinct policy to support or use public procurement, SBIR and its PCP play a prominent role.

Looking at the latest innovation strategy, the practice of public authorities buying innovations is still not strongly developed (National Economic Council and Office of Science and Technology Policy, 2015). There still is no explicit initiative within innovation policy to support or nurture PPI to improve the framework for innovation in the United States. This has been true for many years.

The president's latest innovation strategy takes a bold turn toward a strong role of the state in fostering innovation and directing innovation to tackle societal challenges. This strategy provides a broad rationale for the strong role of the state, from basic funding, risk taking, and skills to supporting societal challenges through innovation. The agenda lays out the need to invest in and deploy technologies to meet future challenges, That is, there is implicit demand planning. It also stresses the need for public sector innovation and innovative government. However, no link is made between a more innovative public sector and the economic push through a public sector demanding and using innovation. Rather, for the most part, innovation in the public sector is related to institutional processes, not to the need to buy and use innovation. Challenges are to be met through targeted investment in specific technologies and capabilities. Further, innovative infrastructure is mentioned as an important enabler for more innovation in the economy, but no mention is made of the innovation-triggering effect of the purchase of the infrastructure itself (and the potential private demand that it might trigger). Nor is there a discussion about the joined-up demand of large private and public buyers to create lead markets. There is no mention of procurement with respect to the commercialization of innovation.

The strategy recognizes the importance of complementing R&D support with market-oriented transfer mechanisms. But the mechanisms mentioned are again supply-side, start-

[8] See, for example, https://www.fai.gov/drupal/training/training.

up grants, SME vouchers, and the like. There is no link to demand or even public demand. Finally, as part of modernizing industry, there is a strategy to support SMEs in the uptake of technology, that is, to support private demand. Thus, beyond a mention of SBIR, the strategy does not have a role for the state as a buyer of innovation, the opportunity to launch the diffusion of societally desirable innovations, or the need to improve the capabilities in the public sector.

A number of more recent, related initiatives, however, indicate that procuring innovation has received more prominence. Public procurement has slowly become a means to deliver "better government," and agencies across the government are expected to improve their procurement capabilities and processes. The major rationale is to rollout and apply the latest technologies in the areas of digital services, e-government, and data availability. To implement this agenda, case studies have been conducted and guidelines and training for procurers as well as procurers' networks ("buyers clubs") have been developed to increase the capacity of government officials to use appropriate procurement means to buy innovation.[9] The focus is to build innovation into the contracting process. The case studies are circulated to showcase how advanced procurement practices can be used to better achieve value for money and buy innovation. The main contracting models introduced distinguish between discovering novel solutions, proving innovative solutions and staging proven solutions (OSTP/OFPP, 2014):

- Discovering novel solutions:
  - Incentive prize, which is not a procurement solution, but an incentive to develop a solution that subsequently can be bought
  - Milestone-based competition, where a sequence of different technological milestones is defined, for each of which a separate competition for solutions is held, enabling the involvement of specialists and risk-taking innovators
- Proving innovative solutions:
  - Rapid-technology prototyping, issuing multiple smaller contracts for prototypes and implementing demonstrator projects
  - Challenge-based acquisition, where an agency pays for successful solutions, but decisions for large-scale purchases are made only after a firm demonstrates the functioning of an innovation prior to purchase
- Scaling proven solutions:
  - Staged contract, using short concept papers to identify which vendors are likely to get an award (as they have solutions needed) and which ones are unlikely and to avoid the cost of developing detailed proposals for the latter group.

Importantly, the collection of case studies provided to the procurement practitioners is interactive, to be amended by agencies with their own experiences. It is a cornerstone of a developmental process managed by the Office of Science and Technology Policy (OSTP) and the Office of Federal Public Procurement in the Office of Management and Budget. This process also entails a public discussion forum; it is strongly linked to the buyers club email group, and supported by a handbook and a digital service playbook. The federal government

[9] See for example https://www.whitehouse.gov/blog/2014/08/21/buying-what-works-case-studies-innovative-contracting-0

has thus recognized the need to develop capabilities and practices on the ground as a precondition for mobilizing innovation in the service of better government.

Linking Procurement to Research and Development and Innovation

The Basic Idea and Functioning of the SBIR

In the U.S. system, there has historically been a commitment to innovation in support of the functions of the state and the capabilities and prospects of the industrial economy. This support is manifest in the creation of the SBIR, established in 1982 under the Small Business Innovation Development Act (P.L. 97-219). Its objective is to increase the role played by "innovative [and] small business concerns" in the R&D procurements of the federal government. While the SBIR may be seen as a support to innovation, it is a competitive program that provides grants and contracts. It is a set-aside program that allows the federal government to support small firms exclusively. By 2009, SBIR had made over 112,500 awards, amounting to a public expenditure of $26.9 billion.

The program is one of the activities of the Small Business Administration (SBA). The SBA was created by the U.S. Small Business Act of 1953, which called for the creation of a federal office to champion and support the interests of small businesses across the United States. This area of government activity was a response to the Great Depression of the 1930s.

In December 2000, Congress passed the Small Business Research and Development Enhancement Act (P.L. 102-564). The program was reauthorized until September 30, 2008 by the Small Business Reauthorization Act of 2000 (P.L. 106-554). The program has been extended, and the most recent extension will allow the program to continue until 2017. The program currently requires government departments in the United States with extramural R&D budgets of over $100 million to set aside a portion of their budgets (currently 2.8 percent) for competitive R&D procurements through the SBIR. This portion will rise to 3.2 percent in 2017. The SBIR does not have its own funds; rather, it is a set of requirements that are legally binding on government departments and agencies to spend their procurement budgets in a particular way.

The SBIR Program is a competitive R&D program. The competition takes place in stages. The companies that take part must be U.S.-based SMEs. The government provides financial support to firms through grants or contracts. This is a major difference from the UK scheme, which uses only contracts. In the U.S. scheme, grants are used mainly by the National Institutes of Health (Department of Health and Human Services), which also uses contracts. The Department of Defense has tended to use contracts. Grants offer support for R&D but do not bind the recipient to deliver a specific output.

The SBIR is limited to departments with procurement above a certain amount. Currently, 11 U.S. government departments operate the SBIR Program (OECD, 2010). These are:

- Department of Agriculture
- Department of Commerce - National Institute of Standards and Technology
- Department of Commerce - National Oceanic and Atmospheric Administration
- Department of Defense

- Department of Education
- Department of Energy
- Department of Health and Human Services
- Department of Homeland Security
- Department of Transportation
- Environmental Protection Agency
- National Aeronautics and Space Administration
- National Science Foundation

Unlike the United Kingdom, where there is a central innovation agency that supports and manages the program across government departments, in the United States, each agency or department operates its own individual program, within a framework established by Congress. The departments define topic areas and then process the applications and conduct the R&D competitions.

The SBIR competition has two main phases, which can be funded under the program. A third phase can also be funded by a third party (such as venture capital companies) or by another federal support activity. Details of the phases and the amounts are as follows:

- Phase 1 (six months), $100,000 for a feasibility study allowing small firms to test the scientific and technical value of their R&D effort and its feasibility
- Phase 2 (two years), $750 000 for a full R&D effort
- Phase 3, the firm pursues with non-SBIR funds the commercialization objectives resulting from Phases 1 and 2. Phase 3 follow-on projects can benefit from U.S. government R&D funding; awards are then funded from mainstream budget lines. (www.sbir.gov/)

Rationales and Rules

There are various rationales for the U.S. SBIR. The SBA, which provides oversight, lists three main ones. The first is to tap the innovative potential of firms that might have difficulty obtaining capital but which, if suitably funded through contracts or grants, could generate high-quality, relevant research, including product or service prototypes that could be widely used by either government or by third parties. A second rationale is to stimulate innovation generally in the economy. To incentivize firms, SBIR-participating organizations are allowed to retain the intellectual property that they create through their participation in the program, subject to various rules that grant the government a license to use the technology. Third, SBIR participation encourages innovation and entrepreneurship by minorities. A fourth justification is that private sector commercialization is likely to be supported by the program, provided that the initial specification for the challenge or need is suitably defined. The SBA's rationales are as follows:

- Stimulate technological innovation
- Meet federal research and development needs
- Foster and encourage participation in innovation and entrepreneurship by socially and economically disadvantaged persons
- Increase private-sector commercialization of innovations derived from federal R&D funding (Williams, 2015).

Access To SBIR and State Support

SBIR is an important federal support mechanism. A number of related initiatives have been developed to ensure that firms are able to take part in the program. Lanahan and Feldman's (2015) recent analysis of policy mixes in the United States examines the various extra support surrounding the main federal SBIR Program. Other state-based initiatives include outreach programs, which engage with firms to support their application to SBIR; and match programs, which support SBIR competition grantees or contract award winners.

There are two types of outreach programs: (i) support to grant writing (Phases 1 and 2), and (ii) match funding. The SBA's Federal and State Technology Partnerships (FAST) and Rural Outreach Program (ROP) initiatives provide support to grant writing. These programs allocate resources competitively and are supported by federal funding. Outreach programs also include support services, which provide ancillary support, such as coaching, mentoring, and proposal review, to the grant-writing process. Thirty-one states now have this kind of support service. Match funding from state programs only supports successful applicants to the main SBIR. Around one-third of all U.S. states have adopted some form of match funding program.

There are three main types of match funding: SMP-I, which provides extra money in the main SBIR Phase 1; SMP-II, which provides extra money to SBIR program winners in Phase 2. These two forms of support have automatic qualification: a winner in Phase 1 or Phase 2 will receive an award. A third, competitive form of support is the Limited Matching Program (LM), offered in four states. Match funding varies considerably from one state to another. Table 1.1 summarizes some key initiatives in the typology of policy interventions for PPI (based on Georghiou et al., 2014).

Table 1.1: Summary of PPI Interventions in the United States

Policy Category	Deficiencies addressed	Instrument types	Instruments implemented in the United States
Framework conditions	i) Procurement regulations driven by competition logic at expense of innovation logic ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	Procurement regulation driven by competition and value for money; innovation not an explicit consideration in public procurement regulations SBIR scheme as SME support, indirectly as ease of access of SMEs to government procurement of innovation (not only R&D services)
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High-level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks	New initiatives to make procurement agencies more aware of innovation, but not yet part of highest-level innovation strategy New program to increase the capabilities of procurers (but innovation not at the core)

			Buyers club, model cases, and new procedures rolled out to help procurers buy innovation
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning, and procurement function	i) Pre-commercial procurement of R&D to develop and demonstrate solutions	In a few domains, PPI is part of policy delivery, e.g., FEMP program in energy efficiency; need definition is central SBIR scheme as main scheme to define needs of administrations and develop concrete solutions
Incentivizing innovative solutions	i) Insufficient expenditure and articulation of innovative solutions	i) Innovation-oriented public procurement programs	Procurement of innovation as part of delivering "better government"

Evidence of Impact

The Impacts of Procurement on Innovation

There is no systematic account of the innovation impact of public procurement in the United States. This is true for procurement practice in general and for those initiatives that explicitly seek to support contracting authorities and their management in requesting, buying, and using innovation. There is only a range of case studies on procurement processes and experiments that had the effect of triggering innovation or making agencies buy innovation (Edler, 2007; OSTP/OFFP, 2014; Vonortas, 2015; Vonortas, Bathia, and Mayer, 2011). Those case studies are normally done for the successful purchase of innovation and thus powerfully demonstrate the leverage of the public procurement process to deliver. Examples include (Vonortas, 2015) the successful deployment of:

- a census system in the Census Bureau (TIGER system), which helped accelerate new technologies across the emerging geographic information system industry;
- an automatic surveillance broadcast program in the Federal Aviation Administration, which showcased the use of a multi-stage procurement and screening process and was implemented through a service contract rather than a product purchase. It has resulted in a vast range of economic and safety benefits for the aviation authority and thus for the aviation industry more generally;
- remotely operated vehicles, purchased by the National Oceanic and Atmospheric Administration, a technology based on a development financed by a NASA program, whereby the deployment for the public agency (and military) helped trigger a broader market and use in private industries such as oil and gas.

Further, there are studies on the effectiveness of the demand management programs that include public procurement to accelerate diffusion of state-of-the-art technology. Those programs are evaluated regularly, and a range of indicators for the diffusion of technologies

has been developed.[10] The relative contribution of public procurement, however, is not systematically captured, as most programs are a mix of supply and demand measures, with public procurement being one element.

The Impacts of SBIR

Introduction

The SBIR Program has been evaluated more systematically. There is now a body of knowledge about the achievements of the various users of the program across different areas of government (defense, health, energy, etc.). Data provided y the SBA (Williams 2015) reveal the economic importance of the SBIR in the most recent year for which complete data are available (2014). In 2014, $2.4 billion was allocated for spending under the scheme. A total of 4805 awards were made across both phases. In Phase 1, which account for 67 percent of awards and 26 percent of funds, the average size of an award was $158,304. Phase 2 awards were 33 percent of all awards. With an average award size of just under $1 million, this accounted for 74 percent of all SBIR funds allocated. In all, 23 percent of all awards were to women-owned, minority-owned or so-called HUBZone-located small firms. The U.S. SBIR awards both grants and contracts. The Department of Defense and NASA tend to award contracts, while the NIH normally awards grants.

Government Impact

As U.S. agencies are compelled to use SBIR, it is not possible to determine from the rate of use by departments and the rate of re-use whether the program is perceived by agencies and departments as useful. However, across U.S. departments, there is significant use, as the competitions imply. Table 1.2 lists the type of SBIR funding by year and the main users (federal agencies). Arguments against the program claim that some agencies believe that SBIR may prevent them from allocating their R&D money with sufficient flexibility to allow them to meet their objectives. A good measure of the effectiveness of SBIR would be how many of the contracts and grants lead to products or services which the government can use. These data are not publicly available, however, and no studies have reported on this systematically across all user departments and agencies.

[10] Evaluations of energy efficiency programs employing demand-side instruments can be found at http://www.energy.gov/eere/analysis/program-evaluation-eere-planned-and-completed-evaluations

Table 1.2. SBIR Award Funding, by Type of Award and Federal Agency: FYs 1983–2011 (in millions of current dollars)

		Type		Agency										
Fiscal year	All	Phase I	Phase II	USDA	DOC	DOD	ED	DOE	HHS	DHS[a]	DOT	EPA	NASA	NSF
1983	38.1	38.1	0.0	0.6	0.0	15.6	0.3	5.0	7.2	na	0.3	0.2	4.9	3.5
1984	149.9	49.3	100.6	2.0	0.0	49.8	1.0	26.2	32.4	na	1.7	0.9	29.9	4.2
1985	195.5	74.5	121.0	3.1	0.2	95.8	1.2	27.0	44.1	na	3.4	1.9	7.8	9.8
1986	305.7	82.0	223.7	3.5	0.9	159.5	1.7	25.0	66.4	na	3.7	2.7	32.5	8.6
1987	272.0	103.8	168.2	3.7	1.7	142.3	1.5	23.3	48.3	na	2.7	3.0	28.4	16.2
1988	392.9	99.3	293.7	3.8	1.4	199.5	2.2	36.3	75.4	na	3.4	3.0	49.2	18.1
1989	401.1	103.1	298.0	3.9	1.1	194.9	1.9	36.2	79.5	na	3.7	3.1	57.6	18.0
1990	453.7	121.2	332.4	4.1	0.7	220.0	2.5	41.5	89.1	na	4.1	3.2	68.5	19.4
1991	454.1	133.4	320.7	5.0	1.2	201.8	2.6	41.6	95.7	na	5.7	3.5	74.2	22.4
1992	532.2	134.9	397.3	5.9	2.1	257.4	1.7	43.1	104.7	na	3.6	4.0	85.5	22.4
1993	630.7	162.1	468.6	7.2	2.3	330.8	2.9	49.5	146.0	na	5.1	4.5	58.6	22.1
1994	602.9	222.5	380.4	7.5	3.7	269.5	2.9	52.0	118.5	na	8.8	5.0	106.4	27.0
1995	960.8	236.5	724.3	11.3	7.6	448.0	3.4	70.8	216.5	na	10.2	7.0	145.7	38.9
1996	926.1	229.0	697.1	9.5	6.2	497.0	3.5	66.9	176.2	na	8.0	4.8	113.1	40.1
1997	1,133.1	281.5	851.6	9.7	7.6	558.9	3.9	73.9	283.4	na	6.8	5.6	130.5	52.6
1998	1,049.7	262.0	787.7	12.9	7.0	568.7	6.5	77.2	232.4	na	5.9	4.8	82.6	51.6
1999	1,123.9	294.9	829.0	12.4	7.0	520.5	4.5	79.1	331.1	na	8.1	5.1	98.2	57.9
2000	1,062.2	295.0	767.2	18.3	6.4	547.6	0.0	85.6	231.2	na	3.8	7.9	99.7	61.8
2001	1,181.4	307.3	874.1	16.2	6.9	604.6	7.1	88.4	283.1	na	4.7	6.1	102.2	62.1
2002	1,505.4	423.3	1,082.1	17.3	7.2	661.5	6.7	94.5	458.5	na	4.6	7.6	187.3	60.2
2003	1,741.4	467.2	1,274.2	16.7	7.9	954.7	9.0	94.9	549.4	na	3.3	6.2	22.9	76.4
2004	1,970.8	493.9	1,476.9	18.9	8.4	1,033.1	7.4	107.3	574.3	10.7	3.7	3.0	114.2	89.8
2005	1,857.6	452.5	1,405.1	18.4	9.0	945.0	8.9	100.6	553.6	30.7	2.5	6.2	103.2	79.6
2006	1,904.0	424.9	1,479.1	16.7	7.0	996.9	9.7	114.3	566.6	13.9	3.3	8.0	106.2	61.4
2007	1,682.4	447.5	1,234.9	18.1	2.3	842.9	10.0	108.5	491.3	36.0	1.9	6.6	96.8	67.9
2008	1,857.1	449.5	1,407.7	18.7	5.8	940.5	9.9	129.7	560.3	22.2	5.3	3.4	99.3	62.2
2009	1,926.2	503.4	1,422.8	16.1	12.5	868.1	9.9	151.0	615.5	19.9	3.8	4.7	133.0	91.6
2010	2,115.2	548.0	1,567.3	22.9	7.3	981.1	10.1	207.0	598.3	26.3	14.9	4.8	136.8	105.5
2011	1,946.0	502.1	1,443.9	22.4	6.1	840.1	12.2	140.9	625.2	19.4	10.5	4.7	173.1	91.2

na = not applicable.

DHS = Department of Homeland Security; DOC = Department of Commerce; DOD = Department of Defense; DOE = Department of Energy; DOT = Department of Transportation; ED = Department of Education; EPA = Environmental Protection Agency; HHS = Department of Health and Human Services; NASA = National Aeronautics and Space Administration; NSF = National Science Foundation; SBIR = Small Business Innovation Research program; USDA = U.S. Department of Agriculture.

[a] DHS, established by the Homeland Security Act of 2002 and formed in January 2003, held its first SBIR competition in FY 2004.

NOTE: Detail may not add to total due to rounding.

SOURCE: U.S. Small Business Administration, SBIR/STTR official website, http://www.sbir.gov/past-awards, accessed 25 February 2013.

Science and Engineering Indicators 2014

Firms and Industry Impact

Compared with total BERD for 2012 for the United States of $290 billion, the SBIR spend in that year is $2.2 billion or just 0.75 percent. Thus, while the Program is important, it should be put in context, and is clearly a small part of overall U.S. business expenditure on research and development.

An important effect of the program is its impact on firm growth. Lerner (2000) conducted a detailed study that provided evidence that SBIR awardees grew faster over the long term than the controls, but this effect was only present where there were venture capital firms present or nearby. Wallsten (2000) shows that government money crowds out private money.

Societal Impact

Two major societal impacts are employment creation and the involvement of minority businesses in the program. A recent survey by the National Academies (2015) suggests that the program is not significantly increasing women or minority participation. The National Academies study of the SBIR Program operated by the Department of Defense shows that for the survey period (2002–2011), women-owned small businesses accounted for around 13 percent of the Phase 1 awards and funds allocated. This analysis includes both the SBIR and the related Small Business Technology Transfer (STTR) Program. Minority-owned small business applications for the SBIR over the same period dropped to about half the level they had been at the start of the period. For the SBIR, Phase 2 applications from women-owned small firms remained level over the decade (2002–2011) of the study, at around 13 percent. In the same period, Phase 2 awards to minority-owned businesses fell significanty, accounting for only 3 percent of the awards.

Factors Affecting Success and Failure

Academic analysis has identified a number of success factors for the SBIR. It encourages novel research and focuses on high-risk projects. There is evidence that it may create employment and new sales. Lerner (2000) found that firms that participate in SBIR and win grants are signaling their fitness in a Darwinian sense and that this signaling identifies them as suitable targets for further investment by venture capitalists. There is also evidence that SBIR makes some links between business and universities (industry-science links), although program applicants must be for-profit. The OECD (2011) believes that the size of the program and its competitive element lead to large numbers of applications from firms that are new to the program each year, although some firms are regular applicants and winners of program awards or grants. A final strength of the program is its flexibility: a large number of government agencies can use it to address a wide range of challenges.

The program can, however, fail to get buy-in from government departments, although most appear to make their targets, as it may be considered to be an unnecessary restriction on their use of funds for R&D. The program can also be slow to respond, according to OECD, with the phased nature of the competitions leading to delays in the receipt of funds by firms. A view has emerged from the long-term analysis of SBIR participation that certain firms have become dependent upon the program, being termed “SBIR mills.” Frequent participation in

SBIR is not necessarily detrimental to the program, its users in government, or for the firms themselves.

Costs of Operation

The SBIR Program is operated by 11 U.S. government agencies. The costs of the U.S. SBIR Program can be split into two main types: contracts won by firms, and the administrative costs of staff engaged with program development, promotion, grant or contract review, and evaluation across the agencies that use the program within the SBA, which oversees it. While attempts have been made to review these costs, the General Accounting Office (GAO) notes that costs "cannot be determined because the agencies do not identify or track all costs." (GAO 2013: 23). They do not track costs because "neither the authorizing legislation for the programs nor the SBA guidance directs agencies to track and estimate all administrative costs, and neither the law nor SBA guidance defines these administrative costs" (GAO 2013: 23). The GAO report also notes that administrative costs have been largely invisible because the use of program funds to fund salaries (for both the SBIR and the STTR) is prohibited. Changes in the operation of the program now mean that up to 3 percent of SBIR Program funds can be allocated for certain administrative costs.

Concluding Remarks

Public procurement activities in the United States are driven mainly by efficiency criteria. Processes and training are oriented toward making public agencies more aware of processes that manage risk (avoid litigation) and reduce process and purchasing costs. Public procurement for innovation has not been high on the agenda for federal public procurement policies, and the evidence on public procurement practice more generally suggests that capabilities and skills to request and buy innovation are not widely available. Most initiatives to improve public procurement are geared toward innovative processes rather than processes for innovation. The general framework of cost saving, risk aversion, a litigious culture, and the lack of well-trained staff (Vonortas, 2015) are not conducive to innovation procurement.

There are signs that the federal government has discovered the innovation agenda for public procurement in recent years. The initiatives to improve the way that the government delivers its services has now been explicitly linked to procurement of innovation. Here, interesting models of innovative procurement processes are promoted to make agencies buy more innovation. This also indicates that the legal framework as such can no longer be regarded as one of the main challenges. However, it is far too early to assess whether this thinking is spreading across the public sector. For now, the persistent challenge appears to be the capabilities and incentive structures of procurers in public agencies.

Second, the overall U.S. innovation strategy is still not linked to the procurement agenda. While research and technology programs are increasingly accompanied by commercialization support, and while procurement is seen as a means to achieve certain policy goals and deliver better government, public procurement itself is not used as a means to promote innovative industries in the United States. The move toward more directionality

and the still largely unrelated agenda to improve the capabilities of public procurement agencies might in the future combine to create a much more powerful use of public demand for innovation.

For now, the main instrument remains the pre-commercial initiative, SBIR. Government departments and agencies employ the SBIR with some enthusiasm to promote innovation. Firms also participate in SBIR because it has strong incentives, as it provides full funding that would not be available elsewhere for R&D that may lead to commercialization. SBIR also acts as a signaling device, with participant firms more likely to receive backing. However, while the nature of the support to innovation is strong, SBIR is a fraction of government expenditure on procurement, and the effects on diffusion of innovation through the public sector are still unclear. A truly demand-oriented rationale would in the future stress the absorption and diffusion of the innovations developed under the scheme.

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2. EUROPEAN UNION

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European Union Overview

The European Union (EU) is a supranational and intergovernmental union of 28 countries formed to create a political and economic community throughout Europe. It plays a significant role in areas of policy that had traditionally been reserved to nation-states.

The EU has 508.3 million inhabitants and an average annual population growth rate of 0.3 percent. In 2013, 74.6 percent of the population was urban. The gross domestic product (GDP) of the EU was €13,920,541 million in 2014[11] and €25.800 per capita in 2014 (Eurostat, 2015).

The EU operates as a single market and is a major world trading block. EU economic policy seeks sustainable growth by investing in transportation, energy, and research while minimizing the impact of economic growth on the environment.

With just 7 percent of the world's population, the EU's trade with the rest of the world accounts for around 20 percent of global imports and exports. Around two-thirds of EU countries' total trade is conducted within the EU.

Institutional Network and Governance

The Treaty of the European Union, signed at Maastricht in 1991, formally established the EU as the successor to the European Community.

Governance in the EU is constantly evolving: powers are transferred from Member States to EU institutions, while traditional assumptions about the scope of European integration are subjected to continuous scrutiny. Governance of the EU is based on a sequence of legal treaties between the Member States. The first treaty, which established the European Economic Community, was signed in Rome in 1957. There have been five subsequent treaties: the Single European Act (1986), the Treaty of Maastricht (1992), the Treaty of Amsterdam (1997), the Treaty of Nice (2001), and the Treaty of Lisbon (2007).

The EU has a complex government structure of bodies known commonly as the EU institutions, responsible for producing European laws, managing European initiatives, distributing European economic resources, and deciding the direction of the EU. The Commission is the most commanding European Union body and has different responsibilities. It is the only institution which has the capacity to propose European laws and is correspondingly responsible for enforcing them. The European Council, on the other hand, is governed by its President and it is made up of the heads of state and government of the Member States and the President. It holds summits quarterly to discuss the direction of European policy and plays a key role in guiding policy together with the Commission. Any laws proposed by the Commission are passed to the Council of the European Union, which comprises government ministers from all the Member States, and to the European Parliament. Both institutions must approve the laws.

[11] Facts and figures on the European Union are taken from: http://europa.eu/about-eu/facts-figures/economy/index_en.htm.

The European Parliament is the only European institution directly elected by citizens of the Member States. It cannot propose legislation; it only discusses and votes on legislation proposed by the Commission. Finally, the Court of Justice of the European Union deals with cases brought by private individuals of the Member States. The EU Civil Service Tribunal rules on disputes between the EU and its staff. Divisions known as Directorates-General carry out most of the Commission's activities. The Directorate-General responsible for public procurement is the Internal Market and Services Directorate General (abbreviated as DG MARKT), which deals generally with the Commission's work relating to the European Single Market.

Currently, the individual countries comprising the EU have important differences. These include differences in labor practices, products, and financial markets. The integration is incomplete and the policy framework is asymmetric. This leads to deficiencies, which do not only limit economic and social development in Europe, but also tax the cohesion among the Member States. European Union policies and governance are designed to reduce disparities and ensure convergence between and within Member States.

The EU's total budget in 2014 was €142,690.29 million. Contributions to the EU from Member States vary greatly: from 0.06 percent from Malta or 0.12 percent from Cyprus, to more than 10 percent from Germany, France, Italy and UK, representing over 60 percent of all contributions.[12]

Economic Performance

The EU is the world's largest economy, representing over 20 percent of the world's GDP. The EU is a single market with free movement of goods, services, and capital and a common currency among 19 Member States (known as the Eurozone). Despite great disparities in per capita income among Member States and differences in national attitudes toward issues such as inflation, debt, and foreign trade, the EU has achieved a high degree of coordination of economic and fiscal policies. The Eurozone is continuing its ongoing recovery and, for the first time since the crisis started, all of its economies are expected to rebound.

The EU is the world's largest exporter and by 2008 the largest importer of goods and services (WTO, 2009). The removal of barriers to trade, such as tariffs and border controls, has facilitated internal trade among Member States. In the Eurozone, having a single currency also facilitates internal trade. The main trading partners in 2014 were the United States, with €515,568 million, and China, with €467,309 million (DG TRADE, 2014).

The EU is also the world's largest trading block, accounting for 15 percent of global trade in goods and 22.5 percent of global trade in services in 2012. The EU is the world's second-largest investor, after the United States: in 2012, global foreign direct investment (FDI) from the EU amounted to around €170.6 billion (WEF, 2012–13). European companies are global players: out of the world's top 20 non-financial multinational corporations (MNCs) ranked by foreign assets, 14 are from the EU (DG TRADE, 2014).

In 2012, the EU was the world's largest market in terms of trade in commercial services, with a trade value of €1153.3 billion, equivalent to 22.5 percent of total trade. In the same year, the EU had a trade surplus in commercial services of €139.7 billion. Furthermore, it was the world's largest global exporter of commercial services, with 24.8 percent of total trade valued at €646.5 billion, ahead of the United States with 18.6 percent, China with 5.7 percent, and Japan with 4.3 percent of commercial services (DG TRADE, 2014).

[12] Data extracted from http://www.statista.com/statistics/316691/european-union-eu-budget-share-of-contributions/

Key Features of the Innovation System

The EU, as a political community of 28 members, approves regulations and directives, among others are those related to issues of research and innovation (R&I). This regulation is transposed in member countries' specific laws.

In general, it is impossible to refer to today's R&I policies in Europe, and the way they embed the current usage of public procurement of innovation (PPI) and pre-commercial procurement (PCP), without addressing the overall framework in which they are grounded: Strategy Europe 2020. This strategy emerged in the midst of the worst economic crisis faced by EU Member States in decades. At such, it aims to put an end to long-term and structural weakness in EU competitiveness and its economic growth path, particularly as a consequence of the considerable productivity gap with respect to its main economic partners. To this end, it identifies three key drivers for growth that should be addressed at both the national and the EU level: smart growth (related to greater reliance on R&I intensive outputs to spur economic growth); sustainable growth (oriented toward a more efficient and environmentally friendly competitiveness); and inclusive growth (which seeks to create more and better paying jobs, among others) (European Commission, 2010c).

In terms of targets, the document *EU Actions: Europe 2020* sets out four output goals related to employment and reduction of greenhouse gas emissions, and only one input indicator: "3 percent of the EU's GDP should be invested in R&D" (European Commission, 2010c).[13]

To meet these targets, the European Commission has established seven flagship initiatives for which participation will be required at all levels (national, local, and regional). Although several of them are linked to R&I (such as a digital agenda for Europe and a resource-efficient Europe), without a doubt the one that has had the largest effect on R&I in recent years is the Innovation Union (European Commission, 2010c).

Horizon 2020 is the financial instrument launched at the beginning of 2014 to implement the Innovation Union. Horizon 2020 is the largest European Union R&I program, with nearly €80 billion in funding over seven years (from 2014 to 2020), most of it built around three pillars: support for excellent science, support for industrial leadership, and support for research to tackle societal challenges. Moreover, this investment should attract private and national public investment (DG Communication, 2014).The first effects of these programs have started to emerge, despite the fact that there is still much left to do.

Regarding innovation performance in enterprises, almost three-quarters of EU companies have introduced innovations since 2012 (72 percent), a growth of six points since the survey conducted in 2014. Additionally, more than one in five companies (22 percent) have invested more than 5 percent of turnover on the acquisition of technology, software or licenses, and companies investing in innovation are most likely to have invested in technology, software, or licenses (70 percent), in training (64 percent), in company reputation and branding (59 percent), and in organization or business process improvements (53 percent) (DG Internal Market, Industry, Entrepreneurship and SMEs).

[13] Perhaps the fact that this is the only input indicator in the set of targets laid out by the strategy is an indication of the intrinsic and crosscutting value assigned to R&D in the EU, which has taken on increasing importance.

Public Procurement Overview and Legislative Context

General Procurement Indicators

Public procurement has great economic significance for European businesses. Estimates made by the European Commission show that expenditure by general government and utilities on public works, goods, and services for 2011 were €2,406 billion, almost 19 percent of the EU's gross domestic product. A large part of this procurement is subject to public rules, either national or EU legislation. Public contracts above a set of value thresholds in EU legislation accounted for about €425 billion in 2011 (3-4 percent of GDP), showing steady growth over the past decade. (European Comission, 2014).

Utilities and government expenditure continue to be significant and influential factors in the economy. They have decreased slightly as a proportion of GDP since 2009, when it was estimated at 20 percent of European GDP. In 2010, the percentage fell to 19.7 percent, and in 2011 it fell still further to 19 percent. In 2011, approximately 41 percent of the value of contracts published in the OJ TED referred to works contracts, 35 percent was spent on services, and 24 percent on goods. If these proportions were to be extrapolated to the Commission estimates of the value of contract notices published in the OJ, the total values would be €174 billion spent on works, €104 billion on supplies, and €147 billion on services (European Commission, 2014).

Organizational Structure

The four administrative bodies that address specific areas of economic and political activity are the European Parliament, the European Council, the European Commission, and the Court of Justice of the European Union. Each of them plays a role in public procurement. Their respective roles in public procurement are described below:

- The European Parliament: the European Parliament consists of members who are directly elected by the citizens of the Member States. Prior to the 2007 Lisbon Treaty, the power of the European Parliament was much more limited than the power of parliaments in the respective Member States. Prior to the Lisbon Treaty, the main legislative authority lay with the Council. Nevertheless, the Parliament plays an important role in most legislation. With some exceptions, the Lisbon Treaty provides for the European Parliament and the Council to be treated equally in the legislative process. Most significantly, agreement between the European Parliament and the Council is necessary before certain types of legislation can become law. This is the case with directives on public procurement. Directives on public procurement (including Public Sector Directive 2004/18, Utilities Directive 2004/17, Directive 2007/66/EC amending Directives 89/665/EEC and 92/13/EEC, and Directive 2014/24/ on public procurement and repealing Directive 2004/18/EC) had to be approved by both the Council and Parliament, under the co-decision provision.
- The European Council: the European Council is the main legislative authority of the EU. It is made up of one ministerial representative from each Member State. Which minister from each Member State attends depends on the subject matter of the action or meeting in question. A meeting with the participation of each national head of state in the Council must be held at least twice a year; in practice, they are held quarterly. The Council must approve most legislation in the EU, such as directives and regulations, before it becomes law, although in some cases the Commission can legislate alone. There are a number of different legislative procedures involving the Council, used for different areas of EU law. Some of them involve participation by the European Parliament as well as the Council.

The Council itself does not meet on a continuous and permanent basis. There is a full-time committee of permanent representatives to the Council, consisting of representatives of ambassadorial rank from each Member State.

- The European Commission: the European Commission can be described as the executive branch of the EU, which is roughly parallel to the civil service of a national government. It is based in Brussels. The Commission consists of a Commissioner from each Member State, each responsible for a different area of EU policy. In contrast with the national representatives on the Council of Ministers, the Commissioners are not political representatives of their national governments but act independently and objectively for the EU itself.

  The Commission has three responsibilities:
  - It drafts new EU legislation that promotes the objectives of the EU. Therefore, while any directives on public procurement must be approved by the Council and Parliament, the European Commission conceives and proposes these directives.
  - It acts as the guardian of the Treaty of the Functioning of the European Unon (TFEU) by enforcing its rules. Specifically, the Commission has the power under Article 258 TFEU (ex Article 226 TEC) to investigate whether Member States (or bodies in those states) have violated EU law. It may ultimately bring proceedings in the Court of Justice of the European Union (CJEU) against a Member State if a violation attributable to the Member State is not corrected.
  - It acts as an executive body in administering certain specific areas of EU law. The Commission has some of these executive functions in the area of public procurement.
- The Court of Justice of the European Union (CJEU) is concerned with the interpretation and enforcement of EU law. It has the ultimate authority to interpret EU law. It does so to ensure that the interpretation follows the same logic throughout the EU. The CJEU also adjudicates certain disputes that arise out of EU law. Its jurisdiction is limited to certain specific matters relating to EU law. It has no jurisdiction over other matters. For example, it does not act as a general appeals court for court decisions handed down in Member States.
- Additionally, regarding control over funds available to the EU, the European Court of Auditors is an independent institution whose main role is to check that those funds are used legally, efficiently and for the intended purposes. The Court audits the accounts of the EU's income and expenditure, which together form the EU budget.

Legal Framework

EU directives on public procurement cover tenders that are expected to exceed a given threshold. The core principles of these directives are transparency, equal treatment, open competition, and sound procedural management. They are designed to achieve a procurement market that is competitive, open, and well regulated. This is essential for putting public funds to good use.

The Utilities Directive (Directive 2004/17/EC coordinating the procurement of entities operating in the water, energy, transportation, and postal services sectors) and the Classical Directive (Directive 2004/18/EC on the coordination of procedures for the award of public

works contracts, public supply contracts, and public services contracts) on public procurement remained in force until April 2016.

In January 2014, the European Parliament adopted three new public procurement directives:

- Directive 2014/24/EU (which replaces the Classic Procurement Directive 2004/18/EC)
- Directive 2014/25/EU (which replaces the Utilities Procurement Directive 2004/17/EC)
- Directive 2014/23/EU on the award of concession contracts

Member States had until January 2016 to transpose the directives into national law. Once transposed, they are binding for public procurers from all Member States.

The aim of public procurement reform is:

- To make the rules simpler and more efficient for public purchasers and companies; and
- To provide the best value for money for public purchases while respecting the principles of transparency and competition.

Under the new rules, public procurement procedures will help public purchasers to implement environmental policies and policies governing social integration and innovation. These new rules emphasize public procurement as a policy instrument, boosting R&D, including social and eco-innovation, simplifying public procurement procedures, and making them more flexible.

PPI and PCP Rationale in the European Union: Background

For decades, several EU Member States have discussed public procurement as a tool to foster innovation. Because of their particular public procurement market size and structure, some countries, such as Germany and the United Kingdom, had elements that allowed to them to cultivate PPI-friendly elements early on, such as including quality and performance characteristics in their tenders and negotiations with potential suppliers. The discussion around PPI in the EU was prompted by the concern over preferential ("nationalist") public procurement that could be fostered by such elements (Molero and Marin, 1998). However, once the competitive element was sorted out through several directives for public procurement, the momentum that the PPI and PCP are currently having within the EU is a consequence of an intricate combination of the advances of EU Member States on their own and the impetus provided mostly by the European Commission. This momentum is described below.

Preceded by the Lisbon Strategy for Growth and Jobs, which identified the need to find solutions for the continuing underinvestment in R&D and to improve Europe capabilities to turn new inventions into new market-validated products, one of the first milestones for the use of PPI and PCP as tools to foster innovation was the 2006 Aho Report *Creating an Innovative Europe* (Aho, 2006). This was the first official report to put demand-side policies at the heart of the debate of EU R&I policy. It recognized the importance of public procurement as a tool to generate markets for innovative products. It was preceded by the Kok Report in 2004, which in a more general way emphasized a need to promote policies driving demand for innovation, including public procurement (Uyarra, 2016). At the center of their recommendations was the need to provide innovation-friendly markets in Europe, through regulation, standards, and public procurement itself. Other recommendations to

exploit new opportunities for public procurement as a driver of innovation include competitive dialogues, allowance for variants (thus opening bids to alternative ideas), and ease of specifying requirements in terms of functional performance, among others (Aho, 2006).[14]

As a consequence of the Aho report, the European Lead Market Initiative (LMI) was released in December 2007, with the objective of gaining leadership for the R&I-intensive EU companies in six strategic areas, including eHealth, bio-based products, and renewable energies. The distinctive feature of this initiative was the elaboration of specific action plans that were meant to last three to five years and that had a clear demand approach as well as a better linkage of policy tools to develop such markets. Accordingly, a set of demand-side innovation policy tools were developed to mobilize public procurement networks, standardization, and regulation, among others (Uyarra, 2016). However, despite the fact that the action plans included the use of public procurement to foster the uptake of innovative products and services, subsequent evaluations showed a lack of evidence of impact of the LMI on PPI (CESS/Oxford Research, 2011).

In the same year, another milestone took place, in this case for PCP. The communication of the European Commission, *Pre-commercial Procurement: Driving Innovation to Ensure Sustainable High-Quality Public Services in Europe* (European Commission, 2007), was released with the aim of drawing attention of members to pre-commercial procurement as an underexploited opportunity to foster R&D expenditure while contributing to the main challenges faced by EU governments. Besides defining the main elements and scope of PCP (mainly those that differentiate it from State aid, such as risk sharing and competitive development), this communication stressed the available channels through which the EU allowed PCP, even giving a practical example.

Within this set of strategies, both the PCP and the PPI were identified as important tools to accomplish the final objectives and were respectively financed through the Framework Program7 (FP7) and the Competitiveness and Innovation Program (CIP). The main objective of this funding was to support the creation of PPI networks, the exchange of good practices, and the achievement of PP performed by at least three Member States (CDTI, 2015). These instruments would then be altered by the change in EU R&I policy, but the use of PPI and PCP would in fact increase.

The Innovation Union and Horizon 2020

From the beginning, the main goal of the Innovation Union flagship project has been to foster Europe' capacity to innovate through a set of measures, denominated Innovation Blocks, which together comprise a comprehensive strategy. These blocks include strengthening the knowledge base and reducing the fragmentation and the already mentioned European Innovation Partnerships, many of which have already been launched in the areas of water, smart cities, and healthy ageing, among others. Another one of these blocks is "Getting Ideas into Market." While some of the measures in this block are oriented toward a more innovation-friendly business environment in Europe, including tools such as the unitary patents and the increase in the funding available for final R&I investment, they also include the facilitation of instruments, such as PCP, innovation-friendly regulation, and standard-setting as a set of demand-side innovation policies that have already started to

[14] It is worth noting, however, that there have been some feeble efforts before. As the report mentions, the first efforts made by the European Commission to raise awareness and spread good practice were in the area of public procurement as an innovation driver.

take precedence over traditional supply-side policies in many of the Member States (European Commission, 2014b). One of the distinctive features of this Innovation Union program is its challenge-based approach to key issues facing EU societies. This approach intends to achieve congruence between improvements in science, technology, and innovation (STI) and real need (European Commission, 2010c). Demand-side policies, which have a similar general objective, are thus likely to emerge in this context Despite the complex framework, this program has the advantage of bringing all the EU-level funding under one umbrella with a single set of rules that will facilitate access and increase efficiency in the allocation of funds.

In the Communication on Innovation Union published on October 6, 2010, Commitment 17 describes the recommendation of assigning targets for procurement budgets that must be reserved for innovation and setting up an EU-level support mechanism to facilitate joint procurement, as follows:

> From 2011, Member States and regions should set aside dedicated budgets for pre-commercial procurements and public procurements of innovative products and services (including those defined by the Innovation Partnerships). This should create procurement markets across the EU starting from at least €10 billion a year for innovations that improve the efficiency and quality of public services, while addressing the major societal challenges. The aim should be to achieve innovative procurement markets equivalent to those in the United States. The Commission will provide guidance and set up a (financial) support mechanism to help contracting authorities to implement these procurements in a non-discriminatory and open manner, to pool demand, to draw up common specifications, and to promote SME access. In addition, the Commission will offer guidance on implementing joint procurements between contracting entities under the current public procurement directives and use the ongoing general evaluation of the current directives to examine the opportunity to introduce additional rules to make cross border joint procurements easier. (European Commission, 2010a)

The European Council has not yet accepted the proposal of setting a mandatory percentage of the public procurement budget for PCP and procurement of innovative solutions. Nevertheless, some Member States have already made important improvements in this direction on their own by setting PPI targets that, although not mandatory, have started to send a signal to the public procurers. For example, the Council of Ministers in Spain agreed on a 3 percent target for innovation procurement in July 2011; France and Netherlands have also agreed to aim at 2 percent and 2.5 percent, respectively, of public procurement destined for this purpose. Additionally, several improvement have been made to instruments in the regulatory and financial field, as well as in awareness raising.

PPI and PCP Promotion Channels in the EU

Innovation-friendly Regulatory Framework

The European Commission has made several efforts to adapt the legal framework so that it is more PPI-friendly. Specifically, two of the three directives that had regulated public procurement in the EU—Directive 2004/17/EC (related to procurement in the water, energy, transport, and postal services sectors) and Directive 2004/18/EC (related to public works,

supply, and service contracts)—have been replaced by Public Procurement Directives 2014/24/EU and 2014/25/EU. They took effect on April 17, 2015, and must be incorporated into Member States' national laws by April 2016 (European Commission, 2014a). While encouraging companies to develop their capacity for innovation, these new directives address issues that been identified as obstacles for the adequate development of PPI procedures.

First, the current negotiated procedure (with prior publication of a contract) was replaced with a new competitive procedure with negotiations clearly structured to ensure equal exchange of information between potential suppliers and the public procuring authority. Additionally, the new directives simplify the competitive dialogue for technically and financially complex projects. Both procedures give public authorities more flexibility to contract any good or service where there is a need for design or innovation and even for those where the technical specifications cannot be fully described by the respective authority (European Commission, 2014a).

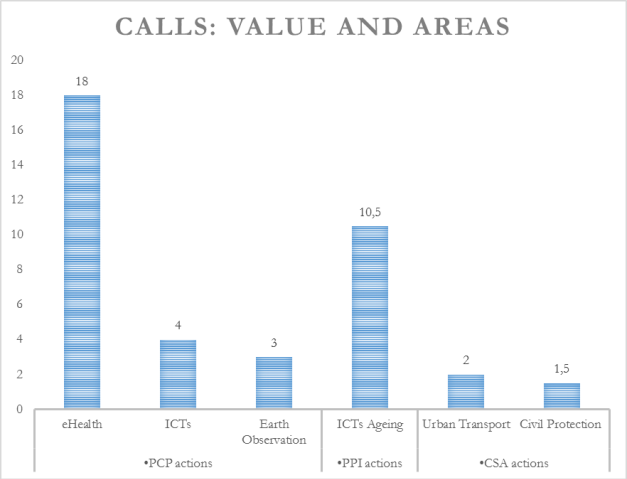
Second, this new framework formally introduces a new procedure for the development of European Innovation Partnerships (EIPs), which have been around for some years. EIPs break down the barriers between PCP and PPI by allowing the funding of R&D for an innovative solution to be part of the same procedure as the later procurement of the solution itself. The few pilots that have been developed have aimed at solving high-level (current and future) societal challenges within R&D-intensive areas, such as energy and water. The new element introduced in these directives is the possibility of public authorities to call for tenders to solve a specific challenge or problem without having anticipated the solution. This clearly leaves additional space for appropriate and innovative answers to emerge from the negotiations between the public contractor and the bidding enterprises (European Union, 2014b). It is a staged process, with competition occurring in the first phase.

Third, other horizontal, innovation-friendly measures were included in these directives. For example, to encourage joint PPI, contracting authorities from Member States are now allowed to set up joint legal bodies. The legal framework for the development of PCP is strengthened through the introduction of a clarification of the exemption for R&D services in the public procurement directives as well as the requirement for contracting authorities to specify in the tender specifications the intellectual property to be partially or fully acquired. This will generate greater security for companies involved in public procurement.

Financial Tools

The European Commission has developed a series of instruments under the umbrella of Horizon 2020 to financially support the development of joint or cross-national PPI and PCP. These instruments can be divided in three large groups: coordination and support action, PPI actions, and PCP actions.

Figure 2.1. Distribution of Available Funds for 2016 within the Work Program 2016–2017



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- **Coordination and support action (CSA):** This action provides 100 percent co-funding for direct (and up to 25 percent for indirect) costs related to raising awareness, preparation for joint or coordinated PPI and PCP, training related to management and follow-up in this area, and other actions to validate and disseminate results in joint PPI and PCP.

- **PCP and PPI actions (formerly known as co-funded actions):** This instrument is based on the FP7 and CIP programs, which offered co-funding starting in 2009 (in the same way as the coordination action mentioned above). Through Horizon 2020's Work Program 2014–2015, it now allows Member States to apply for up to 20 percent of co-funding for the final cost (including the preparation stage, the execution stage, and additional coordination and network activities that clearly add value to the action) of the joint PPI, or 70 percent co-funding for PCP joint projects, which are meant to address common challenges that require new R&D. Specifically, joint procurement means that there are at least three legal entities (each of which should be established in a different Member State or Associated Country) and a minimum of two independent public procurers (again, each of which should be established in a different Member State or Associated Country) (European Commission, 2014c). These rates have increased to 35 percent and 90 percent, respectively, in the Horizon 2020 Work Programme for 2015–2026 (European Commission, 2015). The budget for 2016 is approximately €40 million, while the budget for 2017 will be nearly €84 million. Some additional criteria should be met by countries aiming to have access to these funds. For example, the IPR arrangement for PCP implies that the supplier enjoy full ownership of the attached IP rights while the procurer has royalty-free access to the rights to use the R&D results for their own use. Similarly, the intellectual property rights resulting from a PPI must be owned by the party generating the results (Bos, 2013).

These programs have grown considerably: from €43 million in 2011–2012 to €100 million in FP7 and CIP calls in 2013. Overall, initiatives 1 and 2 accounted for more than €120 million (excluding procurements related to Galileo and Global Navigation Satellite System (GNSS)

[15] The PPI actions also include part of a larger call (SC5-27) for climate, environment, raw materials, and resource efficiency.

evolution under the Space section) of the first Work Program 2014–2015 under Horizon 2020 (European Commission, 2014), and the figure for WP 2016–2017 will be similar.

Strict definitions and specific requirements apply for both for PCP and PPI. Regarding PCP, a number of requirements apply to ensure that the conditions for the R&D services exemption of the EU public procurement directives are respected, that the sharing of IPR rights in PCP takes place according to market conditions, and that the EU Treaty principles and competition rules are fully respected (European Comission, 2013a). In this Horizon 2020 Work Programme 2016–2017 (Annex E: 21) PCP is defined as "procurement of R&D services involving risk benefit sharing under market conditions, and competitive development in phases, where there is a clear separation between the procurement of the R&D services procured from the deployment of commercial volumes of end-products." In the same document, public procurement of innovative solutions (PPI) is defined as "procurement where contracting authorities act as a launch customer of innovative goods or services which are not yet available on a large-scale commercial basis, and may include conformance testing. 'Launch customers,' also called early adopters, refers to the first approximately 20 percent of customers in the EU internal market in the market segment of the procurers are deploying innovative solutions to tackle the challenge addressed by the PPI procurement. PPI shall result in the first application/commercialization of innovative solutions, meaning that the solutions have to be new to the procurers' market segment or new to the EU Internal Market, and relevant to procurers in other Member States and/or Associated Countries." (Annex E: 24)

At the national level, the European Structural and Investment Funds (ESIF) provide funding for PPI and PCP activities, despite the fact that the ESIF support to public procurement does not follow any specific rules. Besides compliance with EU Procurement Directives, the only requirement to access these funds is that the project must be in line with the priorities set in the relevant ESIF program (European Commission, 2014a). This flexibility provides a soft incentive for local authorities to develop PPI and PCP procedures. That is, it is a useful tool for local public procurers where this is already a priority in countries where specific objectives of PPI and PCP are pursued by the national entity that manages the respective fund.

For example, the European Regional Development Fund (ERDF), which is part of Horizon 2020 and is meant to correct imbalances between European regions, focuses its investments in four areas: innovation and research, the digital agenda, support for SMEs, and the low-carbon economy. Local authorities can apply for a percentage of co-funding for PPI and PCP activities in connection with the first of these priorities and up to a percentage determined by the specific level of development of the region (as classified by the respective Member State), which ranges from 50 to 85 percent (DG REGIO, 2014).

In addition, synergies between Horizon 2020 and ESIF funds have also started to be explored to enhance communication between the regional development community and the Horizon-Science community, thus giving a European perspective to the regional development models of Member States (European Commission, 2013). The general rule is that ESIF and Horizon 2020 funding cannot be used simultaneously for the same cost/expenditure item, nor can it be used to finance the contribution of the participant. Besides this, the regions can use funds jointly for different cost items. For example, preparation costs of PCP can be funded through ESIF while the execution costs from the same project can be co-funded by Horizon 2020 (DG REGIO, 2014). Additionally, they can use sequential funding by designing a PCP project that can be followed by a PPI project, funded either first by ESIF and then Horizon 2020 or vice versa (Tsanidis, 2014). As a European officer puts it, "One procurer in the buyers group located in a less developed Region can be co-funded by the ESIF (up to 85 percent rate) to purchase the amount of

innovative products he needs, and another procurer in another Member State can be co-funded by H2020 (20 percent rate) to purchase the amount of innovative solutions he needs" (Bos, 2015, slide 20).

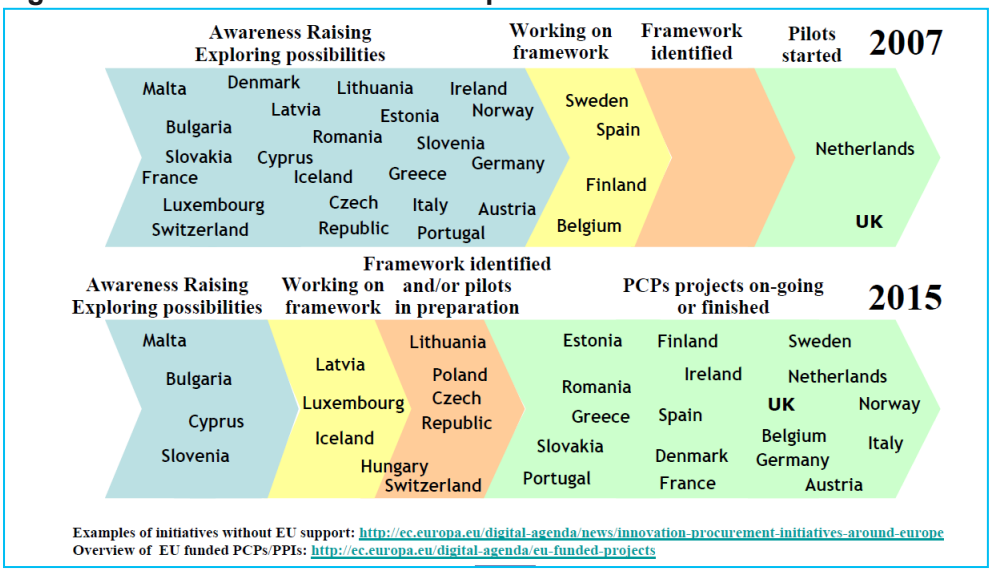
Furthermore, the European Investment Bank's financial instruments may be used to support public institutions to set up a PCP/PPI program, following schemes similar to those applied in supply-side innovation policies. This was the case of Italy, which set aside €170 million for PCPs in the context of large R&I projects. In this initiative, supported by the Italian Ministry for Research and the Italian Ministry of Economy, the EU Structural Funds can possibly be combined with Risk-Sharing Finance Facility support from the European Investment Bank (European Commission, 2015).

Finally, the new 2014 EU State aid framework on RD&I (research, development and innovation) reassures procurers that PCP and follow-up PPI procurements to deploy commercial volumes of innovative solutions do not involve State aid when the PCP is implemented in line with the 2007 PCP communication and the PPI is implemented as a separate open procurement procedure as provided for in EU public procurement directives. Procedures that combine the procurement of R&D with follow-up deployment of commercial volumes of products (long-term innovation partnerships with vendors) are considered not to involve State aid in the exceptional case of unique or specialized products.

Raising Awareness and Sharing Best Practices

Taking into account the disparity in PCP-PPI capabilities among Member States (Figure 2.2), in addition to providing funding to strengthen the networks that perform such procedures, the European Commission has developed several means to raise awareness and share best practices.

Figure 2.2 Overview of PCP-PPI Capabilities in EU Member States



Source: Bos (2015), slide 5.

The Procurement of Innovation Platform (PIP) is one of these means and it has become central for stakeholders that may play a crucial role in PPI. The PPI platform website[16] contains a wide array of information related to PPI, including news and events, references to the European legal framework, updates on PPI-related projects, and specific facts and data. More than 1,500 procurers and stakeholder are part of the platform (European Commission, 2014b). This website also provides access to the Procurement Forum,[17] which is a space for potential and current buyers and tenders, as well as any other key stakeholders, to connect around the subject of PPI. This forum allows users to create groups for developing projects, thus reducing coordination costs. The Resource Centre has a large collection of documents and databases, including case studies, tools, reports, and others, related to PPI. There is also battery of useful guides for contracting authorities. These include *Guidance for Public Authorities on Public Procurement of Innovation, 1st Edition* (Procurement of Innovation Platform, 2014a) *Introduction to Intellectual Property Rights in Public Procurement of Innovation* (Procurement of Innovation Platform, 2014b), and *Introduction to Risk Management in the Public Procurement of Innovation* (Procurement of Innovation Platform, 2015), which complement those developed by European Commission to improve Risk Management in the procurement (DG RTD, 2010).

The Public Procurement of Innovation Award was established to recognize successful public procurement practices that have been applied to acquire more innovative and effective products or services. This award has complementary awareness tools, such as a number of high-level European conferences (in Berlin, Krakow, Madrid, and Paris) held to share experiences about PPI. These conferences are supported by reports and studies carried out to quantify PPI and PCP (European Commission, 2014b). To a lesser extent, due to the early development phase, other conferences have been held to identify best practices and lessons learned. Some studies have attempted to assess the impact of these types of procedures.

The European Assistance for Innovation Procurement initiative is another example of the EU's contribution to raising awareness of PPI. It promotes the benefits of PPI and PCP and offers training and assistance to public procurers interested in implementing PPI procedures, particularly in the field of information and communication technologies (ICTs). The key components of the initiative include the identification and establishment of contact with potential and key public procurers in the field of ICT; the preparation of a toolkit to assist stakeholders that intervene in a PPI or PCP procedure; and the organization of workshops and events across Europe targeted to procurers in need of best practices and hands-on support.[18]

Finally, another way to raise awareness at the policy-making level is the release of communications and recommendations. The European Research Area and Innovation Committee (ERAC) of the European Council has already released a draft opinion that recommends that the EU Member States: create a strategic framework for innovation procurement, together with a clear action plan; raise public buyers' awareness and set up a

[16] www.innovation-procurement.org
[17] www.procurement-forum.eu
[18] European Assistance for Innovation Procurement, available at http://eafip.eu.

coordinating service offering support for procurers; and develop and provide financial incentives for undertaking innovation procurement (ERAC, 2014).

Evidence of Impact

In terms of PCP, although much work has been done to evaluate the impact of the U.S. SBIR, the UK SBRI, and other PCPs in the EU (mostly those co-founded by the European Commission) have been evaluated only in terms of their effects on participating firms (in terms of employment, commercialization, investments in additional research, etc.). Studies have been conducted on the degree of success achieved by the implementation of technologies acquired by PCP, such as Yeow and Edler (2012). However, there is still a considerable gap in evaluating PCP against other procurement procedures that may accomplish similar objectives: almost all evaluations examining net impact using control groups have been conducted on the U.S. SBIR (Rigby, 2016).

A definite milestone, and the exception to the later affirmation, in the field of impact evaluation is the study "Quantifying the Impact of Pre-Commercial Procurement (PCP) in Europe based on Evidence from the ICT Sector" (Bedin, Decarolis, and Iossa, 2014) carried out for the European Commission. This study gathered survey data for eight PCP cases (treatment group) and as well as for a control group made up of public acquisition of R&D services through other means of procurement (non-PCP), all in Europe and all in the area of ICT. As expected, it also included control variables related to specific characteristics of both the procurer and the supplier. When examining different possible advantages of PCP over other possible contracting figures, this study finds evidence to support a particularly positive effect of PCP over the quality and/or efficiency of the public services, the reduction of the vendor lock-in and the access of SMEs to the public procurement market. However, there has been no evidence to show the positive impact of PCP compared to other contracting procedures in areas such as attraction of financial investors to Europe, awardees' market shares, decrease in the prices of products, and interoperability (Bedin, Decarolis, and Iossa, 2014).

PPI has also been studied on an individual-case basis, assessing the difficulties of implementation as well as benefits of the implemented technology: the brochure "Innovation Procurement: The Power of the Public Purse (EU-funded Projects in the ICT domain)" is one of the many examples in the PIP Resource Centre.

Concluding Remarks

The European Commission has largely led the discussion of PPI, and this interest has spread to its Member States. The doctrine of PCP/PPI support has moved from the European Union to the Member States both legislatively (through directives which are then transposed at the national level) as well as from the incentive instruments (specifically through Horizon 2020 programs). In this way, the EU has been an experiment in PPI policy.

Initiatially, DG Industry (the promoter of LMI) led PPI. The leardshiphas been progressively shared with other Directorates-General (DGs): DG CONNECT (as responsible for PCP IST instruments in FP7), DG RTD (main responsible for Horizon 2020), and DG REGIO (which is committed to the support of PPI via Structural Funds 2014–2020). By including these actors, PPI has won both a more horizontal approach as well as prevalence in different policies of the commission. This in turn has been demonstrated in the emergence of more and better instruments to support PPI and PCP.

In any case, trial and error has been a characteristic feature of policymaking in this field within the European Commission. This suggests the complexity of the subject as well as the quality of the lessons that can be learned from the EU experience.

Obstacles

Some of the foremost incentives provided by the Commission are the FP7 and Horizon 2020-funded projects. This instrument requires cross-border purchases from entities from at least three countries. This is complex for newcomers to Horizon 2020, as it is for many contracting authorities. This is frequently the case of small public entities, such as municipalities, which may play a crucial role.

In relation to small public entities, FP7 and Horizon 2020 PPI-PCP-funded projects have been continuously won by countries that already have local capabilities and rarely by countries that do not. This suggests that this instrument favors existing capabilities. It does not provide a strong enough incentive to kick-start the implementation of these processes in the Member States. As national context may be playing the decisive role in the initial phases, the Coordination and Support Action instrument is particularly important, as it may help build local capabilities as a base for other, more complex, instruments.

Experts point out that there is a need for an EU sectoral demand-side innovation policy (Bos, 2014). Most successful PCPs/PPIs are those done by real public demand-side actors that can align PCP/PPI developments with sectorial regulatory actions, create de facto standards from the demand side, and prepare procurement planning for rolling out innovations. Thus, PPI should be part of a broader EU demand-side innovation policy agenda—as envisaged in the LMI—to fulfill all of its promises.

Good Practices

Several good practices have emerged from the EU experience:

- The simultaneous commitment to the PPI and PCP by several Directors General of the European Commission, which has helped spread the interest to all Member States.
- The establishment of the Procurement of Innovation Platform. Its instruments to exchange best practices, networking activities, practical guides, and awards have inspired similar structures and services in many Member States.
- The introduction of the Innovation Partnership as a new form of public procurement is particularly relevant and promising, as it effectively connects PCP and PPI. Additionally, it has the advantage of making both PCP and PPI far more attractive to entrepreneurs.

- The Horizon 2020 instruments, which have cooperation among several countries as a prerequisite, are consistent with promoting the aggregation of demand. They address market fragmentation at the national level. This is a good practice at the local level, as higher-volume contracts are more attractive for bidding companies.
- The focus on the PPI and PCP actions in the instrument battery of Horizon 2020 is a commendable idea, as it is oriented toward covering the high transaction costs associated with preparing cross-border PPI and PCP. Also, it helps fund the training required for key stakeholders and disseminate good practices across the EU. All of these factors have been identified as obstacles at the local level.
- The European Commission expects that more transformative, regionally led PPI projects will be conducted thanks to the synergy between 2014–2020 Structural Funds (aimed at cohesion and development of the less prosperous regions) and Horizon 2020 programs (oriented toward competitiveness and excellence).

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3. ESTONIA

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Estonia Overview

Estonia is a small country in Central and Eastern Europe (CEE) and one of the least populous Member States of the European Union (EU), with 1.32 million inhabitants (BBC, 2015). Since its independence following the collapse of the Soviet Union in 1991, Estonia, the 34th country to become a member of the EU, has become one of the most economically successful CEE members.

Estonia has experienced record-breaking economic growth, followed by a strong decline since the global financial crisis in 2008. While the economy has quickly recovered, with a GDP growth rate of 8 percent, it is still affected by weaker exports since 2011, which began with Estonia's entry to the Euro currency area (OECD, 2013).

Estonia is considered the world leader in the use of technology and is especially renowned for its e-economy, including digital technology, communication networks, and a computer programming skill base. It ranks 21st in the use of information technology and the highest among CEE countries on the Networked Readiness Index, per the World Economic Forum (WEF, 2014). Examples of Estonian technological advances are Skype and Internet-telephone used by corporations worldwide. Furthermore, access to the Internet is considered a human right; Estonia enjoys one of the world's fastest broadband speeds and electronic medical records.

The case of Estonia is relevant because it shows that government procurement initiatives focusing on a specific sector and motivated by improving service provision for citizens can succeed in generating innovation and creating new markets, even without a systematic and holistic strategy. Lessons from this case, therefore, might encourage targeted initiatives even in a challenging institutional and political context.

Institutional Network and Governance

Estonia faces many economic challenges because of the financial crises, the declining, ageing population, and expectations of public services (OECD, 2011). Because of the country's small size, Estonia's government is relatively small, with few ministers. It has long pursued a multi-party political system of diffused power between the executive, legislative, and judicial branches of governments, with limited coordination capacity. With accession to the European Union, Estonia experienced a notable increase in single-sector strategies to respond to binding European framework conditions, requiring increased coordination. Thus, since 2005, there has been interest in the objective to move toward a single-government approach to promote informal coordination and cooperation and institutionalization of certain processes and networks (OECD, 2015a).

Estonia is described as a politically and macroeconomically stable country that respects the rules of democracy and civil liberties. Estonia occupies the highest level of economic freedom in 2013 among transition countries, ranking 11th in the world on the Index of Economic Freedom (Szarzec et al., 2014). The country scores 90 on the property rights index, a subcomponent of the Index of Economic Freedom, indicating good protection of private property (Heritage, 2015). Overall, it has experienced a decline in public sector corruption, with one of the best ratings among CEE countries on Transparency International's Corruption Perceptions Index (2014). However, the country has been

criticized for weak lobbying regulations and Members of Parliament's Code of Conduct, which has been advised to reduce the risk of corruption (BEEBA, 2011).

Economic Performance

After the sharp decrease in economic growth in 2008, real gross domestic product (GDP) is expected to increase by 2.6 to 3.4 percent in 2015–2016. More than 70 percent of Estonia's GDP is derived from the service sectors, with 35 percent from industry and 4 percent from agriculture (EC, 2015). With this, Estonia is one of the largest recipients of inward FDI and a good source of outward FDI, holding one of the highest percentages of innovative firms in the CEE countries. While Estonia was placed just below the top ten in the R&D intensity ranking of the European Member States, most small enterprises are active in the service sectors, especially in information and communication technology (ICT), with limited R&D spending reported in manufacturing.

In relation to foreign direct investment (FDI) and property rights, foreign and local investors have equal rights in engaging in trade and ownership. While attracting FDI has been an important priority for the government, identifying new export markets for Estonian goods and services has been a major focus in recent years. Estonia ranks 29th on the world Global Competitive Index, occupying 12th place among European Member States (WEF, 2015). Hence, Estonia appears relatively competition-friendly compared to many OECD countries (OECD, 2015). In the last decade, Estonia has been one of the leading CEE countries in inward investment per capita, with a rising trend toward cross-border acquisitions, with relatively limited greenfield investments. Intellectual property (IP) protection is taken very seriously in Estonia, which has raised awareness about the importance of IP in promoting innovation and creativity by celebrating World Intellectual Property Day on April 26 of every year.

Key Features of the Innovation System

In recent years, Estonia has sought to strengthen its research and development and innovation (R&D&I) system through market-oriented reform of the former Soviet system. With this Estonia has one of the highest growth in domestic expenditure on R&D (GERD) rates in the OECD area, at 11.8 percent per year in 2005–2010 and with an increase in BERD to 0.82 percent of GDP (OECD, 2015b). However, the economy's focus on R&D remains below the OECD median for R&D expenditure. There is considerable concentration, with only 95 enterprises accounting for 90 percent of R&D expenditure in 2010 (Statistical Yearbook of Estonia, 2012). The country still benefits from a relatively strong public and university research system. OECD (2016) reports a high level of educational attainment at the tertiary level compared to the OECD average (25–64), and is higher than that of Sweden and Iceland.

According to the European Commission's Innovation Union Scoreboard 2014, Estonia ranks 13th among the EU Member States as an innovation follower. With an average growth rate of innovation performance of 1.7 percent in Europe, Estonia has been classified as one of the European innovation growth leaders, with an average annual growth rate of 3.7 percent (European Union, 2014).

The first STI policies were implemented in 2000, when the governance system was still relatively weak. The key policies fostered knowledge accumulation and competition. However, Estonia's technology progress indicators were reported to be below average, with an overly complex governance system driven by bureaucracy and lack of coordination (Lember and Kalvet, 2014).

Since then, Estonia has been supported by several strong institutions and research funds, such as the Ministry of Education and Research (MER) and Ministry of Economic Affairs and

Communications (MEAC), which were established to support the development and financing of innovation and research. The two bodies further developed a new specialization strategy for stimulating innovation and improving the effectiveness of public sector support. Furthermore, the Estonian Research Council, established by the 2011 amendment to the Organization of Research and Development Act, plays a central role as a funding agency in supporting basic and applied R&D and researchers and encourages international cooperation. Other intermediary organizations include major universities and technology parks, such as the Tartu University Institute of Technology, the Tallinn Technical University's Development Centre, the Innovation Centre of TTU, Tartu Science Park, and Tallinn Technology Park.

As Lember and Kalvet (2014) note, in the immediate post-Soviet era, economic policies were influenced by a view that science could push technological and economic development. Since then, however, influenced by the EU and broader innovation thinking, there has been more emphasis on innovation policies with emphasis on demand, and on increasing the connections between different actors.

Public Procurement Overview and Legislative Context

In Estonia, public procurement is governed by the Public Procurement Act, which came into force in May 2007. Public procurement law is under the responsibility of the Ministry of Finance. The act transposed the EU Directives on public procurement and includes several other provisions, some of which are related to innovation. Early transposition of the directives indicates a strong commitment on the part of the Estonian government to the single market, transparency, and competition. Below the EU thresholds, national (i.e. Estonian) procurement rules apply. The service contract threshold has been €40,000 and the threshold for public works has been €250,000. The new directives (classic, sector, and concessions) are currently being considered for transposition, the deliberations are internal to the government and thus not publicly available.

There is no central purchasing authority as such, but there is a single database in which all departmental government procurement is recorded. This database is the State Public Procurement Register. This system connects to Tenders Electronic Daily (TED), allowing EU institutions and other suppliers to know what public procurement is being conducted in Estonia. Governance of procurement decisions is made in Estonia by a nonjudicial review body, the Public Procurement Review Body. This form of governance is not unique in the EU; several other Member States have such a system. The Estonian system allows the Ministry of Finance to impose penalties if the Appeal body finds against an employee of the State.

Thai (2009) notes that this procurement system is generally a decentralized model with some hybrid aspects. In this system, the Ministry of Finance sets policy and, along with the review body, regulates and monitors procurement. Actual procurement, however, is conducted by the contracting authorities within each government department or the lower-level agency delegated by the minister or head without direct control from above. There are exceptions, such as the Ministry of Agriculture, where lower-level bodies must submit their proposals for procurement to the minister.

The Estonian public sector spends around €2.8 billion per year on products, services, and other work, and this accounts for around 19.4 percent of GDP (Lember and Kalvet, 2014). Government procurement (public procurement) has risen to levels comparable to those of other EU Member States. Government spending is largely in three sectors: construction, health, and transportation. These three areas make up 82 percent of all public procurement.

Public procurement is undertaken by either state-owned enterprises or public legal bodies, including the Estonian Health Insurance Fund. These organizations make up for 42 percent of total government procurement, according to Lember and Kalvet (2014).

An indication of the government's emphasis on competition and innovation in public procurement can be taken from the proportion of the total public procurement of a country that is subject to the EU procurement directives, and the proportion of public procurement that is advertised on TED. Data provided in Lember and Kalvet (2014) show that in Estonia, the proportion of public procurement subject to the directives (and on the national register) is rising in absolute terms. More significant is Estonian public procurement as a proportion of GDP, which is published in TED, compared with the EU average. While the average EU proportion is 3.3 percent, in Estonia, the proportion is more than double that amount, at 8.2 percent. Moreover, during the period for which Lember and Kalvet analyze data, this gap grows nearly every year. The evidence suggests that the Estonian public procurement market is very open, and increasingly so compared with the rest of the EU.

The EU conducts monitoring[19] of public procurement performance by each Member State. This is done by DG Grow, the Directorate General that oversees the operation of the single market. The EU's assessment of public procurement focuses upon the following aspects: the bidding process for public procurement contracts, the number of calls that are made by public sector organizations for bids for contracts, aggregation of bids, the award criteria used, the decision speed, and the quality of reporting. The EU also looks at the publication rate of public contracts to see what proportion of government procurement is tendered outside the individual member state. These measures are useful ways of characterizing the Estonian public contracting practice. In general, DG Grow considers that Estonia has performed well, reflecting a strong commitment to the single market, but more recent data suggests that the commitment to openness has declined. Estonia is slightly below average compared with the rest of the EU.

Regarding the bidding process, Estonia has fewer contracts where there is only one bidder, and this constitutes an improvement over time. Estonia's small size and remoteness from the rest of the EU single market means that it has difficulty encouraging bidders for government contracts. In terms of the number of calls for bids, Estonia is falling back, with fewer bids calling for bidders. For the same reason that Estonia has fewer calls for bids, Estonia is also less likely than the EU average to see procurements taking place with other contracting authorities, which is known as collaborative contracting or procurement. The EU indicators also include the use of price in the award criteria. Where factors other than price are used to determine the winning bid, it is considered that innovation is more likely to occur and that procurement is being used as a tool for wider economic development. In the case of Estonia, however, price is widely used as a criterion (although the measures are not weighted to the value of the procurements), a practice regarded by the EU as less desirable. On this indicator, Estonia is on a par with other EU member states. The time it takes Estonian contracting authorities to make decisions about procurement is, however, relatively short and less than the EU average. The last of the six standard measures used by the EU suggests that the Estonian government does not publish as much contracting information as the EU would like. In this aspect, Estonia lags behind many other EU countries.

Until recently, public procurement was not considered a primary stimulus to innovation in the economy. The use of public procurement was not viewed as a policy tool with the aim of generating wider economic and innovation benefits, but as a way to improve the efficiency of public services. There is now more awareness that public procurement might be used to

[19] [http://ec.europa.eu/internal_market/scoreboard/performance_per_policy_area/public_procurement/index_en.htm]

promote innovation more widely, but policies to achieve this objective are very new and limited in scope, amounting more to statements of intent than to practical steps and actual initiatives.

PPI Capabilities and Rationales

Although Estonia has not had a demand-side policy—public procurement of innovation (PPI). Until recently, it has had some public technology procurement, especially in ICT, which has led to innovation. This is the result of a commitment by individuals and groups of individuals to the procurement of innovation. The actions of government procurers, especially in ICT, has landed Estonia 25th on a list of 142 countries in the category of advanced technology products. Estonia is heavily engaged in information technology (IT.) Information technology is immensely important throughout the society, and investment in the period 1997–2007 outstripped that of all other OECD countries. The OECD survey of communications technology, Communications Outlook 2013, shows that Estonia had one of the highest proportions of fiber-optic connectivity among all broadband connections by June 2012. Estonia has a highly competitive mobile phone services market, with one of the highest mobile termination rates in the OECD (OECD, 2013), and telecommunications revenues as a proportion of GDP are higher than in all other countries, at around 4.6 percent.

Pärna and von Tunzelmann (2007) compared Estonia with several other countries (Denmark, Finland, and the United Kingdom) and found that the country's improved innovation performance arose not from explicit demand-side policies but from prioritizing the delivery of information technology services by the state. The authors focused on a number of factors that led to innovation, including increasing the level of service diversity to provide personalized services and reducing waiting times. The authors also noted that within the public sector there was a higher standard of knowledge of what was possible, which led to successful and yet demanding specifications for service delivery. A further factor was the existing good state of the national IT infrastructure, which made it possible to develop and launch innovation in public IT services. The authors noted that the advanced infrastructure combined both public and private aspects: telecommunications, electronic banking, ID cards, digital signature, and others. An additional factor that allowed innovation in this area was the relatively simple national IT system and its recent development, which reduced the risks of introducing innovation. It is possible that the absence of legacy systems that might have complicated the introduction of new IT systems has facilitate this rapid transformation.

Despite Estonia's success in delivering innovation in ICT, R&D spending of firms supplying the government through public procurement is minimal. Therefore, while innovation performance in sectors that have supplied the government has been good (particularly in the manufacturing of IT systems, where growth has been greater), precisely because the government has been a demanding customer, this innovation has not had a significant impact upon R&D expenditures. It is not known whether these native industries that have benefited from government procurement have enjoyed more success in exporting technology than would have been the case without their obtaining work from the Estonian government.

Estonia is committed to open government. It is manifested in the government's attempts to ensure compliance with the United Nations Commission on International Trade Law (UNCITRAL) principles of transparency and technical efficiency in procurement. Adherence to these principles, which is mandated in the Estonian Public Procurement Act of 1995, has led to a long-lasting commitment to a policy of openness and transparency in public procurement. There has been a tendency to avoid using procurement for protectionist

purposes or for development. In 2007, the Public Procurement Act ensured that Estonia became compliant with the World Trade Organization's (WTO) rules on public procurement that are stated in the Government Procurement Agreement (GPA). At that time, the legal framework for public procurement included rules that might allow public procurers to encourage innovation among suppliers, such as the competitive dialogue. In 2011, the Ministry of Finance acknowledged that it would start to support the procurement of innovation. Progress, however, has been slow.

While there is some commitment at the level of the Ministry of Finance to the procurement of innovation, in practice, decisions about procurement are decentralized, and there is no strong framework to support those who might wish to conduct procurement of innovation. As procurement is decentralized, the view of Lember and Kalvet (2014) is that while the procurement directives apply to much government procurement in Estonia, opportunities for aggregation are not taken; any advice from the Ministry of Finance on procurement matters may be disregarded; professional standards of procurement are not high, which leads procurement to be less ambitious than it might be; and there is no training on how best to use the procurement directives to achieve innovative outcomes for the government. Regarding this last point, the authors note that of 5,946 tenders in 2010, only 22 (fewer than .5 percent) have led to the competitive dialogue procedure being followed. A further influence on procurement has been that low procurement thresholds—lower than the EU requirements—have led to transparency but also possibly to more procurement administration.

Key Policy Developments in PPI

The Procurement of Innovation Context

The Estonian government has only recently begun to consider the need for specific demand-side policies in which public procurement would play a role. In 2014, it requested a study conducted by Technopolis (Romanainen et al., 2014) to investigate how and what demand measures should be implemented within an overall policy mix that had previously employed only supply-side instruments. Furthermore, the demand side measures were to be implemented within the context of three smart specialization areas: information technology, health care, and greater resource use efficiency. Estonia was required to choose these areas as a condition for accessing the EU's Structural Funds. These are three areas in which the government has some capacity for innovative procurement and where the economy of Estonia has potential.

PPI policy falls under the MEAC and the MER. The MEAC has developed the country's Entrepreneurial Growth Strategy 2014–2020, one of whose objectives is that the state should increase its capacity to act as a customer:

> To create a market for innovative products and services, we shall increase the state's capacity and readiness to act as a client for innovative solutions (e.g., through innovative public procurements). We shall ensure the state to be an active innovation partner for entrepreneurs as a client for innovative solutions, while fostering the development and procurement of innovative solutions and implementation of demonstration projects. By doing so we stimulate innovation activities, enhancing thus both the emergence of startup companies as well as partnerships with foreign enterprises. (MEAC, 2013: p.12)

The country's R&D&I strategy makes a small reference to the importance of procurement of innovation as a means of stimulating innovation in the economy but within the areas of smart

specialization referred to above. While the government indicates awareness of the link between procurement of innovation and such outcomes as the support of native industries, there is, apparently, relatively little action being taken. Nevertheless, there are some good examples of activity in this area, identified below.

The government supports its enthusiasm for e-governance solutions through high levels of investment in the IT sector over a long period; high-profile applications development, including Internet voting, the involvement of ethical hackers in the development of IT applications, and IT infrastructure and the very early development of mobile positioning technologies for emergency calls. Developments in civilian IT have spilled over into the defense sector, where some significant technological advances have been made.

A major change that will affect procurement of innovation is the forthcoming transposition and implementation of the new EU procurement directives. There are three directives which now apply: Directive 2014/24/EU, on public procurement; Directive 2014/25/EU, for entities operating in the utilities sector; and Directive 2014/23/EU, on the award of concession contracts. These changes were expected to come into effect in Estonia in the last months of 2016.[20] Five people in the Ministry of Finance supervise these directives.

Estonia appears relatively committed to innovation and has no plans to limit the innovation partnership (a procurement procedure that allows procurement all the way from the pre-commercial stage to actual procurement). To spur innovation, Estonia will endeavor to ensure that additional criteria are applied to public procurement contracting, such as the promotion of environmental improvement. This will be carried out through soft law and guidelines following transposition. Greater efficiency in procurement is likely to result from the government's strong commitment to electronic systems of various kinds to support procurement, such as an e-registry for commercial works and licenses, and the e-criminal offenses registry (to supervise bidding organizations), and the government expects move toward full electronic procurement immediately after transposition. Electronic catalogues will also be used.

Pre-commercial Procurement

Pre-commercial procurement (PCP) is the purchase of R&D services by a public-sector organization or group of organizations with the aim of developing new products and services that can be used by the government itself (operationally) or by other groups where there is a public need (a policy need). Pre-commercial procurement should be undertaken under the procurement directives, but there is an exclusion that allows it to take place outside the directives if the contracting authority is not the sole user of the outputs and does not pay for all the research. In the EU, the Commission proposed a procedure in a Communication of 2007 which defined a framework in which PCP could be carried out that was consistent with both this exception and the EU Treaty Principles. Estonia has conducted several PCP activities. Currently, there is Estonian participation in PREFORMA, which stands for Preservation Formats for cultural information/e-archives. This project, co-funded by the European Commission under its FP7-ICT Program, supports efforts across Europe to address the difficulties of long-term data storage by developing common approaches.

[20] http://www.euritas.eu/sites/default/files/egov_in_estonia_-_january_2015_-_v_17_final.pdf

Evidence of Impact

Estonian policy for the procurement of innovation (both PPI and PCP) has less emphasis than in many countries. The government's commitment to demand-side policies is relatively weak, and the general levels of expertise across government to support the procurement of innovation are not especially strong. Nevertheless, in several areas, the government as a customer has acted as an effective stimulus to innovation, particularly in IT, where there has been a range of specific demands by suppliers for higher technology and more sophisticated solutions. As a result, a local industry has developed, and an IT infrastructure within and outside the government has emerged. This infrastructure has further supported innovation in Estonia, particularly in the provision of government services. The degree to which these developments have led to private sector development (i.e., private sector markets) is, however, not easy to assess.

Public procurement of innovation is often limited to large companies. Small and medium-sized enterprises (SMEs) have had difficulty accessing PPI. For this reason, demand-side initiatives, such as Small Business Innovation Research (SBIR) in the United States and similar approaches in Europe (e.g., SBRI in the United Kingdom and SBIR in the Netherlands), have focused somewhat on SMEs, although government procurement within the EU is bound by Treaty principles and so cannot discriminate by firm size or location. However, in the case of Estonia, the need for a specific policy to engage with SMEs is not particularly relevant, as most of the supplier base is small enough to count as SMEs.

If the aim of PPI is to support and strengthen local industries in certain areas, then what has happened in Estonia has been successful, to a degree, in IT. However, even in IT, PPI has not led to significant increases in domestic R&D expenditure. Increases in R&D expenditure by business or R&D employment observed in Estonia over the last decade (OECD, 2015), which have given the Estonian economy nearly the same level of R&D personnel as Germany, cannot be attributed to procurement of innovation policy.

It is worth considering the significant successes in terms of IT innovation in the services provided by the government to the citizens of Estonia. Despite the absence of a longstanding, well-resourced, and widely disseminated policy to promote the procurement of innovation by government departments and other public sector bodies, there are good examples of how innovation has taken place because of government procurement. Central to the development of IT technologies by national companies in the case of Estonia is the adoption of national ID cards in 2002 and the secure technologies that emerged to support it. These technologies exhibit network effects or positive externalities, which have then made it possible and indeed desirable to further technological developments, such as the ID ticket for use in the Tallinn area. The box below contains a presentation of this successful instance of innovation of the ID ticket, which has led to more efficient ticket issuance and greater uptake of the national ID card.

Box 3.1: The Estonian Digital ID Ticket

The ID ticket is an electronic ticket in the public transportation system (bus-tram-trolley) which is sold to the user via the electronic payment collection system and which the user proves with his or her personal identification document (national ID card). Thus, it is sufficient to carry one's ID card along when using public transportation that needs to be presented to the controller, who has a special machine for checking its validity. ID tickets can be purchased via the Internet bank, a mobile phone, or from sales points. Estonia started issuing national ID cards in January 2002 (new functions, increased effectiveness). Without the existence of this infrastructure, several innovative public services in Estonia (e.g., e-voting) would not be possible (multiplier effect of new technological trajectory). In addition to being a physical identification document, the card has advanced electronic functions, facilitating secure authentication and a legally binding digital signature for public and private online services. An electronic processor chip (a respective smart card reader is needed for operation) contains a personal data file as well as a certificate for authentication. Certification Center Ltd. is the key organization, which was established as a 100 percent privately owned company in 2001, and as of 2007 is the only certification authority, providing certificates for authentication and digital signing for Estonian ID cards (public–private partnership). The procurement process generated bids from six applicants; one was a joint tender AS Certification Center, AS EMT (mobile telephone operator) and AS Eesti Ühispank (bank), and this one was selected. The service was introduced successfully in 2004. There was no fixed price. The price was to be derived from the turnover of tickets sold: 4.49 percent of returns in favor for the procuring company (intelligent incentive structures). As a result, the company was interested in the application to work as efficiently as possible. Next to the small financial risks, the technological risk was small, because the technologies developed relied on existing ID card-based infrastructure (novel combination of an introduction to new contexts rather than radical innovation). The main concern was how the users would welcome the new service (successful absorption). The ID ticket was not planned to replace the old distribution channels, but to create additional ones. It has turned out to be a very efficient service, especially from the standpoint of controlling the usage of tickets: (1) the ticket is personalized, so it is not possible to distribute tickets among users, as was the case with paper-based tickets; (2) mechanisms to control the validity of tickets in public transportation is quick (increased effectiveness). The ID ticket was one of the services that generated interest in obtaining a national ID card. Today, a similar service has been launched in Tartu, Estonia (potential infant lead market). The intellectual property remained with the Certification Center.

* Example and text (slightly shortened) from Lember et al., pp 43-44, highlights in bold the authors of this report:

Concluding Remarks

Estonia is a good example of a country where the government has acted as an intelligent and challenging customer to encourage innovation in the supply chain and to exploit and develop the capacities of its own indigenous suppliers. This is true even though the general practices are unsatisfactory for suppliers, largely due to a lack of a general PPI policy, lack of capabilities and market knowledge in public organizations, and limited budgets (Lember and Kalvet, 2014). This has been achieved largely without explicit emphasis on demand-side

policies. The sector that has received the strongest stimulus from the government is IT. Indeed, it is this “outstanding electronic system for publication and statistics” (Thai, 2009: 422) that supports effective and efficient procurement and can support procurement of innovation. By choosing IT particularly and developing key technologies in this sector, the government has made possible a range of network effects or multiplier effects which might not have been realized in other sectors. There is the risk of lock-in with such a course of action, but if the systems that are designed are open, maintainable, and flexible, then this risk is lower.

The Estonian approach to demand-side measures to promote innovation is peculiar in that while government action through procurement has led to innovation, this has been without any deliberate policy that explicitly links government procurement to innovation, until very recently. However, now that such policies exist, there are significant limitations on the procurement of innovation by contracting authorities in terms of the capacities of procurement officials, and there are no systematic mechanisms to use procurement to stimulate innovation. While current policy comprises important statements of intent, specific initiatives that will lead to widespread activities that will stimulate innovation among firms are not yet present. Such activities that exist in other countries and which might be applied in Estonia are capability-building actions that encourage procurement officers working in both central and regional contracting authorities to set more challenging specifications for products and services, and training of procurement officers to underpin this activity and to use the full scope of the procurement directives to conduct this kind of procurement.

The main stimulus to innovation in the Estonian system has therefore been the openness of the procurement system. Government procurement has supported this openness to some degree.

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4. NETHERLANDS

Diego Moñux, SILO

Netherlands Overview

The Netherlands, one of the world's most densely populated nations, had 16.85 million inhabitants, an average annual population growth rate of 0.3 percent, and an 84 percent urban population in 2013. The Netherlands ranked 64th in terms of population, 17th in terms of gross domestic product (GDP), and 11th in terms of GDP per capita in 2014 (World Bank, 2015).

The Netherlands is a modern, industrialized nation, which ranks second in agricultural exports in the world. A left-right coalition government was formed in November 2012, after months of deadlock over plans to cut the budget deficit. The economy is mainly services-based, but trade also plays a major role in it.

Politically and administratively, the Netherlands is a parliamentary representative democracy, a constitutional monarchy, and a decentralized unitary state. Other levels of government are the municipalities, the provinces, and the water boards (regional government bodies charged with managing water barriers, waterways, water levels, water quality, and sewage treatment in their respective regions).

Institutional Network and Governance

The Netherlands traditionally fares well in terms of governance and transparency measures. For example, the country's rule of law ranking has repeatedly been higher than those of the United States, Australia, Germany, and the United Kingdom (World Bank, 2015). Correspondingly, the perception of government effectiveness is well above the figures for these countries. Another positive feature of the Dutch government has been its cooperative spirit and openness to opposing thoughts and ideas, and to commercial and scientific advice, because of never having achieved a clear majority of votes for a single party (Jilke, Van de Walle, and van Delft, 2013).

However, challenges have appeared in recent years: notwithstanding its high ranking, the perception of government effectiveness has seen a decreasing trend. Besides a universal tendency of citizens to demand higher value for money and better accountability, these challenges in government effectiveness have to do with an increased closeness to the public, at the cost of a higher distance from national standards, which have resulted from an increasing decentralization of central government tasks (OECD, 2014a). In fact, because the Netherlands is a decentralized country, the Dutch central government has mostly policymaking tasks while government agencies and the local and municipal authorities have become the executors of the budget (the latter are still, however, financed by the central government (Jilke, Van de Walle, and van Delft, 2013).

Good governance has produced good framework conditions. Government social expenditure is 24.7 percent of GDP; the Netherlands ranked 11th among OECD countries in 2014[21] in social expenditure as a percentage of GDP. Unemployment rates are not high but have increased in the past four years, from 5 percent in 2010 to 7.42 percent in 2014. In terms of development, the Netherlands is ranked as one of the most developed countries, with the

[21] Data estimation for 2014. Extracted from OECD Social Expenditure Database (SOCX).

5th highest score in the Human Development Index worldwide for 2014 (UNDP, 2015). With respect to institutional solidness, the traditional perception of the Netherlands is that it is a corruption-free country. This perception may have led to an insufficient development of its anticorruption policy (OECD, 2014).

Economic Performance

The Netherlands is among the world's most advanced economies. It ranks 9th among OECD countries in GDP and is one of the most competitive economies in the world, ranking 4th in the European Union, and only faces important growth restrictions in terms of labor market inefficiency (WEF, 2015). Although caught in a temporary decline in terms of economic growth due the interaction between its housing market, its banking sector, and its pension system (Ernst & Young, 2014) and a considerable fiscal belt-tightening (OECD, 2013), these indicators are expected to recover gradually (OECD, 2014). The latter is due to the country's commercial openness and, to a lesser extent, its innovation- driven economy and to a slowly paced and planned structural fiscal consolidation (OECD, 2015a).

A distinctive feature of the Dutch economy is its historical and current openness to international trade and investment. The country's volume of imports and exports of goods and services with respect to its GDP is among the highest of the OECD countries and has increased in the last 10 years. Favored by its geographic position, the Netherlands has acted as a gateway to continental Europe (and to a lesser extent, to the United Kingdom) and has become a major logistics hub, specializing in transport and adapting to this area emerging technologies such as information and communication technologies (ICT) (OECD, 2014), leading to this part of the economy representing over 40 percent of total Dutch value-added (U.S. Department of State, 2015). Additionally, the Netherlands is currently the largest recipient and source of foreign direct investment (FDI) in the world and has come to attract the highest share of U.S. FDI (U.S. Department of State, 2015). The Netherlands also strong laws protecting intellectual property, fully complying with international standards and having implemented EU Directive 2004/48 on the enforcement of intellectual property rights (OECD, 2014).

Key Features of the Innovation System

Perhaps because of its commercial openness, the competitiveness of the Netherlands remains somewhat tied to its ability to accomplish sustained advantages through innovation. Although the science and technology innovation (STI) system, fueled by relatively low gross domestic expenditure on R&D (GERD) of 2.1 percent, only 47 percent of which is financed by business (Dutta, Lanvin, and Wunsch-Vincent, 2015), it is particularly prolific compared to other OECD innovation systems.

The Netherlands ranks sixth in the world in the Innovation and Sophistication Factors pillar of the WEF's 2015 Global Competitiveness Index (GCI). Over 40 percent of its manufacturing exports correspond to high and medium-high-tech manufactures (WEF, 2015). In view of that, the Netherlands has a considerable rate of patenting activities that has earned the country a place among the world's leaders in this area, with 5.3 percent resident patent application per billion US$ of GDP and thus ranks ninth in the world (Dutta, Lanvin, and Wunsch-Vincent, 2015), mainly due to the activity of top firms that are globally networked and that have turned out to be especially efficient R&D spenders (OECD, 2014). Additionally, just as internationalization is a distinctive feature of the Dutch economy, it also is a representative characteristic of its strong science base, as is shown by a particularly high share of internationally co-authored publications that exceeds 50 percent (OECD, 2014). This fact has been logically accompanied by a high quality of scientific production and a particularly high H-index citation rate (8th in the world) (Dutta, Lanvin, and Wunsch-Vincent, 2015). International innovation linkages, however, remain relatively low, as less

than 20 percent of Patent Cooperation Treaty (PCT) patent applications are produced with international co-authorship (OECD, 2014).

In terms of governance of the STI system, the Netherlands, like other OECD countries, is facing increasing challenges in term of policy design, coordination, and implementation as more actors, both public and private, are added into the STI stakeholder group while policy instruments are refined by the European Union and demand special attention to their implementation at the regional level. Overall, the main agencies involved in STI policy design and implementation (OECD, 2014) are the following:

- Ministry of Economic Affairs, which governs innovation policy and is the central access point for government information and services in this area
- Netherlands Enterprise Agency (Rijksdienst voor Ondernemend Nederland), a part of the Ministry of Economic Affairs, which encourages entrepreneurs in, among others, innovative and international business and serves as a central contact point for public and private actors on issues ranging from information to regulatory matters
- Major responsible entities for implementing and managing policies as research and innovation funding agencies:
    - Dutch Research Council (NWO), an independent directive body under the responsibility of the Ministry of Education, Culture and Science, is the main research funding agency for the universities and national research institutes.
    - Royal Netherlands Academy of Arts and Sciences (KNAW), an advisory body to the Dutch Government, promotes innovation and knowledge valorization within a group of outstanding national research institutes, and encourages them to cooperate with university research groups.
    - Dutch Bureau for Economic Policy Analysis (CPB), a part of the Ministry of Economic Affairs, does scientific research aimed at contributing to the economic decision-making process of politicians and policymakers.

In terms of the policy mix, in addition to a continuously improving environment for doing business and having one the shortest times required to open and close a business among the OECD (World Bank, 2015), the Netherlands' main support for private innovation and investment in R&D (in an already innovative business sector) has come in the form of tax incentives. It has also included additional support, particularly for SMEs, through loan and credit guarantee instruments for innovation projects.

A specific milestone in STI policy has been the strategy *To the Top: Towards a New Enterprise Policy*, launched in 2011. It replaces former horizontal industrial policies with a strong sectoral approach, organizing instruments around nine top-performing sectors, including high-technology materials and systems, energy and chemicals, and water (Ministry of Economic Affairs, Agriculture, and Innovation, 2011). Supporting this strategy are new forms of governance that are meant to increase vertical coordination and support bottom-up policy and instrument design. The Top Consortia for Knowledge and Innovation (TKIs) were established to ensure that the joint research agenda within the top sectors is realized. For each of the strategic sectors, this Top Team is made up of high-level representatives of industry, academia, and the public sector and is responsible for setting up a shared agenda for the development of the corresponding sector, which are later evaluated by the government. In the end, this mechanism also shows the importance of cost reduction for cooperation between several actors and specifically of instruments such as public–private partnerships (PPP) for STI development (OECD, 2014).

The Ministry of Economic Affairs values entrepreneurship highly, considering it crucial for the success of the Dutch technological development model. In 2013, industry invested €199 million in regular TKI-projects and another €109 million for topped-up projects. Taken

together with the public funding for regular and topped-up projects, the total TKI R&D-expenditures were €850 million (Janssen and den Hertog, 2014).

Public Procurement Overview and Legislative Context

General Procurement Indicators

Government expenditure in the Netherlands accounted for around 45 percent of GDP in 2014, slightly above the OECD mean but below France, Italy, and Hungary. Real government expenditure per capita decreased by 1.04 percent between 2009 and 2013 (OECD, 2015b).

According to the Action Plan Program for Public Procurement of Innovation,[22] the total value of public sector procurement in the Netherlands, excluding expenditure related to the Exceptional Medical Expenses Act (AWBZ), is approximately €57.5 billion (€14.5 billion by national government and €43 billion by regional governments). Much of this is spent on roads, bridges, home care, school material, transportation, and so on.

It is not possible to quantify the share of public procurement expenditure that is directed toward sustainability or innovation. However, the Dutch government has committed to spend 2.5 percent of its total procurement budget on innovation (NAAR DE TOP, 1011).

Organizational Structure

Governance and governmental authority in the Netherlands are decentralized. Central institutions, ministries, and parliament (Upper House and House of Representatives of the States-General) oversee general legislation and policy design, but decisions on provincial and municipal policies and activities are the responsibility of decentralized authorities.

There are three tiers of government in the Netherlands: central, provincial, and municipal. The central government concerns itself with issues of national interest. Provinces and municipalities are tiers of local government. In addition, there are water boards, responsible for local water management.

In the Netherlands, public procurement contracting processes are highly decentralized, with contracting authorities responsible for their own procurement. There is no central purchasing body (OECD, 2015b) as there is in other countries. In this sense, each authority conducts its own procurement.

Local government expenditure in the Netherlands is considerable compared to neighboring countries: between 2007 and 2013, local government expenditure and central government expenditure each accounted for around a third of total government expenditure (the remaining third corresponds to social security). For the same period, the OECD unweighted average for central government expenditure was around 47 percent of total government expenditure, while the figure for local government remained below 10 percent (OECD, 2015b).

Legal Framework

The Public Procurement Act[23] that took effect on April 1, 2013, implements the following European public procurement directives[24]:

[22] Extracted from http://www.inkoopinnovatieurgent.nl.
[23] Aanbestedingswet.

- Directive 2004/18 on the coordination of procedures for the award of public works contracts, public supply contracts, and public service contracts (Consolidated Public Sector Directive)
- Directive 2004/17 coordinating the procurement procedures of entities operating in the water, energy, transport, and postal services sectors (Utilities Directive)
- Directive 2007/66/EC amending Directives 89/665/EEC and 92/13/EEC on improving the effectiveness of review procedures concerning the award of public contracts (Public Contracts Review Procedures Directive)

The Public Procurement Act is further detailed in the Public Procurement Decree[25] and the Proportionality Guide.[26] In addition to these public procurement regulations, Dutch law provides several sector-specific regulations.

Non-discrimination, transparency, and proportionality are recognized in Dutch public procurement law as general principles of public procurement law and general principles of civil law, such as, for example, pre-contractual good faith. Detailed regulations on the application of the principle of proportionality throughout the different stages of a tender procedure are provided in the Public Procurement Act and the Proportionality Guide. All requirements imposed by the contracting authority are proportionate to the scope and object of the public contract. The Guide application strengthens the position of small and medium-sized enterprises (SMEs) during tender procedures. Additional requirements on the determination of the scope of public contracts, specific tender procedures, and the use of qualitative selection criteria are provided in the Proportionality Guide. The application of the Proportionality Guide is mandatory by contracting authorities, and can only deviate from the detailed requirements on proportionality if this is provided for in the tender documents.

The government's Chief Procurement Officer (Ministry of Internal Affairs) is responsible for the implementation and application of legislation in this area in the Netherlands.

Regarding sustainability, since 2010 the objectives adopted were a 100 percent sustainable procurement policy for the Central Government, and a 75 percent for Municipalities, reaching 100 percent by 2015 (House of Representatives of the Netherlands, 2010–2011). Other public bodies (provinces, universities, and educational institutions) also set goals for sustainable procurement. Implementation of the requirements from the Directive occurred by an expansion of tools for sustainable procurement. A framework was developed for the application of the directive for public procurement. This framework will be applied in the procurement process of the Central Government and can also be used by local authorities and businesses (Daniëls et al., 2013). When the Dutch House of Commons ruled that the Dutch public authorities must implement 100 percent sustainable procurement by 2015, Rijkswaterstaat (the Department of Public Works of the Ministry of Infrastructure and the Environment) developed a methodology for infrastructure projects where the functional requirement of the tender and the quality input from the client guarantee a quality and innovative solution. Rijkswaterstaat (RWS) wants Commission procurement projects to be based as much as possible on functional, performance-based specifications of the required infrastructure so that the market has the optimal freedom to arrive at effective, alternative, and innovative solutions (OECD, 2014). The tenderer is also asked to respond to specific quality criteria. Rijkswaterstaat uses the most economically advantageous tender (MEAT) methodology.

[24] Directive 2014/24 on public procurement and repealing Directive 2004/18/EC is not yet transposed to national regulation at the date of the preparation of this section.
[25] Aanbestedingsbesluit.
[26] Proportionaliteitsgids.

With the introduction of the Public Procurement Act 2012 and the Proportionality Guide, all contracting authorities use MEAT methodology as mandatory for European and national (within the public works sector) procedures unless it can be motivated to apply the lowest price. The lowest price can be applied when the procured product/service is highly standardized, when no major differences in quality are expected, or when the specifications and scope of the procured contract are clear. Correspondingly, the Proportionality Guide requires contracting authorities to be transparent about the weighting of different sub-criteria.

In addition to the Public Procurement Act of 2012, the Proportionality Guide provides a detailed and binding guideline to ensure proportionality between the type and size of the contract and the requirements of the procurement process and of private suppliers. The Proportionality Guide deals with, among other things, the choice of procedure, selection and award criteria, and others.

Furthermore, the Public Procurement Rules for Public Works (2012), referred to as ARW,[27] is another obligatory guideline specifically concerning procurement below the European thresholds within the public works sector (construction and infrastructure). The ARW adapts the European procedures for procurement below the thresholds, but with fewer rules (e.g., different requirements for pre-announcements and deadlines). The Proportionality Guide and the ARW 2012 follow what is called the apply-or-explain principle, which means that contracting authorities must apply these specific rules unless they can justify why the rules do not apply in a specific procurement process.

It is remarkable that the Netherlands, although not having specific developments targeting bribery and corruption in public procurement, deal with it under the national criminal legislation with the Dutch Criminal Code as well as the Economic Offences Act, and assume an integrated approach in dealing with corruption finding issues. The Dutch Authority for Consumers and Markets (ACM) is tasked with monitoring unfair competition in public procurement and can impose fines on contracting companies. In this regard, ACM also works with PIANOo to advise contracting authorities. In this sense, the Netherlands is considered one of the countries where competition is fairest. The country ranks 14th out of 144 countries in intensity of competition in local markets, and 2nd in effective anti-monopoly policies at ensuring fair competition (WEF, 2015).

PPI Capabilities and Rationales

Rationales and Evolution in the Policy Agenda

The Ministry of Economic Affairs started a pre-commercial procurement (PCP) program in 2004, responsible for innovation policies, related to finding solutions to social issues using this budget, and inspired by the United States' program but adapted to the local policy context (OECD, 2014). This program is called the Small Business Innovation Research (SBIR) program (Van Putten, 2012).

The aim of the SBIR program was to create an instrument to serve as a catalyst for commercial procurement and contribute to sharing with Dutch companies to solve social challenges in transportation, the environment, security, and health, as well as contribute to innovation in SMEs.

Then, it identified the need to use the potential of public procurement for SME innovations. It initiated the "launching customer project" to cover issues such as functional specifications and intellectual property management, among others. The aim of this strategy was enhanced by the idea that SMEs were the driving force behind innovation procurement, so

[27] Aanbestedingsreglement Werken.

that the authorities could establish a win-win relationship with them. After that, the project was extended under the new approach of strategic procurement, which required a more active role in from the procurer as a lead user for innovative goods and services (Van Putten, 2012).

The government took another approach to innovation in public procurement when it launched the project known as Public Procurement of Innovation (Innovatie Inkoop Urgent program) in 2009 (Van Putten, 2012). The starting point was the parliamentary resolution of Aptroot/Besselink (Tweedy Kamer, 2008), requesting a measurement system and 20 best practices in the public procurement of innovation (PPI). Former Minister of Economic Affairs Maria van der Hoeven sent a letter to the House of Representatives on the Program for Public Procurement of Innovation Program, in which she informed the House about the strategy for PPI, the PPI indicator, and the 20 examples of relevant practices. A new approach was then adopted, which characterized PPI as a demand-side instrument driven by the needs of the contracting public sector organizations.

In its Industry and Commerce letter of September 2011 (NAAR DE TOP, 2011), the government declared its intention to spend 2.5 percent of the total procurement budget of around €60 billion, or €1.5 billion, on PPI. The program was finally launched in 2012. The PPI Program and SBIR provide the foundation for more effective and efficient service provision through the procurement of innovative solutions to social needs, expansion of the domestic market, and the export potential of businesses.

In November 2014, the Director-General of Rijkswaterstaat, Jan Hendrik Dronkers, established the Public Procurement of Innovation Policy Framework (Rijkswaterstaat, 2014), which laid out the partnership and procurement arrangements that Rijkswaterstaat wanted to use to bring about innovation in public procurement. Rijkswaterstaat also worked on an Innovation Agenda, which selected which innovations would be given the highest priority. The aims of the policy framework were to achieve the target of 2.5 percent of the budget spent on PPI and design and execute procurement policy to bring about innovation.

The framework document was proposed to provide guidance to those seeking to undertake this approach to public procurement. The document conditions the purchasing of innovative solutions on greater interaction with other parties and investments in areas that may seem uncertain.

The Innovation Agenda sets out the main innovation objectives of the Netherlands (Rijkswaterstaat, 2014). Public procurement of innovation has a significant role in Rijkswaterstaat's agenda, and encourages SMEs to produce inventive solutions (radical or incremental). Each innovative project must aim to reduce Rijkswaterstaat network lifecycle costs by 30 percent, increase functionality by 30 percent, and increase safety and sustainability by 30 percent as well. In line with the Dutch government's goal of increasing investment in innovation, Rijkswaterstaat set five operational objectives: placing the Innovation Agenda as part of their production target, making optimal use of national and international knowledge progress, designing a selection process which temporarily selects promising initiatives, incorporating PPI strategy into the policy framework, and eliminating obstacles that obstruct PPI.

The aim of the policy framework is to address the obstacles related to this approach. These include legal obstacles, financing of the actual development and implementation of innovations, addressing intellectual property issues, increasing the commissioning party's receptivity to ideas from external parties, managing risk avoidance, and providing experimental space, pilot projects, and test beds (Rijkswaterstaat, 2014).

On the financing aspect, Rijkswaterstaat is committed to spending 2.5 percent of its procurement budget in this area[28] but is exploring the possibility of setting up a special innovation fund, with joint investments and potential innovations of partners (public and private). Earn-back investments will be the long-term goal of the fund. In contrast to other cases, such as Spain, the Netherlands does not seem to have followed the recommendations of the European Commission concerning the use of structural funds for the practice of PPI.

The Minister of Economic Affairs is politically responsible for any legal policy concerning public procurement. The Minister is politically accountable to Parliament that contracting authorities comply with public procurement rules and regulation, and can take measures to ensure compliance. Each contracting entity at the local, regional, and national level is responsible for its own tenders and public procurement procedures, if they abide by the public procurement regulations.

In addition to developing strategies and programming in the field of PPI, the Ministry of Economic Affairs encourages relationships between the public sector and the market in various ways. These relationships affect cooperation between these parties and the tendering process. A key element in the public procurement process is the Dutch Public Procurement Expertise Centre (Professioneel en Innovatief Aanbesteden, Netwerk voor Overheids-opdrachtgevers, or PIANOo), which supports the professionalization of procurement and tendering in public contracting authorities (PIANOo, 2011). As the Action Plan (Inkoop Innovatie Urgent) notes, the Ministry of Economic Affairs has a mainly policymaking role regarding the relationship between procurement and innovation, but has the primary responsibility for innovation (Ministry of Economic Affairs, 2013). Public procurement of innovation is one of the demand-side innovation tools. The Plan recognizes the key role of the Ministry of Economic Affairs in stimulating and supporting PPI in this sense.

Thus, PIANOo seeks to professionalize procurement and tendering in all government departments with a view to improving efficiency and compliance with the rules.[29] PIANOo is part of the Minister of Economic Affairs. It was founded in 2005 as an indirect result of extensive fraud in the construction sector. Part of the conclusion of the Parliamentary Inquiry into this fraud was that the awarding authorities were partly to blame; their way of awarding contracts was far from professional (Tazelaar, 2008). Therefore, the goal of PIANOo is to help the awarding authorities to improve performance. As the OECD remarks in various publications, PIANOo is a recognized best practice. PIANOo is an active actor inside of the European Union, one of the main promoters of the Procurement of Innovation Platform, and highly active in promoting Horizon 2020 (H2020) practices.

The aim of PIANOo is to increase the professionalism of public procurement in the Netherlands, including the use of innovative methods of procurement. PIANOo's target groups are all contracting authorities that must consider the European Union's rules for public procurement, as there are too many organizations to make an individual approach. These include municipalities, provinces, water boards, ministries, police, schools, universities, and health care organizations.

PIANOo, originally founded as a knowledge center for public procurement, positioned itself as a community of practice, in which the community is the owner of knowledge and in which

[28] However, as Observed by *ERAC Opinion on Innovation Procurement*. (ERAC 1209/15, 2015), there are no measurement systems established for this purpose.
[29] https://www.pianoo.nl/public-procurement-in-the-netherlands/about-pianoo

PIANOo facilitates the process of making that knowledge visible and available to everybody (Tazelaar, 2008). PIANOo is explained in greater depth in the following section.

Chronology of major events:

2004	SBIR started
2005	PIANOo was founded
2009	Public Procurement of Innovation Program started
2010	Objectives of sustainable procurement policy adopted
2011	Government declared its aim to spend 2.5 percent of the total procurement budget on PPI
2013	Public Procurement Act
2014	Rijkswaterstaat Public Procurement of Innovation Policy Framework

Technological demand planning is important for the Netherlands to link future demand with planning, to obtain proper results through instruments, such as, for example, innovative purchasing. In the long term, the government chose nine sectors for preferential support: agri-food, horticulture and propagating stock, high-technology systems and materials, energy, logistics, creative industry, life sciences, chemicals, and water.

The "top sector" initiative of the Netherlands uses the approach of sectoral targeting of innovation policies to attract more demand-driven input from businesses into government policy (Izsak and Edler, 2011). Although demand-side innovation policy was not labeled as such, demand-side instruments such as PPI and pre-commercial procurement (PCP) were significant.

There is strong cooperation between institutions, companies, and government to strengthen the competitiveness of these targeted sectors. There is not only programming for research and innovation in these sectors, but also actions planned concerning science, technology, engineering, and math (STEM)-educated human resources. Dedicated funding for top-sector instruments is only US$128 million a year, but considerable amounts of public research (about 30 percent of which is privately financed) in universities and public research institutions (PRIs) are being aligned with the approach, equal to about US$1.2 billion, excluding regional and EU funding (OECD, 2014).

The Dutch government created a knowledge network to share and extend knowledge to public agencies in the country. The challenge for PIANOo, as mentioned before, is to influence or even manage the coordination of the informally shared knowledge.

With respect to the development of innovation at a human level, the Dutch Association for Purchasing Management (NEVI) exists to provide public sector procurement officers with experience and knowledge exchange for purchasing excellence and world-class procurement management.[30]

Key Policy Developments in PPI

There has been interest in the use of public procurement to boost innovation, configured through specific policy developments and instruments created to facilitate the process of incorporation of PPI schemes at a regular and stable practice level. This section describes

[30] https://www.nevi.nl/

some of these instruments in depth, specifically the Small Business Innovation Research (SBIR) Public Procurement of Innovation Program.

In the Netherlands, this toolbox of instruments addresses different deficiencies in innovation procurement. The country's experience also demonstrates that increasing the knowledge of institutions and public procurers is key.

Table 4.1: Summary of PPI Interventions in the Netherlands

Policy Category	Deficiencies addressed	Instrument types	Instruments implemented
Framework conditions	i) Procurement regulations driven by competition logic at expense of innovation logic. ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	Public Procurement Act-2013 European Directives transposition
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High-level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks	PIANOo support network as a Procurement Expertise Centre NEVI professionalizes public procurement development
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning, and procurement functions	i) Pre-commercial procurement of R&D to develop and demonstrate solutions	Small Business Innovation Research (SBIR Netherlands). Pre-commercial procurement program
Incentivizing innovative solutions	i) Insufficient expenditure and articulation of innovative solutions	i) Innovation-oriented public procurement programs	Inkoop Innovatie Urgent Program

Source: Georghiou et al. (2014).

Small Business Innovation Research

The SBIR is an innovation program for SMEs. Through pre-commercial procurement or as "launching customer," the government can encourage innovative solutions for social issues such as health and the environment (ERAWATCH, 2015).

As shown in a study on developing an evaluation and progress methodology to underpin the intervention logic of the Action Plan to Boost Demand for European Innovations (Technopolis Group, 2013), there are three SBIR variants: a departmental SBIR, the STW Valorization Grant (STW is the Technology Foundation of Netherlands), and the TNO-SBIR program (TNO is the Dutch organization for applied scientific research). A remarkable difference is that the departmental SBIR and the TNO-SBIR award contracts to companies, while the STW Valorization Grant awards grants.

In general, the SBIR approach has three objectives: solving social issues and concerns, stimulating innovation through SMEs, and improving the valorization of public knowledge. Each SBIR variant places different emphasis on each objective. SBIR is recognized as best practice by the OECD and the European Union, among others.

Through the SBIR program, companies can develop innovations on a contractual basis (100 percent financing, no subsidy). Because it is PCP (that is, R&D), these contracts do not fall

under the European procurement directives. However, the tendering procedure still must be transparent (sufficient publication), objective (clear criteria and procedures), and cannot discrimination based on nationality (companies from other countries should be able to compete). The company holds the intellectual property rights, but the government can receive royalty-free, non-exclusive licenses in the general interest (Technopolis Group, 2013).

Today, the SBIR program is organized as follows: The projects are acquired through a tender. An independent committee evaluates the proposals and presents a classification used to select the candidates. The contracting authority funds the first two stages of development, while the company still holds the intellectual property rights. Therefore, the new product gives the company the opportunity to grow, as well as to create new jobs, while the government gets innovative solutions to its problems. (Ministry of Economic Affairs, Agriculture and Innovation, 2011) The process is as follows:

- NL Agency (AgNL) and another institution initiate an SBIR procurement and launch an open competition. All competitions are expressed as a desired output, rather than a requirement. Companies submit applications within the tender period (call for tenders). AgNL processes the applications and notifies the companies. Because SBIR involves contracts, it is also attractive to early-stage companies and companies from different sectors to submit their ideas.
- The contract is given in a two-phase competition:
    - Technical, economic and organizational feasibility (maximum six months)
    - Research and development (up to two years)
    - Marketing (This phase is not granted or supported by SBIR)

The SBIR is an instrument for innovation. It does not provide training because it is managed by experts. Initially, SBIR was launched with the support of several professionals called "champions," comprising a network from various ministries. These experts were professionals in innovation environments.

Between 2005 and 2010, 28 competitions were carried out as part of the SBIR scheme with a total contract value of €59.6 million by central departments (Deloitte, 2014). The satisfaction with the results and the efficiency of the process facilitated by AgNL were notable.

Since 2011, over 250 contracts were signed in phase A, and about 60 in step B (Knapp et al., 2011). The aspects that are granted in the SBIR program are defined by the ministries in their strategic plans regarding innovation. For example, the Ministry of Transportation, Public Works and Water Management has a specific strategic program for the SBIR instrument. But the program can also be part of a broader agenda, including the social innovation agenda.

SBIR is subject to the EU PCP legal framework for research and development projects. The European Commission views SBIR as a valuable supplement to the array of financial aid instruments (Ministry of Economic Affairs, Agriculture, and Innovation, 2011). SBIR concurs with the European view on pre-commercial procurement of innovations.

Presently, SBIR is at a mature stage, with an increasing budget.

Table 4.2: Dutch SBIR Budget, 2005–2010 (in millions of euros)

Year	2005	2006	2007	2008	2009	2010
Budget	1.1	3.5	3.1	7.4	18.2	26.3

Source: AgNL (2011).

The needs are identified by the AgNL and organized through tender boards, communications, and published in social media and through other means. The SBIR has encouraged SMEs to develop new solutions to social problems. In a report on market-oriented innovation policy (AgNL, 2011), the Dutch authorities confirmed the importance they attach to public and private demand as instruments that can stimulate lead markets.

The Procurement Innovation Urgently Needed Program

The Procurement Innovation Urgently Needed[31] (Inkoop Innovatie Urgent, or IIU) program encourages PPI produced by the government. This is realized through programs that focus on social issues for which the business community can provide solutions, which can then be purchased by the government. The Procurement Innovation Urgently Needed program is led by a steering group consisting of representatives drawn from various government agencies (national, provincial, and local authorities) and from the business community (Ministry of Economic Affairs, 2013).

The program was launched in 2009, after discussions with the organizations of employers and the ministers responsible for Infrastructure and Environment, Economy and Transportation, and Water. The focus of operations was to initiate and stimulate new innovative procurement processes and promote the use of new contracting tools to enable innovative solutions. It is based on a policy of public procurement to stimulate innovation and meet the needs of the public sector. The goal was to spend 2.5 percent of the total budget for procurement of innovation, although those interviewed have stated that the goal will be difficult to achieve. The IIU program supports over 25 innovation procurement projects in eight flagship themes. In implementing these initiatives, the contracting institutions received added value for less money while also gaining experience in PPI.

Innovation focuses on procurement from two points of view. From the buyers' perspective, the procurement contributes to the solution of social problems and a more effective use of tax revenue. From the companies' perspective, it aims to expand the domestic market and contribute to increased export potential through further development and implementation of innovative products and services. Procurement through innovative solutions is configured as a tool to improve processes and create better products and more sustainable services (ERAC, 2015).

The Action Plan states that the PPI program's objectives are the stimulation, support, and implementation of projects as examples to raise awareness among other public sector organizations of the opportunities and possibilities for innovation in projects and tendering, dissemination, and further developing the philosophy and tools for PPI.

Brokering and bringing parties together based on the demand for goods and services and the use of a steering model is the emphasis in this program. Monitoring and financial instruments for facilitating PPI aim to reach more public sector organizations and reveal more examples of PPI, and provide more active steering for innovation-oriented public procurement.

To achieve these objectives, the following methods and means are provided:

1. Sponsoring: initiating, strengthening and supporting PPI projects within the flagship themes
2. Networking: linking public sector organizations, and bringing public and private sector actors together
3. Tools: sharing and developing tools to support the PPI process

[31] http://www.inkoopinnovatieurgent.nl/

4. Tools: removing obstacles in the PPI process
5. Active participation: linkage with national initiatives
6. Active participation: linkage with European projects and processes to obtain funding, gain experience and exert influence
7. Communication: informing, engaging and matching
8. Benchmarking and financing: monitoring and financing

The projects are selected according to eight flagship themes, each of which focuses on at least one of the stages in the procurement process, that is, feasibility, development, and prototype:

1. Sustainable mobility, energy and smart grids
2. Dynamic traffic management
3. Facility management and building interiors
4. Built environment, outside walls and roofs
5. Healthcare
6. Policy document on raw materials
7. Management of water systems
8. Safety

The organizational structure and governance of the Program for Public Procurement of Innovation have two figures in the governance model of its implementation:

The first figure is the Public Procurement of Innovation Coordination Group, responsible for the PPI program (Ministry of Economic Affairs, 2013), which has the following tasks:

1. Coordinating and supervising projects within the flagship themes.
    - Sponsoring at least one and no more than three innovation-oriented projects in the flagship themes. The sponsorship involves:
        - Holding talks with the project leader/contact person a few times a year.
        - Providing support to ensure the milestones in the project are achieved.
        - If necessary, creating sufficient support for the project among other public sector organizations and companies by liaising with the responsible elected representatives or top officials.
        - If necessary, acting as a figurehead for the project, for example in formal communications.
        - Devoting on average about two hours to the project each month.
    - Monitoring progress and reporting on this annually. A review will be held each year to decide on projects to be discontinued and new projects to be added.
2. Putting PPI on the government agenda:
    - Promoting the philosophy behind PPI in group members' networks. The thematic projects can serve as examples and provide a knowledge base for further application and development in public sector organizations.
    - Arranging for the organization of one umbrella meeting each year.
    - Arranging for the development of tools for public procurement of innovation, such as life cycle costing and risk management.

The Coordination Group is supported by the PPI project team. The second figure is the Public Procurement of Innovation Team, which supports the Coordination Group and falls within the remit of the Enterprise Department of the Ministry of Economic Affairs. It consists of several members from various entities working part-time for the project.

PIANOo

PIANOo has become the tendering expertise center for the government. The expertise is built through a large network of around 3,500 public procurement professionals and contracting authorities.[32] PIANOo brings experts in specific areas together, pools knowledge and experience, and provides advice. It also fosters dialogue between government contracting authorities and private companies. PIANOo addresses a wide range of subjects in procurement practice, organizes meetings, produces publications, and works with expert groups chaired by university professors specialized in the field (Uyarra, 2013). It also produces manuals and checklists and provides special market files on the website. PIANOo sees market knowledge as an essential element in public sector procurement and tendering.

According to Uyarra (2013) and Tazelaar (2008), the success of PIANOo is that it has been able to surmount a number of barriers to pursue its task of professionalizing public procurement. PIANOo-Desk responds to a real need for professionalism and cost savings in procurement and an increasing demand for these services, as the procurement function becomes more relevant. This has raised interest in the management and the development of the profession. The management model is totally exportable to other organizations, especially those in developing countries where procurement regulation is very complex, to gain consistency in procedures and raise transparency of the procurement rules.

PIANOo is in continuous development as an operations center focused on developing knowledge and building expertise. In this sense, it provides different services supported by information tools to engage actively with Dutch procurement professionals. The most important services are the following:

Table 4.3: Services Provided by PIANOo

Service	Content
Procurement expertise center	A contact point for legal, practical, and administrative questions from contracting authorities on procurement matters
Information services	An online library and a basic information service with fact sheets and FAQs provide immediate access to information on procurement matters
Supporting procurement partnerships	Small municipalities especially are encouraged to form partnerships with neighboring authorities to help build professional practice together. PIANOo assists the authorities to set up and develop such partnerships
Expert groups	Groups of experts from the network delve deeply into procurement issues and develop new and innovative approaches. Topics include procurement law, purchasing management, ICT procurements, and e-auctions
Training	From in-depth courses on the legal aspects of public procurement, an annual conference and regional meetings, to lunch-time discussion sessions on specific subjects
International matters	Exchange of experience with government procurement; PIANOo is a member of the EU Public Procurement Lab and actively engages in international debate on procurement issues.
Public Procurement of Innovation	Advice on appropriate instruments and access to national and international networks working on the promotion of innovation through procurement, including the Lead Market Initiative (the European policy for six important sectors of high economic and social value: eHealth, protective textiles, sustainable construction, recycling, bio-based products, and renewable energies)
Pilots on procurement innovation	Support through funding and advice for innovative pilot procurements. The experience of these pilots is shared with the network.
Sustainable Procurement	Practical instruments and guidance to help national, regional and local authorities to implement a Sustainable Procurement policy.

Source: CSES (2011).

[32] https://www.pianoo.nl/public-procurement-in-the-netherlands/about-pianoo

TenderNed, a tool related to PIANOo, is an announcement platform where all Dutch authorities are required to publish their national and European tenders[33] so that businesses can access all public publications from a single webpage. Through TenderNed, all parties can digitally manage all steps throughout the entire tender process. This is determined by the contracting authority.

Another tool, Innovatiemarkt,[34]provides a platform for strong partnership between government and the business community. It forms a virtual marketplace where government bodies can seek out companies capable of offering them innovative solutions. Parties work in partnership to create a healthy business climate in the Netherlands and strong international competitiveness, while at the same time tackling global challenges.

Finally, NEVI, the Dutch Association for Purchasing Management,[35] is the principal authority on matters concerning purchasing in the Netherlands. It has become one of the world's leading purchasing management organizations. NEVI works to professionalize the purchasing function in the interest of business, government, and society and is the norm for any professional organization that purchases. NEVI contributes by supporting procurement professionals in their development and professionalizing procurement (Stuijts, Waterman, and Schreijen, 2009).

Expectations of Future Developments

No major changes are expected in the Dutch PPI panorama. As noted in the study about the transposition of EU regulation on public procurement (Deloitte, 2014), the development of innovation-driven procurement has received significant attention in recent years, especially regarding sustainability within infrastructure and energy efficiency. Six procurement contracts are used as examples in a practical guide. The procedures applied in these six examples were: SBIR, European tender with advance technical dialogue, design contest, and launching customer. As mentioned before, according to PIANOo, innovation-driven procurement has been a particular issue when awarding Design, Build, Finance, and Manage contracts. Rijkswaterstaat under the Ministry of Infrastructure and the Environment is the role model within this field.

PIANOo is expecting to develop supporting tools based on this experience (specifically in cooperation with ProRail, responsible for the maintenance of the Dutch railway infrastructure). With the new procedural innovation partnership, there will be more possibilities to promote innovation in public procurement (Deloitte, 2014). The new procedure is expected to fill an important gap. With this procedure, it will become possible to develop alliances with private suppliers, which can be ended on short notice. As noted in the interviews, PIANOo would maintain an active role in public procurement services. Furthermore, PIANOo is expected to perform more projects as the main structure.

However, the new procedure is vaguely defined within the procurement directive. Therefore, it is expected that most contracting authorities will wait to apply the procedure until a couple of the large procuring authorities (perhaps Rijkswaterstaat) have had their first experience.

According to Izsak and Edler (2011), in the Netherlands, the various departments responsible for sectoral innovation policies, regulation, and public procurement impede the coordination of demand-side policies. The new Dutch Ministry of Economic Affairs, Agriculture and Innovation (EL&I), which plays a greater coordinating role in innovation policy, is a promising solution for the future.

[33] www.tenderned.nl
[34] www.innovatiemarkt.nl
[35] www.nevi.nl

Another example of alignment from the Netherlands is inter-ministerial coordination, such as in the case of the PCP scheme (Izsak and Edler, 2011). The Dutch Ministry of Economic Affairs took the initiative in launching a pilot SBIR program and in convincing other ministries that PCP was a relevant policy instrument. An interdepartmental group was established to facilitate and promote the uptake of SBIR. In 2007, the (temporary) inter-departmental knowledge and innovation (K&I) program department took over this role. AgNL, the innovation agency in the Netherlands, managed the SBIR program for all the ministries that have issued a call for tender under SBIR. Finally, there is no expectation of increasing budget PPI programs at least in an important percentage.

Evidence of Impact and Additional Challenges

Identified Effects

The European Research Area and Innovation Committee (ERAC) (ERAC, 2015) concluded the following: on December 18, 2008, the Lower House of the Dutch Parliament adopted a motion requesting the inclusion in the Budget of performance indicators for the government as launching customer and for innovation procurement. In response to this motion, the Minister of Economic Affairs extended the definition of procurement innovation. Where the focus was initially on finding a first buyer for an innovation (government as "launching customer"), starting in 2009 the focus was broadened to include the full procurement procedure, from strategy building to upscaling. Therefore, the indicator was formulated as "the number of innovation procurement tenders organized by the central government." A national government-wide indicator of innovation procurement was incorporated into the Ministry of Economic Affairs budget. Regarding design of the measurement of PPI in the Netherlands, following a pilot in 2010 concerning FY 2009, audits have been carried out since 2011 on the 2013 financial years. The purpose of the innovation procurement indicator is to encourage innovation procurement within government by measuring how much innovation procurement takes place. The TED database has been used to compile a sample of tenders that might be eligible for innovation procurement.

A written survey is conducted by the Monitor each year among the coordinating procurement directors at the various ministries (ERAC, 2015). This is supplemented by telephone surveys with stakeholders. Desk research is also carried out on tender documents to identify the extent to which the tenders concerned contain elements relating to innovation procurement. Fourteen elements in the procurement process have been identified as "enhancing innovation." Based on the scores on those 14 elements, tenders are identified as enhancing and allowing innovation.

Concerning the future of the measurement system, there is a market dialogue on improving the current measurement system. It is hoped that business side will be monitored and the whole PPI process will be covered, not just the tendering procedure. Since 2011, political pressure has been mounting to measure the 2.5 percent target on PPI (ERAC, 2015).

It is, however, very difficult to measure achievement of the 2.5 percent goal. On the one hand, it is difficult to get information on the budget spent on innovation, which is only available much later and may not be documented accurately. Information on the procurement process is available at an early stage. On the other hand, innovation procurement is much harder to define than PCP, because it encompasses a wide range of projects and procurement methods.

Regarding evaluations, several evaluations of the SBIR program show both strengths and weaknesses. The results of a first internal evaluation in May 2007 were positive. For the first six pilots, 88 companies (80 of them SMEs) sent in 97 proposals. After that, the program was subject to a first external evaluation in 2010, performed by the Technopolis Group

(Technopolis Group, 2010). The objective of the evaluation was to assess the functioning (design, implementation, and results) of the three SBIR variants and to make recommendations. The evaluation could not make an impact assessment or an analysis of the cost-effectiveness because it was conducted too early, the instrument did not have a sufficient track record, and the impacts were not yet clear. Therefore, the evaluation focused on input and process aspects.

The evaluation concluded that the three SBIR variants function well in general. Participating companies were satisfied with the design and implementation. The departments were satisfied with the implementation of their SBIR calls by Agency NL.[36] Expectations on results of participants in Phase 2 of SBIR were, nevertheless, good. The cost of implementation of the SBIR variants were not high and the departments were satisfied with the efficiency of program implementation by AgNL.

The external evaluation in 2010, performed by the Technopolis Group (Technolopolis Group, 2010), shows that SBIR provided innovation in solutions rapidly. The three Dutch SBIR variants are inspired by the various ways in which the U.S. SBIR is implemented by the various agencies in the United States. Each variant has its own specific intervention, logic, and position in the policy mix. Similarities between the SBIR variants include the phasing, which starts with a short feasibility study, followed by—in case of a positive result—an R&D phase and, finally, a commercialization phase. In all three variants, participants receive funding for the first two phases only. The levels of funding per phase are in the same order of magnitude. A noteworthy difference is that the departmental SBIR and the TNO-SBIR award contracts to companies, while the STW Valorization Grant awards grants.

Regarding companies' performance in the functioning of the departmental SBIR, the evaluation results prove that the program is an appropriate instrument for SMEs, because of AgNL methods, the possibilities for all SMEs to participate, and the reduction of administrative burdens. Companies are also eager to contribute to solving the social challenges that have been put forward in the SBIR calls.

The evaluation also showed that companies perceive SBIR as a way to accelerate the time-to-market for the results and to mobilize funding for the initial phases of an innovation trajectory. Without SBIR, the innovation trajectory would not have been started, or would have been delayed or postponed. Companies recognize the contract (rather than a subsidy) with 100 percent funding for Phases 1 and 2 as a key success factor of SBIR. Thus, the SBIR project becomes a job for a client (with an obligation to deliver results) and the firm gives it a higher priority. Winning an R&D contract from the government also helps companies to position themselves vis-à-vis (potential) partners, clients, investors, and the government (as commercial procurer).

On the demand side, the departments that have initiated SBIR calls consider SBIR a well-functioning instrument and are very satisfied with the implementation and support they receive from AgNL. SBIR is a flexible program that can be tailored to the specific needs of departments. As an exceptional case, the Department of Defense (DoD) implements the SBIR pilot itself. Based on their experience with one SBIR pilot, DoD believes that the design of SBIR does not fit well with their normal procurement practices. This is especially true because a new procurement procedure is required if DoD wants to buy the product that is developed in the SBIR project, which DoD considers an obstructing factor.

Some departments have taken up SBIR quickly and used it intensively, which others have not. Some departments are not familiar with the precise functioning of the instrument and have not worked directly with SMEs. Another reason for the slow start of SBIR was that its

[36] AgNL, formerly SenterNovem.

use depended on the efforts of individual professionals in the Interdepartmental Working Group SBIR. SBIR was not systematically connected with the strategic policy agendas of the departments. The key to achieve a solution on this was the linkage to the Social Innovation Agendas. The final important conclusion was that SBIR was known as an instrument that can help departments to find new solutions to realize policy purposes and less as a tool of the innovation policy mix of the Ministry of Economic Affairs.

According to internal evaluation (AgNL, 2012) conducted in October 2012 in 48 SBIR, 94 percent of the respondents indicated that SBIR had a positive contribution on the turnover, 94 percent of them indicated that SBIR made it possible to bring new or significantly improved products and services to the market, and 60 percent mentioned an increase in the number of jobs.

There are several examples of contracts that are considered a success, and the government is working on a change in SBIR with the help of a pilot program that will likely be completed in 2016. The change is that companies cannot appeal the decision about not to continue. This has been a problem when the company has not gone through Phase 2. Complaints are handled internally rather than in court.

Concluding Remarks

The Netherlands is a pioneer country in PPI. Moreover, this policy agenda has become more prominent in recent years.

Main Trends, Role of PPI in Different Countries, and State of Play

A new approach, adopted in 2009, included all the tools for increasing innovations via procurement. The approach also emphasizes that public procurement of innovation is a demand-side instrument driven by the wishes of the contracting public sector organizations.

One of the government's stated objectives is to spend 2.5, or €1.5 billion, percent of the total procurement budget of approximately €60 billion on the procurement of innovation. However, according to interviews conducted, it has not achieved that target.

Main Obstacles and Challenges

The Netherlands has confronted some problems in carrying out PPI approaches. These include the lack of technical knowledge of PPI and insufficient training of civil servants who are dedicated to those processes.

Another issue is related to procurement of more radical innovations. It may involve change of the organization or technical regulations, as innovations cannot be viewed in the same way as mature products. The parties involved must know that during the process they may encounter changes in rules and regulations.

Finally, prior to implementation, it is important to link demand-based instruments to supply-based funding schemes, linking innovation schemes between organizations if the implementation of the instrument affects the whole spectrum of organizations.

Examples of Good Practices

Key elements are recognized internationally as a fast track to boost the procurement of innovation, not only on the demand side, but also for the developers of solutions in the whole process. PIANOo is a world-renowned best practice in this regard.

The Dutch experience has yielded several good practices in PPI:

- There must be permanent political and institutional support for the development of the practice of PPI.
- The involvement of contracting entities in the process of implementation of PPI, and their awareness of the complexities of this process, are key.
- Efficient networking with public practitioners who have expert-level knowledge in the early implementation of a PPI policy or instrument is necessary.
- PPI programs must start with extra funding to support operational needs at the first stage of the program. It would support procurer entities and personnel, as well as providers in the whole process, to guarantee participation of experts in the initial stage.
- The lead customer should take an active interest in new solutions to solve immediate or long-term problems, taking the initiative or playing an important role in the customization of innovations.
- An organization that provides support services for PPI structuring is fundamental to expedite the process. PPI procurers also need to get involved in PPI processes if there is no entity such as PIANOo, because economic incentives are insufficient.

In the Netherlands, SBIR schemes not only provide funding but also brokerage and coaching. They have simple procedures that reduce administrative burdens, they increase networking between organizations involved through well-oriented processes, and they are the reference instrument in the Dutch innovation system. Inkoop Innovatie Urgent is a good example of a problem-oriented or demand-driven innovation policy.

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5. SPAIN

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Spain Overview

- Spain is a decentralized country with 17 autonomous regions and two autonomous cities, with a total population of 46.4 million, located in the southwestern corner of the European continent. Along with Portugal and Andorra, it makes up the Iberian Peninsula.
- The economy of Spain is the 13th largest in Europe, with a high relative weight of the services sector (65 percent) (World Bank, 2014). Until 2008, it was regarded as one of the most dynamic economies in the European Union (EU), attracting significant amounts of foreign investment.
- Trade plays an important role in the Spanish economy, accounting for more than half of its GDP. Its major trading partners are Germany, France, Portugal, and Italy.
- The World Economic Forum (WEF) Global Competitiveness Report for 2011-2012 ranked Spain 36th out of 142 countries. Spain's competitiveness performance continues to be boosted by the large market available to its national companies, strong technological adoption and first-class infrastructure. However, macroeconomic stability has weakened in recent years.
- In recent years, economic indicators show the beginning of recovery. The World Bank reports that Spanish economic growth in 2014 was 1.4 percent while the inflation rate remained at -0.1 percent for the same year (World Bank, 2014).

Institutional Network and Governance

According to the World Bank (2013), Spain scored 1.15 on the *2013 Assessment of Government Effectiveness*. This places it above the EU average of 1.14 and in 15th place compared to other EU countries in the same year. In terms of compliance with the rule of law (Rule of Law Index), Spain obtains a lower score that the EU average by 0.14 points, ranking 17th in the region with 1.14 points. Additionally, the negative perception of citizens of regulatory quality (Regulatory Quality IndeBos) in 2013 ranked Spain in 18th place, below the EU average by 0.24 points. These indicators show the negative assessment of the institutional functioning of public administration in Spain (World Bank, 2013).

With respect to citizens' perception of the government's ability to control corruption, World Bank data (World Bank, 2013) shows that Spain, at 0.81 points, scores below the EU average of 0.98 points and remains behind countries such as Portugal and Malta. Nevertheless, the score for political risk (understood as the perception of the likelihood that the government will be destabilized by unconstitutional means) has improved in recent years, reaching a value of 0.6, which hovers around the EU average (Stoychev, 2013).

Economic Performance

World Bank data (World Bank, 2013) show that Spain has had an average gross domestic product (GDP) growth rate of about -6 percent in the period 2008–2012. In the last decade, however, the total national GDP growth was 54 percent. Today, Spain is ranked 13th in the EU in terms of per capita income (at US$29,863). The largest component of Spanish GDP is the services sector, with an approximate weight of 65 percent in recent years (National Statistics Institute, 2015). According to the International Monetary Fund (IMF, 2015), the economic growth outlook for Spain in 2016 is 1.79 percent, having improved from the year

2013 by 3 percentage points. However, this growth is lower than the 2016 EU average of 2.25 percent.

The country's productivity can be measured by the index of multifactor productivity (MFP) produced by the Organisation for Economic Co-operation and Development (OECD). An increase in the MFP of a country means that the overall efficiency in the production process grows, that is, the country generates as much of a particular good for the same amount of input, or equivalently, that the country needs fewer inputs to generate the same amount of output (Crafts, 2008). According to *The Compendium of Productivity Indicators 2015* (OECD, 2015a), in recent years, Spain has experienced a growth in its MFP of up to 0.20 percent per year until 2011. This puts it in 9th place among OECD countries in 2011 (OECD, 2015b).

With respect to the technological balance of payments, in 2011 Spain was not among the top 15 OECD countries exporting high-tech products. It ranked 11th among OECD countries in terms of importing high-tech (OECD, 2015b), which revealed the country's strong dependence on external technology.

Further, Spain has reduced its position in the ranking of patents (WIPO, 2015), falling from 15th place in 2003 to 19th in 2015. The latest report of Cotec Foundation (Cotec, 2015) indicates that international patent applications fell in the period 2010–2013 by an average of 1.3 percent annually. In contrast, European patent applications of Spanish origin grew on average 1.6 percent annually over the same period and fell by 2.7 percent in 2013. These figures contrast with the period 2000–2010, when the average annual growth rate of Patent Cooperation Treaty (PCT) applications was 10.6 percent and that of European patent applications of Spanish origin, 12.6 percent.

As shown in Table 5.1, Spain is far behind neighboring countries in terms of the number of patent applied for.

Table 5.1: Patent Applications (residents and foreigners) (1999–2013)

	SPAIN		BELGIUM		GERMANY		FRANCE		UNITED KINGDOM	
	Patent applications	Per thousand people	Patent applications	Per thousand people	Patent applications	Per thousand people	Patent applications	Per thousand people	Patent applications	Per thousand people
Total Patent applications	123,412	**2.65**	137,184	**12.25**	2,343,142	**29.06**	839,005	**12.71**	723,788	**11.29**

Source: WIPO (2015).

As for the adequacy of the system to create and develop new businesses, one of the main reasons given by Spain for fostering innovation and private investment in R&D is the tax incentives scheme contemplated in the tax regulatory framework. It provides tax incentives to companies investing in research and development (R&D). This is corroborated by the World Bank's Ease of Doing Business Indicator (World Bank, 2014) on taxation. Spain's score was 32 in 2013 and 33 in 2014, relatively close to the EU average of 35.5 and 35.9, respectively.

In terms of Spanish scientific production, public R&D (which has traditionally been the main source of Spanish scientific publications) maintains its activity despite the budgetary constraints experienced in recent years (Cotec, 2015). Nevertheless, the growth in the number of Spanish publications in 2013 was well below the annual average of the years before the crisis, which was 10.3 percent. From 1996 to 2013, Spain ranked 10th in the global ranking of scientific output produced by SCImago with data from Scopus. The largest

field of research activity is medicine and its derivatives. Scientific production indicators have placed Spain as a world leader (ranking 9th) in the generation of knowledge in medicine, biochemistry, and immunology, among others (SCImago, 2013).

Key Features of the Innovation System

The innovation system in Spain is organized based on the rules and policies defined in European, national, and regional frameworks. There are laws and policy instruments for the promotion of science, technology and innovation (STI), as well as support for public procurement of innovation and pre-commercial procurement (PPI-PCP), at all three levels. The EU, as a political community of 28 Member States, approves regulations and directives related to issues of STI. This regulation is then transposed in Member States' national legislation (OECD, 2011).

Embedded in the Cohesion Policy of the EU, regional innovation policies have played a key role in Spanish STI, both in the definition of smart specialization strategies (RIS3) of autonomous regions and in the operational programs of the latter, which make intensive use of the European Regional Development Fund (ERDF). In fact, the PPI-PCP initiatives carried out by public institutions are based on the current period's ERDF R&D.

Along these lines, the Spanish government legislates on the management of STI and sets strategies to achieve the common objectives of the EU and Spain. Currently, Spain has the National Strategy for Science, Technology and Innovation 2013–2020 (MINECO, 2013). This document describes the great challenges faced by the country in terms of research and innovation as well as the priorities that have been set for action and which cover the whole process of development and application of scientific and technological research, from idea to market.

The General State Administration (AGE), specifically the Ministry of Economy and Competitiveness (specifically the State Secretary for STI, known as SEIDI) and the Ministry of Industry, Energy and Tourism (MINETUR), are the most important public entities in setting relevant instruments to support innovation and PPI-PCP.

The SEIDI belongs and reports to the Ministry of Economy and Competitiveness (known in Spanish as MINECO) and is responsible for policy making in the areas of scientific and technical research, development and innovation. It also manages international relations in this area and represents the Spanish government in several programs, forums, and international organizations and the EU, which fall under its expertise. Indeed, it has inherited the powers and duties of the Ministry of Science and Innovation (MICINN, in its Spanish acronym), which was operational between 2008 and 2011.

The Ministry of Education, Culture and Sports, through the Secretary-General for Universities, has responsibility for promoting cooperation in the field of scientific research, development, and technological innovation among universities and between these and other public and private organizations' research and innovation.

In addition to the ministries and institutions responsible for structuring the national innovation system, Spain has several public entities that provide support and tools to foster national STI. They include the following:

- The Center for Technological and Industrial Development (CDTI) is a public corporation that falls under the Ministry of Economy and Competitiveness. It promotes innovation and technological development of Spanish companies and has specific tools to support PPI-PCP.
- The Spanish National Research Council (CSIC) is the largest public research body in Spain and the third largest in Europe. Under the Ministry of Economy and Competitiveness, and part of SEIDI, its main objective is to develop and promote research to benefit scientific and technological progress. For this purpose, it is open to collaboration with both Spanish and foreign authorities.

- The Carlos III Health Institute is the main public research body that finances, manages, and runs biomedical research in Spain. It is organically attached to the Ministry of Economy and Competitiveness (by Royal Decree 345/2012) and functionally attached the Ministry of Health, Social Services and Equality (Royal Decree 200/2012). Its main mission is to promote the generation of new scientific knowledge in the health sciences and innovation in health care and disease prevention.
- The National Innovation Company, S.A. (ENISA), is a state-owned enterprise that falls under the Ministry of Industry, Energy and Tourism, and particularly to the Directorate-General of Industry and Small and Medium-sized Enterprises. Since 1982, it has been actively involved in financing viable and innovative business projects.

Finally, the Autonomous Communities are administrative territorial entities with legislative autonomy (by policy areas) and with certain executive and administrative powers.

Public Procurement Overview and Legislative Context

General Procurement Indicators

The size of public procurement in Spain is close to the European average. Public tenders in Spain, including local, regional, and state administrations, account for 14 percent of GDP, thus ranking in 6th place compared to the other European countries in 2011 (World Bank, 2013).

Organizational Structure

The organizational structure of the public sector in Spain is decentralized due to the devolution of political power from the national government to the Autonomous Communities (in varying degrees according to the area), as is explained in the OECD report “Government at a Glance 2015.” The authors show how since 2007 Spain has increased its relative central government share of expenditure vis-à-vis expenditure by the Autonomous Communities and local governments. In 2013, Spain was one of the top OECD countries in terms of decentralization, as the Autonomous Communities and local government expenditures are greater than those of the central government (OECD, 2015).

In fact, the OECD ranks Spain in a category called "Regional Countries" for its highly decentralized political structure: "Spain is constitutionally a non-federal country with a highly decentralized political structure" (OECD, 2014).

Spain has no central public procurement agencies as such, but does have a centralized trading platform (the Central State Procurement Platform) where all contracts tendered by public administrations in the country are advertised. In terms of PPI-PCP, all public institutions with legal personality and that are bonded to the Public Service Contracting Law (LCSP, for its initials in Spanish) have the capacity to develop and buy innovation through public tenders. This means that in Spain the PPI-PCP contracts can be launched from any public institution that procures goods and services.

Legal Framework

All PPI-PPC bids are framed within the LCSP (Law 30/2007 of October 30, 2011 consolidated text), which has evolved and been adapted to the public procurement needs of Spain. The central government has encouraged the development of PPI-PCP in Spain in recent years through the following regulatory framework:

- Law 13/1986, of April 14 for the Promotion and General Coordination of Scientific and Technical Research. The first Spanish law to regulate the procedures for R&D in Spain, it did not directly refer to any type of PPI-PCP.
- Law 30/2007 of October 30 on Public Sector Contracts. While in force, it regulated public sector contracting and for the first time established the framework for action for the initial signs of innovation caused by public demand. While it did not address PPI-PCP per se, it does include R&D contracts as an innovative solution where risks and benefits are shared with the public sector (pre-commercial public procurement) (MINHAP, 2007).
- Legislative Royal Decree 3/2011 of November 14 is the approved and revised text of the Law on Public Sector Contracts. In its adaptation of European Directive 2004/18/EC, the reform of the law excluded certain administrative rigidities from R&D contracts. It also made room within the contracts for public–private partnerships and competitive dialogue procedures for the development of innovative products, recognizing them as the subject of such contracts.
- Law 2/2011 of March 4 on Sustainable Economy. This law established that each ministry department and each public department should make a budgetary reserve for financing public procurement of innovation contracts and reserve an amount for "innovative small and medium enterprises."
- Law 14/2011 of June 1, on Science, Technology and Innovation. This law requires ministries to set aside a fixed percentage of ministerial budgets to be contracted through PPI-PCP and obligates the government to publish a plan for PPI-PCP.
- Cabinet Agreements (2010 and 2011). Among these agreements was the goal of reaching a PPI-PCP expenditure of 3 percent of public investment by 2013 (Technopolis, 2011).
- Preliminary Draft Law on Public-Sector Contracts of April 17, 2015. This reform, currently under development, follows the transposition of European Directive 2014/24/EU, which includes the new procurement procedure, European Innovation Partnership. This partnership allows the successful company of a PCP (competitive) phase to obtain a direct (non-competitive) PPI contract for the acquisition of products or services that were developed in the PCP, without violating laws on transparency or loyal competition. According to the latest version of the Draft Law on Public Sector Contracts, the European Innovation Partnership is defined as "a collaboration agreement between the contracting authority and one or more employers, which aims at the realization of research and development activities in the fields of infrastructure, services and innovative products and their subsequent acquisition, provided they correspond to the highest levels of performance and cost agreed, whenever the solutions available on the market do not meet the needs of the contracting authority. The use of this procedure cannot be used to impede, restrict or distort competition" (MINHAP, 2015b).

In addition to that legislation, there have been other initiatives carried out by the government that favor the development of PPI-PCP:

- On July 2, 2010, the Cabinet approved an agreement in which the National Strategy on Innovation (E2i) was ratified. This strategy is also meant to foster PPI-PCP (Technopolis, 2011).
- In June 2014, the government launched Royal Decree 475/2014 for Innovative SMEs. It is anticipated that companies benefiting from this register will be able to participate in restricted tenders, since certain PPI-PCP contests are intended solely for the Innovative SME segment that is registered.

PPI Capabilities and Rationales

Rationales and Evolution in the Policy Agenda

PPI-PCP was introduced in Spain only recently compared to other European countries, such as the Netherlands and the United Kingdom. The turning point occurred between 2008 and 2011, coinciding with the creation of the Ministry of Science and Innovation (MICINN) that set out this issue for the first time in the Spanish national policy agenda (The Lower House, 2008). Other important precedents include the COINCIDENTE program, launched by the Spanish Ministry of Defense (MINDEF, 2011), which, without explicitly addressing PPI-PCP elements, de facto performed PPI-PCP. There are also reports by the Cotec Foundation (Cotec, 1998; 2004; 2007; 2015), an influential think tank that is largely responsible for the PPI-PCP, that it would be led by the MICINN. To this it is important to add the stimulus given to Spanish PPI-PCP by the European Union in the first half of the 2000s, especially in 2007, with the transposition of European Directives 2004/17/EC1 and 2004/18/EC2 to the Law on Public Sector Contracts 2007, which for the very first time opened a legal window to the PPI-PCP.

MICINN's leadership in this matter was embodied in a large battery of laws, regulations, and support tools (see Box 1) that generated the framework and incentives (starting in 2011) for the first PPI-PCP projects in Spain in infrastructure. This launch phase has been followed by one of consolidation under the new leadership of the Ministry.

The intelligent use of specific R&D funds from 2007–2013 ERDF gave rise to the INNOCOMPRA program (later renamed Fomento de Innovación desde la Demanda, or FID), which offers incentives to local and regional authorities to finance large PPI-PCP exercises. In many cases, it incorporated both PPI-PCP and Public Purchase of Innovative Technology (Compra pública de Tecnología Innovadora, or CPTI) packages. This strategy has spread the culture of demand-side innovation policies and has contributed to the development of capabilities in a growing number of regional governments and municipalities. In parallel, from the national innovation agency, CDTI, the INNODEMANDA program was launched as particular incentive for companies involved in PPI-PCP tenders. Both incentives, accompanied by a helpdesk system sponsored by MINECO and CDTI, have reinforced this emerging policy. In addition, some business associations have played a proactive role in spreading the culture of the PPI-PCP through practical guides (FENIN; SILO, 2015) and have even prepared early-demand maps that inspired large PPI-PCP projects (ASEBIO, 2013; 2014).[37]

[37] While almost all PCP initiatives in Spain have received these economic incentives, from MINECO-CDTI to the European Commission (aid included in FP7 and Horizon 2020), incipient efforts of some local governments have launched initiatives without central government or EU co-financing. The Madrid City Council, for example, has reserved € 7 million of its own 2016 budget to launch PPI-PCP projects. This is a first step that will allow the city to consolidate its own PPI-PCP policy starting in 2017.

Box 5.1: Chronological Summary

- **June 1998** - Cotec - Public Procurement and Innovation. First Publication (Cotec, Molero, and Marin, 1998) from the Cotec Foundation that shows the first signs of how public procurement can pull innovation and the importance of the administrative and political environment in supporting Spanish PPI-PCP.
- **June 2007** - Cotec Report 2007 (Cotec, 2007): It contains PPI information and explains its structure and the way it operates.
- **June 2007** - Public Sector Contracts Act 2007, following the adaptation of European Directive 2004/17/EC1 and 2004/18/EC2, which include the possibility of new ways of purchasing and permits technical dialogue in the preparation of the technical specifications in tenders. Currently this adaptation is in Royal Legislative Decree 3/2011 of November 14 - Consolidated Public Sector Contracts Act (TRLCSP).
- **June 2008** - The Minister of Science and Innovation, in her speech at the start of the term, commits herself to push PPI-PCP in Spain: "We will seek ways to encourage innovation through public procurement of technology, following the good practices identified by the European Commission." (The Lower House, 2008).
- **July 2010** - State Strategy for Innovation E2i: It establishes PPI-PCP as one of the main areas of action from the public demand side: "Support to public procurement of innovation managed by the MICINN, with support from all the ministries." (MICINN, 2010).
- **October 2010** – Promotion of PPI-PCP in the General State Administration within the State Strategy of Innovation, acting on the demand side (review of regulatory framework to include PPI-PCP and analyze targets of application—modernization of the administration system, green economy, health, tourism, and defense) and the supply side (study of financial instruments, pilots, fast-track window.)
- **March 2011** - Law 2/2011 of March 4, Sustainable Economy, states that each ministry and each public department should reserve part of its budget for financing PPI contracts, reserving a specific amount for "innovative small and medium enterprises." (Art. 38)
- **June 2011** - Law 14/2011, of June 1, of Science, Technology and Innovation (LCTI) sets PPI-PCP as a priority of the State Plan for Innovation: "Public procurement of innovation will be promoted to align the supply of technology with public demand."
- **July 2011** - Agreement by the Council of Ministers which determines the PPI-PCP process. It calls for: i) a target of 3 percent of central government budget in new investment exclusively dedicated to PPI-PCP,[38] ii) publication of the Guide on Public Procurement of Innovation, and iii) implementation of a financing instrument to support technological supply that is in processes of PPI-PCP.
- **July 2011** - Help desk PPI-PCP in MINECO-CDTI is structured in CDTI, in the Global Innovative Markets department, focused on the orientation of buyer entities and the promotion of PPI-PCP policies.
- **July 2011** - Two PPI-PCP financing programs are launched: INNODEMANDA: Financial support instrument that funds R&D done by enterprises with public PCP contracts. Managed by CDTI; and INNOCOMPRA: Financial support instrument of PPI-PCP actions done by Autonomous Communities using Technology Fund from ERDF.
- **November 2011** – The Public Procurement of Innovation Guide is released to support and provide guidance to contracting authorities who want to do PPI-PCP (MINECO, 2011).
- **October 2013** - Public Procurement of Innovation Manual (Cueto and Garrido, 2013) is published by the National Institute of Public Administration with a focus on public officials.
- **November 2013** - Spanish Strategy for Science, Technology and Innovation 2013–2020 describes PPI-PCP as instruments for achieving strategic objectives (MINECO, 2013).
- **November 2013** - State Plan for Research, Development and Innovation 2013–2016 is released and PPI-PCP is exposed in a specific program of R&D, and has specific measures to support PPI-PCP (MINECO, 2013).
- **April 2015** - Draft Public Sector Contracts Act - April 17: This reform regulates the new procurement procedure "Innovation Partnership" and is expected to take effect in 2016.
- **January 2016** - Draft Public Procurement of Innovation Guide 2.0 is published to support and provide guidance to contracting authorities. It includes recent updates and modifications in national and European law around PPI-PCP, and the lessons learned in PPI-PCP since launching the first Guide (MINECO, 2016).

Key Policy Developments in PPI

To develop PPI-PCP in Spain, it was necessary to encourage both buyers and sellers to participate in these processes. Therefore, from the General State Administration several

[38] If this objective had been accomplished, it would have represented in 2011 nearly €3.9 million destined to PPI tenders.

instruments were designed and implemented to support PPI-PCP. These are described in more detail in Table 5.2 below:

Table 5.2: Classification of Deficiencies and Implemented Instruments

Policy Category	Deficiencies addressed	Instrument types	Implemented Instruments
Framework conditions	I. Predominant value of economic criteria in tender procedures II. Requirements for public tenders unfavorable to SMEs	1. Introduction of procedures 2. Simplification and easier access for tender procedures	▪ LCSP 2007 – TRLCSP 2011 Functional specification included in tenders, negotiated procedure, contracting margin, etc. ▪ Law 14/2011 – LCTI ▪ TRLCSP (2017) – Partnership for Innovation ▪ Official register of bidders and classified state companies (reduction of red tape in public tenders).
Organization and capabilities	I. Insufficient technical knowledge of PPI-PCP in buying institutions II. Procurers lack skills in innovation-friendly procedures	I. Publication of success cases of PPI-PCP II. Demand aggregation	▪ Help desk PPI-PCP MINECO-CDTI ▪ PPI-PCP Guide ▪ Training and publications from the National Institute of Public Administration ▪ INNPULSO: Network for Science and Innovation Cities
Identification, specification, and signaling of needs	I. Lack of communication between demand side and supply side II. Procurers lack skills to identify needs in innovation-friendly procedures	I. New contracting models II. Training of procurers III. Diffusion of PPI-PCP	▪ INNPULSO: Network for Science and Innovation Cities ▪ National Awards for Innovation and design- PPI-PCP category ▪ PPI label in the State Procurement Platform ▪ Business associations that engage PPI-PCP
Incentivizing innovative solutions	I. Insufficient expenditure and articulation of innovative solutions II. Excessive weight given to previous experiences, which inhibits innovative young companies	I. Financial instruments II. Tax incentives	▪ Funding instruments: INNOCOMPRA/FID INNODEMANDA ▪ Contracting margin for innovative SMEs

Source: Georghiou et al. (2014).

Nonfinancial Instruments to Support PPI-PCP

PPI-PCP Help Desk

The unit responsible for promoting MINECO's General Directorate for Innovation supports a PPI-PCP portal that provides de facto support services to other public agencies, thus functioning as a help desk for public entities that are eligible to engage in PPI-PCP. This portal is a one-stop shop for private enterprises that are engaged in PPI-PCP, supported by CDTI, which gives these companies preferential access to certain R&D grants and other complementary PPI-PCP programs. The coordination between the two units has had a positive effect on the quality of service. Moreover, the existence of this help desk has led to systematization of procedures and the creation of an information repository, simultaneously increasing the availability of advice and information services to public entities. In summary, the main objectives of PPI-PCP help desk are the following:

- Contribute to the identification of opportunities for PPI-PCP
- Provide technical assistance in R&D for the contracting authorities
- Encourage PPI and PCP contracting

The fact that the entities in charge of this area—MINECO's General Directorate for Innovation and CDTI—are the same ones responsible for the management of economic incentives (and in general for the support of Spanish entities' participation in Horizon 2020 calls for PPI-PCP), provides additional alignment in terms of access to services and financing.

PPI-PCP Guide

The *PPI-PCP Guide* (MINECO, 2011) was presented to the Council of Ministers in 2011 and published in 2013. It is a document under permanent review, meant to provide orientation for public procurement professionals. An updated guide is being developed to familiarize buyers with the changes that have taken place in the field of PPI-PCP in recent years (Garrido, 2015). Some Spanish regional administrations, such as the government of Catalonia, have followed a similar path and have edited practical guides (GENCAT, 2012).

Training and Publications from the National Institute of Public Administration

The National Institute of Public Administration (INAP), which falls under the Ministry of Finance and Public Administration, is responsible for training civil servants. Since 2013, INAP has been organizing courses and seminars on PPI-PCP in collaboration with MINECO and has published a monograph of PPI-PCP intended for public managers (Cueto and Garrido, 2013).

INNPULSO: Network for Science and Innovation Cities

The INNPULSO network was created by the Council of Ministers on October 8, 2010, to promote local innovation. It consists of municipalities that conform to certain criteria in terms of science and innovation, according to MINECO (SILO, 2015). Its objective is to recognize and promote innovative activities of selected regional governments, encourage collaboration between the municipalities of the network, improve their innovative potential, and serve as a model of good practice for other municipalities. One of the permanent working groups in the network is the PPI-PCP group (MINECO, 2015c). To encourage cities to become part of this network, cities developing PPI-PCP activities have preferential access to MINECO calls. In an alignment of the help desk with the INNPULSO Network, MINECO has articulated a system by which a university entity that has expertise in the field of PPI-PCP (Procurement Observatory of the University of Zaragoza) offers basic advice on PPI-PCP members to the local authorities that belong to the network.

National Innovation and Design Awards—PPI-PCP Category

The National Innovation and Design Awards are high awards given each year in Spain, since 2009, in recognition of companies and professionals who have excelled in their careers. Some of them are granted in the field of design and others in innovation.

In 2011, the category of innovative public procurement was established. This new award recognizes innovation as essential to increase competitiveness and economic performance as well as to improve the quality of life of the citizens. The Innovation Awards are divided into three categories:

- National Innovation Award, modality "Innovative Path"
- National Innovation Award, modality "Innovative Public Procurement"
- National Innovation Award, modality "Internationalization"

In addition, Spain was included among the candidates for the PPI-PCP award, issued by the European Commission since 2014. In the 2015 competition, the Spanish Galician Health Service (SERGAS) won second place behind the Federal Procurement Agency of Austria

and ranked higher than institutions in countries such as the Netherlands, Italy, and Denmark, among others.

Business Associations that Engage in PPI-PCP

Although they have not imposed it, governments have relied on sectoral business associations to have a major role in promoting the PPI-PCP (Barrero, 2015). Business associations and government networks such as the INNPULSO network, which comprises innovative local councils, play a key role in promoting this instrument, which opens a high-tech market to their companies (SILO and PONS, 2014).

Contracting Margin for Innovative SMEs

Small and medium-sized enterprises (SMEs) make up 99.8 percent of Spain's businesses (National Statistics Institute, 2015). One of the measures taken to encourage SMEs to innovate is Royal Decree 475/201413 of June 2014 on Innovative SMEs. The objective of this decree was to formalize a series of requirements so that companies that met them would have access to certain fiscal and financial benefits while having preferential access to public tenders that incorporate innovation. These requires are set forth in the following:

- Tax Benefit (Royal Decree 475/2014)
- Financial Incentives (Bernay Blay, 2014)(Bernay Blay, 2014)
- Restricted contests: This sub-measure is still under development. The objective pursued is to create a business segment with enough critical mass of innovative SMEs to compete in public tenders of PPI-PCP. Thus, when a sufficient number of innovative SMEs registered are reached, they may restrict certain PPI-PCP competitions to that business segment (Garrido, 2015)

Box 5.2: Leadership in the Generation of PPI Capabilities: Galician Health Service

The use of PPI-PCP by the Galician Health Service (SERGAS) is one of the most outstanding Spanish cases in this field (Cueto and Garrido, 2013). SERGAS received second prize, second only to the Federal Procurement Agency Austria, in the 2015 Procurement of Innovation Awards held in Paris (Procurement of Innovation Platform (EU), 2015).

To modernize and improve the quality and safety of the standard health model used in Galicia, SERGAS pitched two health innovation plans in 2011: Hospital 2050 (H2050) Plan, which focuses on innovation in the hospital environment, and the InnovaSaúde (IS) Plan, focusing on innovation in healthcare services (EC-DC REGIO, 2013). Four common objectives of both plans are: i) Establish a model of open innovation that connect different actors in the health sector; ii) Systematically find innovative solutions to meet the current and future challenges and needs of the system; iii) Develop new business models to exploit innovative products and services; and iv) Establish a new relationship that creates agile and enduring synergies between the different actors of the healthcare ecosystem (EC JRC, 2015).

Specifically, the H2050 plan includes nine projects, among which are the management of hospital emergencies and energy efficiency. The result of H2050 is the real-scale demonstration of the facilities for the "hospital of the future" in the new hospital complex in Ourense. The IS Plan is based on a medical model focused on chronically ill patients requiring continuous care. The assistance services are based on delocalized IS tools (remote, tele-monitoring, web 2.0 portals for patients, etc.) to help prevent acute episodes. Thus, the need for hospitalization-based services is reduced while communication and accessibility for patients is increased. The IS Plan consists of 14 projects to realize innovative solutions for current and future healthcare needs.

Both plans, funded with FEDER 2007–2013, contemplate the use of PPI-PCP as a means of channeling public funds to business innovation with the dual purpose of improving health services and generating new goods and services in the business sector with international projection.

For the implementation of the project management office, SERGAS has involved experts from the healthcare management areas. This office has used analysis techniques on internal processes to improve formulation of the needs in each of the projects.

Before contracting solutions for each of the projects, in April 2012, SERGAS launched an open consultation on proposals for innovative solutions aimed at seeking alternatives and innovations through wider consultation of the market. The market response was extensive, generating a significant volume of proposals requiring an internal process of analysis and reformulation. Such proposals, together with those that had been established internally by the organization, are the basis for the procurement of innovative solutions in each of the projects.

Additionally, before releasing the bids there was an early-demand mapping to publicize the suppliers' bidding for innovative solutions that would then materialize (throughout 2013 and 2014). This technique has allowed companies to train potential bidders in areas such as preparing joint proposals while helping innovation funding agencies in properly synchronize their financing.

Funding Instruments to Support PPI-PCP

One of the main functions of several PPI-PCP instruments should be adequate management of the risks of innovation processes. Such management should first try to protect the continuity in service delivery and accountability of the public purchaser and, second, to mitigate the risks assumed by the companies that are attempting to develop this innovation. The latter is the usual function of the tools to promote innovation from the supply side (Cueto and Garrido, 2013). From the demand side, the AGE, through MINECO and CDTI, offers buyers and sellers of innovative technological solutions two mechanisms to stimulate the use of PPI-PCP despite the risk to both that it entails. These complementary mechanisms are INNOCOMPRA/FID (promoting innovation from demand), a financing instrument that supports the public buyer of innovative technology, and INNODEMANDA, also a financing instrument, which supports the selling entity of the innovative technology.

INNOCOMPRA/FID:

In September 2011, the Ministry of Economy and Competitiveness released INNOCOMPRA to support public bodies in the Autonomous Communities (all of those with "power to bid and award" for purposes of the Law on Public Sector) in developing projects that are innovative, and eligible for state aid, so that they could generate PPI-

PCP contracts. INNOCOMPRA was funded through one of the ERDF Operational Programs for R&D, the Technology Fund 2007–2013, which was designed to benefit businesses. INNOCOMPRA was then renamed Promotion of Innovation from the Demand Side (FID).

FID has a budget of approximately €300 million for the period 2014–2020 (funded by ERDF for the same period). Given the co-funding required by the European Commission, the total budget available is approximately €400 million, at least 70 percent of which should be used for PPI-PCP tenders. This alignment of funds is reflected, in the absence of greater detail,[39] through the operational programs of the Autonomous Communities. These programs contain the funds that each community assigns to different thematic objectives set by the EU. Innovative public procurement is included in thematic objective 1, Strengthening research, technological development and innovation, which is meant to be financed with funds from the ERDF. FID funds can be used to finance between 50 and 85 percent of projects in the form of grants (this percentage depends on the geographical location of the procuring entity), while the rest is provided by the procuring entity.

INNODEMANDA

INNODEMANDA is a mechanism that synchronizes financial instruments to support business R&D (supply side) with government procurement (demand side) (Technopolis, 2011). It uses existing financial instruments offered by CDTI, which is the managing agency, according to the fast-track procedure created for this purpose that sets an average evaluation period of six weeks. The mechanism's coverage extends to the public sector in general. The financing of R&D activities reaches not only the winner but all bidders, regardless of whether they are awarded the contract. The aid is in turn subject to the favorable and independent evaluation of CDTI. Thus, INNODEMANDA acts independently from the bidding process, allowing it to preserve its guarantees. The concepts covered by INNODEMANDA funding are only R&D activities, which in turn should not be part of the object of the public tender. The purpose of the tender should focus on the results of such R&D to preserve equal treatment and non-discrimination of both the tenderers who request funding and those that do not. The process begins with the signing of the "Protocol of Accession" between CDTI and the public purchaser.

In this protocol, the timing of the tender is determined and communicated. In this way, CDTI can return applications for funding with enough time to generate incentives for suppliers to undertake R&D aimed at improving the offer that has been originally communicated to the public purchaser. Generally, a flexible timetable for the tender should be established based on certain parameters (which can change) rather than the traditional calendar with fixed dates. If the latter option were followed, any change in the dates would be disruptive and make it difficult to provide adequate time to grant granting the funding requests that run in parallel.

Then, the bidding entity proceeds to announce the tender in accordance with applicable law, including the notice that tenderers who so wish to apply for funding through CDTI may do so through the fast-track mechanism to undertake R&D activities aimed at improving the bid but which are not included in the tender itself. From that moment, the bid falls under the regular public procurement rules without any addition or modification. Simultaneously, tenderers may submit applications for CDTI funding to cover certain R&D activities to enhance their bid, but those will not be part of the object of that tender. Such applications are prioritized and assessed by CDTI so that the decision on the grant is

[39] This budget is not yet annualized on the date of preparation of this document, given that it requires a specific programming derived from agreements with the executing entities of these funds.

communicated to each of the interested parties within six weeks after its presentation and all terms of the financing are granted (amount, interest rate, guarantees, repayment, etc.). This information should be available to bidders before they formulate their final offer.

After the result of the award of the tender in question is announced, the contractor may proceed with the signing of the funding contract (business-CDTI) and then with the execution of the contract tendered (company-purchasing entity). All funding requests may be approved by the CDTI and can be used by their applicants before and after the award regardless of whether they were selected for the original bid.

Expectations of Future Developments

As explained above, the transposition of the European Directive 2014/24/EU is currently being undertaken by reforming the TRLCSP. This directive includes the European Partnership for Innovation, a procurement procedure that has advantages for the development of both PPI-PCP. It is expected to be approved in Spain in 2016.

Following the fifth provision of the TRLCSP, whose objective is to promote PPI-PCP, another initiative launched in 2011 was the creation of a subsection in the Official Register of Bidders and Classified State Companies (known in Spanish as ROLECE)[40] designed especially for PPI-PCP, in which classified companies (innovative companies that had demonstrated and validated that status) will have priority for PPI-PCP bids. This is already being put in place by applying the label of Innovative SMEs (Cueto and Garrido, 2013). This measure on Innovative SMEs was based on the final Provision 5 of Royal Decree Law 3/2011 of November 14 according to which the revised text of the Law on Public Sector was passed. It stipulated that the Council of Ministers, by agreement, would set aside a share of public procurement expenditure to finance contracts for R&D (within the budget for each ministerial department and each agency linked to or dependent on the General State Administration). The respective agency would share with the successful tenderers the risks and benefits of the scientific and technical research that was necessary to develop these innovative solutions. Some of these amounts may also be reserved for innovative SMEs.

The information gathered from the interviews with MINECO PPI-PCP officials shows that MINECO is trying to strengthen the temporal and budgetary dimension of the PPI-PCP, seeking to improve financial efficiency (R&D effort) and increase the potential market (Garrido, 2015). In addition, MINECO is relying increasingly on parallel ministries to enhance the development of PPI-PCP. It is understood because of their proximity to the sectors, ministries can better identify the needs and the buyers that could potentially participate in PPI-PCP contracts. For example, today, MINECO has, among others, the FID-Health Program, supported by the Ministry of Health, Social Services and Equality (Ministerio de Salud, Servicios Sociales e Igualdad, or MSSSI), and has already identified more than 130 industry-specific needs and 19 buyers. Along the same lines, the FID-Security Program, supported by the Interior Ministry, has already identified more than 40 specific needs and five buyers (Garrido, 2015).

Finally, the AGE has identified the need to inform and train regional actors (particularly public purchasers and companies) on PPI-PCP through instruments such as conferences targeted to all actors in the innovation ecosystem. It is currently implementing an action plan

[40]"Registration in the Official Registry of Tenderers and Classified Companies gives companies the basic credentials for contracting with the public sector. The registration contains information on the qualifications of the employer in terms of personality and capacity to act, representation, professional and business qualifications, economic and financial solvency, and classification, as well as compliance or noncompliance with the prohibitions against contracting. This system allows for a considerable reduction of bureaucracy and administrative processing time." Text extracted from Article 83 of the Consolidated Public Sector Contracts Act (MINHAP, 2011).

targeting regional innovation bodies (such as chambers of commerce, clusters, and innovation agencies), regional public buyers, such as municipalities and associations of cities (MINECO, 2015c), transportation services, airports, health services, and research centers, among others (DG Enterprise and Industry, 2014).

Box 5.3: The Self-learning Process Based on Evaluation: Barcelona, AQuAS

Barcelona has always played an important role in the development of innovation culture in Spain, mainly due to its high level of industrialization and technological orientation (by Spanish standards). In 1991, the Catalonian Department of Health and Human Services created the Technical Office of Technology Assessment Office (OTATM) to evaluate the technologies implemented by the Catalonian Health System, and identify their impact on Catalonian society. This new department recently changed its structure and name to become the current Catalan Agency for Quality and Healthcare Evaluation (AQuAS).

The main goal of AQuAS is to generate knowledge to improve the quality, security and sustainability of Catalonian Healthcare System, with a special focus on IT as a fundamental tool for evaluation and achievement of higher efficiency. This objective breaks down as follows:

- Evaluating the structures, processes and outcomes from areas such as e-health, health technologies, quality of health response, social impact of research, and pharmacy and medicine
- Promoting innovation in the field of health, to be a reference in the process of PPI-PCP and encourage participation in innovative projects to provide the healthcare system more advanced and efficient solutions than those that exist in the market

In addition, the Observatory of the Catalonian Health System was founded in 2012, within the framework of AQuAS. It generates information to facilitate accountability and improve decision making through evaluation, transparency, and benchmarking.

AQuAS has become an example of best practice in the field of PPI-PCP, concentrating valuable knowledge on PPI-PCP experiences, connecting the different actors in the process (such as public institutions, knowledge centers, private companies, and final users of innovation), dynamically learning from mistakes and using those lessons to improve PPI-PCP tenders.

Evidence of Impact

Identified Effects

In 2010, Spain designed and launched the Action Plan 2010 National Innovation Strategy, or e2i (MICINN, 2010). Public demand, particularly focused on PPI-PCP, is one of e2i's five strategic lines of action. The e2i contains a section on follow-up and dissemination, which includes a template for purchasing goods and contracting of services that can be understood as a first approach to a toolkit on PPI-PCP.

However, as stated in the report *Opinion on Innovation Procurement* (ERAC, 2015), finding and implementing adequate mechanisms for monitoring the impact of PPI-PCP is a real challenge. Because of this challenge, combined with the incipient stage of development of the PPI-PCP mechanism in Spain, there is currently no impact data available on PPI-PCP policies or on public contracts tendered in this way.

The number of public purchasers in Spain has increased considerably in recent years, as has the number of tenders in PPI-PCP, as shown in data published by MINECO (Garrido, 2015). Between the last two framework programs, it is possible to see how Spain has increased the allocation of ERDF funds to finance PPI-PCP contracts (INNODEMANDA, INNOCOMPRA /FID). In this sense, the interviews provided information on the intensity of use of the INNODEMANDA program. To date, 13 accession protocols have been signed (CDTI-innovative company). From these, 15 projects have been approved, with a total budget of €18.55 million, from which CDTI's contribution was €14.74 million (80 percent) (Garrido, 2015).

The budget awarded and mobilized by CDTI for PPI-PCP programs in Spain has also grown with the new framework program, as reflected in Table 5.4:

Table 5.4: Use of ERDF in PPI-PCP

2007–2014		2014–2020	
ERDF budget for PPI-PCP cases[41]	€ 197 million	ERDF budget for PPI-PCP	€293 million
Total Budget for PPI-PCP cases[14]	€258.5 million	Total Budget for PPI-PCP	€410 million

Source: Garrido (2015a).

For the period 2011–2014, PPI-PCP has been used in 21 agreements (public–public) amounting to a total of €229,49 M in Spanish provinces (Garrido, 2015). In addition, they have used other mechanisms to carry out the PPI-PCP calls because of EU-funded projects (FP7).

According to data presented by MINECO (Garrido, 2015), the first impact assessment for PPI-PCP shows the following:

- The probability of investing in R&D is double for companies that have been awarded PPI-PCP contracts.
- Enterprises that are awarded PPI-PCP contracts increase their private investment in R&D directly (OECD, 2014).
- The relationship between innovative effort from the supply side and technology diffusion from the demand side has increased tenfold (Garrido, 2015).

Box 5.4: The Bio-economy Impulse through PCP: Castilla La Mancha, CLAMBER

CLAMBER is an initiative, aligned with the regional RIS3, driven by the government of Castilla La Mancha in collaboration with ASEBIO, the Spanish Bio-industry Association, and co-financed by the European Commission. The main goal of this initiative is to position the Castilla La Mancha region alongside the European leaders in the so-called bio-economy or industrial biotechnology by fostering the introduction of sustainable bioprocesses in different industrial sectors, to obtain alternative bio-products to petroleum derivatives.

The core idea of the project is that Castilla La Mancha is one of the regions with the largest square km of crop surface in Europe, and lots of waste products are generated from daily crop production. The aim of the project is to design and build a pilot bio-refinery, which would be open to both the public and the private sectors for the testing and development of bioprocesses. ASEBIO developed a model to test small-scale projects through PCP tenders to gather and evaluate a list of potential ideas to be developed in this factory. The purpose was to extract more value from current biomass and foster R&D in the agriculture sector, and finally to make Castilla La Mancha a referent in research related to the use of biomass. Technological ERDF co-funded the CLAMBER project.

Under a PCP tender of €8.6 million for developing innovation projects of R&D, 61 proposals were submitted to the selection process, 39 of which have been preselected and are now being tested through feasibility studies. The most interesting projects will be developed in the second stage of the PCP process. This program of public purchase for innovative technology is organized by R&D contracts that cover 100 percent of the costs of the final awarded companies.

[41] This budget has been spent during the 2011-2014 period.

Concluding Remarks

The results of the analysis of the relevant documentation for this section, along with interviews and experience of the research team in the field, are summarized below.

Main Trends, Role of PPI, and State of Play

The overall assessment of the situation and the main trends are the following:

- The situation of Spain in terms of PPI-PCP is good compared to neighboring countries. Much has been achieved in this area in just a few years, particularly consolidating a favorable regulatory framework (which goes well beyond the transposition of the European directives) and designing and implementing a comprehensive set of instruments, ranging from financing instruments to the awarding procedures (See chronological summary and Table 5.2).
- As interviewees from the public sector acknowledged, it is remarkable that despite the change of government in 2011, PPI-PCP has remained a priority for national policymakers in the R&I field. This continuity in political support has undoubtedly been essential in consolidating such a complex policy.
- The use of ERDF funding for operations led by MINECO has enabled the PPI-PCP instruments to attract the attention of local and regional authorities (as well as both beneficiaries and co-financers of projects) and has fostered the installation of capabilities at these levels. The continuation of this policy in the programming of the EU structural funds 2014–2020 will be guaranteed by the demand-side innovation promotion program (FID). MINECO's involvement of other ministries, such as Interior and Defense, is an ongoing process that will increase interest in PPI-PCP throughout the public sector and will enable the expansion of the network of officials engaged in the process.
- However, the existence of ERDF incentives for bidding entities (such as INNOCOMPRA) and a business support program under the Center for Industrial and Technological Development (CDTI) discourages the public sector from using their regular budgets for investment in PPI-PCP. Indeed, the incorporation of PPI-PCP into the regular budget of purchasing entities would be the quickest way to generalize routines and establish capabilities, given the natural tendency of administrations to implement the budgeted funds. If this is not the case, the target of 3 percent investment will be particularly hard to reach.
- It is noteworthy that, along with projects financed by national budgets, Spanish entities have been increasingly successful in acquiring funding for PPI from FP7 and H2020 programs, and in even greater measure for PCP (Bos, 2014).

Main Obstacles and Challenges

The main barriers to the PPI-PCP identified in Spain, many of which are like those in neighboring countries, are the following:

- The lack of technical knowledge of PPI-PCP in procuring institutions, which is directly linked to the insufficient training of public officials on these types of procedures. Additionally, the legal supervision and intervention authorities, which are conservative by nature, are still referred to as the main group that must be sensitized and mobilized to allow PPI-PCP to become widespread. It is no coincidence that the dynamism of PPI-PCP in various national, regional, and local Spanish administrations is frequently associated with the existence of one or more auditors and legal officers who are engaged in promoting the use of the PPI-PCP.
- The economic crisis and the general guidelines for austerity and restraint in public spending have made it difficult to make the use of PPI-PCP mandatory. Economic criteria do not figure prominently in bidding processes. It has also significantly limited

the investment capacity of administrations, which in turn has made it even more difficult to argue for setting aside a fixed percentage of the public budget for investment in PPI-PCP.

- The lack of communication between end users and procurers has meant that market consultation is often inefficient despite the importance of this step in the process of defining the technical specifications (with which companies articulate their proposals for innovation).

Examples of Best Practices

Some best practices identified in Spain are the following:

- The establishment of a help desk and window for PPI-PCP managed by MINECO and CDTI has systematized procedures, created a repository of information, and made advice and information services permanently available to public entities. The entities responsible—MINECO's Directorate-General for Innovation and CDTI—are the same ones responsible for the management of economic incentives and support to Spanish entities' participation in H2020 calls for PPI-PCP. This provides additional alignment of access to services and financing.
- Linking the use of ERDF 2007–2013 to co-finance the first operations of PPI-PCP with soft loans to regional and local authorities led by the central administration has encouraged the involvement of regional and local agencies in such operations. For ERDF 2014–2020, MINECO has expanded the number of entities involved in PPI-PCP, giving the Ministries of Health and Interior the task of prioritizing the operations in health and safety. This is another step forward in the institutionalization of the PPI-PCP and in the creation of a network of experts in various national and regional administrations.
- The articulation of CDTI's INNODEMANDA program enabled the establishment of a synchronizing system through an agreement with the various public procurers engaged in PPI-PCP procedures. This system allows CDTI to finance the R&D that the company needs to be able to offer innovative products, lifting this burden from the procuring entity. Moreover, aid is de facto awarded to the company through an existing instrument to support business R&D projects, which has helped launch the program with relative ease. Finally, it is noteworthy that most of the INNODEMANDA programs have been in healthcare sector.
- MINECO uploaded the National Public Procurement e-Platform onto the Public Procurement portal, which allows viewers to see the PPI-PCP tenders offered in Spain. Potential procurers of innovation can search for different PPI-PCP specifications that can be then used as references for future tenders.
- A percentage of PPI-PCP contracts is reserved for innovative SMEs. Because SMEs comprise over 98 percent of the Spanish business, generating instruments that support PPI-PCP contracts to SMEs is a promising mechanism (still in the process of being implemented). This is an intelligent way to favor innovative SMEs while complying with the EU's legal framework for government assistance.
- Business associations have played important roles in the development of PPI-PCP. They have raised awareness about PPI-PCP while organizing training programs for their members, published guidelines and documents, and promoted specific projects. These projects can be of two types: those that help close the gap between the supply of technology and the future needs of the public sector, such as maps of early demand and aggregate supply; and large strategic projects of interest to regional and local governments that are eligible for the INNCOMPRA/FID programs. These associations can also initiate PPI-PCP processes, respecting the principles of transparency and proper concurrence of public procurement, because they bring together a critical mass of organizations, and they are aware of the innovations in its

sector and represent the interests of many companies. In addition, business associations' statutes require them to ensure transparency in the PPI-PCP processes in which their members participate.

- The Cotec Foundation for Innovation, an important think tank that brings together some of the country's leading companies, deserves special mention. Since its seminal 1998 study, it has published various reports that have generated a favorable perception of PPI-PCP. This partly explains the strong commitment of the Spanish government to PPI-PCP since 2008.
- The consolidation of a group of officials and public managers committed to PPI-PCP has been key to the success of these initiatives in some regions (particularly Galicia and Catalonia) as well as in the AGE. Early and joint involvement of auditors, legal services officials, and public procurement authorities and, where possible, the specialization of some of them in PPI-PCP, is a good practice and one of the lessons learned (as recognized by all interviewees). Identifying and supporting these pioneers is essential to streamline procedures, which are initially cumbersome in each public entity.

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6. UNITED KINGDOM

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United Kingdom Overview

The United Kingdom, comprising England, Wales, Scotland, and Northern Ireland, is the third largest EU country in terms of population (64.8 million inhabitants, or 12.4 percent of the total EU27 population) and the second largest economy, with around 14 percent of the total gross domestic product (GDP) of the EU27 (Eurostat, 2015). Following a long period of uninterrupted economic growth, and in line with the evolution of other European economies, the United Kingdom experienced an economic recession in 2008. After a period of slow growth and much speculation of a "double dip" affecting economic output and employment, the United Kingdom's GDP is showing signs of recovery, with growth rates of around 2.5 percent (although still lower than pre-downturn rates averaging 3.2 percent) (Cunningham, 2015). The United Kingdom ranked 9th on the Global Competitiveness Index in 2013–14. The services sector dominates the UK economy with over 70% of GDP, followed by key industries such as aerospace, pharmaceuticals, automotive, and oil and gas (Economywatch, 2015).

The United Kingdom has been particularly strong in public research, with high rates of publications, accounting for 16 percent of the world's most cited scientific research articles (HM Treasury, 2014). However, UK investment in research and development (R&D) is relatively low at around 1.8 percent of GDP. In a general context of austerity and budgetary reductions and despite seeing a reduction of public research investment in real terms, the government has committed to a science and research resource funding level of £4.6 billion per year until 2016. In addition, investment of £5.9 billion has been announced in the United Kingdom's research infrastructure between 2016 and 2021. (HM Treasury & BIS, 2014).

Institutional Network and Governance

Since 1998 the United Kingdom has been divided into four separate nations, establishing a national Parliament in Scotland and National Assemblies in Wales and Northern Ireland, with varying power from the UK Parliament. Despite this, the United Kingdom remains one of the most centralized countries in the EU, with strong governance and leadership held in London. There have been repeated debates about achieving greater decentralization in distributing power to regions and local communities, with a series of devolution agreements being currently negotiated in England with combined city-region authorities, such as Greater Manchester, in issues such as transportation, planning, housing, and policing, as well as additional responsibility for the delivery of business support. In Scotland, a referendum on independence was held in 2014, resulting in a majority vote to stay in the United Kingdom (although greater devolution of powers to Scotland and other parts of the United Kingdom are expected because of the referendum).

In terms of economic freedom, the United Kingdom has long been regarded as a champion in Europe, with strong rule of law, open trading environment, and one of the world's strongest financial sectors. With this, the United Kingdom currently ranked 13th in the Economic Freedom Index in 2015, ranking 5th in the world, with an 0.9 increase over the previous year, reflecting an improvement of fiscal and labor freedom (Heritage, 2015). The World Bank Ease of Doing Business index ranks the United Kingdom 8th (after the United States) out of 189 economies. The United Kingdom is regarded as one the least corrupt and

most open and transparent economies in the world in public access to official data, ranking at first place in the global index (BBC, 2015).

Key Features of the Innovation System

R&D expenditure in the United Kingdom in 2013 amounted to £28.9 billion, or 1.67 percent of GDP, an increase from 1.62 percent in 2012 but still significantly below the EU average of 2.02 percent. It is ranked in 12th place among all member countries (ONS, 2015). At 3.2 percent of global R&D investment, the United Kingdom is lagging major international competitors, such as the United States and Germany.

The private sector is both a major funder and performer of R&D. More than half of the funds for R&D in the United Kingdom come from the business enterprise sector (around 64 percent in 2013). Moreover, in 2013 private R&D expenditure increased by 8 percent in current prices, to £18.4 billion compared to 2012. The United Kingdom is also an attractive destination for R&D investment from overseas, so much so that expenditure in R&D by foreign-owned companies exceeds that of domestically owned firms. R&D financed from overseas has increased year on year over the last decade, reaching almost US$7 billion of overseas-financed R&D in 2011, much higher than comparable countries such as France and Germany (BIS, 2014b).

The 2010 United Kingdom R&D Scoreboard reveals that about a third (345) of the top 1,000 R&D performing firms in the world are UK-owned and listed companies (BIS, 2011). According to the 8th Community Innovation Survey (CIS) covering the period 2010–2012, 45 percent of all UK companies participating in the survey reported some form of innovation activities, compared to 37 percent of businesses in the 2011 survey. Eighteen percent reported engagement in product innovations (of which 44 percent were new to the market) (BIS, 2014). A key R&D performer, in 2013, the UK Higher Education (HE) sector was responsible for £2,665 million worth of R&D expenditure, or 19 percent of the total R&D performed in the United Kingdom.

In addition, the government and UK research councils (UKRC) sector funded £6.1 billion of UK R&D, or 21 percent of total funding (ONS, 2015). The United Kingdom's public research laboratories have undergone several waves of privatization, because of which many former public laboratories are now part of the private sector. Some high-profile examples include the National Engineering Laboratory (NEL) and parts of the defense R&D infrastructure, which became QinetiQ. These privatization efforts notwithstanding, some government departments, such as Health, Environment and Defense, have retained much of their intramural R&D activities. In addition, the seven Research Councils spent £2.3 billion performing R&D within their UK public research institutes in 2013 (ONS, 2015).

The long-term policy strategy for UK science and innovation investment is laid out in "Our Plan for Growth: Science and Innovation" (HM Treasury and BIS, 2014), a ten-year investment framework for science and innovation published in 2014. It sets out the actions and priorities for investing the £5.9 billion capital committed to support scientific excellence out to 2021, also informed by the Industrial Strategy and the Eight Great Technologies.

The UK system of research is a centralized one, funding for research being the responsibility largely of central government and allocated based on scientific excellence. The Devolved Administrations of Scotland, Wales, and Northern Ireland have responsibility for aspects of health and education funding, with Scotland having the largest degree of autonomy.

The government department in charge of science and innovation is the Department for Business, Innovation and Skills (BIS), although other departments have important research responsibilities, most notably the Department of Health, the Ministry of Defense, the Department for Energy and Climate Change, and the Department for Environment, Food

and Rural Affairs. Within BIS, the Government Office for Science has responsibility for the Higher Education Funding Council for England, the Research Councils, and the Technology Strategy Board. Innovate UK is an executive non-public body tasked with the promotion of economic growth by stimulating and supporting business-led innovation. Innovate UK is responsible for managing the network of Catapult technology centers, created in 2010 with the objective of bringing research and commercialization closer together and runs the Small Business Research Initiative (SBRI), a pre-commercial procurement (PCP) initiative.

Public Procurement Overview and Legislative Context

General Procurement Indicators

In 2013–14, the UK public sector spent £242 billion on procurement of goods and services (including capital assets). This accounts for 33 percent of public sector spending (total managed expenditure).[42] This puts the United Kingdom close to the OECD average of 30 percent (although per OECD procurement statistics, UK public procurement is close to 20 percent of total government expenditure).

Total procurement expenditure in the central government is dominated by the larger departments, such as the Ministry of Defense, Ministry of Justice, Health, Home Office, Department of Work and Pensions, and Department of Energy and Climate Change, with the Ministry of Defense accounting for around 45 percent of central government procurement expenditure. Procurement by central government departments accounts for 63 percent of the total, compared with an average of 37 percent of central procurement spending across OECD countries (OECD, 2015).

While strategies are in place to support green public procurement, procurement by small and medium-sized enterprises (SMEs), and procurement of innovative goods and services, it is not possible to quantify the share of public procurement devoted to sustainability or innovation purposes, due to lack of available data. However, since 2010, data have been collected on direct and indirect expenditure with SMEs. In 2013–14, it accounted for 26.1 percent (10.3 percent direct spending and 15.8 percent indirect spending), up from 19.9 percent in 2012–13 (10.5 percent direct and 9.4 percent indirect spending) (Cabinet Office, 2015).

Legal Framework

Public procurement in the United Kingdom is governed by the Public Contracts Regulations 2015, which were laid before Parliament on February 5, 2015, and took effect on February 26, 2015. These regulations implement the new Public Sector Procurement Directive (2014/24/EU), following a two-year period of discussion and consultation in relation to the implementation of the directive (consultations on the draft Utilities Contracts Regulations and the draft Concessions Contracts Regulations are ongoing in 2016 prior to their implementation).

The new UK Regulations supersede the Public Contract Regulations 2006 (with separate transposition in Scotland), which implemented into UK law the European Commission's Directive on public procurement (2004/18/ EC), adopted in March 2004.[43]

[42] HM Treasury, Public spending statistics: April 2015 release.

[43] The UK vote in July 2016 to leave the European Union raises questions about regulations governing public procurement in the United Kingdom in the future. The UK public sector will most likely still be required to comply with the Public Contracts Regulations 2015, particularly in the short term. In the longer term, the precise nature of

The new regulations introduce several changes in relation to the previous framework, including the following:

- Greater freedom to negotiate with suppliers within the new procedural rules, including a new "innovative partnership" procedure, allowing greater scope for suppliers to propose innovative ideas
- A new light-touch regime for contracts for certain social and health and some other services (as opposed to the previous distinction between Part A and Part B Services)
- Greater encouragement and simplification of e-procurement, including electronic catalogues and electronic auctions
- Clearer rules to facilitate procurement with social/environmental objectives
- Improved safeguards from corruption, including prevention of conflicts of interests and time limits regulating the period that suppliers can be excluded from procurement by contracting authorities
- Improved mechanisms to enhance SME participation, such as breaking contracts into lots and the introduction of a turnover cap
- Allowance for preliminary market consultation between buyers and suppliers
- Encouragement of full life-cycle costing, allowing more sustainable and/or better value procurements

The Public Contracts Regulations 2015 apply to England, Wales, and Northern Ireland, except for certain areas, such as electronic and aggregated procurement. Devolved Administrations have their own arrangements in place.

The United Kingdom was the first Member State to transpose the new EU procurement directives. Procurement regulations in the United Kingdom have generally followed a direct transposition of the European Directives, yet each home nation can present some variation in its procurement practice (e.g., Telles, 2013). [44]

Additional legislation governing public procurement in the United Kingdom includes the Public Services (Social Value) Act 2012 and the Small Business, Enterprise and Employment Act 2015. The Social Value Act (which extends to England and Wales) introduces a statutory requirement for public authorities to have regard for economic, social, and environmental well-being in connection with public services contracts (not applicable to works or supplies). The Small Business, Enterprise and Employment Act 2015 allows the UK government to impose on a contracting authority duties in the exercise of its functions relating to procurement, on issues such as the provision of relevant information or the process by which contracts are entered. The Act does not apply to devolved functions.

Governance of Procurement

The National Audit Office (NAO) oversees monitoring 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 United Kingdom on EU procurement policy, and improving professional procurement skills through the Government Procurement Service. For local governments in England, the responsibility for ensuring value for money lay with the Audit Commission until

the regulations will depend on the result of the negotiations, for instance, whether the United Kingdom negotiates continued membership in the European Economic Area (EEA) and the European Free Trade Association (EFTA).

[44] This section refers generally to the regulatory system in England, Wales, and Northern Ireland, with reference to Scotland where appropriate.

its closure in 2014. Separate arrangements are in place in Scotland, Wales, and Northern Ireland.

Responsibility for procurement policy and practice in the United Kingdom has become increasingly centralized. Until 2010, the Office of Government Commerce (OGC), part of the HM Treasury, was responsible for providing policy standards and guidance on best practice in procurement and facilitating collaborative procurement to deliver better value for money (for instance through framework agreements which other government agencies can use). Within the OGC, Buying Solutions acted as an executive agency providing a range of procurement solutions and services to drive savings and improve efficiency.

As part of the coalition government's agenda of efficiency and public sector reform, in 2010 the OGC became part of the Efficiency and Reform Group (ERG) in the Cabinet Office. It brought together expertise from different parts of Cabinet Office, HM Treasury, Directgov,[45] OGC, and Buying Solutions.

The ERG became the Government Procurement Service (GPS) in 2011, and in 2014 the Government established the Crown Commercial Service (CCS) as a central function merging the Government Procurement Service, the Cabinet Office Procurement Policy Team, and the Efficiency and Reform Group's commercial advisory function.

The CCS works with departments to drive improvements to procurement and commercial management. It brings together procurement operations for common goods and services, policy development, and the strategic commercial functions, which were previously separate parts of Cabinet Office. Thus, the Cabinet Office now has clearer responsibility and oversight, with ministerial accountability, for procurement across government (NAO, 2013).

The Chief Commercial Officer (CCO), who has responsibility for procurement policy across central government, oversees the work of the CCS. The CCO is in turn supported by a small network of Crown Commercial Representatives, which are senior individuals (some of them commercial directors of the core government departments) who manage a small number of key strategic suppliers or a specific sector of the market. Some Crown Representatives represent specific groups of providers, such as SMEs or the voluntary sector.

CCS manages a spend analysis tool that draws data monthly from departments' financial systems to build a central picture of procurement expenditure across government and supports the work of the Crown Commercial Representatives. Government departments link to the center through the procurement reform board (representing the major departments) and the extended procurement reform board (representing the smaller ones), which is chaired by the CCO.

According to a study by PwC, GHK, and Ecorys (2014), in 2010–11, GPS (now CCS) awarded about 12 percent of all government contracts above the EU threshold level in the United Kingdom and is responsible for around 18 percent of all centralized purchasing volume in Europe.

Besides CCS, as of 2009 around 50 Professional Buying Organizations (PBOs) operated in the United Kingdom at the subregional, 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). One of the biggest PBOs was the NHS Purchasing and Supply Agency (NHS PASA), the purchasing agency of the National Health Service. The Agency

[45] Directgov, later replaced by Gov.UK, is the main website for all UK government services and departments.

closed in April 2010 with its functions transferred to the Department of Health and other government agencies, including the NHS supply chain.

Finally, several professional and trade bodies are also, to different degrees, involved in training and 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. Other actors, such as Nesta, have championed initiatives directed at promoting public procurement of innovation (PPI).

Broader Efforts toward Transparency, Competition and Broader Public Sector Reforms

The Public Contracts Regulations apply to public sector contracting authorities, including the state, regional, and local authorities, bodies governed by public law, and associations formed by one or more such authorities or bodies. This includes central government departments and agencies, non-departmental public bodies (NDPBs), devolved administrations, schools, local authorities, housing associations, police forces, and NHS trusts.

The number of public bodies is, however, under scrutiny since 2010 in the context of the Public Bodies Reform Program, aimed at reducing the number and costs of public bodies and which has so far reduced the number of arm's-length bodies by over 285.

The United Kingdom performs well and above average in all indicators used by the European Union[46] to assess public procurement except reporting quality, namely, the quality of information provided by public buyers, measured by the proportion of contract awards containing no information about the value of the contracts awarded.

Successive government reviews, guidelines, and reforms have been directed at further modernizing the UK public sector and increasing efficiency in procurement, kick-started by the 2004 Gershon Efficiency Review. In terms of procurement capabilities, the *Transforming Government Procurement Strategy* (HM Treasury, 2007) introduced a package of reforms that 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. This strategy led to a series of Procurement Capability Reviews in central government departments.

Since 2010, the government has undertaken efforts to streamline and centralize public procurement for common goods and services. To improve commercial skills and avoid fragmentation, the Cabinet Office appointed a Chief Procurement Officer and a network of Crown Representatives to manage relationships with major suppliers holding a portfolio of contracts across the central government, for the government to act as a strategic single client. These plans were laid out in the 2011 procurement reform strategy, which set out plans to realize savings on the estimated £13.18 billion spent on common goods and services in central government in 2009–10.

The Capabilities Plan published in April 2013[47] identified four priority areas where the Civil Service must build capability, including leading and managing change, improving

[46] http://ec.europa.eu/internal_market/scoreboard/performance_per_policy_area/public_procurement/index_en.htm. The indicators used are: the bidding process for public procurement contracts, the number of calls that are made by public sector organizations for bids for contracts, aggregation of bids, the award criteria used, decision speed, and reporting quality.

[47] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/307250/Civil_Service_Capabilities_Plan_2013.pdf

commercial skills and behaviors, delivering successful projects and programs, and redesigning services and delivering them digitally. To improve commercial skills, in 2013 the Cabinet Office launched the Commissioning Academy as a development program for senior leaders from all parts of the public sector.

New transparency requirements have also been introduced for all central government departments, namely: the publication of all new central government information, communications, and technology (ICT) online and the publication of all new central government documents for contracts over £10,000. A website named "Contracts Finder" (see www.contractsfinderbusinesslink.gov.uk) was launched in January 2011 as the government's single platform for providing access to current and future public sector contracts above £10,000 in the central government and above £25,000 in the wider public sector.

The Improving Procurement review, published by the National Audit Office in 2013, reported good progress on procurement structures and processes, especially greater participation by SMEs and savings of circa £426 million in 2011–12 as a result of reductions in price owing to centralized procurement. It nevertheless highlighted some implementation and operational problems, such as certain inconsistencies in contract management and reporting structures. It noted that despite the mandate to use GPS procurement agreements for common categories, usage is only 40 percent overall (NAO, 2013).

Finally, several measures have been introduced to improve SME participation in procurement. The coalition government committed to an aspiration of awarding 25 percent of central government procurement expenditures to SMEs, directly or via the supply chain, by May 2015. In the Conservative Party Manifesto before the May 2015 election, the party promised to set the target to one-third of all spending. Measures to improve SME participation have so far included the launch of a new contracts finder website advertising all opportunities over £10,000, the appointment of a CCR for SMEs, and a mandate for a single, simplified Pre-Qualification Questionnaire (PQQ) for all main commodities (and the elimination of PQQs for central procurements under £100,000). To support SME procurement, the Mystery Shopper service was introduced in 2011 as a non-litigious (and therefore non-enforceable) way of registering complaints by SMEs to improve the procurement practice of contracting authorities. Since the service was launched in 2011, more than 800 cases have been investigated, helping to improve procurement practices across the public sector. Like the Mystery Shopper service in England, the Single Point of Enquiry provides impartial and confidential advice to suppliers bidding on contracts tendered by Scottish contracting authorities (Telles, 2013).

Efforts to streamline and centralize public procurement for common goods and services were initially only mandatory for central government procurement. The House of Lords Science and Technology Committee (2011: 42) noted the lack of a clear strategy or roadmap to extend reforms to the rest of the public sector, stating that “the government’s laissez-faire approach to the dissemination of best practice in procurement from central to local government appears to be overly optimistic.” It therefore recommended that a system of dissemination is put in place to share examples of procurement of innovative solutions across central and local government as well as mechanisms to assess its effectiveness. Reviews by Lord Heseltine (2012) on increasing UK growth and Lord Young (2013) on micro businesses also stressed the need for a less complex and more consistent approach to procurement across the whole public sector, not just the central government. Lord Young noted the importance of local government and the NHS for small suppliers and recommended a set of single-market principles to be applied by all public bodies in their procurement. Following these reviews, the government launched a consultation on making public sector procurement more accessible to SMEs, accompanying the HM Government (2013) Small Business: GREAT Ambition policy paper, which indicated a commitment to

improve access to public procurement opportunities for small businesses. The 2015 Small Business Enterprise Bill incorporated some of these commitments and further streamlined procurement practices across the public sector to reduce barriers for SMEs. It also placed the government's Mystery Shopper scheme on a statutory footing.

PPI Capabilities and Rationales

Rationales

The use of public purchasing as a deliberate tool to promote technical innovation is not a new debate in the United Kingdom, possibly going back to the 1960s (see Uyarra et al., 2013). Since then, the use of procurement to stimulate innovation has been a steady sub-theme with varying degrees of prominence in the United Kingdom. It gained attention in the early 2000s. Since then, a stream of documents, including guidance, strategies, and white papers had made the case for procurement as an important tool to drive innovation in the United Kingdom.

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), which for the first time stressed the role that public procurement could play as a lever for spurring innovation in suppliers and the need to develop new procurement guidelines designed to make government a more intelligent customer.

In recent years, significant efforts have been directed at improving capabilities and long-term planning and capacity in procurement. In addition, early on the OGC published a series of guidelines to promote innovation-friendly procurement practices. For example, *Capturing Innovation* (OGC, 2004) proposed a framework for action throughout the procurement and contract lifecycle, highlighted the need for early planning and early involvement of suppliers, and issued additional guidelines in *Finding and Procuring Innovative Solutions* (OGC, 2006). Similarly, the *Creativity in Business* review (Cox, 2005) recommended the use of more discussion pre-specification, the adoption of a more holistic approach to project needs, and improvements to procurer capabilities. The importance of market shaping through public procurement was also the focus of the OGC Kelly program, centered on long-term capacity planning in markets where government had significant purchasing power, such as construction.

The 2007 *Sainsbury Review on Science and Innovation Policies* and the 2008 *Innovation Nation* White Paper for the first time highlighted the potential of public procurement within a broader demand-side innovation policy. *Innovation Nation* argued that innovative procurement had not taken root across the government and thus tended to be a low priority, mainly because of lack of capabilities and a risk-averse culture. Following this diagnosis, the *Innovation Nation* White Paper (DIUS, 2008) included a commitment that each government department would include an Innovation Procurement Plan (IPP) as part of its commercial strategy, setting out how they will drive innovation through procurement and use innovative procurement practices. In these IPPs, each department had to specify how it would drive innovation through procurement and use innovative procurement practices. Thus, most central government departments published an IPP (until its discontinuation in 2010).

When the UK government introduced the Innovation Procurement Plans initiative, the DH, responsible for the National Health Service (NHS), took a range of initiatives to bring innovation and procurement of innovation back to the center of the NHS strategy. One notable initiative was the Innovative Technology Adoption Procurement Program (iTAPP)

launched in 2009. The program 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 (Edler and Yeow, 2016).

Similarly, the 2008 White Paper recommended that the pre-commercial scheme focused on SMEs (SBRI) be relaunched. The UK's SBRI program had been introduced in 2001 to increase access of 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. In 2008–09, the Initiative was reviewed and it was felt that it had not realized the objectives envisaged for it. Since its re-launch, the use of the SBRI has risen steadily, with more than £200m spent through the program by mid-2014 (Rigby et al., 2015).

Several related additional agendas associated with the use of government procurement policy were promoted in the late 2000s, for example in relation to using the innovative potential of procurement to improve sustainability and to favor SME growth (Glover, 2008). The sustainable procurement action plan (DEFRA, 2006) proposed the use of forward commitment procurement (FCP), a methodology designed to better manage perceived risks associated with procuring innovative goods and services. It was initially developed by the Environmental Innovations Advisory Group, set up in 2006, which argued that market risk was the single most important barrier to commercialization of environmental technologies.

The use of procurement to address multiple agendas was for the first time made explicit in the Policy through Procurement Action Plan (OGC, 2010), which set the procurement policy priorities of SME development, skills training and apprenticeship, and carbon reduction. The coalescence of multiple policy agendas under a single procurement umbrella led to a critique of excessive fragmentation and potential confusion (Uyarra, 2010).

Additional concerns that have been raised in relation to these efforts to support the integration of innovation objectives in long-term planning of capabilities and purchasing decisions include the lack of effective reporting and monitoring structures, uneven implementation, and insufficient communication and dissemination of good practices among government departments (Uyarra et al., 2013). Often not enough time has lapsed to allow these good practices to take hold. Several initiatives have been discontinued not long after their introduction. For example, IPPs ceased to be a requirement for government departments after the change in government in 2010.

Despite the promotion of practices that have proven to be innovation friendly, such as the use of outcome-based specification, whole-life costing, and innovation-related requirements in tenders, their use by contracting authorities has been reported as being low (Georghiou et al., 2014). Key constraints, such as an excessive emphasis on price rather than quality in contracts, the use of overly prescriptive specifications, insufficient interaction between procurers and suppliers, risk aversion of procurers, and lack of competence of procuring organizations, have been reported by public sector suppliers as hindering the development of innovative solutions (Georghiou et al., 2014; Uyarra et al., 2014).

The momentum for dedicated innovation procurement policy slowed down in the early 2010s. Turning toward austerity budgets, the coalition government adopted a different approach toward procurement and innovation, privileging efficiency, fostering initiatives to streamline and centralize public procurement for common goods and services, and focusing on capabilities, with some commentators arguing for a policy that is more focused on UK-based firms as suppliers. The remaining 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 as a byproduct of purchasing more efficiently.

The House of Lords Science and Technology Committee (2011) questioned the compatibility between the efficiency agenda and the promotion of innovation. It was argued that too much emphasis on efficiency "could take us to the lowest common denominator and toward 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 Science and Technology Committee 2011: 31). The Royal Academy of Engineering (2014) also identified a tendency to rely on large contracts, which hindered wider participation

beyond established large providers, and insufficient engagement and communication with the supply chain. Initiatives directed at centralizing and streamlining procurement, while positive from the point of view of avoiding duplication and increasing efficiency, may further drive away small, innovative suppliers and disconnect suppliers from final users (Royal Academy of Engineering, 2014).

Key Policy Developments in PPI

There has been interest in the use of public procurement to boost innovation in the United Kingdom (albeit declining in recent years), accompanied by a high level of experimentation with a series of innovative policy instruments, such as FCP, IPPs, and a willingness to import and adapt others, notably the SBRI.

This section gives account of some of these instruments, specifically IPPs, the SBRI, FCP, a new scheme to link private and public demand (Carbon Compacts), and the Department of Health's iTAPP.

Table 6.1: Summary of PPI Interventions in the United Kingdom

Policy category	Deficiencies addressed	Instrument types	Examples
Framework conditions	i) Procurement regulations driven by competition logic at the expense of innovation logic ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	i) Implementation of EU Directives including functional specifications, negotiated procedure, etc. iii) Paperless procedures, electronic portals, targets for SME share
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks iii) Subsidy for additional costs of innovation procurement	i) UK ministries Innovation Procurement Plans 2009–10 ii) Innovation procurement guidelines (e.g., OGC)
Identification, specification, and signaling of needs	i) Lack of communication between end users, commissioning and procurement function ii) Lack of knowledge and organized discourse about wider possibilities of supplier's innovation potential	i) Pre-commercial procurement of R&D to develop and demonstrate solutions ii) Innovation platforms to bring suppliers and users together; foresight and market study processes; Use of standards and certification of innovations	i) SBRI
Incentivizing innovative solutions	i) Risk of lack of take up of suppliers' innovations ii) Risk aversion by procurers	i) Calls for tender requiring innovation; guaranteed purchase or certification of innovation; guaranteed price/tariff or price premium for innovation ii) Insurance guarantees	i) UK Forward Commitment Procurement; ii) iTAPP

Forward Commitment Procurement

Forward commitment procurement (FCP) is a procurement model or methodology designed to better manage perceived risks associated with procuring innovative goods and services. It aims to address suppliers' market uncertainty, which may hamper efforts to deliver innovations.

FCP was initially developed by the Environmental Innovations Advisory Group, set up in 2006 to examine the challenges associated with the development of environmental innovations and then championed by the BIS in 2009. It was developed out of the realization of the risks faced by suppliers (expressed in terms of a 'mountain of risks' rather than a 'death valley,' since the uncertainty of future sales was perceived to be a bigger issue than lack of funds) in the scaling-up phase between demonstration and commercialization of environmental technologies. The FCP methodology was thus directed at providing advance information of future needs, searching out and engaging with potential suppliers and, critically, incentivizing them through a forward commitment—the promise of current and future business to promote investment in innovative new product development (DTI, 2006).

FCP consists of three stages: identification of need, market engagement, and procurement. In the first stage, the purchasing authority identifies unmet needs within the organization, including engagement and consultation of stakeholders, including end-users, as well as embedding and buy-in within the organization. Once the unmet need is identified, the FCP project outline and business case is prepared.

The second stage consists of engagement with potential suppliers, followed by a formal procurement stage. The market engagement phase has two stages: a market sounding stage and a consultation stage. It would involve activities such as market sounding to assess whether suppliers can deliver the required outcomes, signposting of demand, and facilitating networking. The procurement strategy is developed after the market engagement phase, and the final procurement may 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 proportional to their benefits. This is known as forward commitment (BIS, 2011).

This process been used a few times in the United Kingdom, the Netherlands, and Poland. For example, FCP was successfully used in 2007 for the procurement of 'zero-waste' mattresses for UK prisons (see Box 6.1) and 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 percent and 88 percent, respectively.

Box 6.1: Procurement of 'Zero-waste' Mattresses for HM Prison Services

HM Prison Service (HMPS) used forward commitment procurement (FCP) to procure a solution that prevented disposal of mattresses and pillows into landfill. HMPS purchased in a typical year around 53,000 foam mattresses and 48,000 pillows, most which were disposed into landfill or had to be disposed of as hazardous waste. Each prison area had its own arrangements for disposal through local contracts. With an estimated cost of more than £3 million per year, it was perceived as costly and environmentally unsustainable, particularly given the increasing cost of landfill disposal.

Following the FCP methodology, HMPS identified an unmet need and initiated a market sounding exercise to make it visible to suppliers. The call for innovative solutions and an information event that followed 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 could use the information gathered through a market sounding and supply chain workshop to inform their procurement strategy and choose the most appropriate contracting approach. Thus, a zero-waste mattress was developed, with new covers that reduced turnover and eliminated the need for clinical waste disposal, and no need for landfill disposal, as end-of-life mattresses would be recycled into useful products instead.

The zero-waste mattress and pillows solution was delivered sooner than expected and with cost savings estimated to be around £5 million over the life of the contract.

Source: MoJ/BIs (2011).

The FCP initiative has not been evaluated. Evidence of impact stems from a limited number of cases which have resulted in demonstrable outcomes in terms of savings, purchase of innovations, and evidence of learning within the organizations, but there is no evidence of the extent to which such practices have become embedded in public sector procurement.

For instance, van Meerveld et al. (2015) and Whyles, van Meerveld, and Nauta (2015) examined two cases in the UK NHS and an academic hospital in the Netherlands where FCP has been applied. In two of the cases analyzed, the process led to the development of

new products, and in the third case, to the early adoption of new-to-market products and technologies (Whyles, van Meerveld, and Nauta, 2015). In the cases analyzed, the contracting authority had no prior experience in procuring innovations, and they conclude that it is unlikely that the projects would have been initiated without this intervention. The projects benefited from assistance in the form of targeted training support, facilitation, draft outcome-based requirements, some market sounding, supply chain consultation workshop, and others.

The level of resources and the time needed to implement FCP are higher than that of standard procurement, both for the customer and the supplier, particularly in the early stages. It also takes longer because, to allow time for innovation, the FCP process needs to start a long time before the formal procurement. This notwithstanding, Whyles, van Meerveld, and Nauta (2015) argue that FCP has proved to be an effective methodology to manage risks in PPI projects and is widely applicable to other sectors and countries. However, it involves a change in the culture of procurement, in terms of early planning and assessment of needs and engagement with suppliers for the definition of specifications. It also requires strong engagement with senior management.

From a legal perspective, Telles (2013) suggests that FCP may pose some challenges at the award stage. He argues that, by including variations to the original specifications that enable innovations, FCP may lead to a situation where the tenders become so different that they may not be comparable, and the contracting authority may find it difficult to assess the specific price of the innovation.

The Innovation Procurement Plans

The Innovation Nation White Paper (DIUS, 2008) included a commitment that each government department would include an IPP as part of its commercial strategy. Guidelines were provided for the departments to establish how they were planning to drive innovation through procurement and use innovative procurement practices. Most central government departments published at least one IPP as a result. However, these plans varied in quality and influence. While they contributed to strategic thinking and long-term planning, their influence and uptake were uneven. Those departments that had more experience of procuring innovative products and services, such as the Ministry of Defense, were reportedly stronger, while others lacked forward-looking strategic thinking, focusing on procurement mechanisms and activities that were underway (House of Lords Science and Technology Committee, 2011).

While IPPs were valuable for identifying the degree of commitment to innovative procurement practices and the extent to which these are embedded in commercial activities of government departments, these plans have not been evaluated, and their lack of key performance indicators or measurable objectives made it difficult to assess the performance of departments against their goals. The coalition government discontinued the commitment to produce IPPs after 2010.

United Kingdom's Small Business Research Initiative

The United Kingdom's Small Business Research Initiative (SBRI) is a PCP program introduced to increase access of 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. It was first established in the United Kingdom, in 2001. SBRI was modeled on the Small Business Innovation Research Program (SBIR) in the United States.

SBRI has two main objectives: (i) to support government departments in finding solutions to their own policy and operational needs where current solutions are inadequate or nonexistent, and (ii) to support technological development among firms.

In a typical SBRI process, a departmental client would invite firms to tender with innovative solutions to a specified problem or challenge. The SBRI supports the department to articulate its problem. In Phase 1 (on average £60,000 per successful application), applicants may be proposing competing or complementary solutions. Phase 2 (an average of £325,000 per successful application) of the program then enables applicants to further develop their innovative solution through the creation of a prototype or alternative testing of the idea. SBRI supports technological development by funding 100 percent of the cost of a feasibility study for a technology in the Phase 1 part of the program and the cost of development of a prototype in the Phase 2 part of the program. Average amounts awarded at Phase 1 and Phase 2 vary, however, across government departments.

Innovate UK commissioned a recent evaluation of the SBRI to look at the performance of the SBRI. The evaluation (Rigby et al., 2015) looked at the period 2008–2014 covering 195 competitions and 17 government departments. It examined the use of the program and its impact for: (i) firms supported by the contract awards; (ii) departments whose operational needs may be met by the ultimate production of technologies (products or processes) developed during an SBRI contract; and (iii) other actors which may ultimately purchase the output of the SBRI program or utilize it in other ways (i.e., an innovation spillover).

In the period 2008–14, the use of SBRI has expanded considerably in terms of number of competitions, number of applications, and number and value of contracts (see Table 6.2).

Table 6.2: Evolution of the United Kingdom's SBRI Program

	Number of competitions	Number of applications	Number of contracts	Value of contracts
October 2008 – August 2010	35	2005	532	£40m
September 2010 – September 2012	70	3073	690	£85.7m
October 2012 – July 2014*	90	3344	644	£101m

*At time of evaluation. This number will grow as the ongoing competitions award new contracts.
Source: Rigby et al. (2015).

Some 70 public sector bodies now use the program, although its use is concentrated in a small number of departments, such as the Ministry of Defense, the Department of Health, the Department for Energy and Climate Change, and the Department for Business Innovation and Skills. In terms of the profile of firms applying for the scheme, applicants tend to be larger and younger than the average population of firms, with an above-average innovation orientation, and concentrated in sectors such as ICT, and professional, scientific and technical activities.

Using a survey of SBRI recipients, the evaluation found a positive impact, with 41.7 percent of firms indicating that SBRI had increased sales. For these firms, the average sales impact of SBRI was around 30.7 percent over the last two years, particularly for Phase 2 winners. An econometric analysis—matching winners with similar firms in the non-applicant population—found a turnover effect of around 12.7 percent on average across the Phase 1 and Phase 2 competitions. SBRI had a positive spillover effect on other innovation projects, with 83.5 percent of recipients identifying a positive spillover. Around a sixth (16.6 percent) of SBRI winners reported that receiving SBRI support had made it easier to access additional financing, with another 38.8 percent of firms indicating that SBRI had made it somewhat easier to access external financing.

The benefits of SBRI on departmental budgets (efficiency, savings, and improved effectiveness) are less clear, however, due to the lack of systematic monitoring of the program by departments. The evaluation therefore questioned whether SBRI winners were deriving the maximum commercial benefit from their SBRI-supported projects, and whether departments are realizing the wider benefits from their support for policy or operational challenges.

Innovation Technology Adoption Procurement Program

In health, several innovation procurement initiatives were launched in NHS (i.e., iTAPP, a national implementation support and guidance program by the NHS Technology Adoption Center (NTAC) through collaboration with NHS organizations for the implementation of health care technologies).

The Department of Health (DH) introduced the Innovation Technology Adoption Procurement Program (iTAPP) in 2009 during the period of the former NHS structure. Its objective was to promote the procurement, adoption, and diffusion of innovative medical devices through practical support, information, and evidence assessment (DH, 2009). The initiative was established as a collaboration between the DH's Procurement Investment and Commercial Division (PICD), NTAC, and the medical technology industry. It is embedded within the local implementation plans of the NHS's Quality, Innovation, Productivity and Prevention (QIPP) strategy (NTAC, 2012). Within the iTAPP framework, suppliers were invited to recommend existing medical technologies that lead to the improvement of patient outcomes and cost reduction in the NHS. The technologies were then prioritized against regional needs and selected in workshops organized with key stakeholders of Strategic Health Authorities (SHAs). Along with the support for adoption and innovation of the technologies, the initiative offered a Regional Innovation Fund of up to £15,000 to each regional SHA to adopt any of the technologies on the iTAPP list (Edler and Yeow, 2016).

There has been no formal evaluation of this program, although there is some case study evidence of the workings and evidence of the initiative on the diffusion of certain technologies. Edler and Yeow (2016) examined the adoption of one of three main technologies under the iTAPP program, the Doppler (a guided intra-operative fluid management system for high-risk surgery). They identified key implementation challenges, including clinical resistance, lack of priority setting, and complexity of procurement processes. This indicated that despite a clear business case on the benefits of a technology, resistance to buy and absorb innovation in organizations can remain high.

Evidence of Impact

The preceding sections have provided an account of some key policy developments and initiatives intended to promote innovation through public procurement. These have included initiatives to articulate demand and offset procurement risk (FCP), schemes to improve diffusion of technologies (iTAPP), and early-stage development of technologies (SBIR).

These schemes are very diverse in nature but also have had different degrees of continuation, implementation, and monitoring.

Some initiatives, such as the FCP program, have mainly been developed as pilot schemes, and have not therefore been rolled out more widely through the broader public sector. However, evidence based on case studies suggests a positive outcome from the projects applying the FCP methodology, the FCP-delivered innovation. Evidence is, however, reduced to whether an innovation was adopted or not, without further evidence on wider

diffusion or spillover effects for supplier firms. In terms of the buying organization, there is limited evidence on whether the innovations contributed to improved service delivery or organizational capacity. There is some anecdotal evidence to suggest learning effects at the organizational level that could improve their procurement practices in the future, particularly their ability to engage with the marketplace and use outcome-based specifications. Despite being short-lived, the IPPs were valuable to a certain degree in supporting strategic thinking at the department level, particularly linking PPI to departmental objectives.

There is also only anecdotal evidence available on the relative success of iTAPP and related initiatives. Studies such as Edler and Yeow (2016) provide qualitative evidence on the implementation barriers that these initiatives seek to address and the role that funding and intermediation structures can play. These studies suggest that key barriers remain, such as silo structures, cultural resistance, risk aversion, and training associated with the use of new technologies.

The evaluation of the SBRI program has reported some positive impacts. However, the assessment of the SBRI program is constrained by some key methodological challenges, including the difficulty of assessing the additionality of the program for firms and government departments.

In general, an assessment of the effects of these initiatives is constrained by a lack of clear metrics and monitoring structures as well as the early discontinuation of many of these initiatives, such as IPPs and iTAPP. The latter issue evidences a problem regarding PPI in the United Kingdom. While there have been several potentially very powerful policy innovations in the country, there was far too little continuity in implementing them. This continuity is, however, needed for these initiatives and intermediary organizations to gain legitimacy and enable organizational learning. Discontinuities in government strategies, with frequent policy reversals and reorganizations, are not favoring the institutionalization of these practices nor achieving the objective of signaling long-term needs to the market. At the same time, the creation of new bodies and coordination mechanisms to overcome fragmentation, rather than trying to improve current structures, is sometimes creating more fragmentation.

Centralization of procurement activities through the CCS and the use of portals such as contracts finder is having a positive effect in terms of reporting of the goods and services being procured by the government departments centrally and in terms of the intelligence available on the characteristics of government suppliers. Better reporting is pivotal for the government's efficiency agenda, and the targets set up to improve contracting with SMEs. However, there are no mechanisms in place to assess the effect that, directly or indirectly, public sector contracting is having on the innovation performance of supplier firms.

There is also a shortage of analyses investigating suppliers' innovative responses to public procurement. Studies directly targeting the suppliers responsible for delivering the contracts as few and far between. The survey conducted within the UNDERPINN study (Understanding Public Procurement of Innovation) for the first time aimed to connect procurement practices in the United Kingdom with the innovation characteristics and performance of supplier firms (Edler et al., 2015; Georghiou et al., 2014; Uyarra et al., 2014). However, these constitute one-off efforts and are insufficient to allow comparative studies across countries or over time.

Better monitoring mechanisms of procurement spending and the characteristics of suppliers, together with an enhanced use of innovation surveys such as the community innovation survey (which has recently incorporated a question regarding the use of procurement), could be used as opportunity to monitor and evaluate the impact of public demand on innovation in the United Kingdom.

Concluding Remarks

The United Kingdom is a good example of a country with high ambition regarding public procurement of innovation. The country has indeed been regarded as a front-runner in pushing the procurement agenda toward innovation (Edler and Uyarra, 2013).

Public procurement of innovation has been high on the political agenda in the United Kingdom, particularly since 2000, with the launch of a host of initiatives and reports to mobilize the use of procurement to support competitiveness and innovation. The use of public procurement has also been connected to the pursuit of additional policy goals, such as sustainability, regeneration, and training. Specific policy schemes have included the IPPs, the SBRI, FCP, and the Department of Health's iTAPP (Uyarra et al., 2014).

Despite the high level of political rhetoric and creativity in designing instruments, the United Kingdom case reveals two major problems. The first is the loss of momentum in terms of policy implementation, which is in stark contrast to the creativity in defining PPI instruments and the political rhetoric. The momentum for dedicated innovation procurement policy slowed down in the early 2010s. The coalition government adopted a different approach toward procurement and innovation, privileging efficiency and fostering initiatives to streamline and centralize public procurement for common goods and services. Thus, the procurement agenda turned toward efficiency and capabilities, which has raised some doubts about the implementation and effects of general innovation procurement practice and dedicated procurement schemes.

Second, the schemes devised often underestimated the institutional challenges within organizations to define a need, to conduct a proper, inclusive process, to trigger innovation and to use the innovation bought. This is true for the SBRI scheme, which lacks widespread uptake of resulting innovation in the public sector, and for the iTAPP process, which demonstrated that good business cases are not sufficient.

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7. CHINA

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China Overview

China, officially the People's Republic of China (PRC), is a sovereign state in East Asia and the world's most populous country, with 1.368 billion inhabitants in 2014 (Walton, 2001). With a gross domestic product (GDP) of over US$10.354 trillion in 2014, China is the second-largest economy after the United States (World Bank, 2014). The country has been one of the fastest-growing economies in the world, with an average growth rate of 10 percent over the last 30 years (IMF, 2015a). GDP growth, however, recently slowed to 6.9 percent due to reduced investment, with a rising trend toward private consumption.

Led by the Chinese Communist Party (CCP) since 1949, China's political system is very distinct from multi-party systems in Western capitalist economies. Originally known as a socialist communist state, its political institutions and culture have continuously evolved over the past several decades. Since 1980, China has been benefiting from a development approach of Special Economic Zones (SEZ), characterized by free market zones and more flexible government measures that are allowing more accessible foreign and domestic trade and investment. China has become a global hub for manufacturing and the largest exporter of goods in the world, with one of the largest-growing consumer markets and international trade.

Institutional Network and Governance

Below the central government of China, at the regional (provincial) level, there are 23 provinces, five autonomous regions, and four municipalities; below the provincial level, there are agencies at the level of cities, counties, townships, and villages (Martin, 2010). As the central government makes national policies, lower-level governments learn from the central themes and articulate and implement them according to the concrete situation of the region. Although the Chinese political system is highly centralized, with higher-level government deciding on the appointment of lower-level officials, the Chinese fiscal system is highly decentralized owing to waves of reforms toward financial decentralization (Zheng, 2007). The political system features characteristics of de facto federalism (Zheng, 2007). The role played by regional governments and their agencies in shaping China's innovation policy processes should not be underestimated.

In the context of the political and economic governance system, China has been placing primary emphasis on capital- and technology-intensive industries to stimulate local economic and fiscal revenue growth. Especially with rising production costs, an aging population, and diminishing returns on capital investments, the focus has been on increasing innovation and demand through domestic consumption (WEF, 2014).

In relation to intellectual property rights (IPR) in China, there has been a long-standing critical concern about IPR enforcement, especially for international companies. Since joining the World Trade Organization (WTO) in 2001, China has strengthened its legal frameworks and IPR laws and regulations to comply with WTO Agreements and IPR. Despite this, China has continued to be at higher risk for counterfeit and piracy activities (Embassy of the United States, 2015).

Economic Performance

According to the World Economic Forum (WEF), China ranks 28th on the Global Competitiveness Index (GCI), which places China at the top of the list of the so-called BRIC (i.e., Brazil, Russia, India, and China) countries. China comes in 2nd worldwide on the 2015 IMD Global Competitive Scoreboard, after the United States (IMD, 2015). In recent years, China has benefited from increasing consumption, which accounted for more than 50 percent of its GDP growth. Forecasts suggest that China will become the world's largest luxury goods market by 2020. China is the largest export economy in the world and the 22nd most complex economy, according to the Economic Complexity Index (ECI). The country therefore plays a vital role in international trade, with increasing engagement in trade organizations and treaties in recent years. China experienced a sudden decline in GDP to 7 percent in 2015, believed to be due to lower commodity prices and weaker domestic demand (IMF, 2015b). With this, forecasts predict a shift in China's growth model toward a more market-based financial system to increase demand and financial stability (IMF, 2015).

As a fast-growing developing country, China still faces significant challenges in fighting corruption, ranking 36th on the Transparency International's Corruption Perception Index in 2014 (WEF, 2014). The country has been particularly criticized on human rights, governance, and stability problems, and has been making an active attempt to combat corruption through anti-corruption campaigns (*Financial Times,* 2014).

Key Features of the Innovation System

Currently, China offers one of the largest information and communications technology (ICT) markets in the world, committing increasingly large R&D investments to high-tech output as a move away from manufacturing (Atkinson, 2014). Since 2008, the number of innovative enterprises has dramatically increased, with 26,894 high-technology manufacturing enterprises in 2013 and a significant increase in R&D investments (NBSC, 2014). China's share of the world's high-technology manufacturing increased significantly, from 8 percent in 2003 to 24 percent in 2012. There are an increasing number of small and medium enterprises (SMEs) in China focusing on high-tech and high-quality product trade (McKinsey, 2014). China's total research and development (R&D) output in the business sector accounts for 72 percent of gross domestic expenditure on R&D (GERD) (1.30 percent of GDP) and has more than doubled during the period 2005–2010 (Nair, 2013).

China's innovation system has experienced a series of reforms since the 1970s, driven by major policy changes. The overall trajectory can be described using five development stages, namely, incubation, experimentation, structural reform, deepening the structural reform, and the current phase toward a market-driven, firm-centered, indigenous innovation system marked by the launch of the National Medium- and Long-Term Program for Science and Technology Development 2006–2020 (MLP) (Li, 2011; OECD, 2008; State Council 2006a).

A core theme outlined by the MLP was indigenous innovation, which has continued to be a programmatic and overarching emphasis in China's current stage of innovation system development (Benner, Liu, and Serger, 2012). The State Council has defined indigenous innovation as "original innovation, integrated innovation, and re-innovation based on assimilation and absorption of imported technology" (State Council, 2006a: 10).

In the Chinese context, indigenous innovation has a connotation of "new to the country" rather than "new to the world." The motivation behind this strategy lies in the country's strong intention to catch up in an increasingly knowledge-based global economy. Following this initiative, the supporting policies for the MLP (State Council, 2006b), and the consequent implementation measures, elaborated practical approaches and designed an institutional setup for each of the policy instruments.

Based on the MLP, China's science, technology, and innovation (STI) system has been moving away from the traditional science-based R&D system toward a more firm-centered, market-based innovation system, with the aim of achieving an innovation-driven economy by 2020 (OECD, 2012). A primary focus of China's STI policy for fostering innovation has been to increase R&D investments and frameworks for government procurement, such as major construction projects. MLP also highlighted the importance of establishing regional innovation systems with diverse characteristics and strengths to support the building of a national innovation system (State Council, 2006a).

Public Procurement Overview and Legislative Context

The core elements of the legislative framework of public procurement in China are summarized in English by Practical Law.[48] Public procurement activities in China are regulated by two primary laws: the Law on Tendering and Bidding (LTB) (LTB, 1999) and the Law on Government Procurement (LGP) (LGP, 2002). Functions of the two laws were supposed to be complementary, with the LGP focused on government procurement issues and the LTB covering tendering issues in general. A linkage between LTB and LGP is very briefly stipulated in LGP that:

> …if a tendering/bidding procedure is required in government procurement of construction, the LTB is applicable (Article IV, LGP, 2002).

Nevertheless, regulating public procurement under two primary laws turned out to be very problematic in practice. Key barriers lie in differences in the definitions of key terms and monitoring difficulties caused by two separate yet overlapping governance systems. Deliberate ambiguity is evident in the wording of both laws, which "destroyed the balance between legal certainty and flexibility" (Wang and Zhang, 2010: 154). The boundaries and functions of LTB and LGP frequently overlap in practice.

Government Market Position

OECD has estimated that public procurement accounts for approximately 13 percent of GDP in OECD member countries.[49] However, for China the size of its public procurement market is not calculable in a straightforward way. A major complexity lies in the narrow and broad definitions of government/public procurement adopted by different Chinese laws regulating procurement issues.

The scope of government procurement in China is much narrower than that of public procurement, with the former referring to:

> …the purchasing of goods, works and services (either listed on the centralized procurement catalogues or above certain thresholds) by various levels of government agencies, public institutes and social organizations with fiscal funds (Article II in LGP, 2002).

The subject of this definition only includes public organizations relying on fiscal funds, while state-owned enterprises (SOEs) are excluded (Wang, 2009). Given that most of the suppliers of public infrastructure and services in China are SOEs (Wang, 2007), the scope of government procurement defined by the LGP is much narrower than that of public

[48] See http://uk.practicallaw.com/4-521-9911 and http://www.loc.gov/law/help/govt-procurement-law/china.php for more details (accessed February 7, 2016).
[49] See http://www.oecd.org/gov/ethics/public-procurement.htm OECD database on public procurement (accessed February 7, 2016).

procurement in the broad sense. Hence, what is defined as government procurement by LGP only represents part of public procurement in China.

One consequence of this institutional fragmentation is the difficulty of tracking public procurement transactions and obtaining accurate statistics. According to the data provided by the Chinese Ministry of Finance (MOF), government procurement expenditure in China accounts for around 2 percent of GDP, while the European Union Chamber of Commerce in Chin (EUCCC) argued that public procurement in China represents "well over 20 percent of China's rapidly growing economy" (EUCCC, 2011: 2). Although there have been no official statistics indicating the exact size, it is certain that the Chinese public procurement market is vast, indicating great potential for utilizing public procurement to fulfill multiple functions, including promoting innovation.

Organizational Structure

As explained in the preceding section, public demand in China should at least be differentiated in terms of:

(1) the demand to be met by government procurement, regulated by LGP, accounting for nearly 2 percent of China's GDP;
(2) the demand to be met by SOE procurement, covered by the LTB in principle, accounting for a tremendous proportion of China's GDP.

Category (1) is very centralized and well regulated. It corresponds to the daily supply of public entities funded by central and local financial departments, supervised by the MOF. Key acquisition agencies include government procurement centers at both the central and regional levels.[50]

Category (2) is fragmented across sectors and appears to be vague and lacking proper monitoring. In principle, contracts exceeding certain threshold values are subject to public tendering. However, there is no central authority supervising the implementation of this process. The LTB was drafted by the National Development and Reform Commission (NDRC) and issued by the State Council.

Recently there have been attempts to monitor and regulate public demand in a more centralized and coordinated way, mostly through implementation measures as supplements to the two primary laws, LGP and LTB. Recent advances to remedy the conflicts between legal frameworks, prevent corruption, and promote the degree of marketization included a set of implementation measures to support LGP and LTB, that is, *Implementation Measures of the Law on Tendering and Bidding*, published by the State Council in November 2011, and *Implementation Measures of the Law on Government Procurement,* published by the State Council in January 2015. Key actions taken include publicizing public demand through electronic platforms, prioritizing strategic areas such as energy saving, environmental protection, and support for SME and minorities. The effectiveness of those concrete measures in streamlining the actual procurement processes at the micro level remains to be seen.

Legal Framework for Competition and Transparency

The degree of open competition in China's public procurement market has often been criticized. The European Commission has identified the lack of access to China's public

[50] Details of China's government procurement regulations and agencies are available at this platform http://www.ccgp.gov.cn/ (accessed February 7, 2016).

procurement market as a trade barrier.[51] Several policies built on public procurement as an instrument, such as the "Buy Chinese" policy, which favors products with domestic elements and public procurement of innovation policy, have been questioned by key international stakeholders for discriminating against foreign candidates.

In the domestic environment, regions compete in various public procurement markets as well. For government procurement regulated by LGP, there is not much room for exercising regional protectionism since this 2 percent of GDP is highly centralized and regulated. However, for broader public procurement involving SOE procurement, regional protectionism within the context of China has been pervasive and has severely hindered open competition (Wang, 2007). The ambiguity of the legal framework built on LTB has provided great flexibility for practitioners to do their own interpretation and exercise informal rules (Gong and Zhou, 2015).

Compliance with international treaties has been an issue. Since its accession to the WTO in 2001, key trading partners, such as the United States and the European Union, have been urging China to open its public market and join the Agreement on Government Procurement (GPA). China made its fifth offer in early 2015, with significant improvement in terms of openness over its earlier offers.[52] Key actions included reduction of thresholds for contract coverage, and expansion of coverage to new procuring entities, such as local governments, in a broader geographical scope. Nevertheless, existing GPA signatories still found the offer unacceptable given its fundamental incompatibility in terms of legislation. For instance, the exclusion of SOEs from government procurement in China implies that non-Chinese products might be subject to discrimination when trying to enter the Chinese public market; meanwhile, under the current offer, only a few most advanced Chinese regions have opened their government procurement markets to international products. Besides those issues related to coverage, the Chinese regulatory framework, if it is underpinned by two separate laws, remains inconsistent with international traditions.

PPI Capabilities and Rationales

This section introduces the evolution of PPI rationales and approaches in recent years in China as well as the broad mechanisms, structures, capabilities, and incentives in place.

Policies promoting PPI in China, launched as one of the highlighted new elements of the national innovation strategy in 2006, were once very high-profile. Following a few years of articulation and implementation, however, PPI in China came to a standstill because of conflicts with key international stakeholders, including the United States and the European Union.[53] The most explicit PPI policy instrument in China, that is, the one based on innovation catalogues, was unexpectedly withdrawn at the national level in 2011, followed by varied responses from regions. The main reason for the termination of the policy has been its protectionist characteristics. Meanwhile, there have been other forms of PPI policies in place, either pure PPI initiatives or sectoral programs coupled with other policy instruments.

[51] See http://madb.europa.eu/madb/barriers_details.htm?barrier_id=960027&version=8 for more details (accessed February 7, 2016).
[52] See https://www.wto.org/english/news_e/news15_e/gpro_11feb15_e.htm for more details (accessed February 7, 2016).
[53] See, for example, USCBC (2011a), USCBC (2011b) and EUCCC (2011) for details of U.S. and EU reactions to China's PPI policies.

The MLP kicked off the use of public procurement as an innovation policy instrument (State Council 2006a). This policy move was originally based on policy learning from the United States and Korea (Edler, Corvers, and Liu, 2008). Article VII-3 makes explicit reference to the use of this policy instrument, specifically the following:

> - Formulate implementing regulations of the PRC Government Procurement Law to encourage and protect indigenous innovation
> - Establish a coordination mechanism for government procurement of indigenous innovative products
> - Government practices a first-buy policy for major domestically made high-tech equipment and products that possess proprietary intellectual property rights
> - Provide policy support to enterprises in procuring domestic high-tech equipment
> - Develop relevant technology standards through government procurement. (State Council, 2006b: 54)

To respond to this initiative, the Ministry of Finance, the Ministry of Science and Technology (MOST), and the NDRC issued several implementation measures, including a regulatory system for a PPI policy instrument in China based on innovation catalogues. This policy approach was terminated in 2011 due to conflicts with international stakeholders. Yet the rationale and the experience of this policy approach offer transferrable lessons for other contexts.

The concrete implementation practices and the engagement of stakeholders went beyond the scope of explicit measures launched by the abovementioned ministries (Li, Georghiou, and Rigby, 2015). Table 7.1, which summarizes the major categories of approaches employed, was developed based on policy analysis and fieldwork. Given the wide diversity of PPI practices and locations in China, the table should be considered exploratory rather than conclusive. The following section reviews the developments of those different initiatives.

As shown in Table 7.1, China has adopted at least three key PPI policy approaches, either explicitly under the title of PPI, or implicitly under the umbrella of broader sectoral initiatives. The most explicit approach was a routinized mechanism implemented through accrediting catalogues. Innovation catalogues were essentially the national-level archetype of "accrediting catalogues." Its rationale was to remedy the information asymmetry between supply and demand and enhance inter-departmental coordination through published catalogues containing information on innovative solutions. Another approach, "signaling catalogues," works from the opposite direction of accrediting catalogues, remedying information asymmetry by forecasting demands to potential suppliers. These types of catalogues play a similar role as technology road-mapping, but with a clear focus on short-term demand. The third PPI policy approach is through PPI elements embedded in demonstration programs for new technologies. Every demonstration program has its special background and policy settings. By rationale this policy approach is like the EU Lead Market Initiative program.

Table 7.1: The Range of Identified National Policies for PPI in China

Forms	Routinized mechanism via accrediting catalogues	Signaling catalogues of equipment and other strategic technologies	Support programs for key, strategic, and emerging areas (lead market initiative- type programs)
Rationale	Enhancing communication between suppliers and procurers	Signaling national demand; technology road-mapping	Creating lead market; systemic mix of policy instruments
Implementation	Ambiguous national measures; regional autonomy in developing local mechanisms; diversified across regions	Relatively smooth; government departments regularly launch catalogues to inform suppliers	Targeted at various sectors e.g., LED lighting, solar energy and new energy vehicles

Source: Li and Georghiou (2016).

Table 7.2 maps China's PPI policy initiatives into the typology of policy interventions developed by Georghiou et al. (2014). As shown, China still lacks explicit policy instruments to address skills deficiency. Although networks of practitioners exist for regular procurement, there has been no such initiative for PPI. Attempts to improve framework conditions have been limited by the fragmentation of fundamental legal frameworks regulating public procurement.

Table 7.2: China's PPI Policy Initiatives Mapped into Georghiou et al. (2014) Typology

Policy Category	Deficiencies addressed	Instrument types	Implemented instruments
Framework conditions	i) Procurement regulations driven by competition logic at expense of innovation logic ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	i) No specific regulations focused on innovativeness but regulations on environment and industry could serve as complementary instrument to implement PPI ii) Adoption of e-procurement platforms; but the use of this has been restricted by the fragmentation of legal frameworks regulating public procurement in China
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks	i) Inclusion of PPI policy as one of the new instruments of the indigenous innovation strategy, backed with a set of high-level policy measures
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning and procurement function	i) Pre-commercial procurement of R&D to develop demonstrate solutions	i) National and regional signaling catalogues which specify the technologies/solutions in great demand ii) Demonstration/support programs for new technologies such as new energy vehicles
Incentivizing innovative solutions	i) Insufficient expenditure and articulation of innovative solutions	i) Innovation oriented public procurement programs	i) Larger government procurement budget for forthcoming financial year if agencies purchase innovative products ii) Accredit innovative solutions into catalogues which then forms a reference for procurers to support innovation

Source: Author's analysis of China's PPI policies against the Georghiou et al. (2014) typology.

Key Policy Developments in PPI

The Innovation Catalogue Approach

Catalogues of indigenous innovation products, or simply "innovation catalogues," were first introduced in the State Council (2006b). The catalogues were designed to include innovative solutions and products that were accredited by the authorities, so that policy practitioners (including public procurers) could use them as a legal reference to provide policy support (including preferential treatment in public procurement processes) for those products. Article XXII of the State Council (2006b) elaborates on overall organizational issues related to innovation catalogues. It stipulates that the production of catalogues would rely on coordination between science and technology (S&T) and finance departments, with the former in charge of accrediting indigenous innovation products and the latter in charge of identifying procurable products to form catalogues containing procurable, innovative solutions. Article XXIII also addresses tendering procedures. It stipulates that indigenous innovation should be an essential criterion in product evaluation.

Concrete measures to implement the innovation catalogue approach were jointly announced through a set of policy measures issued by MOST, NDRC, and MOF. Criteria for inclusion in the innovation catalogues defined by those ministries are summarized in Table 7.3 below:

Table 7.3: Criteria for Inclusion of Products/Solutions into Innovation Catalogues

Legality	Compliance with national laws and regulations, and national STI policies.
IPR issues	Ownership of indigenous IPRs (i.e., the applicant legally obtained IPRs through innovation activities conducted by itself, or legally obtained the ownership or use rights of the IPRs legally obtained by other Chinese enterprises, organizations or citizens), with clear equity position. The use, disposal, and secondary development by the applicant is not restricted by others from abroad.
Trademark	The applicant legally possesses the ownership or the (exclusive) use rights of the product's trademark in China.
Innovativeness	The product can contribute significantly to resource-saving, energy efficiency, or reducing pollution; or makes fundamental improvements in structures, materials, or processes, which lead to significantly improved performance compared with similar products.
Technology	The technology is advanced and internationally leading-edge among similar products. "Leading-edge" means that the overall technology, or a core technology, is internationally advanced, or the technology is advanced and already being exported, or the cost-performance rate is internationally competitive.
Quality	The product has reliable quality and has passed tests by the National Certification and Accreditation Administration or by laboratories and inspection agencies recognized by regional departments of quality control. Production permits from related authorities are needed for industries with specialized national-level regulations; compulsory certifications are needed when applicable.
Commercialization	The product has already entered the commercialization stage or has potential economic benefits and relatively great market potential, or can substitute imports.

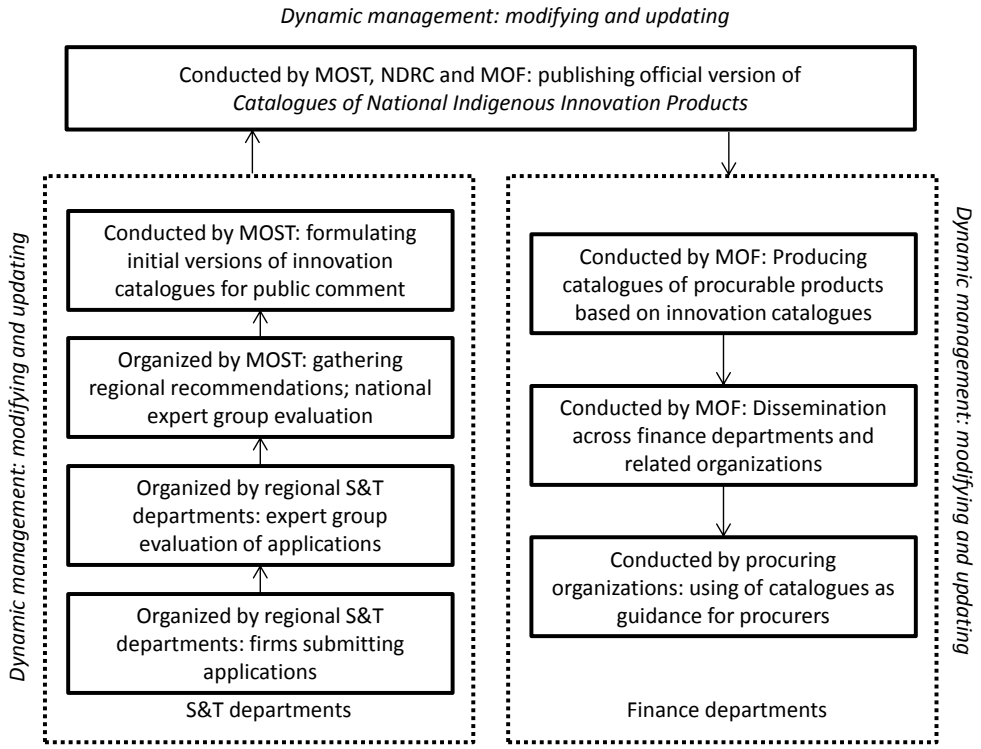
Source: Analysis of policies jointly announced by MOST, MOF, and NDRC in 2006, 2009, and 2010.

The criteria listed in the table above are debatable. One issue is the requirement on the timing of new technologies. High innovativeness, high stability in terms of quality, and high readiness for commercialization are all required, which is unrealistic considering the uncertain nature of innovative products. Another issue, which turned out to be the main

source of controversy, was the requirement on the "nationality" of innovative products. Inclusion in the catalogues is limited to products with domestic IPRs only (USCBC, 2011b).

A flowchart of the innovation catalogues approach[54] is illustrated in Figure 7.1 below. Innovation catalogues were supposed to serve as a bridge whereby the innovation system and the procurement system could coordinate with each other.

Figure 7.1: The Use of Innovation Catalogues in Facilitating PPI – a Flowchart



Source: Li (2013).

On the innovation system side (i.e., the left-hand side of the figure), regional S&T departments should notify local firms about accreditation procedures and encourage them to submit applications on a voluntary basis. After gathering and checking the applications (in terms of format and application materials), regional S&T departments should organize expert groups to conduct preliminary evaluations and recommend qualified products to MOST. MOST should gather recommendations from all regions and organize expert groups to do fieldwork and finalize the evaluation results; MOST should then produce and publish an exposure draft of a national innovation catalogue. After all the dissents are solved, MOST, NDRC, and MOF should jointly issue certificates to qualified products, and an official version of the innovation catalogue will be published. On the procurement system side, MOF should produce a catalogue of procurable products based on the innovation catalogue and disseminate it to all the lower-level agencies and public organizations. The catalogue of procurable products should then be adopted as a reference for government procurers. On both sides, continuous management is required to modify and update the catalogues. Certificates of different products have different periods of validity, ranging from two to four years.

The central government appeared determined to implement this channel, and more than half of the regions responded actively by implementing national policies. During the transitional

[54] See Li (2013) for a detailed account of China's PPI approaches.

stage, when the national catalogues had not yet been produced, regions demonstrated both compliance and some regional variation, with diverse approaches and degrees of progress on implementation. Regional experiences indicated incompatibility between PPI and China's procurement systems, mainly due to the overly narrow scope of government procurement; in some regions, the issue was mitigated through local policies. Funding for the innovation catalogue approach came from MOF, mostly confined within the scope of government procurement at the national level, but regions have autonomy to decide how to implement the approach and what sectors to cover in those catalogues. For instance, Beijing employed a rather broad definition of public procurement and allocated large-scale funding for implementation.

However, subsequent implementation trajectories of this channel, especially after the MOST, MOF, and NDRC launched the nationwide accreditation work in late 2009, were heavily obstructed by external factors, notably political pressure from the U.S. government out of concerns about China's protectionism. After rounds of bilateral negotiations between China and the United States, the Chinese government officially terminated this channel in 2011. The exact impacts of the establishment and the termination of this channel on the country are unknown, yet available data suggested that different stakeholders situated in different regions held diverse opinions, depending on their own experiences of the policy.

A recent update on this issue by USCBC suggested that some Chinese regions are still debating the potential of using various policy instruments to realize public procurement of innovation (USCBC, 2015).

Signaling Catalogues of Equipment and Other Strategic Technologies

The actual scope of PPI policies outlined by the MLP and its lower-level policies was broader than the narrow understanding of government procurement, largely owing to the inclusion of equipment procurement issues. The main users of major technological equipment in China are SOEs. Thus, most equipment procurement is by nature public procurement, which is beyond the scope of LGP.

The State Council issued a document entitled *Advice on Accelerating the Revitalization of Equipment Manufacturing Industry*. It listed 16 areas of needed equipment technologies. Article XIII stated that

> Ordering procurement and use of domestically made first (set of) major technological equipment are encouraged. For those major national projects that procure or use first (set of) equipment, they can be certified as demonstrating projects for technological advancement and enjoy priority during implementation (…) (State Council, 2006c).

The State Council (2006c) was further supported by *Administrative Measures on First (set of) Major Technology Equipment Experiments and Demonstration Projects* (NDRC et al., 2008).

By listing the technological areas in need of development in China, the State Council (2006c) played a "catalogue" role in signaling national demand for major technological equipment. Following this initiative, government agencies further published the *Guiding Catalogue for Indigenous Innovation in Major Technological Equipment*, that is, the "equipment catalogue." The 2009 catalogue listed 18 technological areas and 240 equipment products that had a certain degree of technological foundation but still needed additional support to realize commercialization in the short term. The introduction of the catalogue stated that

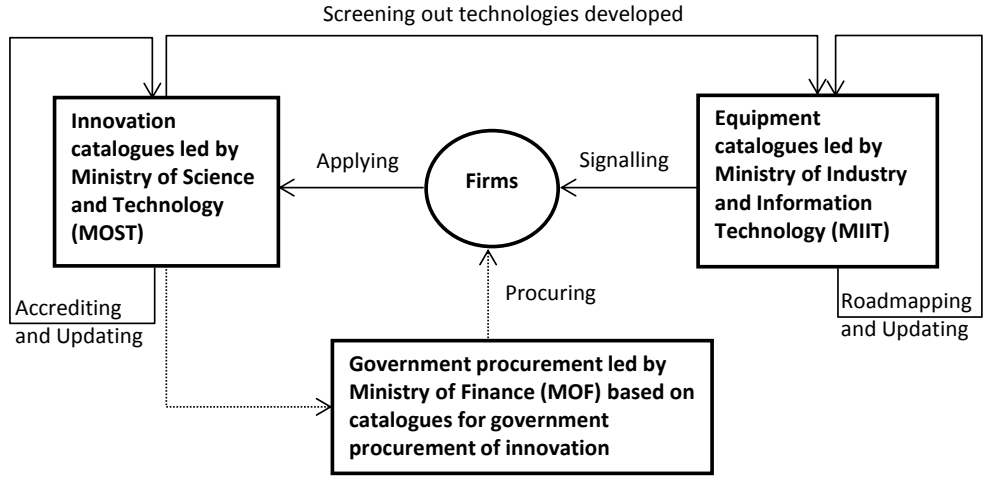
> (…) products listed in this catalogue have the priority to… enjoy related national policies encouraging the use of first (set of) equipment; once the products are developed successfully and qualify as national indigenous innovation products, they

have the priority to be included in innovation catalogues and enjoy government procurement policy support (…) (MIIT et al., 2009).

The 18 areas are mostly beyond the scope of narrowly defined government procurement and not procurable by government agencies, such as power generation and transmission equipment, rail transportation equipment, and mining equipment.

As distinct from an innovation catalogue, which was a "what we have" list, the equipment catalogue was a "what we want" list, underpinned by a strong intention of catching up and targeted at world-leading technologies. Notionally, the two types of catalogues were linked together to form a signaling and accreditation mechanism to facilitate the conduct of PPI (Li and Georghiou, 2016). By working together in both directions, these two kinds of catalogues were intended to stimulate innovation through both "push" and "pull" forces.

Figure 7.2: Mechanism Designed to Use Innovation and Equipment Catalogues



Source: Li and Georghiou (2016).

The equipment catalogue has been updated yearly. It serves multiple functions, including: working as a signaling instrument to guide the directions of R&D, providing policy justification for government agencies to support the equipment manufacturing industry through various measures, and functioning in conjunction with innovation catalogues to promote PPI.

USCBC also raised concerns about potential discrimination against foreign products by the Ministry of Industry and Information Technology (MIIT). Explicit language regarding import substitution and government procurement supporting major technological equipment was removed from later versions of the equipment catalogue.

Regions featuring strong equipment industry bases followed this initiative and undertook their own approaches. Again, both compliance and autonomy were observed; while regions followed the national equipment catalogues, they used various instruments, such as accrediting and supporting locally developed new equipment.

Supporting Programs for Key, Strategic, and Emerging Technological Areas

In recent years, the government of China (and those of other countries) has led efforts to promote the development of emerging and strategically important sectors (OECD, 2011). They are mainly targeted at new technologies that are promising in addressing grand challenges (Edquist and Zabala-Iturriagagoitia, 2012), especially those that the private sector or the market mechanism itself would is unable or unwilling to address. These

programs can be considered systemic policies with various demand-side instruments adopted, such as technological standards, consumer subsidies, capacity building, and public procurement. In China, well-known examples include the New Energy Vehicle (NEV) Program (also called "Ten Cities, Thousands of NEVs") (Li, Georghiou, and Rigby, 2015), and the LED Lighting Program (also called "Ten Cities, Ten Thousand LED lights") (ISA, 2012).

The NEV and the LED lighting programs were both initiated in 2009 to promote the commercialization and diffusion of new technologies in both sectors, as well as to address issues such as the global economic crisis, energy shortage, and environmental pollution. The MOF budget was not the only source of funding for this policy approach; the procured technologies went beyond the coverage of LGP. Other authorities supervising sectoral development, such as the MIIT, often play a more prominent role in overseeing the implementation of these programs.

Other Complementary Policy Instruments

The *Administrative Measures on Government Procurement of Imported Products* issued by MOF in 2007 detailed regulations controlling government procurement of imported products. It is stipulated that government procurers need approvals from financial authorities to buy imported goods if they could not find any domestic alternatives to meet the demand (Article IV); for major technologies, equipment, and S&T instrumentation, the import of which is restricted, approvals from the NDRC or MOST are needed to procure imported ones (Article X). When government procurers purchase imported goods, they are supposed to adhere to the principles of supporting indigenous innovation and give priority to foreign suppliers that are willing to transfer technologies, provide training services, or take other compensatory measures (Article V).

These "control import" and "buy domestic" policies do not necessarily lead to innovation due to the strong protectionist nature without specifications about innovation. Nevertheless, they might have the potential to stimulate indigenous innovation that may be new to the country for developing countries. The legitimacy of this approach is debatable owing to its discriminatory nature; yet, this type of approach has long served as a strong policy instrument used by leading countries such as the United States (Luckey, 2009).

Access to supranational funds has been very limited. In rare cases, local governments have supported PPI practices in collaboration with the World Bank. The Shanghai Donghai Bridge Wind Farm project is an example of such collaboration.

Evidence of Impact and Further Challenges

There is little quantitative information reflecting the implementation and impacts of China's PPI policies, primarily for to the following reasons:

- China still lacks a consistent database that monitors regular public procurement activities, not to mention the monitoring of procurement activities aiming at supporting innovation.
- The PPI policy approaches employed in the Chinese context have been built on different rationales and have experienced diverse trajectories of implementation, which has posed additional challenges of assessing quantitively the overall impacts.
- The measurement of impacts of PPI policies has been challenging, as pointed out by Edler et al. (2012).

Qualitative Assessment of Impacts

Four major outcomes/impacts were observed from nine PPI cases that were stimulated by different PPI policy channels. These are: promoting innovation, improving public infrastructure, developing supply chains, and creating demonstration effects.

These effects, however, were largely limited to the localities rather than spilling over to other places. It was found that PPI in China appeared to be mostly adaptive procurement that facilitates the diffusion of incremental innovation rather than developmental procurement that stimulates radical innovation. PPI policies have been positioned as an instrument to follow supply-side policies and support the commercialization of existing R&D outcomes, rather than triggering the creation of not-yet-existing solutions.

Very moderate behavioral additionalities of target groups were observed in regions such as Beijing and Shanghai. Owing to their financial autonomy, local governments can be easily motivated by central-level PPI initiatives if they see the potential of leveraging procurement to drive local GDP growth. Nevertheless, unintended consequences, such as protectionism and duplicate production, are very harmful to the country. The three PPI policy approaches outlined above have arguably failed to address this problem.

Interactions between PPI policies and other demand-side instruments have been observed from the field. Specifically, there has been a mutually reinforcing effect between PPI and standardization. PPI could lead to the establishment of unified standards in the locality following large-scale public procurement. Yet, the absence of unified, nationwide standards has increased uncertainty for procurers to choose alternative solutions and for suppliers to develop products. This lack of national standards also triggered local protectionism in emerging technological areas, since regions have seen the potential of accelerating local growth by imposing local standards. There have been interactions between PPI and sectoral regulations as well. Environment-related regulations could stimulate PPI of new environment-friendly solutions, offering opportunities for eco-innovation.

Challenges

Quite a few challenges have been observed regarding the use of PPI in China. First, a fundamental challenge lies in the incompatibility of China's public procurement practices with international norms. The regulatory system underpinned by two competing laws is arguably flawed. Some innovative solutions were not procurable due to the fragmentation of the procurement system and correspondingly the absence of a unified procurement classification. Regulations imposed by the LGP and LTB are competing for micro-level practitioners who need to justify their decision making. At the policy level, although some minor adjustments were made to support PPI, fundamental flaws remain. At the micro level, a few case studies conducted by this research team indicated that these failures were, again, largely mitigated by local governments and other actors. Nevertheless, too much autonomy and flexibility for local governments to perform as procurers led to regional protectionism and market fragmentation.

Another challenge, which was also observed in the context OECD countries, is risk aversion. The unwillingness of actors to adopt innovation was highlighted by a few case studies. The longstanding attitude of discriminating against domestic products is an extreme example. As pointed out by an interviewee, equipment users feel more confident and responsible if they buy imported products, as imported products are perceived as being of higher quality than domestic ones.

Poor interdepartmental coordination has also been a challenge. Problems arose primarily owing to a lack of goal alignment and can be considered institutional (e.g., problematic division of labor resulting in competing departmental responsibilities) or interaction failures

(e.g., the institutional setup is fine but communication and collaboration between departments are lacking). Practitioners frequently needed to strike a balance among de jure compliance with the LTB or the LGP, de facto operationality for implementation, the goal of procuring qualified products, and fulfilling political tasks such as promoting innovation.

The strong intervention of both central and local governments has limited the room for open competition. The interventionist governance style, on the one hand, helped achieve the desired outcomes, serving as a complementary force to implement PPI policies. On the other, it created administrative pressure for potential procurers, making them feel obligated or expected by the government to purchase.

Concluding Remarks

Key characteristics of the Chinese economy, including but not limited to the dominant role played by the government, the enormous public demand, and the vibrant private market, point to great potential for stimulating innovation through public procurement.

The Chinese State Council first launched PPI policies in China in 2006 as one of the new innovation policy instruments included in the *Guideline on National Medium- and Long-term Program for Science and Technology Development (2006–20).* Between 2006 and 2011, several policy approaches were put in place at the national and the regional levels. Reflecting on the policy typology proposed by Georghiou et al. (2014), China's PPI policy approaches mainly fall into the categories of identification, specification, and signaling needs (in the case of equipment catalogues) and incentivizing innovative solutions (in the case of innovation catalogues). While some supporting programs for key, strategic, and emerging areas involved instruments of the categories of "organization and capabilities" (e.g., user subsidies) and "framework conditions" (e.g., regulations), the effort remained rather fragmented and trivial.

A key feature of those approaches was the focus on the indigenousness of innovations, import substitution, and catching up in general. Owing to exactly this protectionist feature, Chinese PPI policies raised severe concerns on the part of international trading partners, such as the United States and the European Union. The conflict between international free trade and domestic PPI policies eventually led to the termination of core PPI policies in China. This offers important lessons for other developing countries, such as Colombia and Brazil, which seek to use public procurement as an innovation policy instrument.

There was no officially commissioned comprehensive evaluation done for the Chinese PPI policy experience. However, through analyzing nine PPI cases at the national, regional, and micro levels, a few common themes of achievement have been identified:

- Stimulation and diffusion of innovations: PPI served mostly as a diffusion policy, and key technology development was mostly achieved with the support of supply-side policies such as R&D programs.
- Development of suppliers, supply chains and local industries: Most of the PPI cases resulted in development of suppliers' businesses, in terms of firm size as well as capabilities.
- Improvements in public infrastructure have come about especially in the cases of public transportation and lighting systems, which relate to citizens' everyday life.
- Demonstration effects have come mostly in the form of enhanced public awareness.

Core challenges lie in the following aspects:

- Fragmented and inconsistent institutional settings supporting government and public procurement
- Incompatibility between the domestic legal framework and international common practices
- Low level of transparency, high vulnerability to corruption
- The difficulty of striking the appropriate balance between promoting catch-up in indigenous innovation and international free trade
- Lack of capabilities of both procurement and innovation policy practitioners, which has not been addressed by existing policy instruments

Good practice:

- Regularly updated equipment catalogues to signal strategic, technological needs of the country played an important role in accelerating the pace of China's catching-up in core sectors.
- Some demonstration programs effectively served as cornerstones to integrate PPI policies with other instruments such as standardization, subsidies, and regulations.

Lessons learned:

- PPI policy design in developing countries needs to be more sophisticated to align external and domestic needs, which requires a high level of policy capacity and intelligence.
- Instruments such as innovation catalogues aiming at accrediting new products into procurement lists might be too slow and rigid a mechanism for implementing PPI.

Some implications for PPI in developing countries can be drawn here. The nature of both innovation and public procurement, and the institutional settings where the innovation and procurement systems are situated, are different from what they are in developed countries. In developing countries, innovation is rarely "new to the world;" rather, it is understood as being "new to the country" or even "new to the region/company." In terms of public procurement, most developing countries are not yet signatories of the WTO GPA, which implies that developing countries have more room for using public procurement to achieve various socioeconomic objectives. Nevertheless, the incompatibility of their existing domestic regulatory systems with international treaties can pose tensions for PPI, as is the case in China.

In the context of developing countries where legal and regulatory frameworks are not well developed, the active role of informal elements (e.g., proactive individuals, temporary coordination mechanisms, and stakeholder relationships) in stimulating and shaping PPI activities should not be underestimated.

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8. CONCLUSIONS

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An analysis of the countries selected for this study reveals a wide heterogeneity of rationales, policies, and structures for introducing public procurement for innovation (PPI) policies and instruments, with priorities that have also shifted over time in many cases. Regarding the rationales for intervention referred to by Lember et al. (2014), we find a wide variety, from countries that use PPI as an R&D policy instrument (Spain), as a targeted industrial development policy (China), as generic or innovation-friendly procurement (some initiatives in the United Kingdom), or as a "no policy" policy (Estonia to some extent). These countries have also introduced a range of interventions aimed at addressing the various barriers or dysfunctionalities identified by Georghiou et al. (2014). Most interventions have sought to improve the framework conditions for procurement, including adapting legislation (often following EU imperatives), building capacities and skills, developing structures to improve market signaling of public sector needs, and introducing incentives to offset the risks associated with the take-up of innovative solutions. The remainder of this section contains a summary of these practices and some lessons learned from the country studies.

Main Trends, Role of PPI in Different Countries, and State of Play

In **Spain,** there has been consistent interest in PPI despite changes in the government. Support for PPI and pre-commercial procurement (PCP) has been a priority for national policymakers since the 2011 Science, Technology and Innovation Act and has contributed to the consolidation of key elements of the Spanish PPI agenda. The recent drive toward greater austerity in public-sector spending limited the investment capacity of administrations, as well as the funding for supply-side innovation instruments, but has not had a negative impact on PPI funding, as most of these projects have been funded by EU Structural Funds. A distinctive feature of the Spanish case is the relatively extensive use of PPI-PCP instruments by local and regional authorities (as well as project beneficiaries and co-financiers) that have accessed EU funds through the INNOCOMPRA program. This strategy has been accompanied by business support programs on the supply side (INNODEMANDA program) and growing success in H2020 PPI-PCP projects. These incentives are improving capabilities and routines of regional authorities for the use of innovation-friendly procurement, supported by a very active ministerial help desk.

Public procurement of innovation was particularly high on the policy agenda in the **United Kingdom** until 2010, with a high degree of policy debate and experimentation, including pilot initiatives such as forward commitment procurement (FCP). The United Kingdom was the first country in Europe to think systematically about public procurement as an innovation policy dimension. A range of interesting initiatives had been developed and PPI was seen as supporting innovation dynamics and policy goals. In addition, the United Kingdom introduced a PCP scheme like the US SBIR. However, after the financial crisis of 2008 and with a new government in 2010, the focus has been overwhelmingly on improving central structures to drive efficiency and transparency in the procurement system. What we find in this period is a

'no policy' policy for PPI. PPI all but disappeared from the agenda of strategic innovation policy making, while the UK SBRI scheme has been strengthened. Therefore, the evaluation activities have focused in recent years on the SBRI scheme.

In the **Netherlands,** the agenda around PPI is quite recent but is gaining considerable importance. It began with a parliamentary resolution in 2008 requesting a measurement system and 20 best practices of public innovation procurement, followed by a series of initiatives and a national strategy for PPI. An interesting feature of the Dutch case is that it made an explicit commitment in its strategy to spend 2.5 percent of the total public procurement budget of approximately €60 billion on procuring innovations. The Netherlands also has a US-inspired SBIR program managed by the NL Innovation agency, while PPI policy interventions are articulated from a program (Inkoop Innovatie Urgent) oriented to innovation, which is applying new procedures and new ways of tendering. Its governance is articulated by a ministerial team (Ministry of Economic Affairs, RVO, PIANOo), a large steering committee (directors, managers), and surrounded by an extensive network of all kinds of contracting authorities and independent experts.

Estonia does not have an explicit PPI strategy, although in recent years it has developed a demand-side innovation policy strategy. Public procurement has not been employed in general as a conscious and coordinated policy tool for achieving wider social and economic goals. However, the country is a good example of targeted PPI in terms of delivering innovation in the ICT sector, where the government as a demanding customer has acted as an effective stimulus to innovation. This has contributed to the development of a local industry and an IT infrastructure within the government (especially for the provision of government services).

China has developed several high-level PPI policies since 2006, most of which have been designed as industrial policy with the focus on supporting catching up of the economy by targeting indigenous innovation and import substitution. The two main initiatives, the equipment and innovation catalogues, were an essential part of the country's overall science and technological development strategy. They were implemented comprehensively at the national level, and with varying degrees of rigor at the regional level. This protectionist focus led to conflicts with trading partners and subsequently to abolishing key features of the policy. While there were several cases of innovation procurement, there has been no overall evaluation of PPI policies or the effect of public procurement on innovation.

In the **United States**, PPI and PCP are to be understood in the mission-oriented paradigm of science, technology and innovation policy. PPI and PCP are situated in departments and agencies responsible for implementing innovative solutions. Thus, the economic aim of the SBIR, stimulating innovation on the supply side, is fully linked to domain policy goals, and in energy and the environment, for example, innovation is sought to increase energy efficiency, with public procurement being one element among others. The SBIR scheme, launched in the mid-1980s, with its combination of supply-side SME support and demand-side definition of needs and mission-oriented funding, is established across the government. While there is government support for the development of a solution, it is a strong instrument to define and signal needs and have companies generate solutions that can help to achieve policy goals. The actual purchase by public bodies or even the private market is not an integral part of this instrument. More generally, PPI does not play a central role in innovation strategies,

although recent, small-scale initiatives have discovered the need to build capacity and roll out practices that are more likely to lead to innovation purchasing. In energy and the environment, PPI has traditionally been part of policies that seek to diffuse innovative technologies. With respect to monitoring and evaluation, the United States is very strong in assessing the economic effects of its SBIR scheme and market diffusion effects of energy-related schemes that entail public procurement. But as in all countries, a systematic analysis of government purchasing of innovation triggered by those instruments is lacking.

For the European countries, the **European Commission** has largely led the discussion of PPI, and this interest has spread to Member States. The idea of PPI-PCP policy support has moved from the European Union to the Member States both from the legislative perspective (specifically through directives which are then transposed at the national level) and from the incentive instruments (specifically through FP7 and H2020 programs), and in this sense the EU has been a procurement of innovation policy experiment. The PPI agenda has also progressively expanded to other parts of the Commission responsible for research, regional policy, and industry, thus gaining horizontal prevalence in different policies of the Commission and the ability to mobilize regional development programs which are part of the Structural Funds. This has been demonstrated in the emergence of more and better instruments to support PPI and PCP. Trial and error has been a characteristic feature of policymaking in this field within the European Commission. This suggests the complexity of the subject as well as the quality of the lessons learned from the EU experience.

Overall, the potential of PPI has become clear in all country cases. There is ample case study evidence that innovation can be procured even in very challenging framework conditions. Since PPI is not part of the established indicator framework on innovation, we do not know how much innovative activity is triggered by PPI and how PPI differs from the private market. Importantly, we do not have evaluations of those measures that try to mobilize public procurement for innovation, beyond a range of individual case studies which are often not linked to PPI support measures, but are simply the result of a normal public procurement process.

Examples of Good Practice and Impact, and Promising Approaches

In **Spain**, the mobilization of ERDF funds to co-finance PPI schemes is a good practice. The use of these funds to provide co-funding grants to regional and local authorities led by the central administration (INNOCOMPRA) has encouraged greater involvement of regional and local agencies in such operations. This is also a step forward in the institutionalization of the PPI-PCP in Spain and in the creation of a network of expert officials in various national and regional administrations. CDTI's synchronization system to support the potential tenderers of any agency's call for PPI-PCP, which is the basic principle of the INNODEMANDA program, is also a good practice. Business associations play an active role in raising awareness and identifying potential challenges to be solved through PPI-PCP.

The **United Kingdom** has designed and implemented several interesting approaches. Forward commitment procurement, for example, is a multi-step process that, following a phase of need identification and market engagement public agencies, gives potential suppliers an early commitment to buy a certain batch of an innovation if it meets the agreed performance criteria. It is thus a risk-reduction instrument. Pilot cases of this scheme have

been very successful. Another example is the Innovation Procurement Plans of departments, which require departments to outline their procurement needs and explain how they will ask for innovative solutions. While these plans were not binding, they helped advocates in departments to advance the innovation procurement agenda. A final example is a process of collecting innovative solutions in the health sector that failed to diffuse through the system, and constructing business cases to disseminate awareness of those products across the health sector.

In a short period, the **Netherlands** has developed a range of schemes and initiatives for PPI which amount to a comprehensive portfolio for PPI intervention. PIANOo is an internationally recognized instrument with a wide range of services supporting PPI. Evidence suggests that the Dutch SBIR is delivering positive results for participating SMEs in terms of product innovation, turnover, and job creation. However, evidence of impact is limited, due to the short life of the program and limitations in reporting and monitoring of the activities. Like the United Kingdom's SBRI initiative, uptake has been uneven across the public sector, with questions around the alignment of the program with the strategic policy agendas of the departments. The Dutch case provides an interesting example of institutional coordination for the implementation of PPI schemes, involving various ministries, organizations, and experts. The Netherlands has set up an explicit target for PPI. However, it is unclear how this 2.5 percent is articulated and operationalized, namely, how it will be measured, monitored, and enforced.

There are no major proactive policies for PPI in **Estonia**, except for some developments in PCP and environmentally friendly public procurement. Estonia is a good example of signaling public sector priorities. It has actively promoted a technology-based information society by the Estonian public sector through, for instance, the implementation of e-government solutions. The high-level support of these strategies and the role of enthusiastic civil servants, and the resources available to support ICT developments have made the Estonian government a strong and demanding client.

The two long-standing pillars of PPI in the **United States**, the SBIR scheme and the mobilization of demand in energy efficiency and the environment, can be classified as good practice, even if for the SBIR an analysis of government uptake of innovative solutions is missing. The SBIR scheme is a long-standing means to define administrative and government needs and mobilize SMEs to develop solutions. It is a good instrument to connect the SME community to public bodies and to reduce the risk to SMEs of engaging in innovation.

In **China,** the assessment of policies is ambiguous. The basic idea of equipment and innovation catalogues to create transparency about needs and innovative products and services has proven to be powerful. However, the fact that the instrument was geared toward supporting indigenous companies only put it under severe pressure. If done in a non-discriminatory manner, setting up repositories of innovative solutions and public agency needs can help to create transparency between demand and supply and thus encourage and simplify PPI. As the Chinese case shows, such an instrument is mainly a means for diffusion of innovation (demonstration effect, scale effect, etc.), rather than inspiring the generation of novel solutions.

At the **European Union** level, some good practices can also be highlighted. In legislative terms, directives have incorporated important novelties for the support of PPI. Recently, the introduction of the innovation partnership as a new form of public procurement is particularly relevant and promising as it effectively connects PCP and PPI. Additionally, it has the advantage of making both PCP and PPI far more attractive for entrepreneurs. Other relevant initiatives include the establishment of the Procurement of Innovation Platform, with its instruments for exchanging best practices, networking activities, practical guides, and awards, which have inspired similar structures and services in many Member States. At the instrument level, some H2020 instruments have cooperation between several countries as a prerequisite. This is consistent with promoting the aggregation of demand and tackling market fragmentation. This has already been identified as a good practice at the local level, as higher-volume contracts are more attractive to bidders. In addition, it encourages regional-led PPI projects, which can be financed with 2014–2020 Structural Funds (aimed at cohesion and development of the less prosperous regions) and H2020 programs (oriented toward competitiveness and excellence).

Main Enablers and Success Factors

Since the PPI-PCP is a particularly complex policy that requires the participation and coordination of different ministries and government agencies, an important enabler to ensure that PCP/PPI remained on **Spain**'s political agenda was the presence of PPI-PCP enthusiasts at the middle-management level in MICINN (and later in MINECO) as well as their uninterrupted support to emerging PPI-PCP advocates in regional governments. Paradoxically, an additional success factor was the economic crisis, because it raised the importance of the EU funds, which helped shift the priorities toward areas that benefited from them. This was the case of EU Structural Funds.

For the **United Kingdom**, the main enabler of experimentation with PPI was the fact that it was high on the political agenda, backed by various important stakeholders in the system and pushed by the department responsible for innovation. The government conducted a range of conceptual and review studies to design new approaches, tested them in pilot projects, and marketed PPI widely. As for the SBRI, the government did not end the program after its initial poor uptake, but redesigned it and invested more rather than less in it. The program is now well established because of political will over time.

The main success factor of the **U.S.** SBIR program as well as the energy and environment diffusion programs is the fact that they are designed, financed, and implemented by the departments responsible for the policy goal, which improves the flexibility and agility of the instruments. For SBIR, this means that needs are defined by the same agency that implements and finances the competition. PPI or PCP schemes that are run by the departments responsible for innovation or the economy are less convincing in mobilizing stakeholders and linking innovation to policy goals. Further, key design features of SBIR program, such as the multi-step competition, have become standard across several countries. Some of the more recent initiatives, such as the rollout of innovation-friendly procurement processes and the setup of a buyers' network, cannot yet be assessed.

The **Netherlands** is a good example of coordination and sharing of good procurement practice. The PIANOo initiative is now well established and an effective mechanism for

ensuring professionalism in procurement, networking among procuring agencies, and sharing information and good practices.

In **Estonia**, a good practice is that the government is an intelligent and challenging customer to encourage innovation in the supply chain, and to exploit and develop the capacities of its own indigenous suppliers. However, this has come in the form of initiatives of specific departments, not within a broader public procurement strategy.

In the **Chinese** case, the main success factors of the initial success of the catalogue program—which was subsequently stopped because of international pressure—has been to systematically showcase innovative solutions to potential buyers in a well-defined and policed process.

In the **European Commission,** a triggering factor for the development of demand-side policies, and specifically of PPI-PCP programs, has been the relatively common belief (backed by several STI metrics but contested by some academics) about Europe's weaknesses in transforming R&D into innovation (the so-called European Paradox), combined with an awe of the United States' innovation support programs. In fact, the SBIR precedent has deeply contributed to the EU's interest in and design of PPI-PCP.

Main Obstacles and Challenges

In **Spain,** a key limiting factor is the lack of technical knowledge, which is directly linked to the insufficient training of public officials in these types of procedures. Risk aversion is another barrier; the legal supervision and intervention authorities, which are conservative by nature, are often the main group that must be sensitized and mobilized to allow PPI to become widespread. Lack of experience and competencies is also associated with insufficient use of market engagement in the early stages of PPI, and generally a lack of communication between end users and procurers in procurement.

The main obstacle in the **Netherlands** is the competence of public procuring agencies to deal with the demands of PPI or PCP, which is tackled by the PIANOo activities discussed above. This applies especially to procurement of radical innovations, that is, innovations that are more disruptive. Finally, the country faces the challenge of linking supply-side measures (and their outcomes) to the demand side, specifically to public procurement.

In the **United Kingdom**, the main obstacle to successful, sustainable PPI was the lack of political will with the advent of the austerity policy. The government considered PPI an unaffordable luxury in times of tight financial resources, ignoring the long-term efficiency gains and improvement in public services and goal achievement that PPI could bring. In contrast, the PCP scheme SBRI was a means to support businesses in the late stage of development without committing it to actual purchases of products or services. Thus, this scheme was preserved and broadened. A second problem in the United Kingdom is the underestimation of the organizational challenges within and across government agencies regarding the conduct of PPI. It focused on capabilities of procurers rather than on the broader organization and incentive structures in the public sector.

In **Estonia**, despite some very successful PPI cases, the main obstacle now seems to be the rollout of good practice due to lack of capacity and the lack of systematic mechanisms to

use procurement to stimulate innovation. While current policy contains important statements of intent, specific initiatives that will lead to the widespread activities that will stimulate innovation among firms are not yet present.

In the **United States**, the main obstacle to a more systematic and holistic mobilization of public procurement for innovation beyond SBIR and some diffusion-oriented programs is lack of high-level political commitment. The latest innovation strategy does not embed PPI systematically. Despite recent attempts to educate procurers to be more innovative in what they buy, and despite the agenda to improve government services, there is still a lack of urgency in turning the procurement system around to improve capabilities as well as incentive structures in organizations. The U.S. procurement system is strongly oriented toward efficiency, openness, and competition. To bring in innovation as a criterion will require a bold effort that is still missing.

In the **Chinese** case, the main obstacle to a coherent PPI policy was the fragmented and inconsistent institutional setting differentiating between “government” and “public” procurement, which is mainly due to the specific nature of the Chinese economy with its many state-owned enterprises. Further, the Chinese case shows that a domestic program for innovation procurement does not work if it is geared toward indigenous innovation only (to protect economic catch-up), unless a country remains outside the relevant WTO agreements and bears the burden of strained relationships with trading partners. Further institutional barriers in China have been low transparency and high level of corruption. As in other countries, there is a lack of capacity on the part of procurement and innovation policy practitioners, which has not been addressed by existing policy instruments.

The instruments and initiatives proposed at the **European Commission** level have faced implementation challenges. For instance, FP7 and H2020-funded projects require cross-border purchase from entities from at least three countries, which is complex for H2020’s newcomers, as is the case of many contracting authorities. This is the case of small public entities (i.e., municipalities) that may play a crucial role. Thus, they have been continuously won by countries that already have installed local capacity and rarely by countries that do not. This suggests that this instrument fosters existing capabilities but is not a strong enough incentive to kick-start the implementation of these processes in the Member States. Another challenge is the alignment of PPI with broader demand-side and sectoral policies. Most successful PPI-PCPs are those done by public demand-side actors that can align PCP-PPI developments with sectoral regulatory actions, create de facto standards from the demand side, and prepare procurement planning for rolling out innovations. This means that PPI should be part of a broader EU demand-side innovation policy agenda—as envisaged in the Lead Market Initiative—to fulfill all its promises.

General Remarks of Special Interest to Latin American and Caribbean Countries

The review of the cases leads to some conclusions which may be of special interest to countries with relatively weaker or recently emerging institutional capabilities for innovation policy design and implementation. The following conclusions also condense information from the experience and suggestions of the experts interviewed and the team's own understanding of the subject.

1. **Institutional Leadership.** PPI-PCP is a particularly complex policy that requires the participation and coordination of different types of ministries and government agencies: those responsible for the regulation of public procurement, those that oversee the promotion of research and innovation, and those responsible for public expenditure. Institutions that oversee the supervision and control of public spending and of the activity of civil servants responsible for public tenders are also key in the implementation PPI-PCP. In the countries analyzed, the leadership on this subject has emerged from agencies or ministries responsible for innovation policy (which sometimes coincide with those responsible for economic policy in general). In some cases, this leadership has benefited from political support at the highest level or even from a parliamentary mandate. In countries without experience in PPI-PCP, it is important to begin with the identification of the best potential leader, understood as the one who can maximize this policy's prospects of success. The important role played by public procurement agencies as well as monitoring and controlling agencies in many Latin American and Caribbean (LAC) countries (and which emerges from the political sensitivity associated with public procurement processes) suggests that these entities may play a more prominent role than in the countries analyzed throughout this paper.

2. **Sustained political commitment and long-term vision.** PPI-PCP policies require long cycles for their development. They need conditions ranging from regulatory changes (necessary for the implementation of the first pilots) to the design and implementation of economic incentives and the provision of support services. Certainly, this period covers more than a single political term. This means that PPI-PCP needs continuity of political commitment (which can be embodied in laws, plans, or multi-annual commitments to PPI-PCP investment) regardless of the political leaders in power. While it is possible to implement support programs and perhaps a few pilots without depending on a profound regulatory reform, it is important to consider that the institutionalization of a PPI-PCP policy is subject to the achievement of certain prerequisites. It is crucial to have the commitment of the four types of institutions mentioned above. Not having it considerably increases the risk that the first pilots fail and, consequently, that the PPI-PCP ends up being labeled as “too difficult,” thus deterring advances in the future.

2. **PPI champions.** Experts interviewed in all countries indicated that a key success factor is having the appropriate people engaged in the process. PPI-PCP advocates or champions should ideally be present in at least three of the institutions mentioned above: agencies that regulate public procurement, entities in charge of promoting research and innovation, and agencies that perform public purchases. These communities of people, individually or collectively, have been the ones who have overcome the uncertainties and reservations that PPI-PCP initially creates. They have also incorporated the necessary expertise for an adequate design and implementation PPI-PCP processes (with specific technical knowledge) and have nevertheless been proactive in constantly identifying new projects and new challenges. In all cases, these champions have been key to the success of the first programs, particularly those belonging to contracting authorities.

3. **Support structure for the PPI-PCP:** The need to involve various agencies and the role of the champions cannot distract policymakers from what is, without doubt, the first necessary step for the institutionalization of the PPI-PCP: creating a basic support structure. Ideally, this structure should be the responsibility of the agency that exercises the institutional leadership described above and, in countries with a culture of strong agencies, this strategy might even be the origin of a new agency solely dedicated to managing the PPI-PCP program. This structure should provide services such as training, champions' networking, and technical support for PPI-PCP project management, while raising awareness. These services are essential to develop successful pilots and to guaranteeing their future consolidation.

4. **Measurement and showcase:** The countries analyzed show the difficulty of establishing sophisticated metrics systems for PPI-PCP. While this should not be the main concern of a government that takes its first steps toward implementing a PPI-PCP policy, programs must be properly monitored, and successes of the first projects must be communicated to showcase the positive and transformative power of PPI-PCP. This is an exercise in which the participating companies must play a central role, since it is not easy for them to enter the culture of PPI-PCP. Therefore, it is important to have as many quick wins as possible, knowing that they will not be as quick as in the case of supply-side policies.

5. **Sectoral bet and pilot selection.** In PPI-PCP, sector targeting is defined by the size, orientation, and degree of decentralization of public procurement in each country. However, three lessons learned should be noted. The first and more political one is that the prioritization of sectors should correspond to socioeconomic challenges of the highest order for the country in health, education, environmental sustainability, and other areas. This adds legitimacy to the projects and makes it easier to mobilize key players and political will, which in turn will be necessary to overcome the difficulties. This sometimes includes the highest authorities: president, governor, mayor, and others. The second, more pragmatic lesson is that it is advisable to invest in sectors for which the respective responsible ministries or agencies have a wider culture of innovation and may be even responsible for public research centers, such as hospitals. The third, purely opportunistic one, is that the selection of sectors for the first pilots can depend simply on the existence of champions within the responsible institutions, to ensure project success.

6. **Economic incentives.** Despite the different approaches to economic incentives in the countries studied, there is one constant: public funding is essential to the successful launch of PPI-PCP and is recommended for the consolidation and maintenance of this policy. It is difficult for any public procuring entity to commit to participate in a PPI-PCP project without additional funding, especially if the entity in question has neither a track record in innovation activities nor a relatively sophisticated innovation unit. Most countries have several programs with guaranteed annual funding or, at least, an instrument that can mobilize the necessary funding for each project in response to the demand of the agencies in charge of public purchases.

7. **The role of the private sector**. The PPI-PCP is not easy for anyone, and innovative companies are no exception. The participation of companies in PPI-PCP projects requires joining two areas that often operate under different rationales: the business department and the R&D department. Moreover, in less developed countries, there may be a lack of private sector confidence in the government's innovation policy and in the transparency and oversight of procurement policies. The private sector should participate in at least in two ways to help institutionalizing a policy of PPI-PCP. First, it should be consulted in a structured and systematized manner throughout the design process of PPI-PCP policy. Second, it should play a proactive role (ideally through representative associations) in raising awareness, providing training, and identifying concrete opportunities to promote PPI-PCP.

PART TWO: PPI AND PCP IN LATIN AMERICAN AND CARIBBEAN COUNTRIES

INTRODUCTION

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The economic slowdown that began in Latin American and Caribbean (LAC) countries around 2010 continued into 2015. Although there is wide variation among the economies, many LAC countries continue to be highly dependent on the export of natural resources with low value-added, leaving them vulnerable to commodity booms. The only option for LAC countries to achieve sustained economic growth is to implement structural reforms aimed at enhancing productivity and competitiveness by investing in education, skill building, and innovation (OECD, 2015a).

A wide variety of policies have been implemented to bolster much-needed innovation capacity in LAC countries, against a backdrop of low commodity prices.

The innovation policy mix in Latin America has and still is undergoing major changes and challenges. Traditionally focused on horizontal market interventions, according to the framework proposed by Crespi, Fernandez-Arias, and Stein (2014), mostly in the form of research and development (R&D) subsidies, LAC countries have recently turned to other forms of support, such as public seed and venture capital financing. Entrepreneurs at the center of the innovation system have become as the main catalysts of science, technology, and innovation (STI) processes. To supply their needs, support programs and schemes for start-ups, among others, has been growing in Latin American countries. Chile, Colombia, Mexico, and Peru have devoted an important part of their innovation policy agendas to the design and implementation of better instruments to support start-ups, in line with the global trend around crowdfunding, business sharing, and open innovation (OECD, 2015b). Nevertheless interventions in the form of publicly funded technological centers and thematic R&D funding are still dominant forms of innovation policy intervention in these countries.

Yet, most of these innovation policy tools have not lived up to expectations (Arocena and Sutz, 2010). Although this disappointment has not been exclusive to Latin America (and thus the debate around innovation policy mix is just as lively in STI leading countries), in LAC countries their limitations have been mostly attributed to the lack of a broader, more holistic approach that considers the so-called framework conditions for innovation (WEF, 2015). Because the public agencies responsible for these framework conditions have been joined the debate around the appropriate measures to foster innovation, the innovation policy mix has increasingly incorporated new actors.

At the same time, the rising sophistication of innovation policy tools in leading STI countries (both in terms of academic discussion and in practical design and implementation) has influenced the policy mix debate in Latin America (Arocena and Sutz, 2010) and has led to the incorporation of innovation policy tools that can be considered non-traditional for most LAC governments.[55] Specifically, the growing consensus among academics and

[55] Incidentally, these tools are often biased toward the coverage of needs that are specific to more advanced countries. STI is not the only policy arena in which LAC countries attempt to emulate certain policies or programs, despite sometimes lacking the institutional framework to do it properly.

policymakers is that, besides adequate framework conditions, achieving innovation results requires a better balance between supply-side and demand-side policies (OECD, 2011) . This has contributed to the growing interest of LAC government on demand-side measures to complement supply-side programs, such as R&D grants. The main conclusion of this debate is that in favouring the supply of innovative businesses, innovation policymakers have neglected the generation of domestic demand for innovation (Georghiou, 2007), leading to a mismatch between demand-side needs and supply-side offerings that has also contributed enormously to the encumbering of the impact of innovation policies (Cimoli, Ferraz, and Primi, 2009). This situation is more worrisome in developing countries, such as those in LAC, where overall R&D expenditure is considerably lower and relies heavily on the public budget, thus reinforcing the idea that endogenous demand for knowledge is weaker (Arocena and Sutz, 2010). Only Brazil has outspent the lowest European R&D expenders in R&D (i.e., Turkey and Greece) and surpassed the threshold of private expenditure, representing 40 percent of gross expenditure on R&D (GERD) (Dutta, Lanvin, and Wunsch-Vincent, 2015).

Some LAC countries have instituted demand-side measures, such as R&D tax benefits (following OECD innovation policy rationales) (Arocena and Sutz, 2010). Along these lines, some advances have been made on public procurement of innovation (PPI) as a generic policy, or a “policy for all seasons,” according to Lember, Kattel, and Kalvet (2014). For example, regulation and communication platforms have been introduced to make procurement more innovation friendly. Some of these programs have overlapped with the objective of fostering start-ups and small and medium-sized enterprises (SMEs).

The emergence of demand-side polices has been accompanied by broader industry development policies that are also leveraged by public demand, such as local content policies. In this context, goods and services that have a higher input of local labor are preferred (either with or without a price margin) over those with lower local content. As such, this policy builds capacity in local industry, although it is not the same as many other policies that serve this purpose.

Local content policies and PPI policies can indeed coincide in specific cases when the procurement is directed toward local industries and to innovative goods or services. This has happened in many PPI cases (e.g., the Galicia region in Spain) where criteria such as local impact of the procurement is introduced in the tender for any specific innovative good or service. This is not always the case, as PPI does not necessarily have to contribute to industrial innovation: although promotion of innovation can be a common policy goal for governments interested in PPI, the purpose of improving efficiency and efficacy in government agencies through the acquisition of innovative goods and services can be both complementary and an objective in itself. As such, public procurement of foreign innovative goods (either innovative to the country or to the world) that contribute to the enhancement of public provision of services is just as legitimate in a PPI policy objective framework as the acquisition of locally produced, innovative good that meet the functional requirements specified in a tender. These two policy goals, as shown in the table below, can be complementary or independent of each other.

	Local content procurement policies	Public procurement of Innovation Policies
Policy objectives	Increasing local output and/or increasing local employment	Improving performance of innovative companies and/or increasing efficiency and efficacy in public provision of goods and services
Necessary conditions	Local is generally understood to mean national but it can also be understood as subnational (regional or, effectively, local). To determine the local content of a good or service, the most common criterion is the ownership or location of the enterprise that produces it. Then, the value-added approach is used in most contexts (percentage of local value-added serves as a country-specific hurdle)	Innovation can be defined as new to the country and new to the world: binary hurdle usually verified by a government agency.
Procedure requirements	Value-added analysis, verification of company ownership	Functional requirement specification, life-cycle analysis, competitive dialogue

Source: prepared by the authors and based on European Commission (2014a) and Wells (2008).

Despite the latter, the development of PPI as industrial development policy or public technology procurement, to endorse either strategic sectors or socially desirable technologies or to solve specific government needs (Lember, Kattel, and Kalvet, 2014), is still quite rare in most LAC countries (Arocena and Sutz, 2010).

There is an explanation for the lag in demand and in implementation of PPI policies, specifically public technology procurement.[56] Although these tools are portrayed as particularly promising, some of the barriers that STI-leading countries have faced when attempting to institutionalize public procurement of innovation and pre-commercial procurement (PPI-PCP) are ex ante expected to be found in the LAC environment. These are related to regulatory complexity, the inability to manage risk (both on the suppliers' and the buyers' side), potentially contradictory policy objectives, and lack of capacity and resource constraints within contracting authorities. These barriers are exacerbated in LAC countries by, for instance, the level of deinstitutionalization and the greater risk of corruption in most LAC countries (Navarro, Benavente, and Crespi, 2016). These factors have probably kept this instrument off the policy agenda. Thus, regulatory issues and coordination mechanisms between buyer and supplier should be treated even more carefully than in the countries analyzed in Part One of this report.

Nevertheless, in addition to the growing interest in these instruments, other conditions that are common to many LAC countries can create momentum.

[56] Public technology procurement is defined as a government policy instrument whereby a public organization places an order for a good or service that does not exist but could probably be developed within a reasonable period (Edquist and Hommen, 1998). It was later renamed PPI, but its meaning is limited to PPI as an industrial policy.

First, the growing perception of the innovation process as nonlinear (which also contributes to the increasing value given to demand-side policies) and highly sector-specific (OECD, 2011) has triggered interest in vertical interventions for innovation as the most effective means to achieve public objectives for R&D in LAC countries (Navarro, Benavente, and Crespi, 2016). Another advantage of technology public procurement (or PPI as industrial policy) is that it avoids the limitations of traditional (i.e., horizontal and non-market-oriented) R&D blanket policies that have been widely implemented in Latin America (Crespi, Fernández-Arias, and Stein, 2014), allowing the government to pursue the most socially desirable objectives. The use of PPI has been identified with the accomplishment of other social objectives, such sustainability and social inclusion (McCruden, 2004), which are highly valued in the LAC context (Arocena and Sutz, 2010; Crespi, Fernández-Arias, and Stein, 2014). Thus, these elements should help the uptake and streamlining of PPI as industrial policy.

Along the same lines, the situation of the LAC countries requires the pursuit of many other objectives that may seem contradictory but which can be accomplished through an appropriate PPI-PCP policy mix. On the one hand, and following the global trend of transparency, accountability and fiscal pressures, LAC countries are forced to “do better with less” while, at the same time being pressured to increase the share of public budgets directed to areas of high social and economic impact, such as STI activities. In this context, PPI-PCP offers a solution to address simultaneous problems, as it can help increase quality and efficiency in the provision of much-needed public services (such as health and housing), while increasing much-needed public expenditure in R&D.

On the other hand, PPI-PCP is perceived as especially promising because it is meant to reduce the mismatch between producers of innovative products and end users and to facilitate private access to finance by knowledge-supplier firms. It not only signals the types of solutions that producers should focus on developing but, also helps reduce market uncertainty when the procurement includes the actual purchase of the innovative good (Georghiou et al., 2014). This is the cornerstone of STI policy in most Latin American countries. According to the Organisation for Economic Co-operation and Development (OECD), putting companies at the center of STI policy is vital, and measures should be taken to ensure that private innovation is a high priority (see OECD’s Reviews on STI policy for Chile and Colombia in OECD (2014a) and OECD (2014b)).

Among the reasons for focusing on PPI-PCP is the longstanding objective of enabling technology diffusion in many LAC countries. In these countries, goods and services that are "new to the sector" or "new to the country" are considered a type of innovation whose diffusion contributes to the development of the capacity to generate more ambitious “new to the world” innovations. PPI-PCP can help incorporate processes and products at the national level that were developed abroad and are identified as a priority for assimilation and adoption in the country. Similarly, the introduction of innovations in public sector areas immediately generates the diffusion of innovation in future providers of such goods or services. Finally, the emergence of new key stakeholders in the Latin American public arena, particularly central acquisition agencies, introduces the possibility of viewing public procurement as a tool to accomplish different objectives and allows a new agent to contribute to, or in some cases lead, new strategies such as this one. The consolidation of public–private enterprises in LAC governments introduces yet another interesting actor in the innovation system, one that is simultaneously keen to implement public policies and increase financial benefit. Instruments such as PPI can facilitate both objectives. Moreover, the emergence of STI-specific regional funds (mainly in response to large regional

disparities in STI) in many LAC countries pushes forward the need to foster innovation policy design and implementation in local governments. This is another opportunity to channel these resources to foster innovation.

The implementation of PPI-PCP in many LAC countries is as necessary as it is challenging. In view of the challenges, and considering those that OECD countries have faced in implementing PPI-PCP, drawing valuable lessons for LAC countries is a priority. Although there is no uniformly successful formula for implementing demand-side polices, some factors associated with successful implementation of PPI-PCP have been identified. Part One of this report discussed some tools that six countries and the European Union implemented in four areas according to the framework provided by Georghiou et al. (2014): measures that are meant to address deficiencies in the framework conditions for procurement (in the areas of legislation and governance); those that address the potential lack of capacity and resources for PPI-PCP within the contracting authorities; those that support the identification, specification, and signalling of needs; and those that address barriers that emerge in the process of defining requirements and designing selection and evaluation procedures.

Considering the lessons learned from the policies and programs developed in these areas, it is worth noting that LAC countries have both opportunities and challenges that make it difficult to apply them. Specifically, to address the common barriers that they face in implementing PPI-PCP, preliminary steps may need to be taken. For example, a best practice identified in Part One is instituting enabling mechanisms to strengthen the interaction between buyers and suppliers. However, LAC countries score higher on corruption indexes, which might entail greater risks of capture (OECD, 2011) as well as a lower propensity to protect intellectual property rights (IPR). This suggest the need to take a different approach. In addition, while the countries analyzed in Part One have already embarked on PPI-PCP, countries that have not yet implemented PPI-PCP need to ask themselves whether it is appropriate and feasible to embark on such a policy. If so, and given the availability of lessons around the subject, they need to decide what first steps are the most promising.

Bearing in mind these two questions, the aim of this Part of the report is to analyze the readiness of different LAC countries to develop a PPI-PCP policy and to elaborate on the pros and cons of the different paths for implementation. It draws on the experiences reviewed in Part One and on the initial experiences of Colombia, Brazil, and Chile in PPI-PCP to make recommendations on the previous LAC-specific steps. It identifies some best practices and potential risks to implementation.

This second Part of the report is organized as follows: the cases of Brazil, Chile, and Colombia are presented, addressing the capabilities required to develop a comprehensive PPI-PCP policy based on the analysis of empirical information obtained from the projects that have been implemented to date. These three countries were selected because all three governments have expressed interest in developing PPI-PCP as an innovation policy tool.

These country cases also include a summary of lessons learned from other innovation-friendly procurement practices, which can illuminate obstacles to implementation of PPI-PCP. These three countries vary significantly in many aspects related to PPI-PCP, such as the institutional path they have followed to develop the first projects (e.g., using a central purchasing body in one case and decentralized among various institutional actors in another) and differences in the level of development of their innovation systems. Finally, the it presents recommendations for LAC countries and specific calls for action.

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9. BRAZIL[57]

Yanchao Li, MIOIR

Country Overview

- Brazil is the largest country in South America and the fifth most populous country in the world, with 205 million inhabitants in 2015. Historically ruled by Portugal, Brazil became an independent nation in 1822 and has been Latin America's leading economic power since 1970. It features very rich biodiversity and abundant agricultural, mineral, and energy potential.
- One of the five so-called BRICS nations—Brazil, Russia, India, China, and South Africa—Brazil's macroeconomic stability has been a crucial factor behind its success. However, low commodity prices and high inflation have adversely affected Brazil's fiscal performance.
- On October 5, 2014, Brazil elected its first female president, Dilma Vana Rousseff. Currently, Brazil's key challenges and priorities are fighting corruption, supporting human rights, and combating violence associated with drug trafficking and social exclusion.

Network and Governance

Brazil is a federal presidential representative democracy with a multi-party system. It has a bicameral legislature, composed of 513 members of the Chamber of Deputies and 81 senators. Administratively, the country is divided into 26 semi-autonomous and self-governing states, each with its own governor and legislature. State elections are held every four years, and state governments wield considerable power.

Brazil's large public sector oversees utilities and natural resources, especially the petroleum industry (PwC, 2013). Brazil is world-renowned for its emerging economy, with dramatic reductions in social inequality and a stable economic context. However, with a governance effectiveness index of (-0.15%) in 2014, Brazil's public service sector is relatively weak and ranks 98th in the world according the World Bank's governance indicators (World Bank, 2014). Poverty and inequality remain Brazil's primary challenges.

Furthermore, Brazil ranks 69th on Transparency International's Corruption Ranking, which is a significant improvement since the major corruption scandals reported in 2012. However, corruption continues to be a major problem in Brazil, especially in those sectors where state-owned companies dominate. According to Transparency International, Brazil's high levels of bureaucracy and regulatory barriers are believed to provide opportunities for bribery.

A survey by the World Bank Group in 2009 indicated that corruption is a major obstacle to up to 70 percent of Brazilian businesses.[58] To counteract corruption, Brazil introduced the Clean Company Act 2014 to combat bribery and fraud in public procurement and official affairs (Financier Worldwide, 2014).

[57] We wish to thank the following innovation policy academics and practitioners for their invaluable input to this project: André Tortato Rauen, Instituto de Pesquisa Econômica Aplicada (IPEA); Fernanda De Negri, Division of Production and Innovations Studies, IPEA; João De Negri, IPEA; and Edmund Amann, the University of Manchester.

[58] See the World Bank Group Enterprise Surveys data for Brazil (2009), available at http://www.enterprisesurveys.org/data/exploreeconomies/2009/brazil (accessed November 14, 2016).

Economic Performance

Following significant growth in the early 2000s, Brazil made substantial progress in establishing a strong national currency. However, in recent years, Brazil's fiscal outlook has become more challenging due to high interest rates, large spending rigidities, and increasing debt (OECD, 2015b).

The Brazilian Real (BRL) was rated the second-worst-performing foreign exchange currency in 2015 (Osborne et al., 2016). Due to intensifying political risk, inflation, and recessions, the BRL is forecasted to continue to weaken (Osborne et al., 2016). Strengthening Brazil's fiscal credibility has become of central political importance to attract more domestic and foreign investment and to improve the overall living standards in Brazil (OECD, 2015a).

Economic forecasts predict that the recession will continue throughout 2016 due to the challenging fiscal situation of inflation and political uncertainty, with slow recovery expected in 2017 (OECD, 2015b). In 2013, Brazil was the 22nd largest export economy in the world. Its main exports were iron ore, soybeans, petroleum, and raw sugar, and its key export partners were Argentina, China, Japan, the Netherlands, and the United States (OEC, 2013). However, imports decreased by 28.7 percent to US$10.5 billion in 2015, the biggest drop since 2009. Brazil's main imports are raw materials and intermediate products, capital goods, fuels and lubricants, and durable and non-durable consumer goods (Trading Economics, 2015).

According to the Global Competitiveness Index 2015-2016[59], Brazil ranks 75th out of 140 in terms of overall competitiveness. Brazil is the 7th largest market in the world and benefits from a relatively high level of technological readiness (54th), particularly in the use of information and communication technology (ICT), air transport, and infrastructure (Schwab, 2015).

Key Features of the Innovation System

Brazil scores 34.94 on the Global Innovation Index and belongs to one of the top-scoring middle-income economies with a narrowed innovation quality gap, along with China and India (Dutta, Lanvin, and Wunsch-Vincent, 2015). However, according to Brazil's innovation agency, the Funding Authority for Studies and Projects (Financiadora de Estudos e Projetos, or FINEP), overseen by the Ministry of Science, Technology and Innovation, investment in research and development (R&D) is insufficient, at less than 2 percent of GDP (Else, 2015).

The Law on Innovation and Research in Science and Technology[60] (Law No. 10.973, passed on December 2, 2004) is the main law that underpins the promotion of innovation in Brazil. This law was revised and republished in January 2016, incorporating changes such as a more explicit emphasis on need to engage all government departments in innovation, and on the formation of public–private partnerships (PPPs) as vehicles to undertake innovation activities. In principle, the law provides incentives to innovation actors. Complementing this law, the Law of Goods (Law No. 11.196 passed in 2005) provides tax incentives to trigger more R&D investment by companies (Negri, F., 2016). There has been an increasing policy emphasis on commercialization and innovation as opposed to the more traditional support to science (OECD, 2012b). Since the 2008 global economic crisis, the government has

[59] See http://reports.weforum.org/global-competitiveness-report-2015-2016/competitiveness-rankings/ for details [accessed November 14, 2016].
[60] See http://www.wipo.int/wipolex/en/details.jsp?id=8255 for details [accessed March 16, 2016].

adopted several measures oriented toward increasing the role of state interventions in the economy. These include overarching industrial policy programs, such as Brasil Maior, launched in 2011. Meanwhile, there has been increasing participation by public banks, including the Brazilian Development Bank (BNDES) and Caixa e Banco do Brasil, in financing the economy. More recently, there has been a turn toward addressing social challenges by promoting innovation, in line with global trends (OECD, 2014b).

There has been a strong trend toward more state interventions to promote development. Observing recent developments in innovation policy, Negri, J. considers that "…Brazil is on the right track regarding the measures taken to encourage technological innovation and partnerships among science and technology companies and institutions" (2016: 6), despite the gap between Brazil and leading nations in terms of science and innovation. The responsibility for supporting innovation has shifted from the traditional agencies in charge of science and technology to broader agencies, including sectoral authorities and state-owned enterprises (SOEs). One person interviewed for this case pointed out that, compared to East Asian countries, LAC countries have lacked policy consistency owing to the unstable nature of politics and the uneven development across the region in general. Within the country, there are regional disparities in terms of stage of development and innovation. Leading regions, such as the state of Sao Paulo, are developed in nearly all aspects, including financing, innovation capacity, facilities, and a strong culture of supporting R&D through public interventions; in other regions, this is not the case.

Brazilian universities are relatively weak compared to those in other countries, with a few of them ranked in the Global Top 500, according to the Shanghai Ranking.[61] Brazil's research output is low compared to that of OECD countries, with the number of patent and trademark filings by universities and firms below the OECD median (OECD, 2012b). Brazil has a relatively strong science base compared to other Latin American countries (Mourão and Cantu, 2014). Innovation in small and medium-sized enterprises (SMEs) and entrepreneurship activities are not globally competitive. In some sectors, however, Brazil is renowned for its leading innovative firms and is at the forefront of high-technology industries, such as deep-water oil extraction. According to the OECD (2014b), Brazil is also relatively advanced in emerging fields such as biotechnology, nanotechnology, and environmentally friendly technologies. However, framework conditions and social challenges, such as poverty, hamper overall STI performance. Although Brazil is a democracy, its high degree of inter-regional inequality makes it difficult to achieve efficiency in policy coordination to promote innovation. Mourão and Cantu (2014) point out that the lack of a culture of innovation and the existence of severe information asymmetry between private firms and the government are major barriers to innovation.

While investment in resources and infrastructure is still crucial, Brazil needs to further diversify institutions and communities of practice to build a modern, efficient innovation system (Negri, F., 2016). In addition, better framework conditions, including but not limited to a stable macroeconomic environment featuring a high degree of openness, competition, and transparency, are needed to support such a system.

[61] See http://www.shanghairanking.com/ARWU2014.html for more details [accessed November 14, 2016].

Overview of Public Procurement and the Legislative Context

Government Market Position

According to the OECD (2015c), overall government expenditure in Brazil accounted for 40 percent of GDP in 2014, up from 38.7 percent in 2013 and 37.2 percent in 2009, with an annual average growth rate of real government expenditures per capita of 3.88 percent between 2009 and 2014. The central government accounts for 50 percent of total government expenditure, lower than the Latin American average of 78 percent of general government expenditure made by central government in 2011, with only around 22 percent of the expenditure by state and local governments (OECD, 2014a).

Government procurement accounted for 26 percent of total government expenditures in Brazil in 2011 (OECD, 2014a). On average in Latin American countries, government procurement spending at the state and local levels in 2011 accounted for 38 percent of total procurement spending. In Brazil, the states spend around 26 percent, with local government spending 33 percent and the central government spending 40 percent. Expenditure at the state level is lower than in other federal countries, such as Mexico (39 percent).

Owing to the lack of systematic monitoring and measurement and the high degree of fragmentation of public demand across levels of government and sectors of industry and businesses, the overall size of the public procurement market in Brazil remains unclear (Ribeiro et al., 2016). Estimations from 2009 suggest that the size of the public procurement market can vary between 7 and 9 percent of GDP, depending on the methods of calculation (Mourão and Cantu, 2014). Ribeiro et al. (2016) developed a systematic approach to measurement of market size and concluded that for 2012, Brazilian public procurement spending was around 13.8 percent of GDP. According to records obtained from 2014, the federal government spent BRL 62 billion on purchasing activities, while the total market is estimated to be around BRL 350 billion (Vilela, 2015).

Organizational Structure

A key concern of Latin American countries in recent years has been improving public purchasing practices to increase transparency and efficiency. Thus, recent reforms have aimed at preventing corruption and improving competition and transparency, including access to public procurement information.

In Brazil, the following information on public procurement is publicly available (OECD, 2014a): access to information on laws and policies; general information for potential bidders; guidance on application procedures; gender documents; contract awards, contract modifications; and procurement spending. The Transparency Portal of the Federal Public Administration[62] provides free real-time access to information on federal government programs.

Most Latin American countries have developed single-entry procurement websites that serve as one-stop shop portals for public contracts. In Brazil, this includes the creation of ComprasNet. The services offered by ComprasNet include the possibility to search and download tender documents and access online training materials, electronic catalogues, statistics, and databases related to past procurement and electronic reverse auctions.

[62] See www.portaldatransparencia.gov.br for more details [accessed March 16, 2016].

Public procurement processes are highly decentralized in Brazil across 26 states, the federal district, municipalities, and public agencies (Vilela, 2015). There is no single central agency in charge of procurement.

As noted by Sorte (2016), the public procurement culture is risk-averse and conservative. Direct interaction between public agencies and supplier companies is deliberately minimized and normally confined to administrative procedures mandated by Law No. 8,666/1993.

Complaint resolution mechanisms are in place at both the federal and the state levels (World Bank, 2010). The complaint mechanism in Brazil is used extensively by participants of public tenders, which is distinct from Sorte's review of the Japanese experience (Sorte, 2016).

Based on a comprehensive assessment of the organizational structure and institutions of the Brazilian federal procurement system, the World Bank (2010) concluded that the federal system complies with international standards. It scores well in several dimensions examined, including the legislative and regulatory framework, the institutional framework, management capacity, procurement operations, market practices, and integrity and transparency.

Legal Framework

Brazil is a member of the World Trade Organization (WTO), but like other developing countries, it is not yet a signatory of the Agreement on Government Procurement (GPA).[63] This in principle gives Brazil more flexibility to exercise public procurement as a multi-functional policy instrument, since Brazil does not have the obligation to open up domestic public market as signatory countries do.

The Federal Constitution provides a general framework for public procurement in Brazil. It stipulates that:

> … except for the cases specified in the law, public works, services, purchases, and disposals are contracted by public bidding, ensuring equal conditions to all bidders, with clauses that establish payment obligations, maintaining the effective conditions of the bid, according to the law, which only allows requirement of technical and economic qualifications essential to secure performance of the obligations.
>
> Item XXI, Article 37, Section I, Chapter VII, Brazilian Constitution of 1988

The Federal Constitution contains overall principles which have been further articulated in various laws. The range of primary laws and related decrees which constitute the legal framework regulating public procurement in Brazil are summarized in the table below.

[63] See https://www.wto.org/english/tratop_e/gproc_e/memobs_e.htm for list of signatory and observer countries. Unlike China and Columbia, Brazil is not yet on the route of negotiations to accede to the GPA [accessed March 16, 2016].

Table 9.1: Legal Framework Regulating Public Procurement in Brazil

No.	Short English title	Function/coverage
Law No. 8,248/1991 Decree No. 7,174/2010	ICT-related Procurement Law	Preference of products and services developed with local technology and manufactured according to the so-called "Brazilian Basic Productive Process"
Law No. 8,666/1993	The Public Procurement Law	Defines general rules of public tenders, bidding and contracting
Law No. 8,987/1995	The Concessions Law	Regulates the delegation of public services to the private sector
Law No. 9,472/1997	ANATEL Procurement Law	Provides for special rules for public biddings launched by the ANATEL, the Federal telecommunication regulatory agency
Law No. 9,478/1997	ANP Procurement Law	Sets forth specific procedures for public biddings launched by the ANP, the Federal oil, gas and biofuel regulatory agency
Decree No. 2,745/1998	Petrobras Procurement Law	Provides for special public procurement rules for Petrobras which are more flexible than the bidding procedures provided by the Public Procurement Law
Law No. 10,520/2002	The Reverse Auction Law	Regulates the reverse auction[64] system
Law No. 11,079/2003	The Public Private Partnerships (PPP) Law	Regulates PPP activities
Law no. 12,349/2010	Buy Brazilian Act	Sets a 25 percent preferential margin for domestic products
Law No. 12,462/2011	The 'Special Procurement' Law	Regulates a Special Procurement System (concerning special procurement such as projects related to FIFA and Olympics)
Law No. 12,598/2012	The Defense Procurement Law	Defines special rules for public procurement relating to so-called "strategic defense products"

Source: Author's compilation of information gathered from Frizzo and Oliveira (2014) and ICLG (2015).

Table 9.1 shows that procurement in some sectors might be subject to specific regulations. Petrobras is entitled to a simplified bidding procedure regulated by Decree 2,745/98. For agencies such as the National Communications Agency, the National Oil Agency, and the National Supplemental Health Agency, there are specialized rules in place to regulate their purchasing activities (Frizzo and Oliveira, 2014). Public procurement regulations in Brazil cover a wide range of activities, from public procurement rules, sector-specific procurement rules, agency-specific rules, to rules concerning preferential treatment of domestic firms.

There are six modalities of public procurement: public competition, in-person and electronic trading, price quotation, bidding exemption, unenforceability, and invitation (Speck and Delmondes, 2012). Different contract formats are required depending on the monetary threshold involved and the nature of the purchase, that is, public infrastructure or services (Speck and Delmondes, 2012). The federal government prefers open competition and reverse auctions to guarantee efficiency and transparency (OECD, 2012a). Despite the various types of contracts defined by the procurement-related laws on paper, one person interviewed noted that Brazil's procurement practice is still limited to fixed contracts, as distinct from the case of the United States, where different types of contracting (e.g., fixed or cost-plus contracts) are used based on the circumstances. This rigidity is not innovation friendly, but changing and implementing the legal framework is a challenge. Despite the sophistication of the six modalities of procurement, according to another interviewee, none is

[64] A reverse auction, or "supply" auction, is a type of auction where multiple sellers compete to supply a good requested by one buyer. Differently from an ordinary auction where multiple buyers compete to obtain goods by offering increasing prices, in reverse auctions sellers compete by offering decreasing prices. The use of electronic reverse auction is becoming increasingly popular because it enables sellers to compete online in real time, and enables buyers to realize goals such as cost effectiveness, transparency and efficiency.

suitable for contracting the development of new products or services. Presidential Decree 8.269 (Institui o Programa Nacional de Plataformas do Conhecimento e seu Comitê Gestor) was an attempt to solve this problem. However, the Decree has never been fully implemented, and public practitioners are either too risk-averse or lack the capacity to implement initiatives and adopt new procedures.

Although there is a dedicated PPP law (Law No. 11,079/2003), the use of PPP in Brazil has been limited (OECD, 2012a). A study by the Inter-American Development Bank (IDB) found that successful PPP in Brazil still requires greater effectiveness in the use of traditional procurement procedures to adhere to principles of transparency, open competition, and better contract monitoring (Queiroz, Astesiano, and Serebrisky, 2014).

Transparency and Corruption

The existence of corruption hinders implementation of PPI policies, since anti-corruption efforts often require more regulation and bureaucracy to reduce discretionality. The explicit aims of public procurement in Brazil are greater transparency, value for money, and efficiency (Queiroz, Astesiano, and Serebrisky, 2014). Key agencies that are advancing the agenda of enhancing integrity in public procurement include the Federal Ministry of Planning, Budget and Management, the Federal Ministry of Justice, and the Office of the Comptroller General (Queiroz, Astesiano, and Serebrisky, 2014).

Electronic procurement portals have greatly enhanced transparency in public procurement. Procurement information in Brazil is becoming increasingly publicly available, with more and more sources of operational documentation accessible online (OECD, 2014a). Meanwhile, non-governmental organizations (NGOs) are making efforts to monitor procurement activities and bidding processes in general (Speck and Delmondes, 2012), which could be an opportunity to push the transparency agenda further.

However, although federal and subnational governments are making efforts to enhance transparency and prevent corruption, there have been widening scandals related to key public procurement-performing organizations such as SOEs (e.g., Petrobras) (Vianna, 2014). A few well-known multinational enterprises have been found to engage in bribery to get contracts with Petrobras,[65] including Rolls-Royce and Samsung. More pressure has been put on these key procuring organizations to provide information and enhance transparency and accountability.

Public Procurement: Broader Considerations

Supporting Domestic Suppliers

In principle, all suppliers are treated equally in their bids for public contracts in Brazil. In practice, however, non-Brazilian firms might be disadvantaged,[66] as they are in public procurement markets in many other countries. On December 25, 2010, the Buy Brazilian Act (Law 12.349) was promulgated, modeled on the Buy American Act, which has been in effect in the United States since 1933. The Act gives a 25 percent preferential margin to domestic products. Its primary objective is to leverage development of Brazilian companies through

[65] See reports from a few major news websites: Bloomberg, Financial Times and BBC News [accessed March 16, 2016].

[66] As reported by the US Department of State in its Investment Climate Statements 2015 http://www.state.gov/e/eb/rls/othr/ics/, as well as the European Commission DG TRADE's Barrier fiches result http://madb.europa.eu/madb/barriers_details.htm?barrier_id=970031&version=6 [accessed March 16, 2016].

the purchasing power of the State (Novais, 2012). It calls on the government to only consider importing products/services after exploring the possibilities of buying domestic alternatives. The European Commission DG TRADE considers this policy to be a trade barrier.

Supporting Micro Firms and Small and Medium-sized Enterprises

Besides domestic firms, the General Law for Micro and Small Enterprises (known as the Complementary Law No. 123/2006) has stipulated that the government should give preferential treatment to micro firms and SMEs in procurement processes. This, again, has drawn upon existing practices internationally, including the U.S. Small Business Innovation Research (SBIR) program. According to the OECD (2012a), a quota may be established for micro and SMEs of up to 25 percent of a public body's procurement expenditure, including subcontracting.

Promoting Sustainability

Recent rationales of public procurement have evolved toward the realization of wider socioeconomic goals such as promoting sustainability (OECD, 2012a). D'Amico (2013) considers that international organizations, such as the United Nations, have influenced the dissemination of interest in sustainable procurement. The federal government and some active states have launched policy initiatives. In advanced Brazilian regions, such as the state of Sao Paulo, proactive regional government has launched and implemented procurement policies to promote sustainability (Brauch, 2012). Sao Paulo is favored for leveraging public procurement to achieve sustainability because of its relatively advanced economy, its substantial purchasing power supported with a large procurement budget (US$12 billion in 2011), and relatively well-developed procurement platforms and capacity (Brauch, 2012).

Supporting Innovation

Supporting innovation is intertwined with support to domestic suppliers, micro firms and SMEs, and sustainability, since supporting those players or sectors can lead to innovation in various ways.

Key Policy Developments in PPI

A broader policy instrument that has been supporting PPI, such as the "Innovation Enterprise Program," identifies strategic areas of national interest or that have demand potential and supports their systematic development (Negri, J., 2016). Among the productive sectors, the recurrent themes have been defense, aerospace, energy, agriculture, and ICT. There have also been modest initiatives, in the education sector, such as attempts to digitalize education, and to promote a stronger domestic electronics industry (Mourão and Cantu, 2014).

The Potential for PPI in Brazil

The potential of using procurement to promote innovation in Brazil can be substantial given the size of the domestic public market. The spending power of different levels of government bodies as well as that of major SOEs such as Petrobras implies great potential to leverage socioeconomic development. The potential for PPI in Brazil also lies in the science and technology (S&T) base that the country has established over the past decades. This S&T base, according to Mourão and Cantu (2014), has placed Brazil on the cutting edge in technology sectors such as energy, aviation, and agriculture.

Even though PPI policies in Brazil have gained traction in recent years, there were some trials and failures in the use of similar instruments historically. As noted by Mourão and Cantu (2014), from the 1970s to the 1990s, the Centers for the Articulation of Industry once played an active role in encouraging SOEs to strengthen their technological capacity through procurement. This attempt arguably failed owing to difficulty in coordination, an unfavorable macroeconomic climate, and the prevailing trend toward economic liberalization in Latin America. FINEP made another policy attempt, identifying some strategic technological areas and supporting firm innovation with non-refundable subsidies. This attempt has again been considered as unsuccessful (Mourão and Cantu, 2014). Both attempts contributed to the development of innovation capacity of Brazil to an extent, although the 'innovation' involved was mostly 'new to Brazil' rather than completely not-yet-existing (Mourão and Cantu, 2014).

Public procurement in Brazil is generally perceived to be still lacking the readiness to tackle broader policy goals, such as promoting innovation. A joint report by the Instituto de Pesquisa Econômica Aplicada (IPEA), the World Bank, and OECD has pointed out that "…there appears to be a mindset against cooperation and risk taking involving intangible assets in public and private expenditures" when it comes to the use of public procurement for innovation (IPEA et al., 2015: 37). Indeed, the emphasis on anti-corruption and the current institutional setting hindered the willingness of procurement practitioners to take risks and exercise procurement for innovation (Mourão and Cantu, 2014). In addition, while acknowledging the great potential of using procurement to address wider development needs, procurement practitioners can face a dilemma in practice, that is, the trade-off between internal (such as within a region) development needs and external trade relations (with other regions within Brazil or with international partners) (FGV Projetos, 2013).

One person interviewed pointed out that the role played by public procurement in Brazil is a lot less significant than it was 40 years ago owing to the impacts of the Washington Consensus. The public sector in Brazil is now a lot smaller, with the exception of SOEs such as Petrobras.

Core Legislation Linking Public Procurement with Innovation

There have been a few laws and acts which either explicitly or implicitly linked public procurement with innovation, or preferential strategies that might nurture innovation. These include:

- The Law on Innovation and Research in Science and Technology[67] (Law No. 10.973/2004), Article 20, stipulates that public bodies can outsource R&D activities to firms to address specific problems. The revised version of this Law has placed even more emphasis on the role of procurement in stimulating and supporting innovation.
- The Law of Goods (Law No. 11.196/2005), which stipulates that a firm's spending on R&D would affect its prospects in gaining government contracts.
- Federal Law No.12.349/2010 (The Buy Brazilian Act) articulated criteria that could stimulate innovation during procurement processes, including sustainability and socioeconomic development.
- Presidential Decree 8.269 (Institui o Programa Nacional de Plataformas do Conhecimento e seu Comitê Gestor), Article 9 of which stipulates that the recruitment of PPPs should adhere to the procedure of public procurement of R&D as detailed in Article 20 of Law No. 10.973/2004.

[67] See http://www.wipo.int/wipolex/en/details.jsp?id=8255 for details [accessed March 16, 2016].

The Buy Brazilian Act establishes a preference margin of as high as 25 percent to support domestic products, especially those involving a high level of R&D. "Domestic products" are those products for which the R&D and manufacturing are conducted in Brazil, not necessarily those developed by local firms. The sectoral scope of this law does not yet cover all industries; rather, it has an explicit focus on pharmaceuticals, ICT, agriculture, equipment, footwear, and textiles (Sorte, 2016). Complementary decrees have been issued that specify which items are preferred in the context of this Act. Although "buying domestic" is not necessarily linked to "buying innovative," for developing countries such as Brazil it could offer some opportunities to trigger new-to-the-country innovations. Nevertheless, one person interviewed for this study pointed out that this preferential margin was mostly applied to the purchase of products without much innovation potential, such as books and textiles. Technological development was not an emphasis of this preferential margin. The nearly exclusive focus was "buy domestic."

According to Law No. 12,462/2011 concerning special procurement, innovation was introduced, in addition to cost effectiveness, as a criterion for procurement related to the 2014 FIFA World Cup and the 2016 Olympic Games (UNOPS, 2014). The government is considering expanding the sectoral coverage of Law No. 12,462/2011 to broader contexts so that more suppliers from the private sector can be involved.

The announcement of the abovementioned laws, regardless of their impact, has at least shown that public procurement in Brazil has moved beyond the mere consideration of cost effectiveness. The overall progress in terms of implementation, however, remains unclear. Those interviewed for this study all pointed out that implementation of PPI in Brazil has been problematic. Despite the announcement of the Law on Innovation and Research in Science and Technology, procurement-related laws continue to dominate. One of those interviewed noted that, for all intents and purposes, the Innovation Law has not been used.

Sectoral Initiatives – Healthcare

In 2008, the Ministry of Health and BNDES jointly launched the Profarma Innovation' scheme[68] (Mourão and Cantu, 2014) which is part of the Profarma series program covering production, export, and other matters (Sorte, 2012). The Profarma approach is that the Ministry of Health announces lists of needed products and the Brazilian Development Bank (Banco de Desenvolvimento Nacional, or BNDES) provides venture capital to firms to develop those products. Once the products are developed, the Ministry of Health acts as a lead user to purchase the newly developed products. Until 2014, the impact of this initiative remained vague, but beneficiaries of this policy reported higher efficiency in the pharmaceutical sector triggered by this instrument (Mourão and Cantu, 2014).

Sorte (2012) elaborated in detail the role played by public procurement and PPPs in the development of medication. The development of domestic drugs in turn forced foreign pharmaceutical firms to reduce prices, which greatly reduced costs and strengthened the

[68] There appears to be some controversy in terms of whether 'Profarma Innovation' counts as a PPI-PCP scheme. While Mourão and Cantu (2014) and Sorte (2012) recognize 'Profarma Innovation' as a PPI-PCP scheme, one of our interviewees doubted about the operationality of this approach. The interviewee pointed out that the existing procurement regulations could 'prevent the Ministry of Health from linking the procurement process to the credit award or investments made by BNDES on pharmaceutical companies… there is no legal support to link these two operations made by two different public agencies…Because of that, I wouldn't mention Profarma as an example of PPI initiative.' Nevertheless, given the PPI rationale of this initiative, and the significance of this initiative in the literature, we still include it as a PPI example here.

domestic pharmaceutical development and manufacturing base. Nevertheless, Sorte (2012) noted a few barriers that were hindering this process of innovation through procurement and PPP, including a lack of alignment between sectoral policies and the research priorities of public labs, lack of demand, and logistical constraints. A long-term vision and a more systematic approach were needed.

A major initiative launched by the Ministry of Health was the Brazilian Industrial and Innovation Complex in Health, which is like a lead-market initiative type of innovation policy mix (Cunningham, 2009). The initiative involved a range of supply-side policy instruments as well as demand-side instruments such as adjustments in the regulatory framework for public procurement. The initiative aimed to augment general procurement focused on cost effectiveness with an additional orientation of addressing health development needs. The initiative integrates various industrial sectors that supply the healthcare industry to increase the efficiency of Brazil's Unified Health System (Salomão et al., 2013).

This initiative is directly linked to the preferential treatment as stipulated in Decree 7767/12, focused on promoting local content in the medical sector. Essentially, this Decree is an implementation initiative to support Article 3 of the Public Procurement Law (Law No. 8,666/1993). Again, the preferential rate can be up to 25 percent depending on how technologically intensive the solution is (Salomão et al., 2013). Salomão et al. (2013)'s analysis suggests that this preferential margin has been applied to 413 procurements, which saved US$104.5 million worth of imports. Yet CEBRI (2012) found that this preferential treatment focuses on localization only and can hardly be considered an effective innovation policy instrument.

Besides direct preferential treatment involved in regular procurement processes, the Productive Development Partnerships in Health, a PPP-type initiative, has also been announced (Nascimento et al., 2013). In this type of partnership, public research institutions from the Brazilian health sector engage with private suppliers to conduct R&D on drugs. Outcomes of this type of partnerships would then benefit from preferential treatment during procurement processes. Nevertheless, one of those interviewed for this study clarified that, per existing procurement regulations in Brazil, the government cannot buy medicines directly from pharmaceutical companies. Procurement calls are only open to public labs associated with private companies, which means that private companies might have to transfer their technologies to public labs. This barrier might discourage companies from participating.

Initiatives along these lines have also covered specialized equipment area, such as X-ray therapy (Pereira et al., 2013). Core policy instruments are the so-called "technological compensation" aimed at technology transfer through public procurement. This is essentially an import substitution move in strategic sectors.

PPI-PCP Practices of Petrobras

While there is renewed interest in PPI policies in Brazil, large SOEs in Brazil had been utilizing their purchasing power as monopolies since the 1960s (Lember et al., 2014). The core rationale of this approach is that, by setting demanding technological standards and requiring leading-edge equipment, those companies could stimulate the establishment and upgrading of local supply chains and pressure international suppliers to transfer their technologies to Brazil.

Petrobras is the largest SOE in Brazil. Its purchasing power is tremendous and highly influential on the development of related supply chains. Petrobras was the monopoly in the

Brazilian oil industry since 1953, when it was established as a key instrument for industrialization (Ribeiro and Furtado, 2015). By 1997, it was no longer legally a monopoly but still it is a near-monopoly in the industry. Petrobras features the largest enterprise R&D center in Brazil, which is also one of the largest in the international oil sector. Petrobras has been intensively used as a tool to test industrial and economic policies. It has dedicated a procurement strategy and electronic portals. It is situated at the leading edge of the oil industry globally. Its purchasing power coupled with its high-tech demand implies that the potential of PPI under the umbrella of Petrobras could be very promising.

The National Petroleum Agency (Agência Nacional do Petróleo, or ANP) stipulates that energy companies need to guarantee minimum margins for R&D spending and domestic components of purchased products/solutions. Petrobras is subject to Decree No. 2,745/1998, a special decree on procurement conducted by Petrobras. Enabled by this Decree, Petrobras has enjoyed more flexible procedures in procurement, having closer interactions with suppliers (especially those for equipment) so that leading-edge prototypes can be developed through co-learning. One of those interviewed pointed out that the interactions between Petrobras and its suppliers could be so close that they become increasingly politicalized.

With respect to the criteria adopted by Petrobras in procurement, Furtado (2015) suggested that Petrobras might have focused too much on local content rather than innovation. There could be technological areas offering potential for local suppliers to achieve a leading edge at the global level, but in general, local suppliers were unable to meet the needs of Petrobras. Petrobras has been considered a pioneer among Brazilian SOEs in charge of utilities, which followed suit in introducing local content criteria into their procurement practices. This emphasis on local content without taking the reality of technological innovation into account is problematic. On the one hand, local suppliers arguably failed to satisfy Petrobras' demanding requirements; on the other, the local content requirement could easily lead to rent-seeking and other forms of corruption. One of the interviewees noted that there are ongoing discussions in Brazil to eliminate the local content requirement in Petrobras' procurement strategy. The outcome of those discussions remains unclear.

Ribeiro and Furtado (2015) analyzed a case of procurement by Petrobras—the procurement of a leading-edge stationary product unit 'P-51'—in detail. Although there was high percentage of local elements, the most technologically intensive parts were produced by non-Brazilian suppliers. The Petrobras approach is arguably an import substitution strategy which does not necessarily lead to fundamental technological learning (Ribeiro and Furtado, 2015). They find that, in addition to the challenges identified in developed countries, such as risk aversion and difficulty in articulating demand, some of the challenges faced by developing countries are technological backwardness and lack of capability of suppliers.

National Champions – Aerospace and Defense[69]

Besides the Petrobras case reviewed above, two interlinked sectoral themes—aerospace and defense—have been explicit in the context of PPI through activities of national

[69] Although this section does not discuss defense procurement in Brazil, the subsection mentions it for two reasons: (i) the limited evidence available on PPI in Brazil has shown that the defense sector has been playing an important role in this picture, and (ii) defense procurement has been strongly linked to the aerospace industry, which offers some lessons for broader use of PPI in Brazil.

champions. For aerospace, the PPI practices conducted so far include both civil-use aerospace and defense-related aerospace technologies (Furtado, 2015).

Brazil is advanced in aerospace technologies. It began developing core technological competencies in the 1950s and kicked off a formal space program in 1979. The National Institute for Space Research (INPE) is the main agency promoting R&D and innovation in aerospace technologies. Besides instituting proactive policies to promote independent domestic research, the government has emphasized international partnerships in this sector to mitigate risks in cost and technology (Dewes, Dalmarco and Padula, 2015). The Law on Innovation has also had an impact on innovation activities in this sector by stimulating interactions between academia, industry, and government. This has led to more productive partnerships based on a better articulation of demand (Dewes, Dalmarco, and Padula, 2015).

Chagas (2015) reviewed procurement practices associated with the China–Brazil Earth Resources Satellite (CBERS) program. CBERS was launched in 1988 as a joint R&D initiative between China and Brazil. During the two decades of cooperation, generations of solutions have been developed and there was a need for further diffusion through procurement. INPE performed its functions of driving innovation in this case from both the supply and the demand sides. It significantly improved its capacity to understand the nature of the innovation process and perform as an intelligent lead user. Chagas (2015) considers this a successful example that illustrates how developing countries could work together to catch up with technological frontiers in strategic sectors. During this time the success rate of Brazilian suppliers in gaining contracts increased.

One lesson that can be drawn from the experience of aerospace sector procurement is that, to better support leading-edge innovation and alternative designs, specifications from public authorities are better explained in terms of functionality than in technical terms, since the prospective users do not necessarily understand the technologies involved behind the scenes (Dewes, Dalmarco, and Padula, 2015).

In the defense sector, public procurement is subject to special legislation. It covers technologies and solutions in procurement of nuclear submarines and aircraft (Mourão and Cantu, 2014). F. Negri (2015) elaborated on the experience of developing the KC 390 aircraft through procurement by the Brazilian Air Force. Owing to the monopolistic nature of this sector, there was no bidding procedure involved. The Brazilian aerospace conglomerate, EMBRAER, is the only aircraft manufacturer in Brazil.

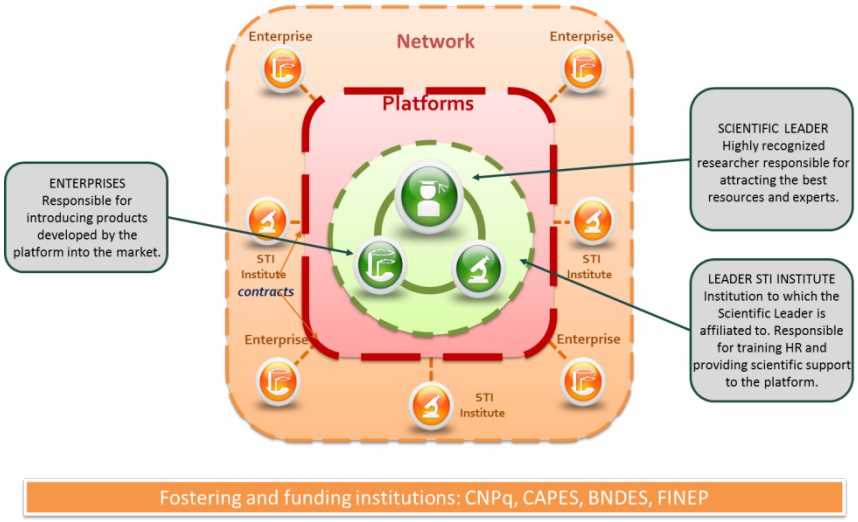
Public–Private Partnerships – National Knowledge Platform Program

The National Knowledge Platform Program, a major, high-profile innovation policy instrument, was announced in 2014 through Presidential Decree 8.269. Article 9 of the Decree stipulates that recruitment of PPPs would follow the procedure of public procurement of R&D, laid out in Article 20 of Law No. 10.973/2004 (Law on Innovation and Research in Science and Technology). In this context, the process of selecting proposals and establishing knowledge platforms is essentially a process of pre-commercial procurement (PCP).

As explained by F. Negri (2016), platforms are PPPs that link research institutes conducting basic research with commercialization enterprises to develop cutting-edge technologies in selected areas. These partnerships will then provide a window of opportunity for the public procurement of newly developed innovations. Platforms feature an orientation toward

problem solving, and the problems to be addressed reflect the country's strategic demands for socioeconomic development. Platforms aim to generate knowledge, discoveries, products, and processes that would have high impacts on the Brazilian economy and society. This program is a systemic one, supported with a portfolio of complementary policy instruments. Figure 9.2 illustrates key actors and elements associated with this program.

Figure 9.2: National Knowledge Platform Program – Key Actors and Elements



Source: Negri, J. (2016).

As shown in the diagram, the institutional arrangement of the National Knowledge Platform Program involves a research institution and an enterprise, and the role played by the scientific leader as an individual can be crucial. The Program features an emphasis on risk sharing in the development of new technologies and therefore to overcome the so-called "valley of death" or the funding gap that often exists between basic research and commercialization.. Core technological areas that the program focuses on include energy, agriculture, and health, areas in which Brazil is comparably advanced. The program also pays attention to globally emerging technologies such as robotics and big data. In terms of maturity of technologies, the priority is to develop those technologies at levels 4-7 in a 10-level technological readiness scale (Negri, F., 2016).

Owing to the very recent introduction of this Program, there has not been tangible evidence to show how this Program was operationalized or how effective it has been. In 2015, the first batch of proposals was debated, ranging from those focused on biopharma to those on nanomaterials.

Very recently (July 2016), however, one person interviewed for this study affirmed that there has been no practical implementation of the platform. The Program was terminated with the change in administration.

PPI Policy Instruments and Rationales in Brazil – A Summary

Using the framework proposed by Georghiou et al. (2014) to analyze the instruments utilized in Brazil to carry out PPI, their rationales can be mapped in the Table 9.2.

Table 9.2: Rationales of PPI Policy Instruments in Brazil

Policy category	Deficiencies addressed	Instrument types	Examples
Framework conditions	i) Procurement regulations driven by competition logic at the expense of innovation logic. ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of innovation-friendly regulations ii) Simplification and easier access for tender procedures	i) FINEP-30 days which enables faster, more transparent policy services based on digitalization ii) Formal legislation officially linking public procurement with innovation
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) High-level strategies to embed innovation procurement ii) Training schemes, guidelines, good practice networks iii) Subsidy for additional costs of innovation procurement	
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning and procurement function ii) Lack of knowledge and organized discourse about wider possibilities of supplier's innovation potential	i) Pre-commercial procurement of R&D to develop and demonstrate solutions ii) Innovation platforms to bring suppliers and users together; foresight and market study processes; Use of standards and certification of innovations	i) Innovation Enterprise Program setting technological priorities ii) National Knowledge Platform Program identifying leading-edge areas and debating technological development proposals iii) National champions setting demanding standards, signaling their needs
Incentivizing innovative solutions	i) Risk of lack of take up of suppliers' innovations ii) Risk aversion by procurers	i) Calls for tender requiring innovation; Guaranteed purchase or certification of innovation; Guaranteed price/tariff or price premium for innovation ii) Insurance guarantees	i) National Knowledge Platform Program implying opportunities for new solutions to be procured by public agencies ii) Preferential price margin as high as 25 percent for innovative solutions

Source: Author's compilation of instrument rationales per Georghiou et al. (2014) framework.

Evidence of Impact and Further Challenges

As is the case in other countries, there has been no formal evaluation of the effectiveness and impacts of those PPI initiatives. Nevertheless, the qualitative studies reviewed in this chapter the exercise of PPI policies.

Impacts

Most PPI processes that have taken place in Brazil are related to incremental innovation, that is, “adaptive PPI” rather than “developmental PPI.”

Sorte (2016) has identified some early impacts of PPI in Brazil. First, more contracts have been awarded to R&D-intensive firms, encouraged by the margins of preference. Second, some good practice has emerged in this context as well, including dynamic, constant interactions between the user and supplier, which led to the co-development of specifications. Third, spill-over effects have been generated for the supplier company which substantially established its business in the public sector and then reached out to private sector enterprise users. Finally, improved transparency, accountability, and efficiency have been achieved owing to the dedicated design of the mechanism.

Ribeiro and Furtado (2015) noted that in addition to the leading-edge stationary product unit ‘P-51', developed through the procurement done by Petrobras, some moderate learning effects on the part of subcontractors are evident. However, these learning effects were more limited than initial expectations.

A broader initiative, the Innovation Enterprise Program, has shown positive impacts on creating a friendlier environment to promote innovation comprehensively (Negri, J., 2016).

Challenges

There were challenges at the operational level, specifically concerning the interactions between public users and private-sector suppliers. With respect to procurement of innovation, a high degree of interaction between user and supplier is often needed to better articulate the demand, understand the needs of users, and develop technological specifications around it. Formal rules in place to prevent corruption often turn out to be barriers hindering this type of interaction. In the case analyzed by Sorte (2016), the first round of reverse auction arguably failed because the supplier was too keen to get the contract with the lowest bid, which led to failure to deliver the promised solutions. Eventually, a new round of reverse auction was conducted, and a different supplier took over the project. This led to a delay in upgrading public ICT infrastructure, which caused delays for the public agency’s ability to provide improved services. Second, the non-selective nature for preferential treatment of domestic firms by 25 percent can benefit firms that the government does not intend to support, such as some opportunistic suppliers. Strong foreign firms can still enter the Brazilian public market by offering very competitive solutions at very low prices which are unbeatable by their Brazilian counterparts. This revealed that the preferential treatment favoring Brazilian firms might not be efficient in establishing long-term partnerships between government and firms because of its nonselective, rigid procedures

A challenge pointed out by one of our interviewees is that there is a need to “get the basics right.” That is, the framework conditions, including a stable macroeconomic environment, must first be in place.

Another challenge is how those policies could reach local suppliers beyond public labs or national champions. Even though the government can play a role by leveraging its

purchasing power in public utilities and services sectors, it plays a much less significant role in high-tech sectors such as ICT, which are mostly driven by private sector developments. There seems to be no way around this barrier except better exploring the potential of PPP. The initiatives associated with the National Knowledge Platform Program are of a systemic nature to facilitate PPP, to stimulate innovation with a higher level of directionality.

There is also a challenge in terms of how to differentiate between the local and the innovative. Like the United States and large catching-up countries such as China, Brazil launched explicit "buy domestic" regulations to boost national development. However, to what extent do "local solutions" overlap with "innovative solutions"? The answer to this question depends on the circumstances in the country. While countries might benefit significantly from "buy domestic" policies while they are catching up, such as in the cases of South Korea and Japan, implementing "buy domestic" policies when domestic solutions are not yet available could only hinder the progress of innovation. A one-size-fits-all preferential margin across sectors and technologies could cause confusion in this regard and generate technological lock-in effects. To reconcile the tensions between innovation and supporting local industries, and potential tensions between domestic innovation and international trade/investment, policymakers should carefully explore the potential of selected sectors. For instance, the recent practices of Uruguay and China around wind farms have exercised "local content" requirements, which to an extent promoted domestic innovation, but not without controversy (Kuntze and Moerenhout, 2013).

For the longer term, there is the challenge of maintaining policy continuity. Recent policy trends in Brazil regarding innovation have been favorable, including policies aimed at promoting PPI. Yet the experience of other countries (e.g., United Kingdom and China) exercising this policy instrument suggests that policy continuity and effective implementation make a real difference in innovation outcomes in both the public and the private sectors. In the current state of political uncertainty in Brazil, it is important to maintain this line of effort to make progress on PPI. A notable aspect associated with this challenge are budget constraints experienced by the Brazilian government. In times of austerity, the room for implementing PPI policies might be substantially limited.

Concluding Remarks

Public procurement of innovation has great potential in Brazil owing to the size of the domestic public market, the country's advantage in several technological sectors such as aviation and energy, and the tremendous opportunities to invest in public infrastructure such as those seen in high-profile events such as the World Cup and the Olympics.

There is only a limited body of literature which documents the use of public procurement to promote innovation in Brazil. Still, it paints a picture of a rather fragmented use of various instruments to realize PPI. This is different from the case of China, where the government ambitiously launched a systematic set of PPI policies in a high-profile way. As distinct from traditional instruments such as direct R&D grants, PPI requires a higher level of policy design and implementation capacity and more sophisticated skills of policy practitioners. Brazil's approach of exploring various possibilities through various agencies and in various sectors appears to be more realistic for a catching-up country which has not yet joined the GPA.

The current procurement system in Brazil is perceived to still lack the capability to uptake complicated procurement objectives such as innovation. Without addressing the primary

principles of equality, transparency, and efficiency, a public procurement system can hardly address even more demanding tasks. As described in Telgen, Harland, and Knight. (2007), to achieve the sixth stage of development of public procurement, that is, support for broader government policy objectives, the procurement system must go through earlier stages of development, such as compliance with legislation and regulation, accountability, and efficiency.

There has been a strong tendency toward import substitution, with the requirement of domestic elements. Besides the case of Petrobras, there is no evidence that the innovation involved in this context has been world-leading. PPI has been positioned more like an industrial policy instrument, or a development strategy, featuring a strong orientation toward catching up and meeting social and economic needs.

PPI initiatives in Brazil have been limited to specific sectors and not yet fully integrated or routinized. There have been active attempts to link procurement practices to agendas of promoting innovation, and to make more systemic innovation policies with elements of procurement. Indeed, the integration of government purchasing power and the government's innovation promotion function now appears to be a bottleneck that hinders PPI. This is true not only in developing countries such as Brazil and China, but also in developed countries.

To enhance the integration of innovation policy with government procurement functions, it is worth exploring the role that can be played by cross-cutting agencies. In Brazil, innovation as a policy task itself in principle falls under the Ministry of Science, Technology and Innovation. Nevertheless, as illustrated by the Brazilian experience and that of other countries, PPI goes well beyond the traditional arena of science and technology, since it should be ultimately directed at advancing and improving government functions at all levels. Further diversification of innovation functions across agencies and ministries could offer better alignment of PPI with the existing procurement functions, as well as other social and economic functions. This could provide space for the appropriate sectoral agencies to pioneer PPI approaches. Diversification of PPI necessitates greater collaboration across governmental functions, which requires coordination mechanisms to bridge different functions of government. It remains unclear which existing agency could perform this coordination function. Based on the de jure division of labor, agencies such as the Federal Ministry of Planning, Budget and Management may be able to play this role.

Besides the disconnection between the procurement system and innovation policies, other challenges involve the need to train practitioners in the skills required to conduct PPI under various circumstances shaped by factors such as sectoral characteristics, technology life cycle, and features of the target groups. Reflecting on Table 9.2, which outlines the various PPI policy instruments adopted in Brazil, we found that the portfolio of instruments lacks an explicit emphasis on skills, capability, and capacity building. This is a clear policy gap that should be urgently addressed. The challenges highlighted in the preceding section all point to the need for greater capabilities, capacity and expertise from policy practitioners in various functions of the government. Since there is no single agency in charge of procurement or training procurement workforce, there is no standardization of the procurement procedures and practices among agencies at the federal level and among local governments. In this context, capacity building might take various approaches from different angles. Because the existing PPI practices in Brazil are distributed across different sectors such as healthcare and energy, distributing capacity building targeting specific themes can be explored. This could involve training sessions and workshops with leading practitioners and experts.

Corruption remains a severe barrier. Petrobras' procurement activities, which have been plagued by corruption scandals, have been controversial. This problem is not confined to this SOE. There is a need to strengthen the basic principles of public procurement to achieve efficiency even if procurement could seemingly deliver innovative solutions. The multiple facets of public procurement need to be well aligned, which is especially challenging for developing countries with underdeveloped institutions.

In terms of policy design itself, the National Knowledge Platform Program looked rather promising in addressing the challenges mentioned above. It involves an ambition to lead in comparably advanced technologies, a vision to guarantee sustained financial support, the employment of various policy instruments from both the demand and the supply sides, a commitment to facilitate learning among different stakeholders, and most importantly, an advantage of engaging stakeholder groups in a transparent way. Nevertheless, the very recent political changes led to the termination of this promising initiative. This highlighted the need for policy continuity when it comes to innovation policies with a cross-cutting nature.

Brazil is moving in the right direction in terms of policy design, but implementation remains problematic. As an emerging innovation policy instrument, public procurement in Brazil still has a long way to go to be able to deliver the desired policy outcomes. To date, PPI initiatives in Brazil have been limited to strategic sectors such as healthcare, petroleum, defense, and education. How to leverage the power of the public purse to benefit a wider range of players remains an open question. The penetration of PPI policies from federal level initiatives to the local level, from national champions to private sector suppliers, and from ad hoc practices to more routine-based implementation, is very much needed.

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10. CHILE

Diego Moñux and María José Ospina, SILO

Country Overview

- Chile is one of Latin America's most prosperous countries: it surpasses its neighbors in terms of income per capita, human development, low perception of corruption, and external debt. It also has remarkable advantages when compared to other Organisation for Economic Co-operation and Development (OECD) countries: with one in every three central government employees a woman, Chile hold the first place in gender equity in the public sector across the OECD. However, with a GINI coefficient of 0.51, Chile has the highest level of income inequality among OECD countries.[70]
- In 2006 Chile elected its first female president, Verónica Michelle Bachelet Jeria. She was re-elected in 2014, becoming also the first person since 1932 to win the presidency of Chile twice in competitive elections. The Bachelet government's overarching priorities are poverty reduction and economic growth focusing on science and innovation and support for small and medium-sized enterprises (SMEs).

Institutional Network and Governance

Chile is a unitary, democratic, and presidential country. The president serves a regular four-year term. The country has a bicameral congress, composed of 120 elected members in the Chamber of Deputies and 38 elected members in the Senate. Like the president, the term of office of the deputies is four years while Senators are elected to serve for an eight-year period. The administration is functionally and territorially decentralized into 15 regions, each with a government made up of a regional intendant (named by the president) and a regional council. The regional council is made up of advisors elected by the inhabitants of the region. Its size varies from 14 to 34, depending on the population of each region.

Chile holds a proud place among the 40 most developed countries in the world and has one of the lowest poverty rates in Latin America. This has allowed President's Bachelet to focus her reform agenda to a considerable extent on one of the country's lingering negative features: inequality.

In terms of governance and rule of law, corruption perception is currently an advantage. Chile scores 7.2 out of 10 on the Corruption Perception Index, which is 95 percent better than the average. Additionally, 38.4 percent of citizens surveyed in 2014 by Transparency International believe that the government is effective in the fight against corruption, while 21 percent report having paid a bribe in the preceding 12 months (Transparency International, 2014). Despite Chile's favorable reputation and position among LAC countries in this area since the 1990s, and the national pride about this freedom from corruption, corruption scandals in the past year (known as "Pentagate") have caused the Freedom from Corruption score to fall by one point, which caused the overall index score to drop last year. Recent corruption scandals are also negatively impacting this perception (Roberts, 2015).

[70] Data for 2013 on OECD's country fact sheet for Chile.

Economic Performance

Chile has experienced steady economic growth in the past few decades. Recently, weak demand, specifically the fall in commodity prices affecting the copper sector, have hampered this growth. Although trade, restaurants and hotels, transport, communications, financial and business services, real estate, and personal services together account for more than 56 percent of Chilean gross domestic product (GDP), mining accounts for 13 percent of the total output, with copper representing the largest portion. The government provides 5 percent of the output (Trading Economics, 2016).

In the last decade, Chile's productivity growth exceeded that of most OECD economies (OECD, 2014). However, the country still lags other OECD countries in placing science, technology, and innovation (STI) at the heart of its economic development strategy. Thus, Chile's economy is still quite sensitive to commodity prices.

Despite scoring lower than the OECD average on the Ease of Doing Business Index, Chile has continued to make progress in this regard. A law introduced in May 2013 intended to ease requirements for business registration has reduced the time required to register a firm to one day (OECD, 2014).

In recent years, foreign direct investment (FDI) has played a key role in Chile's economic growth and productivity gains, and specifically in capital formation. Chilean studies affirm that "around 30 percent of the increase in the Chile's total investment rate (gross fixed capital formation) since 2010 was thanks to the increase that on average FDI showed in this period" (CIEChile, 2015). Furthermore, this contribution is expected to dramatically increase with the new law (Law N° 20.848) that took effect in January 2016. This law grants additional rights to foreign investors, such as access to the formal exchange market to liquidate or obtain foreign currency without authorization of the FDI regulators as well as non-discrimination in the legal regime applicable with respect to domestic investors. The latter right is extended to public procurement as well (Carey, 2016).

This openness to FDI is also related to Chile's active participation in the international arena. A member of several international organizations, including the Community of Democracies, the Asia-Pacific Economic Cooperation Forum, the World Bank, and the World Trade Organization, Chile is also a member of the Pacific Alliance, the Union of South American Nations (UNASUR), and the Community of Latin American and Caribbean States (CELAC). Chile has 11 free trade agreements (FTAs) in effect, with specific chapters on public procurement (Central America, the European Union, the United States, Korea, AELC, P-4, Canada, Japan, Australia, Colombia, and Mexico) (Belaústegui, 2011). Chile was the first Latin American country to become part of the OECD by signing its accession in 2010. This was the result of two decades of democratic reforms and sound economic policies. It entails, now and in the future, interest and commitment on the part of Chile to remain at the forefront in policymaking in many fields, one of which is public procurement.

Governance and Performance in the Innovation System

In the current scenario, the key stakeholders in STI perform the following complementary activities:

Strategy

- National Innovation Council for Competitiveness (CNIC), which became the National Innovation Council for Development (CNID) in 2015

Policy:

- Inter-ministerial Committee for Innovation (CMI for its initials in Spanish): Comprises the Ministries of Economy, Agriculture, Education, Treasury, Interactional Relations, Energy, Public Works, and Transport and Communications

Execution:

- Chilean Economic Development Agency (CORFO), Under the Ministry of Economy
- Chilean Foundation for Innovation in Agriculture (FIA), under the Ministry of Economy
- National Commission for Scientific and Technological Research (CONICYT) under the Ministry of Education
- Government Laboratory
- Other non-governmental entities, such as Fundación Chile

The National Innovation Council for Development is the key stakeholder in the Chilean STI system in terms of strategy. It is an advisory organ to the President of the Republic. Its mission is to offer advice on strategic directions to strengthen innovation, competitiveness, and development. As such, it releases strategic documents, reviews, and policy guidelines on different subjects related to STI and competitiveness. These include sectoral reviews, policy guidelines for specific STI actors (such R&D centers), and recommendations on specific tools for STI promotion.

CORFO and CONICYT are identified as the main stakeholder in terms of STI execution, both with a wide array of programs and tools. CORFO's mission is to improve the competitiveness and economic diversification of the country by encouraging investment, innovation, and entrepreneurship, further strengthening human capital and technological capabilities to achieve sustainable (and territorially balanced) development. CONICYT's mission is to promote the formation of human capital and promote, develop, and disseminate scientific and technological research, consistent with the National Innovation Strategy.

The recently created Government Laboratory (Laboratorio de Gobierno, or LABGOB) is a new stakeholder in innovation policy implementation for the public sector. Comprising a multidisciplinary team, LABGOB's mandate is to promote innovation processes within the Chilean government. A special feature of the strategy developed by LABGOB is that it is based on the active involvement of several civil society actors in the process of imagining, design, and co-creation of the public services that the government must deliver when facing increasingly complex challenges.

The multiplicity of STI stakeholders and the current arrangement under which they operate have been identified as problematic. Specifically, according to the Presidential Commission on Science for the Development of Chile[71] (CPCDC), the current institutional arrangement for STI entails a major problem of disarticulation in the provision of R&D capabilities and innovation, because the agencies in charge of each task fall under a different Ministry (i.e., the Ministry of Education in the case of CONICYT, and the Ministry of Economy in the case

[71] President Bachelet created the Commission in January 2015. The Commission is made up of 35 experts in R+D+I. Its main objective was to deliver a report with recommendations on how to strengthen the role of science as a pillar of Chile's national development and international position.

of CORFO). Most experts within this CPCDC suggest that the system would be better off creating an STI ministry that performed both functions while leaving certain tasks related to tech-based innovation to the Ministry of Economy (CPCDC, 2015).

According to CPCDC, the major weaknesses of Chilean STI policy are: dispersion of efforts, lack of political relevance, discontinuity of efforts around major strategic goals, coordination problems (both horizontal and vertical), and problems of regional capacity to conduct STI policy and activities (CPCDC, 2015). However, the rising consensus on innovation as a key development driver in Chile has led to increased public support for the development and redesign of related policies as well as progress on institutional strengthening and policy learning in this field (IDB, 2010). Consequently, comprehensive new strategies and approaches have been launched in a very lively policy arena for innovation and competitiveness. President Bachelet launched the Growth, Innovation and Productive Agenda, which includes priority sectors for social and economic development (OECD, 2014) while the OECD released "Policy Priorities for Stronger and more Equitable Growth" (OECD, 2015), an analysis of the reforms pursued by President Bachelet and a contribution to the debate over other measures that the country might be lacking.

As in many other LAC countries, there have been several efforts to identify and promote strategic sectors. In 2013, the National Innovation Council reviewed Chile's innovation strategy and identified energy, biology, and education as strategic business sectors. This review, however, came shortly before the change of government between the Piñera administration and the Bachelet administration (OECD, 2014). Other initiatives, such as the centers of excellence, promoted by programs such as the Fund for Financing R&D Centers in Strategic Areas (FONDAP), Associative Research Programs (following a block funding scheme), the Millennium Science Initiative, and regional centers, have established capabilities in some areas (CPCDC, 2015). Nevertheless, according to the CPCDC, Chile is not currently systematically promoting any strategic areas. Specifically, the country is in the process of identifying areas in which to focus its STI efforts aimed at putting Chile in a leadership position in specific subjects.

Although the Strategic Programs Initiative recently received by CORFO is also aimed at prioritizing efforts, CPCDC considers that they still lack the magnitude required to change Chile's position internationally. They also fall short in specific areas: while some programs may be aiming at fostering innovation in specific productive sectors, they may be lacking the scientific capabilities in the same area to support long-term, more competitive R&D-intensive industries. One of the mechanisms suggested by CPCDC is to allocate 30 percent of total public expenditure in STI toward these areas as a way to achieve an acceptable and measurable level of effort. The means to achieve this, however, are still under discussion.

Contrary to the main trend in LAC countries, in Chile the government is not the indisputable main purchaser of R&D. While the government's R&D expenditure in 2014 remained below 10 percent, private firms accounted for 32 percent and universities accounted for 40 percent, with the remaining corresponding to other nonprofit entities. However, the government continues to be the main source of R&D financing, with about 65 percent of R&D expenditure coming from public sources. In this sense, Chile's private contribution to R&D expenditure remains below the OECD average. It is in a good position with respect to neighboring countries, second only to Brazil, which has 43 percent business-financed gross domestic expenditure on research and development (GERD) (GII, 2015).

In terms of geographical distribution, as in other LAC countries, Chile's research, development and innovation (R+D+i) activities are concentrated in a few regions of the

country: more than half of the tax benefits are acquired in the metropolitan area of Santiago. Additionally, the current Innovation Fund for Competitiveness (FIC) is distributed among projects and programs according to the demand in each region. Thus, it benefits regions where at least some capacity already exists. Capacity in STI policy and program design and execution remains low in many of Chile's regions. Specifically, there is a lack of interaction and articulation scenarios for key stakeholders of the local innovation systems (CPCDC, 2015). Some advances have been made, however, in terms of local capabilities for planning and execution of STI policies and resources: since 2006, up to 25 percent of the original amount of FIC has been transferred to the regions in the form of FIC Regional (FIC R); the regions are then responsible for distributing these resources to meet the region's specific objectives (MINECO, 2014).

In terms of performance, Chile's innovation system lags the OECD average in several indicators. For instance, triadic patent output (as a share of GDP) suggest that Chile still has a weak international technological presence (OECD, 2014) while Chile's business innovation performance remains well below the OECD average and even lower in the case of SMEs (measured in terms of venture capital as a share of GDP, young patenting firms, and ease of entrepreneurship index). To improve the situation, the government supports entrepreneurship through several funding schemes, including seed, angel, and early-stage venture capital programs that also offer financial, legal, and managerial advice (OECD, 2014). Compared to regional standards, Chile has a relatively innovative business environment, with nearly one in four enterprises being innovative. As in other LAC countries, and against what the literature suggests when there are competitive markets, the largest companies are more likely to innovate: 40 percent are innovative, while the percentages for medium and small enterprises are 36 and 21 percent, respectively (MINECO, 2014).

Public Procurement Overview

Evolution and Rationale of Public Procurement in Chile

Chilean procurement regulations are simple compared to those of other LAC countries: it has 37 laws and 108 regulatory articles (Schapper and Veiga Malta, 2011). The Law on Terms and Conditions for Administrative Supply and Service Contracts (Law No. 19,886), and its Decree No. 250/2004 issued by the Finance Ministry, is the most relevant legislation in terms of public procurement. This law and its regulation set the general conditions for an open, unique, and electronic market for public procurement, along with the broad rules framework agreements, control procedures and appeals, among others. The Law of General Bases of State Administration and the Law on Administrative Procedure are also applicable as a general framework for all public entities (ICLG, 2016).

There are no specific laws for public procurement of innovation or for public contracting of R&D services per se. Some government officials interviewed underscored the need to develop such a regulatory framework. The CPCDC shares this view, although the current concern with the regulatory framework tends to be more concentrated in the capacity of universities and other R&D actors to transfer innovation to the private sector (CPCDC, 2015).

In terms of transparency and compliance with laws, Chile occupies a good place by Latin American standards. Auditing activities are not only considered to be a traditional strength of Chile (with a highly competent internal control function) but are clearly differentiated from other Latin American countries as they are mostly a means to obtain valuable management information (Sopher, Sanchez, and Onowunmi, 2009) rather than solely an oversight tool.

This makes an important difference in officials' response when asked to increase the amount of information that they share (as can be the case in PPI-PCP processes).

Other transparency rules relevant to public procurement include Law No. 20,285, which regulates access to public information, and Law No. 20,730, which regulates lobbying and other actions before public authorities (ICLG, 2016). Those interviewed considered this law to be particularly important as a means to increase transparency in all public procurement processes, as it regulates access of unsolicited proposals to public authorities. However, there are no studies that examine the actual effect of such regulations. Dialogue with providers is diffuse in the case of special public procurement processes (as distinct from public tenders) but is nevertheless still informal and ad hoc.[72]

Chile's procurement regulation is also found to be progressive at the international level as it establishes principles such as value for money and total cost of ownership (Schapper and Veiga Malta, 2011). Other relevant principles that permeate Chile's framework and apply to all public procurement procedures are open and electronic market, equal treatment for providers, transparency and autonomy, and responsibility of each government institution. These principles are frequently understood to be superior to judicial decisions to interpret the applicable law (ICLG, 2016).

There are also well-established examples of inclusion of wider social objectives in the process of public procurement. For example, a sustainability criterion was recently introduced in the evaluation of proposals (leading to sustainable public procurement or SPP), through the initiative "Let's Achieve a Public Market Committed to Sustainable Development" (*Avancemos a un mercado público más comprometido con el desarrollo sustentable)* (Beláustegui, 2011). Under this initiative, certain goods have been prioritized for both their respective percentage weight over the public expenditure (higher volume of goods and higher price result in a higher percentage weight over total purchases) and, simultaneously, for their environmental impact.[73] Sustainability Sustainable Procurement Advisory Board (Consejo Consultivo de Compras Sustentables), comprising public and private experts, was formed with a mission of periodically analyzing the policy, monitoring reporting on its implementation, and proposing improvements and modifications.

Bidders can earn additional points for compliance with human rights (i.e., non-discrimination) and improved employment conditions (i.e., wages, healthcare, and security). Special valuation of energy efficiency of publicly acquired goods was also introduced in Chilecompra's Guidance on Public Procurement (*Directiva de Contratación Pública)* No. 9 (2008).

Promoting small and medium-sized enterprises (SMEs) is also a special feature of Chile's public market: at the regional level, SMEs represent 20-30 percent of participation over the value of public purchases, while nationally SMEs represent close to 50 percent (Chile is the only country of the ICT4GP[74] to be over the 50 percent threshold). The case of Chile is

[72] Statement made by Chilecompra interviewees.

[73] See Beláustegui (2011) for a comparison with SPP in Paraguay, Colombia and Peru.

[74] The ICT4GP is the Program "*Fortalecimiento de los Sistemas de Contratación Pública a través de TICs y la participación de las MIPYMES*", which in turn is led by the *Red Interamericana de Compras Gubernamentales* (RICG). According to Beláustegui (2011), the main objective of this program is to identify and implement best practices for incorporation ICT in public procurement systems and institutional public–private cooperation, to improve the efficiency and transparency of the procurement processes and to facilitate SMEs' access and participation in these processes.

peculiar in this area, as tools for preferential access for SMEs were not put in place until the public procurement reforms introduced in 2015. On the contrary, non-mandatory policies have shown to be particularly effective: the government has implemented a series of successful initiatives to promote SME participation, such as greater availability of information about tenders, improved electronic procurement platforms, capacity development in SMEs, among others (Beláustegui, 2011).

A general feature of the Chilean regulatory framework for public procurement related to the principles mentioned above is the clear understanding shared by leaders in both the executive and the legislative branch that effective delivery of public services and efficient utilization of public resources are the indisputable objectives of public procurement (Sopher, Sánchez, and Onowunmi, 2009). This not only permeates the principles that guide the regulatory framework; it has also helped to form a critical mass of suitably qualified staff assigned to the public procurement function in each agency (Sopher, Sánchez, and Onowunmi, 2009). This also constitutes a specific advantage in the Chilean context for subsequent implementation of PPI.

Public Demand Composition and Organization

The Chilean government spent over US$74 billion in 2015 in public purchases according to Analiza.cl,[75] which represents about 3.5 percent of GDP in Chile for the same year. This has translated into more than 14 million tenders, 48 percent of which came from municipalities, 27 percent from the health system, and 11 percent from the central government and the universities (Analiza, 2015). The participation of local governments in the overall value of the demand for public purchases (21 percent) is like those of other LAC countries: 25 percent for Paraguay and 17 percent for Peru (Beláustegui, 2011).

As in other Latin American countries, a central purchasing body—Chilecompra—has been established in Chile. This agency became operational in 2003 under the Ministry of Finance. It is a decentralized public agency whose mission is increasing transparency, improving coordination between demand and supply in public procurement, and providing support in general for public purchasing agencies and suppliers. Directives are Chilecompra's main vehicle for providing guidance in public procurement. However, Chilecompra has no legal status; thus, compliance is voluntary. To date, Chilecompra has issued guidelines on topics such as energy efficiency, purchase of technological equipment, use of deposits, deferred payments, and use of a register of domestic suppliers, among others. Another line of action of these directives, which has been emphasized in recent years, is related to the strengthening of best practices and integrity in the actions of public bodies and government suppliers in the purchasing process. Although compliance is not mandatory, these directives have been widely accepted, and ministries are increasingly following, for example, the those on SPP (Chilecompra-MMC Consultores, 2016).

Standard Bidding Agreements (*Licitaciones de Convenio Marco* in Chile) are the main tools established by Chilecompra through which public purchasing is created. Chilecompra Express is an electronic platform designed by Chilecompra to allow public agencies to acquire the goods and services included in the Standard Price Agreements. There are over 60 standard agreements under which goods and services can be easily acquired (with prior selection of the provider by Chilecompra in a competitive manner) through this platform. This

[75] This value corresponds to purchase orders, accessed at http://www.analiza.cl/web/Modulos/Cubos/CubosOlap.aspx.

platform contains over 1,500 providers offering more than 17,000 goods and services. The overall value of the goods and services purchased through the Standard Price Agreements surpassed US$10 billion.

In terms of sophistication of public demand, Chile has made progress and will continue to do in specific areas, such as the following:

- **Technological Surveillance Activities:** Although there are no mandatory technological surveillance activities, the information available at analiza.cl is an important step toward improving the image of an active role of the government as a smart procurer. Additional STI-specific features would have to be added to establish this as an actual capability for PPI and PCP. In fact, one of the specific proposals of the CPCDC is to develop in the Chilean STI system the capacity to provide technological surveillance services for the public and private sector to enable more informed decisions on investment in STI and well as in the formulation of public policies, programs, and funds associated with these areas.
- **Life-cycle cost analysis:** Taking into account life cycle when planning and evaluating the effects of public procurement is already mandatory for some sectors (especially those associated with wider social needs), such as energy efficiency (see *Directiva de Contratación Pública N°9 (2008)*).
- **Aggregate demand:** The public sector's needs are rarely identified in collaboration with other public agencies: only 18 percent of public procurers interviewed by Chilecompra stated that they did so often or always (CPCDC, 2015). However, in terms of collaboration between different departments of the agency in defining the tender, Chile has a relative advantage. In a survey recently conducted by Chilecompra, 53 percent of public procurers stated that this collaboration occurs often or always between departments of a single public agency (Chilecompra-MMC Consultores, 2016).

Chile also has specific advantages with respect to the institutional capabilities of public procurers. Chile's public sector is small (around half of OECD average) compared to those of Brazil and Colombia. Officials have demonstrated commitment and have undergone training beyond what is required for public employees (Sopher, Sanchez, and Omowunmi, 2009). This strength is further enhanced by the availability of permanent training and skills upgrading offered by Chilecompra. Each year, Chilecompra launches several courses (either at a distance or face-to-face) to upgrade the capacity of purchasing officers, preparing them for the Skills Accreditation Examination in Public Procurement. This test is conducted by the Public Procurement Bureau and determines which users can use the state procurement system This accreditation is valid for two years. By the end of 2012, 92 percent of buyers in the public market that are active users had a valid accreditation (Chilecompra, 2012).

Contracting Procedures and Platforms for Public Procurement in Chile

According to some officials interviewed, public tendering is the default rule for all public procurement procedures as the contracting procedure that offers the most transparency, although special procedures may also apply under specific circumstances. The main ones are listed below:

1. Public tendering (*Licitación Pública*): This procedure includes a call for tenders and is awarded to the most appropriate bidder per the bidding specifications.

2. Standard agreements (*Convenio Marco*): This functions as explained above. When there is no standard agreement available, public tendering is mandatory for contracts exceeding US$654,633[76] unless the circumstances correspond to those described below.
3. Private tendering (*Licitación o Propuesta Privada*): In this procedure there is a "closed contest" in which the State invites certain suppliers to submit proposals according to the corresponding bidding specifications. This process must be previously approved through a well-founded decision (ICLG, 2016).
4. Direct contracting (*Trato o Contratación Directa*): This procedure is carried out without the requirements of a public or private tendering process, because of the nature of the negotiation involved. In each case, these circumstances must be duly accredited (ICLG, 2016).

In addition to the former, there are contracting procedures of special interest for PPI, such as private and direct contracting. These can be used in the special circumstances listed below as gathered by ICGL (2016):

1. If no suppliers place bids in a public tendering process
2. If a contract has been terminated before the deadline because of supplier negligence or other grounds, and the remainder of which does not exceed 1,000 UTM
3. In case of emergency or unforeseen circumstances, established through a well-founded resolution
4. If only one supplier offers the goods or services
5. In the case of service contracts signed with foreign suppliers and executed abroad
6. In the case of confidential services
7. In cases where, given the nature of the negotiation, the contract may have characteristics that make it necessary to resort to direct contracting
8. When the amount of the purchase is under the limit established in the regulations

Notably, and as pointed out by interviewees, this can be the case when the provider is the owner of the intellectual property rights of the good demanded or when it has already been shown that the provider is the only one with the technical capabilities to produce it.

Although there are no specific contracting mechanisms for R+D+i, there are other areas which are not subject to the public procurement legal framework, such as government staff recruitment, cooperation agreements between public entities, contracts relating to financial instrument transactions, public works, and war material are subject to their own special rules (ICLG, 2016).

There is no consensus on which of these figures would be better suited for the acquisition of R+D+i. There is a pronounced difference in perception between the private provider and the public procurer regarding the extent to which each of the available contracting instruments (i.e., standard agreements, public tender, private tender, and direct contracting) favor the purchase of innovative goods, cooperative interaction between procurer and provider and, in general, how flexible they are—all are important characteristics for future PPI-PCP projects.

[76] This is threshold that is measured in monthly tax units (*unidades tributaries mensuales*, or UTM), established by the Chilean government. It can change on a yearly basis.

Procurers have a relatively uniform perception of how each of the four available instruments have these three characteristics: on a scale of 1 to 5 (with 5 being the higher flexibility and equivalents), all four instruments scored an average of between 3 and 3.7. The lowest average of these three characteristics was on private tendering, while the highest average of the three was on direct contracting. The private providers have more varied results between instruments with averages ranging between 2.4 and 4. For them, public tender is the least flexible figure (2.4 average qualification) and the one that least favors the purchase of innovative goods and cooperation between procurers and providers. Conversely, direct contracting is the instrument that favors these last two aspects the most (scoring 4 on average for both) and the most flexible one (with a score of 3.8) (ChileCompra-MMC Consultores, 2016).

In terms of public–private partnerships, Chile has a simple normative framework embodied in its Law No. 20.410 (Law of Concessions for Public Works), which modified 1996' Law on Concessions. According to the IDB (EUI (Economist-Intelligence Unit), 2014), Chile ranks first among LAC countries in terms of suitability for the development of PPPs. Its advantages over its neighbors include long-established systems for the evaluation and cost-benefit analysis of all public projects, which performs well in balancing technical and economic aspects of each project and has transparent and efficient mechanisms for dispute resolution. However, Chile still lags behind OECD countries in risk management, although it is still better than other LAC countries in this regard. Chile has regulation for public procurement of projects solicited by private companies, indicating that the management of unsolicited bids is somehow formalized. The advantage of the proposing company is determined in the relevant Bidding Conditions, which may vary from one project to another (Martín, 2012).

Finally, electronic procurement implementation is in an advanced stage of development in Chile. For two consecutive years, the OAS-IDB-sponsored Inter-American Networks for Public Procurement (RICG) has awarded Chilecompra the Innovation Prize for its advances in mostly electronic procurement platforms that serve multiple purposes. In Chile, the electronic public market represents 37 percent of the total volume of the e-Chile market which, according to the Santiago Chamber of Commerce, of was estimated at US$12,000 million by 2011. The following are the main platforms that support Chile's electronic public market:

a) www.mercadopublico.cl: Here public agencies can acquire goods and services included in the Standard Agreements. It is administered by Chilecompra. 850 public agencies and 117,000 providers participate (Chilecompra, 2012).
b) www.chileproveedores.cl: This is the electronic registry of providers. It publishes commercial, legal, and financial information on all providers.
c) www.analiza.cl. Provides key indicators and information on the public market, including historical data on transactions and tenders.

These platforms have contributed to the wide array of information available on the Chilean public procurement market. It is used as valuable input for decision-making rather than oversight activities. The recently launched portal *analiza.mercadopublico* (still in its beta version) is intended to provide valuable data on both buyers and providers and identifies trends in the public market at both the aggregate and the individual level. In this sense, it is likely to increase transparency and provide information to facilitate decision making by stakeholders.

Perceptions of the Private Provider on Chilean Public Procurement

The platforms mentioned above appear to have contributed to the positive perception of providers about the public procurement process. According to Chilecompra's data on the first half of 2015, the initial stages of public procurement (which are supported by these platforms) are positively perceived by the providers compared with LAC standards. Fifty-two percent of the providers believe there are no problems with the registration process while only a third believe that the process is too bureaucratic while complaints related to the efficiency of the system in earlier stages of the public procurement process (such as the registration of providers and the availability of information) remained remarkably low (well below 1 percent) (Observatorio Chilecompra, 2015). These features can also be considered a relative advantage of the Chilean public market.

Negative perceptions on the providers' side seem to concentrate on later stages of the public procurement process and are mostly related to the awarding step. According to the same data, the main cause for complaints in Chilecompra's portal was the insufficient or inadequate definition of evaluation criteria (15 percent). This was followed by the fact that the awards are not consistent with the evaluation criteria included in the tender (14 percent) and, in third place, by the poor justification of decisions to either award a contract or declare the tender void (13 percent).

Finally, in a logit regression on the probability of selling innovative goods or services to the government, significant variables included company size, the strategic commitment, and the company's vision (this was true for both micro and medium-sized enterprises) (MMC Consultores, 2016). However, it is hard to establish a causal relationship without further information. Having sold innovative goods and services to the government is just as likely to influence the perception of public agencies as intelligent buyers as the other way around: in the case of big and small enterprises this variable was not significant.

Spurring Innovation through Demand-side Policies: Rationales and Advances

Background in Demand-side Policies for Innovation

There is a strong interest in the Chilean STI policy arena in migrating toward demand-pull initiatives rather than staying within a pure supply-push rationale. Consequently, the CPCDC recommends implementing, in the long run, coherent and strategic demand-side policies through an "innovation procurement strategy" (directly transcribed from the document), a legal framework that fosters regulation, and the establishment of standards and norms (CPCDC, 2015). The CPCDC states that there is a general concern about the excessive focus on horizontal policies in STI, which has contributed to the emergence of small-scale projects that are not consistent with the priorities of the country. To counteract this, there is the recommendation to redirect the FIC R toward established regional strategies for STI (five-year programs) with the support of regional scientific-technical committees (CPCDC, 2015).

CORFO is contributing to the stimulation of R&D private demand by helping to create and consolidate business technology consortia, contracted research, and technology programs. It also maintains supply-side policies, such as tools to support the creation and growth of technological startups (CPCDC, 2015).

Other tools to increase private demand for R+D+i in Chile include a policy of tax benefits that has been adapted on different occasions to increase participation of the private sector. Initially aimed at enhancing private investment in R&D, the tax benefit scheme implemented

in 2008 was applied to funds for in the purchase of R&D services. In 2012, this tax benefit was modified so that funds invested in intramural R&D could also included. In that same year, the annual ceiling for this tax benefit was tripled, to US$1.2 million, while the eligibility requirements of collaboration with external research centers and the initial requirement to invest at least 15 percent of the company's gross annual revenue were abolished (OECD, 2014). After this modification, the number of new applicants has increased fivefold.

While the use of this mechanism has been increasing (from just above US$1 million to over US$12 million between 2012 and 2015), it is used mostly by large companies (79 percent of the contracts) and in the metropolitan area of Santiago (with half of the contracts and the monetary sums) (MINECO, 2014). Firms lack knowledge about the R&D legal framework in general and this law in particular: only one in six companies is aware of this instrument (MINECO, 2014). Tax avoidance may also be contributing to this.

In terms of public demand, the incorporation of innovation criteria in tenders is scarce even though including wider social objectives in tender evaluation is a widespread practice in Chile. In a survey conducted by Chilecompra, 65 percent of procurers stated that no evaluation criteria to favor innovative solutions were considered in the evaluation process. However, there are at least some capabilities to include as, according to the public procurers that were interviewed, on 60 percent of the time, the evaluating teams had the necessary technical competence to evaluate innovative proposals. Despite the latter, the perception on the providers' side is different: 72 percent believe that the evaluating teams rarely or never have the necessary technical competence to evaluate innovative proposals. This is related to the fact that only 41 percent are often or always satisfied with the evaluations received.

Public Procurement of Innovation: Initial Discussions and Attempts

Although not going as far as establishing the need to develop PPI-PCP projects, the CPCDC does mention the need to advance in the identification (together with other actors) strategic challenges of public institutions that can be addressed through STI projects. Furthermore, they recognize the importance of consolidating capacities in STI in the government, as they believe that scientific and technological knowledge is a key contribution to the modernization of the State (CPCDC, 2015).

Furthermore, the CNID identified three strategic pillars on which the new strategic guidance on the Chilean STI system should be based: horizontal agreements around national priorities; science and technology for the service; and a broader understanding of innovation. In the latter, the CNID's main concern evolves around the excessive attention on financing tools for STI with respect to other measures, such as regulation and public procurement. This concern is also related to the focus on entrepreneurship as the only main space for innovation, which has eliminated interest in other relevant scenarios for innovation, such as the entities in charge of providing public services. Coming from the highest authority on strategy for the Chilean STI system, this shows a clear interest and is a valuable precedent for the future implementation of demand-side policies, particularly for PCP-PPI. It makes sense that the studies for this pillar include a review of co-production in international public policy as well as an assessment of the state of social innovation, but valuable elements to take in account when identifying capabilities that can be used in the future for the establishment of a PCP-PPI policy (CNID, 2015).

MINECO has started to show interest in PPI as a policy to foster innovation in the country. In fact, this document is the result of MINECO's aim of identifying potential advantages and obstacles for the subsequent design of a comprehensive PPI policy in Chile. To this end it

has already begun working with the Inter-ministerial Committee for Innovation (led by MINECO's Innovation Division) in the design of a PPI policy.

Chilecompra has also begun to engage in the subject. It commissioned a study on public demand and private supplier's view on the state of PPI in Chile, released in 2016. Despite Chilecompra's orientation and accomplishments in PPI, the study concludes that Chilecompra's strategic orientation has yet to include PPI, that it still lacks capacity to provide support in the area and, that is not yet connected to other relevant actors in an ideal PPI-supporting scheme. To this end, Chilecompra has already started to recruit specialists in innovation policies who will be responsible for consolidating the organization's capabilities to implement PPI. Chilecompra's current strategy for PPI was scheduled to begin in late 2016 with the implementation of PPI-PCP pilots in coordination with MINECO. These pilots are meant to inform both the policy led by MINECO and the specific reforms to the legal framework that Chilecompra recommends to enable the dissemination of PPI. Currently, Chilecompra is helping public agencies identify their needs in functional terms on a case-by-case basis and for the purposes of the pilots. In the long run, however, it is considering the implementation of processes that systematize both this identification and the receipt of unsolicited bids from private suppliers.

Other entities have begun to get involved in the field, in a more eclectic and less institutionalized form than MINECOs policy and Chilecompra's development of internal capabilities. In view of LABGOB's mandate to promote innovation and efficiency in the delivery of public services, it is currently encouraging private enterprises to improve public services through innovation. In this arena, two pilots have been already launched (with financial support of CORFO) and are currently in an "experimental implementation" stage: Impact Health (Impacta Salud), launched in July 2015 in partnership with the Health Ministry, aimed at alleviating overcrowding in primary health facilities in the community. AULAB, launched in August 2015 in partnership with the Ministry of Interior and its National Office for Emergencies (ONEMI), has the mission of improving the country's response to natural disasters. Both pilots are part of a strategy to strengthen the public–private ecosystem around innovation in public services by encouraging entrepreneurs and innovators from all over Chile and abroad to develop solutions to complex public problems. While LABGOB provides the methodological support, CORFO oversees the funding for the two stages of the selected pilots.

Box 10.1 The Case of *Impacta Salud*

The aim of this competition is to bring health to people to relieve overcrowding of family health centers and promote prevention and self-care. This initiative was developed under LABGOB's leadership with the support of CORFO in the district of Recoleta, where the Innovation Projects team has already conducted a research and co-creation with the community of Quinta Bella to identify the response capabilities of the local family health centers. They identified an opportunity for innovation in public health and a chance to connect valuable ideas that emerged outside of the government with the public services that contribute to citizens' quality of life. The main question was how to bring health care closer to people to relieve overcrowding in family health centers and promote disease prevention and self-care. Applicants include individuals, legal entities (small companies), Chilean or foreign citizens, and multidisciplinary teams. They have already undertaken the following steps between July and December, 2015.

1. Evaluation of electronic proposals
2. Demo day and grant award: Maximum of 20 grants of $ 5.000.000 CLP each (US$7,000) to be awarded for travel and accommodation expenses for 45 days in Santiago, and for prototyping the solution during the boot camp
3. Boot camp
4. Expo Minimum viable prototypes
5. Announcement of winners: four winners with a prize of $50.000.000 CLP each (US$ 70,000) for the pilot implementation phase

The pilots are currently under implementation in the community of Quinta Bella, according to the implementation plan included in the exposition of their six-month minimum viable prototypes. The idea of these pilots' experimental implementation is to gather data on the effectiveness and costs under real-life conditions to identify the best alternatives for the health system. Although the Health Ministry is part of the team that led the project, the vehicles for the acquisition or implementation of the best alternatives has not yet been defined.

These pilots are the basis for establishing capabilities in the identification of challenges at the public level and the selection of best projects based on a specific need. They also open a valuable space for the government to become a first user of innovative technologies. However, the capabilities toward PPI implementation still lack specificity in terms of functional requirements There is no actual assurance that the government will acquire these technologies in the near future. In any case, and as we have seen in the case of Colombia, open innovation with social purposes is an emerging area for LAC countries. In the Chilean case, the two pilots are based on the incorporation of civil society into the design of solutions for the government, and oriented toward finding new ways in which people can become actively involved in the outcome of public services: Impacta Salud awarded solutions that increased people's responsibility for their own health, while AULAB had one stream oriented toward improving the community's response to disasters. LABGOB is working on an open innovation platform to institutionalize and multiply the work accomplished by the pilots.

There are also precedents of co-development in Chile's public enterprises. METRO, Santiago's public transportation company that is part of Chile's Public Companies System (Sistema de Empresas Públicas, or SEP), is an important innovator. METRO's R&D department designed and co-developed the Multivia card with private providers in 2003, when it was released to replace the old value tickets. It is also the precursor and technological basis of the current Bip! card, introduced in 2012, and is one of the aspects that gets the most positive evaluations by users of public transportation in the capital. METRO has patented this technology and has sold it to other Latin American countries, including Panama. Currently, the R&D department is identifying new technologies that can be adapted to Santiago's needs, such as improving the ease of recharging the card without having to set up more paying stations. So far, however, the technology will be designed in-house or that, at most, it will entail the outsourcing of certain R&D services.

CODELCO, Chile's public copper extraction company (and the largest copper mining company in the world), is also a key stakeholder in Chile's innovation system. It has also focused on building in-house innovation capabilities and in acquiring world-class state-of-the-art technologies wherever they are developed. CodelcoTec groups, the company's high-tech subsidiary companies, occupy a prominent place in the country in terms of patent applications and granted patents in areas such as new materials and biotechnology applied to copper mining. While the national innovation system (entrepreneurs and innovation agencies) expects CODELCO to become the company that will launch many of the country's innovations in the mining sector, CODELCO's plan is somewhat different.

According to CODELCO's business and innovation department, the structure of mining makes it difficult to consider the possibility of being the first user of new technologies: benefits or losses are expected in the long term and, if on a large scale, trying out a new technology can be extremely risky and goes against CODELCO's mandate of maintaining a stable income as the country's main copper producer. Furthermore, the company has identified a mismatch between supply and demand in technology: on several occasions, the company is approached by private entrepreneurs who try to sell technologies that, although useful, are not priorities for the company. However, the company is also aware of the benefits that it might reap from contributing to the development of the local innovation system (particularly taking into account the pro-cyclical behavior of the company's R&D expenditure) and has thus started to introduce a new approach to local innovation.

First, the company is betting on an innovation platform that should allow both insider and outsider initiatives in innovation in a controlled strategic environment, with clear goals that are consistent with the company's objectives in a highly competitive and changing context. This would help ease the mismatch between supply and demand and would also contribute to the stability of the innovation process, as goals and budgets would be open to the public and would overcome the changes in management. This platform would also operate under the portfolio of innovations, but with stages that each project should accomplish to advance to the next one (in terms of funding). In any case, the company has limited willingness to be a first user of new technologies and asserts that public–private partnerships should foster the experimental implementation of such technologies in medium-scale mining companies before they can be considered for industrial upgrading in CODELCO.

In addition, CODELCO is planning on using CodelcoTec as an intermediary with other technological companies that intend to offer new technologies to the company, taking into account their knowledge of the technological landscape. Although the scheme is still under construction, it remains unclear if it would favor new providers or not, since CodelcoTec

subsidiaries are their natural competitors. In any case, the tension between in-house, co-development, and outsourced R&D services in CODELCO has additional points that should be considered when determining feasibility for PPI. As distinct from what might happen with public service companies, in the case of CODELCO, competitive advantage is especially important. Thus, it makes sense that there is a high preference for developing certain technologies either in-house or, at least, with exploitation benefits that are less profitable for the external developer or provider.

Along these lines and in the same sector, the Programa Nacional de Minería de Alta Ley is an initiative led by CORFO and the Ministry of Mining, coordinated by Fundación Chile. This program should be highlighted because of the potential interest that it represents as a precedent for PPI-PCP implementation. Under this initiative, the recently released Roadmap of Mining Technology constitutes a milestone, as it can be considered a well-designed exercise for identifying early demand of the whole mining sector. The document was the result of a process of deliberation and agreement of several stakeholders associated with the sector (including mining companies, suppliers, academics, research centers, government bodies, and other actors related to mining), and contains the identification of existing challenges for the mining sector. It goes one step further by identifying the technological alternatives to achieve the proposed goals of the Program, thus helping close the gap between supply and demand that CODELCO has identified.

Innovation in Public Procurement

A key distinctive feature of the Chilean policy in PPI-PCP is a simultaneous interest in fostering both PPI and innovation in public procurement. As stated by LABGOB, although these are two different objectives, they are both intertwined in the Chilean rationale, as "innovation in processes of public procurement should be introduced in other to achieve PPI": as such, the participation of LABGOB, at least providing methodological support, in both initiatives contributes to guaranteeing consistency between the actions taken in both areas. Their stated objective is to contribute to the establishment of a common agenda that should be concluded by the end of the year.

Innovation in public procurement is meant to increase the effectiveness and efficiency of public procurement through the introduction of innovative figures and tools within the procurement process. This initiative is led by Chilecompra with the support of a multi-stakeholder committee. It is currently in the diagnostic phase, with studies and focus groups expected to be concluded by the end of 2016. It has a special emphasis on new challenges in public procurement and in ways to guarantee more transparency and competency in direct contracting mechanisms, since these have been identified as facilitating the introduction of more innovations (both areas of interest for PPI itself).

With respect to this common agenda, confusion remains among some of the key stakeholders about these two different, yet complementary, objectives. This is true not only for some of the officials from public agencies interviewed but also for the providers themselves: when asked between four options of what they understood for "innovative public procurement," over 65 percent of public procurers and private providers answered "a purchase that allows for a better way to satisfy a need." The option that followed (with 50 percent for the procurers and 37 percent for the providers) was "a purchase that allows the government to minimize costs". In the remaining places where the options that were related to the characteristics of the object that was being purchased rather than the characteristics of what could be done with it: "a purchase of a completely innovative product" and "the contracting of R&D services" (ChileCompra-MMC Consultores, 2016). There are advantages

of this situation in the sense that innovation is not necessarily linked with technological advances. However, this also entails confusion between innovative solutions and tailor-made solutions (such as IT), and it also discourages the acquisition of solutions that, although innovative and useful, do not necessarily reduce costs (or that only do so in the long run).

Challenges, Opportunities, and Recommendations

The instrument rationales are summarized in Table 10.1, according to the framework proposed by Georghiou et al. (2014).

Table 10.1: instrument Rationales

Policy category	Deficiencies addressed	Instrument types	Examples
Framework conditions	i) Predominant value of economic criteria in tender procedures ii) Requirements for public tenders unfavorable to SMEs	i) Introduction of additional criteria (i.e., cost) in public procurement regulations ii) Simplification and easier access for tender procedures	i) Introduction of criteria on SPP, mandatory in specific cases ii) Directiva de Contratación Pública N°9 *(2008):* life cycle cost analysis and valuation of energy efficiency iii) Compliance with human rights and improving employment conditions iv) Improved electronic procurement platforms and wider availability of information on tenders
Organization and capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) Guidelines and good practice networks by a CPB ii) High level strategies to embed innovation procurement	i) Chilecompra's initiative on Innovation in public procurement ii) PPI policy by MINECO with CIM (in progress)
Identification, specification and signaling of needs	i) Lack of communication between end users, commissioning and procurement function ii) Innovation ideas/opportunities that emerge out of the public sector and have no established channel for adoption/ demonstration	i) Innovation platforms to bring suppliers and users together; Foresight & market study processes ii) Pre-commercial procurement of R&D to develop and demonstrate solutions iii) Early demand Mapping and technological surveillance	i) CODLECO's platform for open innovation (in progress) ii) CORFO's Programa Nacional de Minería de Alta Ley and strategic sectors in general (in progress) iii)LABGOB's AULAB and Impacta Salud iv) Analiza.cl portal
Incentivizing innovative solutions	i) Risk of lack of take up of suppliers' innovations ii) Risk aversion by suppliers	i) Financial instruments ii) Two-stage financing for R&D	i) Tax incentives ii) CONYCIT's IDeA program

Source: Author's compilation of instrument rationales according to Georghiou et al. (2014) framework.

Shared Vision of PPI-PCP Value and Suitability

The fact that Chile is starting to show interest in both PPI *and* Innovation in Public Procurement can be an advantage for PPI, as new processes and tools can be introduced in the public procurement framework which can support implementation of PPI. However, it can also pose a disadvantage. In fact, some of those interviewed were confused about the difference these two concepts. The survey conducted by Chilecompra also showed that private providers and procuring officials have different understanding of the meaning of PPI even in a multiple-choice question (and, in many cases, it was confused with innovation in public procurement). A common understanding of PPI, and in this case, its differentiation, is urgently needed to raise political support and engage key stakeholders.

There is also confusion about the range of what is considered innovation. There appears to be confusion between PPI and tailor-made solutions, both in public agencies and in the SEP. Consequently, interviewees cited examples of pilots such as a project in the Ministry of Public Works, even though this project was only a framework for standardization of Building Information Modeling (BIM) technology. Although there is a murky line between innovation and adaptation in software, some clarifications must be made to guarantee that the institutional effort does not favor certain areas of the economy but rather that they encourage innovation in general. This should be considered when determining the most advantageous pilots.

It is also necessary to determine the common objective of establishing such a policy, considering the actual capabilities in the country. METRO and CODELCO's case suggest that some key stakeholders believe that PPI might be more of a policy to strengthen their services/revenues than for consolidating the local innovation system (thus recurring to foreign providers would be just as desirable), if they are willing to take this road instead of consolidating internal capabilities. A balance between these two benefits (for the public procurer and the local private provider) is ideal in a PPI policy but, in the end, the particularities of the country should help determine the way in which the policy is presented and, in some cases, the order of priorities might need to adapt to different contexts.

Political Leadership and Key Stakeholders

Long-term political commitment has shown to be a weakness in STI policy design and implementation in Chile (IDB, 2010) and can cause a problem for the adequate implementation of PPI-PCP. On the other hand, the pronounced division of tasks in STI policy design and execution seems to be problematic when determining who should be leader in STI in general (CPCDC, 2015). These two features of leadership in STIs must be considered when determining who should lead PPI-PCP policy design and implementation.

Despite the general interest and positive attitude toward PPI (and to some degree as consequence of it), the lack of coordination between public agencies around this subject persists: MINECO has taken the institutional path and has started to work on a PPI policy with the Inter-ministerial Committee while CORFO and LABGOB have started to develop pilots (with the latter interested in obtaining valuable conclusions from the pilots to include in the policy). In this sense, and because of its political muscle (as well as its financial capabilities that can be easily directed toward PPI through CORFO), MINECO would appear to be the natural leader. In any case, according to those interviewed, communication around this subject is insufficient. A brief assessment of the government's key stakeholders is provided below:

i) **Chilecompra:** Notwithstanding the favorable attitude of public agencies toward Chilecompra directives, Chilecompra itself considers that the non-mandatory aspect of their instruments prevents them from being a good candidate for leading the implementation of a comprehensive PPI-PCP policy. Nevertheless, Chilecompra has shown commitment to the establishment of a PPI-PCP policy by conducting an assessment on capabilities and obstacles and increasing its internal capabilities for innovation policies. Under the current scenario of cooperation with MINECO for the development of PPI-PCP pilots, Chilecompra is a valuable partner to design the policy and subsequently implement supporting mechanisms.
ii) **SEP:** The Chilean SEP, on the other hand, appears to be a very important actor in the promotion and support of pilots in public companies. Not only do public enterprises in Chile have a more flexible contracting framework than public agencies; SEP's presidency fully understands the potential benefits of PPI-PCP and has a clearer idea of what it entails, in terms of capacity building. But the views of METRO, and the fact that CODELCO (that doesn't belong to this group), suggests shifting company's strategies toward outsourcing rather than building inner capabilities has its own challenges.
iii) **LABGOB:** This agency has played an important role in designing and carrying out pilots and will provide key outputs for the design of a PPI comprehensive policy. However, given its mission, it appears to be better suited to provide methodological support and coordination for such projects than to lead them because it lacks the political muscle needed to push public agencies into engaging in large scale PPI-PCP projects. It can also help generate awareness among public agencies on new tools for PPI policy implementation.
iv) **CONICYT:** This agency is another key actor in promoting demand-side policies. Although PPI has received most of the attention in Chile to date, and particularly innovation in processes rather than technologies, PCP can also bring benefits to the Chilean government and is particularly close to CONICYTs mission.

Planning: Between Policies and Pilots

While providing the strategic rationale for PPI (with CNID stating the importance of demand-side measures), MINECO should start by explaining PPI: what it means, what it entails and, particularly, how it is differs and complements (this is a very important characteristic) efforts of other entities, such as Chilecompra, LABGOB, and CORFO (regardless of the fact that these efforts are being done either at the policy or at the execution level). The many disparate initiatives that are attempting to push innovation (not PPI itself) can be considered a great advantage if MINECO can interpret and incorporate them into the design of its PPI policy. Conceptual clarity should thus entail a clear vision of how capabilities that are being developed in *other* policy/execution areas can subsequently be used to implement PPI-PCP implementation.

In this sense, making actors such as Chilecompra and even LABGOB an active part of the policy process is desirable because many lessons can be learned from initial pilots that they might develop well as a result of related policies (such as open innovation, public–private cooperation platforms, and innovation in public procurement). Collecting outcome information (i.e., identifying key enabling factors for future PPI-PCP developments) can inform the policy-making process in a more realistic way. This assessment been identified a good practice at the international level.

The outcome of Chilecompra's pilots, as well as those led by LABGOB, especially to the next phase in which the public services will ideally acquire new technologies, should be taken into account when designing a PPI-PCP policy. Details on the obstacles encountered by public authorities when trying to acquire these technologies, such as technical limitations, lack of an adequate contracting and awarding entity, problems of communication and negotiation with the private provider, and others, would contribute to a more resilient and forward-looking PPI-PCP policy. Similarly, advances made by CORFO in programs such as *Minería de alta ley* (higher-grade mining) are vital for identifying opportunities. While they are not PPI-PCP programs, they address basic PPI-PCP requirements, such as the different ways in which public demand and private supply can be brought together prior to implementing PPI-PCP). With CORFO's financial strength and LABGOB's methodological expertise, together they could comprise a good team to provide support and feedback to pilots before and after MINECO's release of the PPI policy.

It is crucial to include the private sector in PPI policy design. Chile already has valuable experience in the design of public procurement policies that include providers as key actors. For example, in the design and implementation of SPP (Beláustegui, 2011) and in the joint STI public procurement committee established by Chilecompra. Such committees, which were formed as a result of recommendations of OECD, may pose an advantage for further advances in PPI and PCP, as Chile seems to be following the STI policy path set out by other OECD countries that foster participation by confederations or industry associations in boards, executive committees, or consultative groups in strategic planning exercises. This has been found to be helpful in designing instruments that better respond to the needs of the private sector and identify duplication between different public initiatives in order to fine-tune policies (OECD, 2014).

When considering sectors in which to focus initial efforts in PPI-PCP, mining is a logical answer both because of its prominence in Chile and because it has already started to build a strong platform of public–private cooperation around innovation through the National High-grade Mining Program (Programa Nacional de Alta Minería). With the technological road map recently released by the program, it has become a promising initiative and a very attractive candidate for a PPI-PCP hub. It is a strategic priority of the country (which has been identified as an international good practice for PPI-PCP implementation), and it is led by CORFO, with the participation of CODELCO, the largest public company in Chile that is also a key innovator in the region.

Social innovation in Chile is also an interesting sector for PPI-PCP. LABGOB pilots have focused on this area. Social innovation also has the advantage of being among Chile's priorities. It requires a broad range of solutions which, while being "new to the world," can have varying levels of R&D content. In this sense, they can be implemented in areas with both high and low R&D capabilities. If smartly managed, they can prevent large-scale failures that help brand PPI-PCP as too complex.

Legal Framework

Currently, there is no legal framework for R&D or for PPI-PCP. However, there is a common understanding that these procedures can take place under the current legislation and the guidance of Chilecompra. Chilean public procurers are already used to including wider criteria for the evaluation of tenders beyond price, such as environmental impact and SME inclusion. Moreover, public agencies have already acquired innovative technologies through various mechanisms. Chilecompra's study on the state of Innovation in the Chilean public procurement system provides several examples (Chilecompra-MMC, 2016). These

successful cases of both PPI and PCP have been carried out through public tendering and direct contracting, depending on the case, in areas such as solutions to optimize disaster management, acquisitions of new products to reduce costs of oral health, the development of IT-based solutions for government services, and the design and application of new ways to measure poverty.

The success of these projects shows that Chilean authorities have acquired valuable experience in key elements for PPI-PCP, without having had to amend any laws. For example, functional requirements had to be specified in most of the cases, like such as the Enablement of the High Mountain Refuge in Llullaico National Park and the Biomass-based energy generator in Empedrado county. In other cases, unsolicited proposals from the private sector led to the acquisition of innovative goods, such as water bags for flood management. Additionally, life-cycle costs were taken into account when determining whether to buy solutions for dental restoration that would only bring savings in the long run, and no specific budget (only a 100 UTM top) was established for the acquisition of an IT-based solution to facilitate consultation of Tax and Customs Courts data. However, specific common barriers to PPI-PCP remain, which are evident in some projects. For example, innovative SMEs had trouble signing big contracts with the government because they lacked financial muscle to produce and store the large quantities of goods (such as water bags) required in disaster management. Additionally, after having contracted the development of a specific solution, the subsequent tenders for the acquisition of the good and/or the maintenance services and parts led to null or void tenders. This suggests that Chile could benefit from an innovation partnership. These precedents must be taken into account for the design and implementation of a PPI-PCP policy.

With respect to contracting, there doesn't seem to be a single contracting procedure that is recommended for PPI-PCP, as directed contracting and public tendering have been used in the cases mentioned above. Also, there is a difference in perception between the private provider and the public procurer in the extent to which each of the available contracting instruments favor the purchase of innovative goods, the cooperative interaction between procurer and provider, and the extent of their flexibility. These are important characteristics for the establishment of PPI-PCP. Consequently, a consensus should be reached as to which entity would benefit the implementation of PPI-PCP, taking into account the specific characteristics of each project and the rules under which it can operate.

The fact that there are no special rules for STI contracting may pose a problem particularly with regard to determining the budget for PPI-PCP projects that have a higher content of R&D and that are characteristically multi-year. These include projects in health and public works. This poses an obstacle for both the PPI executing agency and, when applicable, for the agency providing financial incentives (i.e., co-funding) for the development of PPI-PCP, such as CORFO or CONICYT (IDB, 2010).

In LAC countries, such as Colombia, where a PPI-PCP policy has been established, the lack of a specific framework has been cited as one of the main obstacles. Other countries, such as Brazil, have developed a de jure legal framework for the purposes of PPI-PCP. However, it is not feasible to expect a modification to public procurement in Chile any time soon, since it was modified last year to increase participation of small companies and set inclusive criteria, such as social impact) for the evaluation of proposals (ICLG, 2016). Although the legal reforms proposed by the CPCDC include a recommendation to modify the public procurement law (Law 19.886), the purpose of this reform was allow public universities to use direct contracting of scientific equipment and personal services in R&D activities. In this

sense, following the European Union's model, the introduction of new entities in the public procurement framework, although not feasible in the short run, is recommended in the long run to facilitate the multiplication of PPI-PCP projects. In the short run, more efforts are needed to determine how the current possibilities of the public procurement framework can be used for PPI-PCP. Additional resources should be directed toward the training of both public procurers and private providers in these procedures.

In any case, this is an area in which Chile has a clear advantage: as seen before, Chile's public sector is small and highly qualified and there is are permanent training and skills upgrading offered by Chilecompra. This may contribute in the future both as platform for PPI-PCP specific training or for the conformation of teams to develop projects within the framework of PPI-PCP.

Execution: Preliminary Steps and Financial Features

As seen in countries that have become leaders in PPI-PCP, the success of PPI-PCP depends on the implementation of previous steps and capabilities.

i) **Information flow:** With respect to information and evaluation systems, as information on public procurement has been traditionally used in Chile to enhance decision making and efficiency in general rather than solely for oversight purposes, minor modifications on the advanced public procurement electronic platforms to improve monitoring of PPI-PCP should not meet with much resistance. Additionally, digital options for the reception and systematization of unsolicited proposals should be studied. This is because, although the Lobby Law (Ley de Lobby) was intended improve the case-to-case rationale, interviewees identified this need as one of the lingering concerns that induced them to find ways to develop their own platforms.

ii) **Knowledge of intellectual property:** As seen in early stages of the implementation of these policies in European countries, limited knowledge of public bodies about intellectual property has been identified as one of the main obstacles to the success of PPI-PCP. However, another of Chile's advantages in this area that is that CORFO already offers training in procedures, protection, and enforcement of IPR that may be complementary to other programs aimed at strengthening capacity this area among public procurers. The public companies in the SEP also lack knowledge of IPR. SEP is willing to address this if pilots are developed there. Chilecompra also has a team in charge of both training and a support desk that offers advice to private companies on issues such as sustainable procurement.

iii) **Financial incentives:** As international good practice shows, providing financial incentives to develop PPI-PCP is recommended, at least in the early stages. Whenever available, existing funds with similar objectives should be redirected toward these purposes. Both CORFO and CONICYT are recognized as the strongest agencies in terms of experience and success in implementing STI promotion programs and tools, and have financial strength. Because of their nature, it is logical that CORFO should lead a PPI initiative, just as it is feasible that CONICYT lead a PCP one. However, neither of these entities would be a relevant potential buyer. A matching grants program should be considered to encourage the most relevant public procurers (for instance, at the local level) to perform either PPI or PCP. Programs that link demand and supply, such as INNODEMANDA, might also work in this scenario as both agencies have experience in this field. CONICYT's IDeA program is an example.

Conclusions and Roadmap

Chile does not yet have a PPI-PCP policy as developed as those of Colombia or Brazil, which have already made strategic decisions on the allocation of responsibilities based on initial pilots. It is therefore not possible to compare policy successes of PPI-PCP. However, the authors have identified some key elements of a potential roadmap to consolidate a PPI-PCP policy and to successfully undertake the first pilot.

This tentative proposal synthesizes, on a Chilean scale, the main lessons learned in other countries and reflected in the conclusions of this study.

1. **Coordination and leadership.** It is vital to establish an effective dialogue among all institutions involved in PPI-PCP to introduce a stable structure of coordination for a national PPI-PCP policy. This structure should function under the clear leadership of an institution. It reasonable to believe that the leading institution should be the MINECO and its strong executing wing, CORFO. The challenge for MINECO is threefold. First, it should ensure a high level of political commitment to overcome the difficulties and resistance that PPI-PCP implementation can generate. Second, it should lead regulatory changes, at least in the medium term. Third, it should be able to mobilize the necessary budget to launch the first pilots, including the cost of the purchase itself (which will be the responsibility of the procuring agency) and those costs associated with the design and support of the pilot. This cost may be shared between the leader and the purchasing organization and might have the support of other agencies, such as LABGOB)
2. **Allocation of responsibilities: training, support and funding.** A national PPI-PCP policy can only succeed if there is a clear division of responsibilities, in which each agent does what it does best. Chilecompra could play a key role in raising awareness and providing training of officials, while CORFO can do the same with the private sector, supporting their involvement in identifying niche opportunities and in starting future projects. Chilecompra can provide legal support while LABGOB can help with methodology. In the long term, best practices point to the development of a stable structure in the form of a PPI-PCP office which identifies opportunities for future purchases and acts as a helpdesk for government entities that are interested in this practice. In terms of funding, success depends on the existence of economic incentives for buyers and sellers. In principle, both CONICYT and CORFO could implement, without difficulty, a PCP program (SBIR type) and a support program for innovative companies such INNODEMANDA. The design of economic incentives for buyers in PPI exercises is more complicated at the national level. The most reasonable options are the budget commitment of the entities themselves around major national challenges or access to funds from multilateral institutions such as the IDB.
3. **Identification and responsibilities for the pilots.** The choice of sectors and pilots always moves between political priority and pragmatism. International experience shows that PPI-PCP works better in the long-term when it is built on the challenges faced by the country or national priorities. In this way, it can mobilize procurement entities which, while not having a mandate to promote innovation, are assigned tasks to resolve of social, economic or environmental challenges. In terms of pilots, and given the need to show short-term results, it is recommended that they start with entities with effective procurement routines and significant internal technological capabilities. These entities are more likely to be accustomed to formulating their needs in functional terms and to have fruitful dialogues with suppliers regarding their needs. In this regard, companies belonging to SEP, as well as CODELCO, appear to be the most suitable candidates to drive the first pilots.

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11. COLOMBIA

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Country Overview

- The fourth largest country in South America and 28th most populous nation in the world, Colombia has 49.5 million inhabitants, 75.9 percent of whom live in urban areas.
- In recent years, Colombia has experienced a remarkable transformation, making great strides in restoring security and national stability, and advancing policies that have led to significant social progress and economic growth. Currently the country ranks 31st in terms of gross domestic product (GDP) and is a free market economy with major commercial and investment ties with several countries around the world.
- The Republic of Colombia is a representative democracy with a central government and separation of powers. There is a bicameral legislature consisting of a 102-member Senate and a 165-member House of Representatives. Both chambers are directly elected to four-year terms.
- President Juan Manuel Santos commenced his second term in government on August 7, 2014. Almost three years after the beginning of the peace negotiations of the conflict, agreements have been reached on four out of five topics: illegal drugs, rural development, political participation and transitional justice—restorative and reparative. The last pending topic is the end of the conflict.

Institutional Network and Governance

Colombia has undergone a profound transformation in terms of conflict status in the last ten years that has had a considerable impact over governance indicators. The rule of law has improved considerably as the conflict has been controlled, but Colombia still lags in this area with respect to the Latin American average. Government effectiveness, on the other hand, has remained relatively strong in recent years, and Colombians appear to be relatively satisfied with service delivery by the national authorities.

Nevertheless, corruption perception is still a rampant problem, scoring considerably lower than the Latin American average (ranking last in the region in 2013 according to Transparency International). It has deteriorated in the past 10 years (Verduzco, 2011). A staggering 80 percent of Colombians view their government as corrupt, 52 percent believe that corruption is getting worse, and just 8 percent of public entities are considered to be a "low risk" for corruption (Gillin, 2015). Although some measures, such as the reduction in bureaucratic procedures, have been implemented (Verduzco, 2011), and an Anti-Corruption Statute was adopted in 2011, control of corruption is still a central concern for Colombia's government and its citizens.

Another key feature of the current Colombian political scenario is the struggle of local and regional authorities to keep up with the accelerated pace of decentralization imposed by the Constitution of 1991, which has revealed the need to strengthen policy design and execution capabilities at the local level. These entities are responsible for the provision of basic services, such as health and education, and have independent revenues which comprise nearly 40 percent of all government revenues, as well as revenue from the Royalties' System (coming from mining activities) and execute over 60 percent of total investment in the country. Under the administration of President Santos, this decentralization has in fact

become wider, as several reforms have contributed to increase regional budgets and have also put at the heart of political debate the re-election of governors and local authorities (Maldonado Copello, 2011) .

The fact that Colombia is currently in the process of accession to the Organisation for Economic Cooperation and Development (OECD) poses interesting opportunities to re-evaluate public policies in very different aspects: science, technology, and innovation (STI) being only one of them (OECD LEED, 2015).

Economic Performance

Colombia has experienced rapid economic growth over the past 10 years, remaining well above the average GDP growth of the region: 4.8 percent GDP growth last year is expected to be followed by 4 percent growth rate in 2015, despite the near 50 percent decline in the price of oil (Chan, 2015). The principal and the fastest-growing sector of Colombian economy is services. Finance insurance, real estate, warehousing and transport, among others, account for more than 50 percent of GDP (Trading Economics, 2015).

Colombia's central bank has kept inflation close to its target of 3 percent for more than half a decade. (IMF, 2015). A strong policy framework along with prudent macroeconomic management, a tighter fiscal policy (through which the public deficit has fallen to less than 1 percent of GDP), and an improvement in security conditions have increased foreign investor confidence, thus facilitating the success of the open policy to foreign investment. In accordance with this policy, Colombia has aggressively pursued free trade agreements.[77]

Another of the country's strengths is its business climate. Colombia ranks among the top three in Latin America according to the Global Innovation Index and holds the 34th place in the world, according to the World Bank's Doing Business index, ahead of countries such as Mexico, Brazil, Italy, and Belgium, with regulations increasingly aimed at fostering private interests.[78] According to the WEF's Global Competitiveness Index (CGI) for 2015-2016, Colombia ranks 10th in the world in terms of strength of investor protection, with a score of 7.2/10. However, according to last year's GCI-WEF, tax rates, corruption, and inefficient government bureaucracy are the most significant problems for doing business in Colombia and are worse than the LAC average.

Notwithstanding Colombia's stunning economic growth, the current scenario (a consequence of the decline in oil prices) poses enormous challenges for the Colombian economy. The scenario is also worrisome given that labor productivity remains low (the worst in the region after Brazil and Bolivia (Consejo Privado de Competitividad, 2014). Moreover, 7.4 percent of Colombia's manufacturing exports correspond to high-tech manufactures, while the equivalent value for the OECD average is 13.6 percent.[79] Additionally, over the last ten years, the concentration of exports in primary goods and precious stones has grown from 65 percent in 2003 to more than 80 percent in 2013 (Consejo Privado de Competitividad, 2014).

[77] The country has secured over a dozen deals around the world, including with the United Kingdom, Switzerland, the European Union, and the United States. Colombia is also part of the Pacific Alliance, a Latin American trading bloc composed of Colombia, Mexico, Chile, and Peru, that suppressed duties for 92 percent of the goods and services traded between them, becoming a particularly successful regional integration model.

[78] This also carries the risk of capture of the state by increasingly powerful companies/trades.

[79] Data obtained from United Nations, COMTRADE database.

Paradoxically, general industrial policies in Colombia have traditionally tried to address and foster a still vaguely defined concept of competitiveness rather than explicitly established market failures: despite this, Colombia has increasingly improved its ranking on the GCI, occupying 5th place in the region. Additionally, Colombia has made progress in structuring vehicles to allow the participation of the private sector's vision in its industrial policies (Meléndez and Perry, 2010).

There have been several attempts to establish priority sectors for economic development: Competitive Routes (Rutas Competitivas), a key project of the Productive Transformation Program (Programa de Transformación Productiva), is one of the latest examples. Nonetheless, these prioritization strategies have suffered from both top-down characteristics, that have undermined their ability of being adopted at the regional level, and from capture of the public policy by interest groups that have protested when their sectors have been excluded, leading to an endless list of priorities that end up being, of course, none at all.

In this scenario, the new Productive Development Policy (Política de desarrollo productivo, or PDP) is clearly oriented toward rescuing the local/departmental specialization sectors and generating multi-departmental clusters around them to develop a new bottom-up strategy that might be able to overcome the obstacles that the process has faced so far. However, the problem of choosing what not to do remains, as local lists of strategic sectors are also overly long (Consejo Privado de Competitividad, 2014).

Key Features of the Innovation System

The fusion of the STI and Competitiveness Systems, expected be in place soon as it has been included in the National Development Plan (Plan Nacional de Desarrollo, or PND) 2014–2018,[80] can be understood as the representation of two main concerns of key Colombian STI stakeholders over governance in this area: lack of coordination between government agencies (both horizontally and vertically) and insufficient orientation of science outcomes toward productive applications (OECD, 2014). So far, agencies in charge of STI have focused on either science, or technology, or innovation rather than integrating all three. Although this scenario has started to change, important questions remain on how to fuse these two systems operationally in practical terms—especially in terms of leading the policies and the division of tasks when implementing programs. This is aggravated by the fact that there are several government agencies involved in STI and competitiveness, both in policy design and in program execution, and the division of tasks between them is not always clear.

A key stakeholder in this field is Colciencias (*Departamento Administrativo de Ciencia, Tecnología e Innovación),* which had been the leading agency for the National System of STI, as decreed by Law 1286 of 2009 and which is also expected to play a relevant role in the new System for Competitiveness and STI. It falls under the Presidency and, although it has a lower status than a Ministry (its Director is administratively equivalent to a Vice Minister), it is also present and has voting power in the Council of Economic and Social

[80] This document is the main roadmap for the Colombian government.

Policy (Consejo de Política Económica y Social, or CONPES).[81] Colciencia's main duties are the overall coordination of the System, the formulation and implementation of STI's policies, and the direct investment in STI promotion programs and strategies. They are also in charge of the management of the Francisco Jose de Caldas Fund, a special fund where the central budget for STI is kept. A considerable portion of it belongs directly to Colciencias, while other parts come from Ministry of Health resources for STI as well as ICT Ministry resources, among others. Its main coordination vehicles are the National Programs for STI (covering areas such as basic sciences, biotechnology, health, ICT and defense, among others), where representatives from the productive sector, the government, and academia decide on yearly investment priorities of R&D projects to be funded. Traditionally, Colciencias has leaned toward scientific development far more than toward fostering innovation (OECD, 2014). It has made important efforts in terms of human capital formation through scholarships for masters and PhD degrees: 65 percent of Colciencia's budget is allocated to PhD scholarships and research and 22 percent is invested in R&D projects mainly through calls. Universities execute 52 percent of R&D resources, firms execute 22 percent, and R&D centers execute 19 percent.

Another important STI stakeholder at the central government level is the Ministry of Commerce, Industry and Tourism, specifically, two of its main agencies: Productive Transformation Program (Programa de Transformación Productiva, or PTP) and Innpulsa. The first one is in charge of performing sectoral and prospective studies for the development of strategic sectors (such as ICT), while the second one has important resources from Bancoldex,[82] which are invested in programs to support technology transfer, development of technology-based enterprises and, in general, instruments to promote an innovative mindset among Colombian entrepreneurs. The National Planning Department (Departamento Nacional de Planeación, or DNP) is also responsible for the overall coordination among government entities for policies regarding economic and social development and is thus another key player for STI governance (OECD, 2014).

Local governance for STI has been developing increasingly as circumstances have changed radically: the Royalties Fund, created in 2012 and valued at approximately US$500 million a year, allows 10 percent of the regional income to be destined for STI activities. However, the increased availability of funds at the regional level, prompted by the Royalties System, has not been matched by improvement in regional capacities to execute these funds, with specific exceptions, such as Antioquia with the *Ruta N* initiative in Medellim (OECD, 2014). Currently, local governments have developed STI regional councils to plan and execute Royalties' STI funds. Although Colciencias provides technical support and determines what can be considered as an STI project under the current legal framework, the regional and local authorities have complete independence in terms of their choosing and execution of STI projects. This issue continues to pose immense challenges as regional disparity in both institutional capabilities as well as STI outcomes continues to be a characteristic feature of Colombia's context: for instance, 64 percent of the overall production of research groups

[81] The National council for Social and Economic Policy (CONPES) was created by the Law 19 of 1958. It is the maximum authority for planning and is the main advisor of the government in all aspects related to the social and economic development. It comprises the vice president, the ministers, the director of Colciencias, and the directors of the following administrative departments: Presidential Administration and National Planning.

[82] Bancoldex is a second-tier bank aimed at fostering entrepreneurial development in Colombia. Besides iNNpulsa, it has other special programs to fulfill this purpose, such as *Banca de Oportunidades* and *Programa de Transformación Productiva.*

comes from Bogota, Antioquia, and Valle (Colciencias, 2015) while three out of 32 departments account for over 75 percent of the R&D expenditure (OCyT, 2013).

Despite the intricate governance, Colombia has made important efforts in terms of STI policy design. Proof of this is the newly created Unit for STI Policy under Colciencias Deputy Director, in cooperation with Sussex' SPRU. The immense majority of Colombia's policies for STI promotion have been oriented to the supply side. Specifically, perhaps due to a decreasing budget for STI and an increasing interest in rising private expenditure in R&D, tax benefits have become the main tool for STI promotion. Since 1997, for each Colombian peso that is invested in STI, 1.25 are tax exempt. Although there have been some problems with this instrument, such as limited access by SMEs due to the prerequisites as well as difficulties in the application process, the 2015 Conpes signed by President Santos is aimed at reducing them.

Nevertheless, most of the STI framework policies that have been delivered so far by the STI System have suffered from key structural problems even in terms of design per se. Most have been written in a top-down fashion and have lacked coherence with industrial/competitiveness policies. Additionally, they have fallen short in terms of implementation due to the high turnover rate in key managerial posts in Colciencias (which has undermined this agency's ability to build strong institutional alliances with other key stakeholders in the Innovation System), the lack of coordination within the government as well as between the government, industry, and academia, and the limited availability of funds to support highly ambitious initiatives.

In fact, overall R&D expenditure remains low, at 0.19 percent of GDP in 2014, in comparison to other LAC countries like Chile, Mexico, and Argentina and is well below the 2,4 percent OECD average for that same year. This continues perhaps to be the most important challenge to the development of the Colombian STI system in the near future (OECD, 2014). The Royalties Fund may, however, represent a significant opportunity to improve this, as it could represent an increase of 0.13t-0.16 percent of GDP in available funds.

In general, the performance of the Colombian STI system is poor considering the country's economic development. Regarding high-impact scientific production, Colombia publishes 6.1 scientific articles per billion USD in GDP, ranking 7th in Latin America and standing quite far from the OECD average of 38.8. In terms of impact, it has an H index of 133 (compared to a vastly superior OECD average of 433), ranking 5th in Latin America. This is related to the fact that the scientific base remains low: despite the effort that has been made in terms of tertiary education, and particularly masters and PhD scholarships, there are 346 researchers per million inhabitants in Colombia (ranking 8th in the region), while the OECD average is a stunning 5,825 (Dutta, Lanvin, and Wunsch-Vincent, 2015).

Additionally, Colombia has lagged in the registration of patents by residents, having only 0.1 international patent applications filed by residents at the Patent Cooperation Treaty (per billion PPP$ GDP) in 2012, ranking 6th in Latin America and remaining well below the 3.51 OECD average. However, the intellectual environment for IP development has improved substantially mainly because of Colombia's FDI policies, which include trade agreements and investment protection agreements. In this sense, and although the total applications in Colombia are still low (1,667 in 2012), over 95 percent are foreign applications (WIPO, 2013).

There may be other causes for low patenting activity in Colombia, such as a low domestic demand for knowledge, particularly from the productive sector. Universities are by far the

stakeholders that have more to do with development of STI, leaving the productive sector far behind (OECD LEED, 2015), leading to less than 10 percent of Colombian researchers working in private firms or in the government. Respectively, while the OECD has 38.5 percent of knowledge-intensive employment, Colombia only reaches 16.8 percent, ranking 12th in the region and 84th in the world (Dutta, Lanvin, and Wunsch-Vincent, 2015). Accordingly, the percentage of innovative companies has decreased slightly in recent years (in 2012, only 21 percent of Colombian companies were national innovators, while a very small 0.22 percent were considered innovators in the strict sense (DANE, 2012)[83] and the BERD only reaches 30 percent of the GERD, having in this sense an opposite tendency with respect to OECD countries.

Public Procurement Overview and Legislative Context

Regulatory Framework for Public Procurement and its Relationship to Rationales of Public Procurement in Colombia[84]

Without doubt, the most important laws behind public procurement in Colombia have been Law 80 of 1993, which was originally created to unify the contracting procedures of all public entities and was thus named the General Statute for Public Procurement, and Law 1150 of 2007 (which introduces several efficiency and transparency aspects for Law 80). The original objective of General Statute for public procurement was to simplify and integrate under a single umbrella the general legislation for PP. This original purpose was not achieved as several exceptions to the Law 80 were released for public entities that were found to have differentiated needs, such as public universities, Colombia's central bank and State Owned Enterprises (among others). In the same line, specific conditions were set out for contracts that were made in certain sectors or under certain conditions, such as the case for STI and inter-administrative contracts.

In fact, there is a wide range of exceptions to the rules that allow specific public entities to procure goods and services outside of the competitive tendering process (OECD, 2013). In detail, the following entities are **not** subject to the general procurement regime by general rule[85]: Public Utility Corporations; Industrial and Commercial Corporations when they are in direct competition with the private sector; Public Universities; Inter-administrative Contracts; Social State Enterprises; Internet and Communication Technologies, Public entities entering into contracts with a non-profit organizations for execution of social programs, Colombian Republic Bank, Finance Sector Enterprises (Brigard and Urrutia, 2012). In the end this has led to a complex framework, which often has rules that overlap but that are nevertheless deeply rooted in the main objective behind Colombian public procurement legal framework: fighting corruption.

[83] This category includes the companies that introduced a considerably improved/innovative good or service for the international market.

[84] Although rationales behind a public procurement system depend on a series of political and social factors, the way in which the regulatory framework evolves and responds to this factors allows us to understand these rationales better. In this sense, in this chapter the observation of the regulatory framework evolution is complemented with the observation of the institutional network for PPI as well as different assessments of the Colombian public procurement to offer a better approximation to the rationales that have guided it.

[85] Conversely, non-public entities that undertake monopolistic activity **are** subject to the public procurement regime.

In fact, the apparently paradoxical combination of this complexity with the mentioned concern about corruption has contributed to the development of particularly powerful anticorruption oversight bodies which include *Secretaría de Transparencia* (Secretariat of Transparency) *Procuraduría General de la Nación* (Office of the Attorney General), *Contraloría General de la República* (Office of the Comptroller General), *Fiscalía general de la nación* (Office of the Auditor General), *Superintendencia de industria y comercio,* which set up an office in April 2012 that is in charge of handling both enforcement and education regarding anti-competitive practices in public procurement, and that has a group that specializes in dealing with bid-rigging. The Anticorruption Statute of 2011, that is a special tool that stipulates particularly strong punishments for corrupt practices is yet another evidence of the special concern with corruption. Is worth noting that in this ambiance, there is a lack of established and efficient mechanisms for coordination or communication with procurement agencies and prosecuting officials at the individual level.

Unsurprisingly, this has been found to be the explanation of two additional features of the public procurement landscape in the country: firstly, officials have incentives to adopt a compliance-based approach to public procurement rather than an outcomes-based one and, secondly, access for specific suppliers such as SMEs to public tenders is especially harder (OECD, 2013).

Additionally, although the legal framework has generated an orientation toward the minimization of expenditure and guarantee of transparency in the public procurement process (i.e. it is oriented toward procedure) (CCE, 2015), public procurement in Colombia had been originally intended to be understood as an activity through which several public goals can be achieved, for example securing work opportunities for the disadvantaged, etc., and in some cases this approach may be in conflict with the value for money approach (OECD, 2013). The fact that some contracts have already been implemented in areas such as Green Procurement (see Box 1 below), shows that the Colombian government is in principle willing to trade efficiency for efficacy in accomplishing wider economic, societal and environmental objectives. The problem remains, however, on how to measure the costs and benefits of this procurement to be able to justify the *real* value-for-money that is being acquired.

Notwithstanding the fact that the one of the main OECD recommendation for Colombia's public procurement is that they move from a compliance-based approach toward a more commercial approach (a condition that has indeed been a consequence of the regulatory framework orientation), the most important critique was not the regulatory framework itself but the organization and operation of this system to guarantee coordination, integrity and transparency (OECD, 2013). As a matter of fact, although the three WB-IDB procurement assessments on Colombia all stressed the importance of consolidating and harmonizing procurement rules, they also recommended creating a central government agency for procurement and developing an electronic procurement platform to reduce effort duplication and coordination costs in the operation of the Colombian public procurement system.

Without leaving the corruption concern aside, the Colombian government has in fact reacted to these observations in many fronts. Specifically, reforms to public procurement set out in PND *Prosperidad para todos 2010-2014* were meant to increase the transparency and accountability *and* the quality of public-service delivery. For this it determined the objectives of increasing the use of ICTs for government effectiveness (governance tool), transparency and accountability, and the need for a central technical authority in charge of public

procurement policy, which would contribute to coordination and alignment of central and local levels of government, improving public sector professionalization and performance.

Precisely as consequence of this, *Colombia Compra Efficiente* (CCE), the National Public Procurement Agency was created in 2012 as mandated by the decree 4170/2011[86] as the governing body of the public procurement system. It has been given the mission of achieving different, yet complementary, objectives: to achieve public procurement policy coherence across agencies; to foster public procurement capacity building across the different levels of government; to promote efficiency and effectiveness in procurement processes; and to procure a broader base of suppliers (OECD, 2013). It is worth noting that CCEs final objective is to obtain higher value-for-money as well as accomplishing greater welfare and quality of life for the citizens (a far more goal oriented approach rather than the previous one). This agency has a high-level orientation coming from a directive council presided by DNP' Director and made up by several Ministers: this allows for better horizontal coordination of public procurement policies (CCE, 2015). The fact that CCE's director is appointed by the president helps ensure this agency' leadership in public procurement policy.

Some projects of CCE include the development of e-procurement platforms, the simplification of the legal framework through the publication of, communications, manuals and guides, the training of authorities involved in public procurement as well as the design of quality indicators for public procurement evaluation. Signing framework agreements is another central task for CCE. As in other countries, these agreements constitute a tool for public demand aggregation for the acquisition of products, works and services with uniform technical characteristics for common use and whose use is compulsory for central government at the Executive branch. CCE has in fact earned its place as the leader for public procurement in Colombia and is seen as a serious and strong entity in the country. Nevertheless, the lingering fear of oversight agencies may have hindered several efforts that have been directed from this agency to incorporate new and more efficient procedures in Colombian public procurement. This has also been the case for PPI.

Public Demand Composition and Organization

At first glance, Colombia's public procurement may seem rather large, accounting for nearly 16 percent of GDP (DANE, 2013), against an OECD average procurement of 15.2 percent for the same year (OECD, 2013). However, when taking per capita figures, Colombia's government procurement is considerably lower than in most OECD countries, reaching a 92 percent difference with the Netherlands' public procurement.

This expenditure was distributed among 549,868 contracts in 2013, with a very important component coming from general and professional services with nearly 68 percent of the contracts and a corresponding 22 percent of total government expenditure, showing in this way a dispersed investment in relatively small contracts. This is most likely a consequence of the parallel payroll in Colombian public entities, which has been considered a cause of concern for several years: in 2012, a study revealed that the relationship between public servants and contractors was 1/1.3 in central government entities while the corresponding proportion was nearly 1/1.7 in public institutions at the regional level (Portafolio, 2012). It is

[86] This agency was meant to overcome the limitations that the former *Comisión Intersectoral de Contratación Pública* (CINCO) had in terms of institutional capabilities to ensure the coordination and execution of public procurement policies across the country. (CCE, 2015).

still uncertain, however, how much of this parallel payroll is a consequence of personal favors, higher demands on government performance, and overly strict measures to increase the number of public servants in each entity (OECD, 2015), poor performance of current public servants, or a combination of all these factors.

Although there are more than 2,000 public purchasing agencies at the national and regional level, the key spenders are clearly differentiated. For instance, according to SECOP[87] in 2013, fewer than 5 percent of public entities (i.e. 100) executed more than 75 percent of the total expenditure of approximately 65.5 billion COP. Ecopetrol[88] and ICBF[89] occupy the first two places in terms of acquisition agencies, with 7 percent and 5 percent of the public procurement, respectively (in both cases, services are again the highest expense). The ministries, on the other hand, are strong players in the central government and are responsible for 12 percent of all government expenditure, with Treasury, Education and Agriculture Ministries accounting for nearly 50 percent of this amount.

The level of decentralization of Colombia is also clearly visible in the distribution of the expenditure when seen in terms of the type of purchaser: according to the same source, 20 percent of 2013's expenditure went to municipal authorities while 12 percent went to regional ones. Illustrative of this is the fact that Gobernación de Antioquia comes in third place right after Ecopetrol and ICBF, while Medellin occupies fifth place (after the National Police), among the public spenders. Despite the high relative weight of local and regional authorities in public expenditure, this decentralized expenditure is nevertheless still quite concentrated: the central regions of Antioquia, Cundinamarca, and Santander account for nearly 50 percent of regional public procurement.

In terms of public demand aggregation, CCE has already marked a milestone by signing over 20 Standard Agreements (Acuerdos Marco de Precios, or AMP), by the end of 2015 for a variety of goods and services that are needed on a recurrent basis by multiple government agencies, such as airline tickets, cleaning and other general services, and cloud computing.[90] The addition to these AMPs is mandatory for the entities from the executive branch (i.e., ministries and administrative departments) that are subject to the regular contracting statute and voluntary for all of the public entities, including those of the legislative and judiciary branch as well as the regional/municipal authorities (CCE, 2013). These agreements have already proven to be quite effective in terms of savings for the public budget: just in the case of cloud computing, during the first three months the entities that acquired the services through the AMP have accomplished savings between 10 and 75 percent, and managing to gain total savings of over 9.5 billion COP for the Colombian government (MINTIC, 2014). Overall, the savings achieved through these AMPs in 2015 were worth more than 232.00 million COP according to CCE. New AMPs are in process and, given the previous success, are expected to continue gaining adherents.

[87] Raw data retrieved from https://www.contratos.gov.co/puc/buscador.html, self-calculations.

[88] Formerly known as Empresa Colombiana de Petróleos S.A., ECOPETROL is the largest petroleum company in Colombia. It is a partially government-owned company and is linked to the Ministry of Energy and Mines.

[89] The Instituto Colombiano de Bienestar Familiar is a public entity with over 30 regional branches in charge of protecting and promoting childhood and family welfare in Colombia.

[90] Although AMPs have been available in the Colombian regulatory framework, only the Ministry of Defence (MoD) has been the pioneer in this area, aggregating the demand of specific goods for the Navy, the Army and the Air Force.

Contracting Procedures for Public Procurement in Colombia

As listed below, there are five general procurement procedures for public procurement established in Law 80/1993 and Law 1150/2007, each of which has a specific mode of selection:

1. **Public tender:** Applied by default and highly competitive. Selection is based on best cost-benefit as established/defined in the tender.
2. **Abbreviated selection process:** A simplified procedure that can only be used in specific cases as mandated by law (for example, acquisition of goods and services that are vital for the nation's security and defense).
3. **Merit-based selection:** This procedure can only be used for projects that involve services or for consultancies. It can be a public invitation or a pre-qualified one (where the public entity can approach a limited number of applicants) and considers criteria such as the experience and the intellectual capabilities of the bidders for the award (in this type of procedure price cannot be legally considered).
4. **Direct contract**[91]**:** This is a non-competitive selection procedure which can be applied when the public entity (regardless of the sector) can justify urgency, insufficiency of suppliers, research projects, hiring of professional services and inter-administrative contracts, among others. Although direct contracting is widespread, accounting for over 38 percent of contracts in Colombian public procurement, it is worth noting that the number of legislative acts permitting direct awarding (in this case 9) is in the range of many countries and is just one more than the EU average (OECD, 2015).
5. **Minimal quantity:** A procedure which can be justified when the value of the contract is below the 10 percent of minor quantity threshold for the respective agency and which has fewer formalities and steps than an open call.

In addition to these procedures, the financial enterprises of the state, certain bodies linked to the MoD, as well as SOEs and partially government-owned companies, as well as their branches, belong to the Special Regime. Consequently, they each have the power to regulate their own public procurement manual.

Besides the Price Framework-Agreements led by CCE, there are two contracting mechanisms that are worth emphasizing because of their relevance for PPI. First, there are the contracting mechanisms for STI activities, which are summarized in CCEs Circular 6 and, second, the public–private partnership contained in Law 1508 de 2012.

Contracting for STI activities as summarized in *Circular 6*: There are 15 types of STI activities mentioned in CCEs. Circular 6 was released in 2013 by CCE to clarify the main features of the contracting processes for STI available in Colombian law, and describe more precisely which activities can be considered as STI activities (i.e. it does not represent new legislation on the subject, but rather integrates the available legislation in the different STI-Contracting laws in effect, dated from 1991 to 2009). Four STI activities (chosen because of their relationship to PPI) and their contracting typologies are summarized in Tables 11.1 and 11.2.

[91] In 2013, 46 percent of the total were procured through direct award procedures, and within this amount, 38% corresponded to service contracting. This tendency is also true and is particularly higher in the regions that account for most of the regional public procurement such as Antioquia and Cundinamarca.

Table 11.1: STI Activities (selected from 15 included in Circular 6)

(8) Scientific research projects, technological development and innovation; development of new products and processes.
(11) Innovation projects that incorporate technology, capacity, generation, appropriation, and adaptation of it.
(12) Technology transfer comprising counseling, negotiation, ownership, unbundling, assimilation, adaptation, and application of new domestic and foreign technologies.
(15) Research and experimental development (R&D), training and scientific and technological training, scientific and technological services, and social innovation activities and innovation.

Table 11.2: Contracting Typologies available for STI Activities

1. **Special cooperation agreements to bring together resources, capabilities and competencies agency (may include project management and financing).**	These are bilateral agreements between the parties to join resources, skills and competences to finance projects.
2. **Grants to finance scientific, technological and innovation activities**	Welcomes the development of STI activities, including pre-competitive activities with high technological risk (Supports direct contracting mode where IP rights are released by default)
3. **Project management contracts: commission a suitable third party to carry out activities in science, technology and innovation management and project implementation in these areas**	It is comprehensive management activities of projects (pre-feasibility studies, technical advice, etc.) that does not include the development of STI activities

There are some elements of these selection procedures that represent clear advantages for future PCP developments up to the level of prototype. For instance, although the competitive dialogue is not included in Law 80 or Law 1150, the processes of direct contracting for the development of scientific and technological activities open the possibility of introducing similar processes. In fact, they establish guidelines for a technical dialogue that takes place before the contract is awarded. Furthermore, special cooperation agreements, specifically, being governed by private law, do not restrict awarding several suppliers under the same contract to work in parallel in different areas of development of the same good (according to Article 7 of Decree Law 393 of 1991). Additionally, both special cooperation agreements and grants to finance STI activities allow for risk management in pre-competitive STI activities.

According to data from World Bank (OECD, 2015), around 3 percent of the direct contracts have this reason to follow such procedure at the national level, while at the regional level the figure barely reaches 2 percent.

Public–Private Partnerships: Although not a traditional contracting mechanism in Colombia, public–private partnerships (PPPs) have started to be exploited in infrastructure

since the passage of Law 1508 of 2012 which regulated them. Currently, there are 104 PPP projects under construction or operation (PPP Knowledge Lab, 2015). Although fundamentally oriented toward infrastructure, this law addresses three main factors that are compatible with PCP-PPI. First, it addresses the management of unsolicited bids. Second, it makes it mandatory to have a cost/benefit analysis (in a broad sense) to evaluate proposals. Third, it requires prequalification, which allows the public purchaser to invite a limited number of bidders for a phase that precedes the selection procedure. Throughout this stage, modification suggestions made by either party to the conditions initially contained in the tender can be considered, thus allowing for the public procurer to take advantage of the offerors' experience. Considering its multi-year nature, this might be an interesting figure to base on further developments that allow for one-phased PCP-PPI.

Finally, public tenders have certain elements that can be a valuable basis for performing PPI: they all allow for the assignment of value to technical requirement and, in the specific case of reverse auction, they provide a dynamic purchasing system and a negotiated procedure and the contract is awarded to the offer with the best cost-benefit ratio.

State of Electronic Public Procurement

In terms of tools used to award any of these contracts, it is safe to say that the full deployment of electronic procurement in Colombia began in 2016 under the leadership of CCE and with the advantage of an increasingly embedded usage of ICT in the Colombian government. Colombia's e-government development index (although still below the middle range of OCED), with a value of 0.617, is considerably above the regional average of 0.5, surpassed only by Argentina, Chile, and Uruguay (OECD, 2014). Improvements in this index have been the direct consequence of the Ministry of ICT's campaign for enhancing openness in the government and citizen participation through e-government.

With respect to public procurement, a milestone is the transactional electronic submission system that the country has embedded in the second version of the Electronic System for Public Procurement (SECOP II) since February 2015. This was one of the main gaps identified by the OECD in terms of electronic procurement implementation (OECD, 2013) for Colombia. However, there are electronic platforms could be potentially available for this purpose and that are currently subject to modifications. The two main electronic tools for this purpose are:

4. **Single Suppliers' Registry (Registro único de proponents, or RUP):** The RUP is a bidder's registry in which potential public suppliers must submit their professional data (including, for example, any penalties against them during public contract performance and other legal and financial information). After the supplier submits this information, the local Chamber of Commerce is required to verify its veracity and successively issue the RUP certificate, which is accessible on-line and is a prerequisite for most public contract procedures. In this sense, this is the first check-up hurdle and, as such, can be useful when assessing specific characteristics of the potential supplier.
5. **SECOP II:** Created in 2007, SECOP I was a platform for the advertisement of contract notices, which also contained information on awards. It has been the main source for bidders to find procurement opportunities and for oversight authorities to find information related to public procurement. With CCE, SECOP II was launched in early 2015 to correct the weaknesses of the former platform by allowing for online bidding or data collection on steps of procurement procedures, award of contracts, and contract performance, among others. Another great advantage of this tool is that

it enables communication at all stages of the procurement cycle (OECD, 2015), thus supporting a framework for a competitive dialogue. Additionally, interoperability between this platform and the Integrated System of Financial Information (SIIF), which contains information on public budget and payments is undergoing development (much of this advance is due to the implementation of the *Tienda Virtual del Estado Colombiano*, the e-store for goods and services that are contained in the framework agreements). CCE has published drafts of user manuals for SECOP II and intends to bring on board 4.076 public agencies as users by 2018, as established in the PND 2014–2018 (OECD, 2015).

Despite Colombia's recent development in the availability of valuable public procurement data, according to the OECD (2015), there is still room to reduce duplication, as the supplier is required to be registered in at least two of these portals.

Rationales and Developments in PCP-PPI

As in most LAC and OECD countries, innovation policy in Colombia, is strongly focused on supply-side issues. Specifically, the focus is on human resource development and allocation for public funding of R&D projects. The reason for this is that Colombia still lags behind in terms of resources for STI while still exhibiting poor management of existing resources (OECD, 2014). In this sense, there have been some relatively feeble attempts to develop PPI-PCP which are described at the end of this chapter. Although the demand-side innovation policies are not fully integrated in the rationale of STI policy in Colombia, there have certainly been advances. In addition, there have been certain advances in matching STI demand and supply as well as in directly fostering both private and public demand for innovation that, although not explicitly classified as demand-side innovation policies, are nevertheless relevant for this subject. Lessons can be drawn from these experiences, as they have helped (or in some cases hindered) the development of capabilities for future attempts to establish PPI-PCP. In addition, their development reveals the rationale behind key STI actors with respect to the role of demand in fostering innovation.

Inducing Private Demand for Innovation

A relatively low public budget to support STI policy has become key in turning the government's attention toward private demand for STI. There has been a debate on how to increase companies' investment in R&D (since the percentage of private participation in expenditure lags far behind with respect to OECD average). Colciencias' main mechanism for increasing private demand for high-tech goods is a tax benefits scheme. Although this scheme focuses on incentivizing private investment in R&D, it has increasingly introduced exemptions that are meant to increase demand for innovative or high-tech products (that are nevertheless intended more to increase firms' innovation capabilities than to increase demand). For instance, imported equipment and goods used in STI projects are exempt from value-added tax (VAT) and, in coordination with the ICT Ministry, a VAT and import duties exemption for the purchase of computers and tablets was introduced in 2011.

Another way through which the government can foster private demand for innovation is by promoting knowledge and skills of end-users of high tech content goods and services. In this area the Colombian ICT has definitely played a key role through the *Vive Digital Plan*. The aim of this plan is to reduce the digital gap by increasing access of disadvantaged populations to ICTs. To accomplish this, the plan includes a wide array of programs, including seminars, training, kiosks around the country with free access to learning technologies, and the distributions of thousands of tablets and computers. This program has

already been praised for its effect on narrowing the technology gap, which will in turn increase demand for ICT products. The extent to which these efforts will increase national companies' demand for innovation, as a direct pressure from the market, is still not determined, but they will certainly stimulate overall demand for these technologies (OECD LEED, 2015).

Open and Social Innovation in Matching STI Supply and Demand

There have been important steps forward in translating social challenges into demand for innovative solutions at both the central and the regional levels in Colombia. Social innovation is a key aspect of Colombian STI policy, and it leads the way in terms of open innovation in the country.[92] These practices may help pave the way for direct forms of PPI-PCP in the sense that they translate challenges into requirements that are specific only in terms of functionality.

To name a few, in 2012 Colciencias introduced the *Ideas for Change* program, which is meant to support low-cost innovative solutions that aim at solving social and environmental challenges of disadvantaged communities. Since then, each year a shared need of these types of communities is identified (for instance, access to clean water) and an open call is made for communities to define their need. Then, another open call is made to receive proposals of innovative solutions that could come from any national actor. Selection of both the needs and the respective solution determined with the local government, and Colciencias awards a grant to develop the solution, accompanied by a social appropriation plan meant to increase the sustainability of the solution. Similarly, the participation of the local government should in turn contribute to increase the probability of their subsequent purchase of the solution developed (Innovation Platform, 2015). In this sense, although containing relevant elements of PPI-PCP processes, it cannot be directly classified as such, since there is no direct purchase of the development of the solution or the solution itself by the end-user, but there are only grants given by Colciencias. As such it resembles a PCP.

The National Agency for the Elimination of Extreme Poverty has taken up these programs, but keeps giving more attention to the participatory character of the innovation rather than to the innovation itself as a way to solve a problem. The fact that this agency leads the fight against poverty shows that the program is a case of PPI (which is not the case in Colciencias *Ideas para el Cambio* program), as grants are given so that third parties can perform the necessary R&D+i to develop a new solution for an identified problem for this public entity.

At the local level, additional programs have been developed. Antioquia has given particular importance to this subject. The *¿Quién se le mide?* (Who's up to it?) is a small-scale programme managed by Tecnnova. Its main purpose is to assess the creative and innovative potential of university researchers, research fellows, technology development centers, firms, and students. To do this, it is a contest aimed at solving some of Medellin's everyday problems, which usually require small-scale technology. According to OECD LEED (2015), in any case, this has been a successful initiative that illustrates the potential of public procurement in promoting social innovation, and could serve as an example to other regions

[92] The definition of social innovation has undergone a great debate, particularly in LAC countries where societal needs are often mistaken with needs of only disadvantaged communities or where social refers to a wide participation in the process. However, for the purposes of this document, we make a reference to social innovation understood as innovation that is meant to solve a pre-identified societal need at any level and that may or may not include participatory processes of innovation.

of Colombia and the world. However, according to Tecnnova there some lessons that can be drawn so far, which include the need to support public officials involved in this process, especially in the formulation of the challenges. There is the need to disseminate and increase the number of proposals, and finally the need to support the winners so that they use the award effectively.

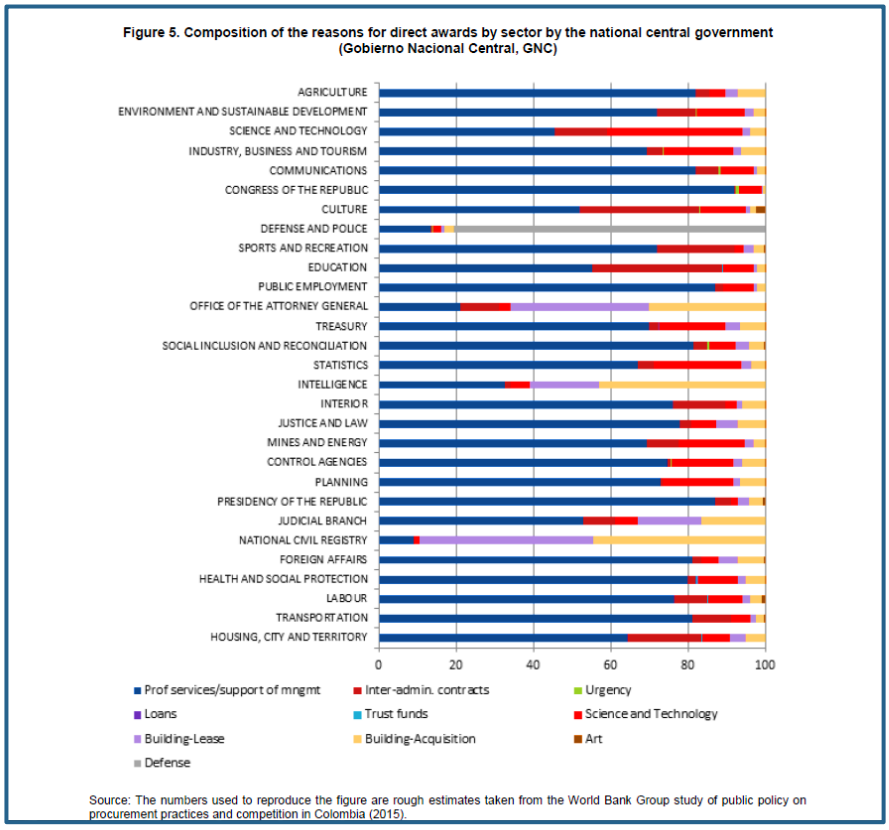
Although the point to which the idea is financed varies among the different programs, the truth is that to date none of them includes the promise of purchase of the developed good on the part of the public sector. However, this is not the case of SOEs, which have also developed open innovation platforms. For example, Public Enterprises of Medellin (Empresas Públicas de Medellín, or EPM) has released PCP for innovative solutions to reduce their operating costs. Similarly, Innpulsa's open innovation platform for mining and oil, which incorporates challenges form different enterprises (both private and state-owned) also allows the company to procure in advance of the solution.

Spurring Innovation through Public Demand: The First Direct and Indirect Attempts

In addition to PPI and PCP, the government can also foster innovation through demand by including it as a parameter in the assessment of public tenders. The incorporation of innovation-related criteria in tender specifications and in assessment of tender documents, although only sporadically used by public entities, has also been promoted by the vehicle of green public procurement. Although not specifically aimed at spurring innovation, the advances made in this area by the Ministry of Environment could have effects over the innovation demand in the sense that they promote the use of high-tech and innovative products (with sustainability characteristics that are relatively new to most public purchasers). Additionally, these specifications set the groundwork for the inclusion of wider social objectives in public tender (OECD, 2013), one of which could be innovation. In accordance with the general objective of fostering environmental sustainability stated in the PND, this fact is also included within CCE's general strategy (CCE, 2015).

Public entities in Colombia lack a coherent demand for technology. This hinders the development of PPI and PCP. Nevertheless, some advances have in fact been done in terms of the role that public entities play in terms of defining the purposes of the resources invested in R&D in the area for which they are responsible. Consequently, some public agencies bestow a large percentage of their direct contracts to R&D contracting (Figure 11.1).

Figure 11.1: Reasons for Direct Awards by the National Government (by sector)



Source: OECD (2015).

Most ministries have considerable sectoral funds destined for STI, managed either by the ministries themselves or by Colciencias. In the latter case (which is the case of the Ministry of Health and the Ministry of ICT, for example, the respective minister leads (in coordination with the director of Colciencias) the corresponding National STI Program Council. At the beginning of the year, each National STI Program Council determines the priority areas for the R&D calls to be made (e.g., diagnostic images for diseases, crop quality enhancement), and that are meant to create an integral assessment of the sector's needs. This fact is relevant, as the main public entities are used to predict the needs of the sector or identify challenges that remain unsolved in the area (e.g., agriculture, health) and to make budgetary decisions to support them. There is still a long way to go between this and actual PPI or PCP. These needs are still identified in a broad sectoral way (they are also discussed with other public entities and representatives of the productive sector) rather than oriented toward solving a need of the entity itself (through the delivery of a service, for example).

Despite the latter, some examples can be cited of the public entities intending to use innovation to solve their needs. One feature of this is that the Colombian government has been more successful in developing in-house capabilities to support the R&D+i needed by the sector in question than in outsourcing it. The government has turned to the creation of R&D+i corporations, attached to the respective ministry or administrative department. As expected, because of the particularly confidential nature of innovation, the Ministry of Defense's High Tech Corporation (CODALTEC) is a good example of this. Additionally, it has already been aimed at producing specific needs of the Ministry in the area of radars. In the agriculture sector, Corpoica has also filled this gap, especially in relation to high-quality

R&D in the area. The challenges that are given to Corpoica by the Ministry of agriculture are still not directed to the entities needs; rather, they respond to wider sectoral priorities.

Both the transference of sectoral funds to the Fondo Francisco José de Caldas (Francisco José de Caldas Fund) (FFJC) managed by Colciencias and the creation of corporations to manage R&D efforts provide an initial clue of how public entities might be attracted by the easiness of these figures, in budgetary terms, with respect to other more traditional vehicles for contracting.

In this scenario, however, and with encouragement from the OECD (2013) recommendation to foster innovation and improve quality and efficiency in the provision of public services through PCP and PPI, the CCE decided to take steps forward in this matter. The first step was the design of a national PPI-PPC policy, which included a series of indicators and considerations on governance issues. However, the official launching and implementation of this policy has been informed by lessons drawn from a series of workshops and a set of PPI-PCP pilots. Implementation is still in an incipient phase and, given the difficulties they have already encountered, it is not clear whether they will move to the next one. The selection process of these pilots took two to three months, mostly due to insufficient involvement of procurement entities, although in the early policy design stage, some participated and identified needs that could potentially be solved. CCE chose four pilots in a variety of sectors, listed below:

- National Planning Department (Departamento Nacional de Planeación, or DNP): The objective was to design and develop a new single system of public consultation to improve citizens' participation in the process of issuing regulation.
- Natioal Ministry of Information Technologies (Ministerio Nacional de Tecnologías de la Información, or MINTIC): The objective was to design and develop practical laboratories meant to provide services to build simulation scenarios (forecasting) to address the knowledge needs of public entities and related key stakeholders.
- National Agency for Overcoming Extreme Poverty (Agencia Nacional para la Superación de la Pobreza Extrema, or ANSPE): The objective was to custom design an online education system for isolated rural areas. It was dropped mostly due to the reform that took place in late 2015, which caused ANPSE to merge with the National Department for Social Prosperity.
- COLCIENCIAS: The objective of this pilot was to develop biosimilar drugs for Colombian health system.
- EPM: the objective was the public procurement of an innovative technology (device) to remotely detect in real time the location of the points of the system that were generating water losses.

The pilots have experienced delays and difficulties that in some cases have even led to failure in early stages due to change of management, change of priorities in the high-executive level and budgetary issues. Also, some agencies have identified the lack of an appropriate contracting and selection figure as one of the obstacles to reach subsequent stages of the process. Despite this, CCE has maintained interest, and has provided buyers with technical and legal support for the detailed design phase. However, at the time of writing this section neither driver could successfully complete the full course of bidding.

Challenges, Opportunities and Expected Further Developments

Despite the feeble advances in PCP-PPI in Colombia, the obstacles to the initial attempts to launch the pilots, as well as the thorough analysis made both by CCE and by multinational organizations of the Colombian public procurement systems, allows us to draw valuable conclusions about the point to which a country like this might be ready to face the implicit challenges of these types of contracts as well as to identify the key factors for future success. These advances are listed in Table 11.3.

Table 11.3: instrument Rationales

Policy category	Deficiencies addressed	Instrument types	Examples
Framework conditions	i) Procurement regulations driven by competition logic at the expense of innovation logic ii) Predominant value of economic criteria in tender procedures and lack of mechanisms for STI-related risk management iii) Requirements for public tenders unfavorable to SMEs	i) Introduction of specific contracts that are coherent with STI activities (competitive dialogue, risk, etc.) Introduction additional criteria (to economic) in public procurement regulations ii) Simplification & easier access for tender procedures	i) Law 1286 of 2009 (contracting for STI activities) ii) Law 1508 of 2012 on PPPs iii)Green public procurement iv)Electronic System for Public Procurement (known as SECOP II)- intending to allow for online bidding
Organization & capabilities	i) Lack of awareness of innovation potential or innovation strategy in organization ii) Procurers lack skills in innovation-friendly procedures	i) Guidelines, good practice networks ii) High level strategies to embed innovation procurement	i) CCE's Guidelines including Circular 6 (summarizing contracting of STI activities) ii) Inclusion of the definition of PPI in the PND iii) PPI policy and PPI-PCP user guide (in progress)
Identification, specification & signaling of needs	i) Lack of communication between end users, commissioning & procurement function ii) Lack of knowledge & organized discourse about wider possibilities of supplier's innovation potential	i) Pre-commercial procurement of R&D to develop & demonstrate solutions ii) Innovation platforms to bring suppliers & users together; Foresight & market study processes	i) Open innovation at the central and regional level ii) National STI Program Councils iii) Initiatives to identify priority sectors with key stakeholders (PTP, Consejo Privado de Competitividad, etc.) iv) First pilots of PPI (in progress)
Incentivizing innovative solutions	i) Risk of lack of take up of suppliers' innovations ii) Risk aversion by procurers	ii) Financial Instruments	i) Tax Incentives ii) Ruta N's development of innovative projects

Source: Author's compilation of instrument rationales according to Georghiou et al. (2014) framework.

The obstacles that have been found throughout the process have in turn been used to the design of the policy itself that is being led by CCE, allowing us to forecast the general trends that it will have.

Institutional Capabilities

Any kind of strategic procurement requires multidisciplinary teams in charge of public procurement. This is certainly not the exception for PPI-PCP: it is one of the main obstacles that the implementation of PPI-PCP will face in Colombia. According to CCE (2015), the great majority of procuring practitioners in the public sector only have legal training that prevents the respective personnel from acquiring the technical and strategic abilities that these types of processes require. In this sense, there is a minimal percentage of economists or logistics experts (among others) in the acquisitions departments in Colombian public entities. This is exacerbated by the fact that most practitioners learn on the job, since there is no official program and the upgrading courses at this level are rare (beyond specializations given in law schools which have the same legal-procedural orientation). The strategic provisioning training program recently created by CCE will most likely help reduce this limitation but will only be unfolded in pilots by this year.

According to interviewees, the formation of these teams (e.g., including people from other departments) may be difficult, as there is a great separation between officials in charge of public procurement and those involved in other activities that are central to the respective agency, such as strategic planning. This supports the idea that public procurement is still viewed as an operational activity rather than a strategic one, and that requests of purchases from the technical area are made up to a point and then transferred to the legal departments. In a context of PPI-PCP, where there is a need for a permanent interaction between public procurers and potential suppliers on technical grounds as well as legal grounds, the need to increase capabilities of public procures or to enhance the dialogue between acquisitions departments and technical ones is urgent.

Another aspect that might be contributing to the lack of technical capabilities among procurers is the figure of the Interventor (which can be translated as comptroller or auditor) that is key in contract supervision in Colombia. The Interventor's duty is to ensure and guarantee to the procuring entity the provider's compliance with the contractual agreement through regular examination of the requirements in the legal, financial (i.e., accounting, budgetary, and treasury), and technical aspects. The Interventor can be a person within the procuring entity or, a subcontracted natural or legal person who performs these duties for the duration of the contract. Some interviewees have pointed to the fact that the subcontracting of Interventors (e.g., in public R&D contracts) has undermined the development of technical capabilities for contracting that are much needed in PPI.

Furthermore, the incentives for participation in the teams that will lead PPI-PCP pilots must be reviewed. According to interviewees, the perception of public procurers is that enrolling in such a task implies high risks, as punishment for noncompliance is severe for practitioners (CCE, 2015) and poses few expected gains for procuring practitioners as they have to take time away from their daily duties (which, in the best cases, *are* awarded).

Additionally, public entities' limited knowledge of intellectual property made the process particularly difficult. The definition of the distribution rights of intellectual property raised the most questions among the entities, due in large part to the treatment that would have to be given to the information that was to be exchanged in the competitive dialogue. Given the intention to transfer the ownership of the solution, a possibility is contained in Article 10 of

Law 1753 of 2015 (except for cases of national interest, such as those related to defense and security), while there were entities that had the intention of preserving the property rights. However, neither of these options was the consequence of a conscious cost-benefit analysis; rather, the option taken was the one with which the entity was most familiar.

At the macro-institutional level, CCE's leadership is good news for the implementation of PPI-PCP, as it is perceived as a trustworthy authority in matters of public procurement by procuring agencies, oversight bodies, and suppliers (OECD, 2015). Nevertheless, the full implementation of PPI-PCP must have the additional support of agencies responsible for R&D+i targets, such as Colciencias and DNP. This support has not yet materialized, but it would be extremely beneficial in the design and implementation of the policy.

Legal Framework

CCE has considered the appropriate elements that had to be developed and adopted to make it easier for the first projects in PPI-PCP to work. In terms of legislation, it was determined that despite the generally unfriendly legislative environment for the development of particularly relevant element for PPI-PCP, such as the competitive dialogue, the contracting mechanisms for STI were suitable as a basis for PPI-PCP. Thus, Circular 6 could clarify doubts around this subject.

As the leading entity in the matter, interviewees from Colciencias have agreed that STI contracting in Colombia is perfectly compatible with PCP and considers that the main problems with it are derived from the same problems that the public entities have when contracting any kind of STI project (i.e. lack of knowledge of the subject).[93] A shared view in this manner may also benefit future joint actions for the establishment of PPI-PCP.

Challenges in Public Demand

In general, the relatively low importance given to demand planning and risk assessment in the procurement process is an important weakness of the Colombian public procurement system (CCE, 2015). In addition, the absence of a model of technological development (and consequent lack of technological demand) in public agencies in Colombia will make it more difficult for procurers to identify a priori what kind of problems could be solved through innovative solutions and could be acquired through PPI-PCP. According to interviewees, the existing mechanisms for channeling STI resources toward sectoral needs (such as the National Programs for STI) rarely have the participation of those who are actually aware of the most urgent needs (i.e., technical officers that manage STI are far apart from those responsible for mission activities) and even less with the participation of a high executive level that can actually pull out these types of projects. The lack of horizontal and vertical coordination in this area may pose additional challenges for PPI-PCP.

Although there are innovative management programs in some public institutions**,** they appear to be limited to innovation in services supplied or developed by the same entity. Moreover, in Colombia, technology forecasting activities among public purchasers is quite rare. Specifically, sectoral market studies are mostly intended as a formality to achieve 3 contributions necessary to launch the tender and are rarely used as tool for early identification of demand or aggregate demand.

[93] This does not appear to be the case for PPI, unless it takes place in a two-stage manner, combining PCP and regular open biding, which would obviously entail an unwanted higher risk for the provider.

The identification of the innovative component that makes a project subject to PPI or PCP may be also a challenge in Colombia due to the lack of familiarity with STI contracting in some public entities. This is also related to the fact that, in general, the country lacks a clear strategy to help determine the most suitable contracting entity for each project (CCE, 2015). Circular 6 is meant to clarify this issue, but additional reinforcement and socialization vehicles should be put in place through coordinated actions of CCE and Colciencias to increase familiarization with these contracting entities.

In the budgetary arena, the current design of the budget system is not conducive to innovation. Except for funds specially designed for STI purposes (such as the Fondo Francisco José Caldas), the budget does not favor planning and execution beyond the budget year. Additionally, the legal framework is aimed primarily at minimizing public spending and preserving transparency. Considering that a public agency's performance includes assessment of budget execution (vs. budget planning), it would not be surprising that public bodies would have problems with leaving a relatively flexible budget when planning for a PPI-PCP projects.[94]

According to the interviewees, there is a widespread belief among public procurement officials that innovative solutions are more expensive than existing solutions. This may limit the number of public entities that want to be part of this process. This may be in turn be caused by the fact that taking the whole life cycle for budgeting public procurement into account is quite rare, except in specific areas such as defense.

Some aspects point to the fact that public bodies may exhibit additional difficulties when specifying the functional requirements. For instance, the changes in value according to specifications is quite low in the Colombian public procurement system—0.1 percent in 2014, according to CCE (OECD, 2015). Although this index is commonly used as an index of savings, it also shows that public procurers prefer to take a strictly budgetary approach (following a spend-it-all logic) to public procurement rather than resorting to the negotiation and functional requirements approach

Private Provider

One risk that can be anticipated for the successful completion of further stages of PPI-PCP in Colombia is the distrust of the productive sector in government as a "smart procurer," combined with a perceived lack of transparency in the process. This ends up generating an atmosphere of distrust between procurer and provider (CCE, 2015). Thus, innovation-oriented companies may not be motivated to propose solutions in this context. Additionally, the dialogue between public purchasers and suppliers in Colombia is viewed with suspicion. This poses a huge risk to successfully establishing the technical dialogue, a key aspect of PPI and PCP. This risk could be exacerbated by the limited number of employers specialized in intellectual property as well as the absence of general knowledge of PPI-PCP in the productive sector overall.

However, in the end, one of the greatest risk for the successful implementation of PPI-PCP in this area appears to be the absence of an innovation orientation on the part of Colombian companies. As OECD (2014) notes, in Colombia the interaction is not yet between enterprises and the innovation generated at the public level; rather, enterprises must

[94] SOEs, however, may be more likely to be familiarized with higher flexibilities in budgets and thus may have advantages at this stage of PPI-PCP.

respond to the private market's demand for innovation. However, this private demand for innovation remains frail. The fact that enterprises can survive four years without any innovation,[95] as well as the existence of a large number of low-productivity enterprises, suggest that competition is more limited than in other LAC countries, and that pressure to innovate is weak. Private demand for innovative products should be matched with competitiveness measures (such as more FTAs) as well as development of local capabilities for innovation to increase companies' demand for STI.

Expected Further Developments in PPI-PCP

The instruments that will be designed and implemented to foster PPI-PCP in Colombia should be included in a comprehensive policy led by CCE and informed by the lessons drawn from the pilots that are still in incipient stages of implementation. A first sign of the government's commitment to PPI-PCP is the fact that PPI-PCP is included in the PND as a program that should be designed and led by CCE. PPI appears in two sections of the PND: first, as an action within the STI strategy, aimed at increasing private investment in STI and should be accompanied by a matching program that should foster SME's capabilities to access these tenders; second, as an action to increase the effectiveness of public management and performance. Although it was not included in the corresponding law, there is already a wide array of vehicles through which CCE can begin supporting PPI-PCP development and will most likely do so.

PPI is also included in a recent policy document, the *National Policy for Science, Technology and Innovation 2016-2025* (currently under review). It is part of the strategic objective of creating financial support mechanisms for innovation and entrepreneurship. The paragraph in which PPI is addressed states that the DNP, in coordination with CCE and the entities form the Mixed Technical Committee for Innovation,[96] will be in responsible for defining a mechanism to enable public entities to identify needs or problems that can be potentially addressed through PPI. It also states that this procedure should consider the lessons learned from CCE's pilots, and it has a deadline for July 2017.

In this regard, there is a consensus among academics, private suppliers, public buyers, and international organizations on the need to carry out an integral reform to the entire case law and doctrine for public procurement in Colombia.[97] This review has produced a proposal for a new legislative framework oriented to CCE's broad strategic objectives (such as a value-for-money approach, etc.) and is currently under public review. Among the reasons given for the new project, some are related to PPI.

First, CCEs argues that best practices at the international level show that the mechanism to select providers for STI projects is not necessarily direct contracting, and these procedures should be included in the new law. Second, in the exposition of reasons for this project, competition among providers is also addressed. It emphasizes that if the procuring entity does not have enough information, it might be unable to design a competitive process that

[95] This was documented in the Colombian Survey on Technological Development and Innovation (*Encuesta de Desarrollo e Innovación-Tecnológica,* or EDIT) for the manufacturing sector in 2013–2014.

[96] This committee is made up representatives from: Presidency, Colciencias, Ministry of Commerce, Ministry of IT and Communications, Ministry of Agriculture, el Sena, Innpulsa, PTP, Confecámaras, and the Private Council for Competitiveness.

[97] According to "Motivos del Proyecto", an electronic document justifying the project for a new law on public procurement in Colombia, obtained in CCEs webpage, in http://www.colombiacompra.gov.co/sites/cce_public/files/cce_documentos/20160620motivos.pdf.

optimizes the budget unless it can interact with potential providers, get to know the market, and negotiate with them. In this part, European Directive 2014/24/EU, which contains the procedures for competitive dialogue and European innovation partnerships, is cited as a precedent. Third, CCE argues that sustainability and innovation are principles that the procuring entities should value when making decisions to increase value for money in every purchase.

As a result, the Law Project includes several points that are enablers of PPI directly and indirectly. Sustainability and innovation are included as guiding principles of public procurement and innovation, and cost-benefit and cost efficacy are included as criteria for the evaluation of proposals, as long as they are consistent with the aim of the contract. Furthermore, Article 51 (Chapter 9), which describes procedures for selection of providers, has a subsection on PPI. It states that public entities will be allowed to use the following procedures for provider selection to promote innovation and solve their needs:

> "Article 51. Selection of suppliers:
>
> 4. Public Procurement of Innovation: Public entities can use the following award mechanisms to solve their needs through the promotion of innovation and honoring the principles established in Article 7 of this law.
>
> (a) Competitive dialogue: Public entities can invite the public to make proposals to solve a specific problem of the public entity. The competitive dialogue must have successive stages to adjust the scope of the research, works, goods and services that the public entity needs. The public entity must request a formal bid from the bidders that have participated in all the stages.
>
> (b) Innovation partnership: Public entities can make partnerships with third parties to look for innovative solutions to their needs that do not exist in the market. Innovation partnership can be structured by successive stages that include research processes, production of prototypes and goods, construction of works or provision of services. The agreement must include mutual benefits, and treatment and assessment of the investment."[98]

In addition, the subsection mentions that the public entity can share both the benefits and the risks of the innovation and can completely or partially relinquish IP rights in favor of the private provider. Additionally, public entities should be allowed to negotiate with the providers to improve the contents and possibilities of success of their proposal (while complying with the competition principle). In the end, it establishes that the publication of the proposals and the related information is subject to the approval of the respective provider.

Although the vehicles for PCP are already laid out in current Colombian law, PPI in particular could benefit from supporting legal regulations and formalizing mechanisms such as Competitive Dialogue[99], although operationalization of these procedures still have a long way to go.

[98] Translation of the articles (http://www.colombiacompra.gov.co/transparencia/informacion-publica) provided by CCE.

[99] Although the figure is not explicitly contemplated in Colombian public procurement there is no prohibition to do so in R&D direct contracting. However the lack of clarity of how this awards should be finally awarded might deter participation of suppliers.

The PPI manual for public procurers, scheduled to be issued in 2016, will contain a comprehensive communication plan to familiarize both procuring and oversight agencies with the main elements of PPI-PCP and how to access them under current legislation. This is part of the PPI policy that CCE is expected to release before the end of 2017. The actions that make up the implementation plan of this policy are organized in six areas, each corresponding to a particular objective, as shown in Table 11.4.

Table 11.4: Implementation Plan

Area	Objective
Planning and managing	Plan and manage a new national program for PPI
Financing	Financing PPI projects through instruments that foster demand and supply
Awareness	Raising awareness in demand and supply actors about the advantages and opportunities that PPI entails, and align the priority sectors for the country with the PPI policy
Training	Training public procurers and companies' technicians to professionalize PPI processes
Catalyze	Catalyze future PPI-PCP processes through preparatory and planning activities
Support	Provide legal and technical support and release updated information to the officials that are responsible for the execution and supervision of tenders and contracts.

The challenge faced by CCE in confronting and reducing the excessive use of non-competitive procurement methods by both central and regional agencies (OECD, 2015) however, puts Colombia in an apparently paradoxical situation in terms of its capacity to implement PPI-PCP, as greater accountability over direct contracting might discourage public purchasers to use R&D contracting mechanisms with which most are unfamiliar. The outcome will depend to a great degree on CCE's approach to the subject. According to interviewees, the approach to address this challenge is to introduce PPI-PCP as a direct yet competitive contracting procedure. The formal introduction of competitive dialogue might help identify this practice as competitive rather than non-competitive. This is then a promising option to simultaneously respond to the objective of reducing the use of non-competitive procedures and promoting the use of PPI-PCP.

Along the same lines, one of the OECD's (2015) recommendations is to introduce a centralized monitoring mechanism with either a committee or a leading agency (which could well be CCE) that would help determine whether a direct procedure is necessary so that this important issue will not be left solely in the hands of local contracting officials. This is meant to improve transparency at the subregional level, but having this would mean a significant endorsement and an increase in confidence on the part of those who intend to contract R&D.

Some of the main guidelines that CCE states in its Strategic Plan (CCE, 2015), added to their already manifest interest in developing PPI-PCP, imply additional relevant aspects that will be improved in the future to benefit PPI-PCP implementation. For instance, as part of their objective of positioning public procurement strategically, new indicators and yearly

measurement schemes will be included. Guaranteeing that these indicators actually consider performance in PPI-PCP is the first step in the development of a monitoring system that could induce procuring practitioners to implement it.

The latter is reinforced by OECD recommendations on transparency and evaluation of the effectiveness of the public procurement system, which call for the development of indicators to improve performance measurement, effectiveness, and savings (OECD, 2015). SECOP II's automatization and centralization of relevant public procurement data will also generate key performance indicators. Indicators from other OECD countries, such as percentage of contracts that consider the whole life cycle and contracts that consider financial and other aspects of the bid during the selection procedure (thus leading to the economically best alternative), could be introduced to support the performance measurement of the public procurement system in terms of PPI-PCP capabilities. The OECD (2015) recommendation that reports must be designed to address specific stakeholder needs should be addressed. Depending on CCE's interest in this subject, this could be one of those packages.

In terms of human capital, CCE is planning to improve the capacity of public procurers. For this purpose, their strategies include a thorough study of the current profile of the Colombian public procurer and a graduate degree in the subject (to amend the current needs in the short-term) and a complete program and certification for public procurers (which will take longer to put together). PPI-PCP may be included as a module in either or both courses.

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12. RECOMMENDATIONS FOR LATIN AMERICAN AND CARIBBEAN COUNTRIES

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This final chapter assesses the suitability of three Latin American and Caribbean (LAC) countries for the introduction of instruments and structures to support public procurement of innovation and pre-commercial procurement (PPI-PCP). To do so, it identifies adjacent demand-side measures that have already been adopted to promote innovation. In those cases where attempts to directly implement PPI-PCP have been identified, it assesses the advantages and obstacles that these measures have encountered.

Overall, there has been a variety of rationales that have shaped the institutional path that each of these countries has taken for the implementation of the aforementioned policies. Each has come with a specific array of advantages and disadvantages to take into account for future developments. Some common obstacles that these countries have faced have also been identified. These tend to be related to common concerns over corruption, the positive-law nature of the legal context, and insufficient local capabilities to meet R&D needs. Likewise, there are also common factors that lead us to believe that there are valuable opportunities to implement such policies in the LAC context.

This chapter provides an overview of the obstacles and advantages that each of these countries have faced in their early PPI-PCP experiences and in other adjacent or complementary innovation policies. Together with the lessons of Part One of the report, this is then the basis to offer recommendations for the deployment of these policies in other countries in the region.

The lessons learned from the international experiences reviewed in Part One clearly showed that there is no unique prescription for success. Thus, this last chapter elaborates on the pros and cons that countries might face when deciding different elements of their PPI-PCP policies. This should serve as a starting point for the weighing different options that a particular country may have.

This chapter is organized as follows: We start with a very basic and general statement about the basic rationale for innovation procurement. This clarification is the result of broad discussions with many stakeholders and the secretariat of the IDB. It is important in order to establish the basic justification for innovation procurement and broaden its appeal. We then discuss the need for establishing a shared vision on the value and suitability of PPI-PCP, which is of particular importance for the countries under consideration that start to establish innovation procurement. This is followed by reflections on issues related to the political leadership and the key stakeholders that should also be engaged. Next, we discuss the legal and institutional framework for public procurement, and then go on to introduce a discussion around two key aspects of the planning phase for a PPI-PCP policy: determining how to kick start it and making decisions on a focus for the pilots. Lastly, we offer thoughts on the preliminary steps and networking mechanisms that should be put in place for an effective implantation of PPI-PCP as well as the financial features of such a policy. Each section contains recommendations, succinctly summarized in boxes. For an improved understanding of these specific points, it is recommended to review them in parallel with the conclusions in Part One.

Preamble: The Basic Idea of PPI and PCP

Strictly speaking, PPI and PCP are not innovation policy tools in the sense that innovation is not their primary aim. Rather, PPI and PCP can contribute to (1) improving the efficiency or effectiveness of the public sector or (2) supporting targeted sectors and policy challenges.

(1) PPI and PCP are mechanisms to mobilize innovation for the purposes of public services. In everyday, operational procurement, innovation may, or may not, make public services more effective and efficient. In cases where innovation does not increase the efficiency or effectiveness of the public sector, PPI and PCP are not needed. However, this means that countries need to think creatively about long-term needs, taking into account the overall benefit of an innovation in terms of delivering benefit to the citizens—which should be recognized in procurement decisions. When those long-term considerations become routine in public procurement, procurers will conduct the innovation test, asking for something novel when it contributes to long-term value and benefit for money—in its broadest sense. A thorough innovation test will deliver ample opportunities for PPI and PCP; and because the public-sector need is the starting point, it will reduce the 'prototype syndrome' and the likelihood of developing solutions that are not subsequently taken up.

(2) Innovation can be mobilized in targeted sectors and for targeted societal and policy challenges and problems. In those cases, procurement is an explicit means to find new solutions or to accelerate the diffusion of novel solutions. Those strategic cases of innovation procurement can be supported through additional budgets. In those cases, the traditional rationale for operational procurement is superseded by the policy goal and part of a strategic initiative.

In both cases we see an advantage for mobilizing innovation through procurement. Importantly, in both cases we can also expect an effect on the supply side in the procuring country as well. This can be realized through intelligent selection of areas, through provisions in specifications, whereby, for example, there is a need for interaction and maintenance that can only be fulfilled with physical presence in the country, and through intelligent management of the procurement process itself. Especially strategic procurement can be coordinated with supply-side and innovation policy consideration in mind. Procedures such as development of long-term sectoral roadmaps, with suppliers that are active in the country, or joint definition of needs and solutions, are helpful in that regard. In some instances, innovation policy can initiate those processes, defining, with sectoral ministries and agencies, the main condition to create win-win situations between the innovation policy goal and the sectoral policy goal. In any case, the main message is that PPI and PCP should not be seen as innovation policy tools, but as mechanisms to mobilize innovation for the purpose of public administration and public policy, whereby economic benefits and supply side capabilities can be strengthtened through a variety of mechanisms.

Shared Vision of PPI-PCP Value and Suitability

Despite the fact that PPI-PCP is a promising innovation policy, it has been hard to effectively establish it in leading countries and, so far, this has also been the case in LAC countries. This assessment is not defeatist but it does mean that in order to design and implement PPI-PCP procedures, there are a number of necessary conditions, some of which are especially hard to meet in the countries under consideration. Any policy that seeks to mobilize PPI and

PCP needs to ensure that those conditions are met first, and might develop PCP and PPI initiatives step-wise and sequentially, rather than jumping into premature rollout of innovation procurement.

On the one hand, some basic capabilities both in the demand and in the supply side of the public market should be available in the country before embarking in PPI or PCP policies. In general, we have seen that the inclusion of wider societal objectives in public procurement (innovation or any other) might require countries to have gone over earlier stages of compliance with regular public procurement procedures (Telgen, Harland, and Knight, 2007). A specific example of this is that high corruption indexes seem to be a deterrent for the effective implementation of PPI-PCP. In the three country cases that we have examined throughout this second part of the report, although having average to low corruption indexes in comparison to the region, we found that concerns about corruption have undermined the capabilities at the institutional level for PPI-PCP implementation by generating distrust between the public and the private sector and by discouraging procuring organizations to accept more complex public procurement procedures. Countries with even higher corruption indexes and concerns should face perhaps excessively high barriers, and thus PPI-PCP mechanisms might be used only in selected instances *before* those weaknesses are remedied. In this sense, identifying the basic country features that enable or prevent the implementation of a PPI-PCP policy is essential to determine if the country should (already) develop such a policy and, furthermore, such a reflection at the beginning is the basis for planning how to do it.

On the other hand, it is important to build a shared vision of what PPI-PCP means and why it is important to engage in it. This is why the preamble of this chapter is so important. In Chile, we saw that there is no shared understanding of what PPI-PCP is and of the purposes that it can serve. This contributes to the lack of interest among some of the main agents that could help promote a comprehensive PPI-PCP policy as well as a general confusion about who should do what in it. In Colombia, although there is a broader understanding of what PPI-PCP is (among key stakeholders), there is no common vision of why it is important to pursue it in the specific Colombian context. It is reasonable to believe that the fact that the main central purchasing body (CPB) has led it has generated an understanding of PPI-PCP as a means to increase the sophistication of the public procurement system rather than as a means to shift public expenditure more toward innovation, for example. This may explain the insufficient support of agencies that would most benefit from buying innovation, such as DNP and Colciencias. Building up a common basic idea about what innovation procurement is across government is fundamental not only to increase stakeholders' engagement but also to determine if PPI-PCP is indeed the best policy to achieve it.

1 **Start with a realistic assessment of capabilities and objectives:** An effective PPI-PCP policy design and implementation depends to a large extent on the government's clarity, not only of the country's initial capabilities but also of the objectives that it is trying to pursue with the implementation of such a policy. It is also important to guarantee that the whole process starts with: (1) a shared vision of what PPI-PCP is and the reasons that make it worthwhile and (2) a systematic analysis of the country's initial capabilities and the specific roadmap that must be designed ad hoc for each country.

2 **Develop and sustain political commitment and long-term vision.** The institutionalization of PPI-PCP policies require long cycles for their development as they need conditions that range from regulatory changes to the design and implementation of economic incentives and the provision of support services. Certainly, this period covers more than a single political term. This means that PPI-PCP needs continuity in the political commitment which can be embodied in laws, parliament mandates, government plans, or multi-annual commitments to PPI-PCP investment regardless of the political leaders that are in power.

Political Leadership and Mobilization of Key Stakeholders

As observed both in the case of the countries analyzed in Part One and in the LAC countries reviewed in Part Two of this report, the strategy to introduce PPI-PCP has followed a wide variety of institutional paths. In terms of political leadership, we have seen that some countries have had one specific agency taking a centralized leadership in all matters related to PPI-PCP, such as is the case with Colombia's *Compra Eficiente* and, in a milder way, with Chile's MINECO. In others countries, actions toward PPI-PCP implementation have been disseminated among different public agencies depending on the exact modalities of the instrument. For instance, Brazil's preferential treatment for innovative products in tenders is implemented through several procurement channels (i.e., through decentralized procurement agencies) while PCP in Brazil is undertaken by various research-intensive organizations such as Petrobras or research sponsors such as FINEP.

As expected, there are several pros and cons in each of these approaches that should be weighed according to the country's specific context. These are summarized in Table 12.1.

Table 12.1: Pros and Cons of Leadership Approaches

Leadership	Pros	Cons
Centralized/ CPB	1. More security for procuring organizations: "seal of approval" from the main public procurement agency 2. Better position to influence legislative framework 3. Established communication channels with providers and procuring organizations 4. Greater likelihood of having a high-level mandate to promote PPI-PCP (case of Colombia and OECD's accession process)	1. Horizontal approach: complimentary capabilities and additional leadership at sectoral level needed and further tailor-made incentives necessary 2. Commitment to fostering innovation not necessarily as strong as other objectives that may be seen as conflicting with PPI-PCP (such as simplification of public procurement procedures) 3. Low purchasing power for PPI-PCP projects (only Framework Agreements)
Scattered/ Sectoral	1. Motivation driven by sectoral needs: less need for sectoral-specific incentives (e.g. Brazil's case with inner motivation of agencies with intensive R&D activities driven by their functions) 2. High purchasing power and better knowledge of most promising PPI-PCP pilots 3. Projects follow closely the sector's logic: better chance of being rapidly developed (see pilots in Colombia vs. pilots in Brazil)	1. In the case in which this policy is mainly aimed at supporting innovation, this ultimate objective might be blurred when the focus is policy-domain oriented 2. Less likely to be resilient in the process as other public procurement policies might serve their missional purposes better.

Regardless of the political leadership being centralized or scattered, we have found a feature in terms of executing agencies of PPI-PCP which is common for all three countries that we have examined. That is, the importance that has been assigned to state-owned enterprises (SOEs) as key actors. In LAC countries, SOEs pose several advantages: they have an experienced perception of efficiency and value-for-money as well as better understanding of and closeness to the productive sector. These capabilities were recognized by interviewees in both Colombia and Chile, while in Brazil key SOEs have taken up the mission of strategic procurement for decades. An example is Petrobras, which took up strategic procurement in the 1960s.[100]

However, when trying to engage SOEs in a PPI-PCP policy, their size and area of economic activity should also be considered. Specifically, there seems to be a trade-off between having a small or large SOE leading the procurement. On the one hand, very big SOEs may lead to monopsony-like behavior, which is most likely accompanied by highly politicized relations between these and their potential or actual private providers that it is harder to control for corruption. On the other hand, too small an SOE might lack the financial muscle that most PPI-PCP projects need. Again, these features should be examined and weighed in the specific country.

Additionally, when determining which other actors should play an important role, especially in PPI and PCP procedures which necessitate investment in R&D, we start by addressing who is the natural leader in R&D expenditure and activities. Countries where the leaders in

[100] It is worth noting that in this specific case, the mission has been primarily oriented toward "buying domestic," which nowadays is increasingly intertwined with "buying innovative." The Petrobras experience nevertheless suggests that there is a difficult balance to strike between the emphasis on local content and the adoption of leading-edge technologies. See section Planning: Decisions on Focus for more on this subject.

R&D are universities, such as Colombia, and countries with relatively stronger R&D-performing companies, such as Brazil, face different advantages and disadvantages of putting a particular actor at the center of the policy. Specifically in cases where there is a clear need of R&D to deliver either for PCP or PPI, while in the first case it might be easier to point to PCP through partnerships between universities and public agencies, in the second case PPI in a transaction between private companies and public agencies might be more attractive.

Lastly, it is worth mentioning the role that industry federations and branch organizations can play in overcoming the distrust of the private sector in the public procurement market in many LAC countries. This is not only because of their traditionally strong political standing (that can actually influence legislative outcomes) but also because their role implies representing the interests of several companies *simultaneously*. In this sense, they could be vehicles that protect companies' interest when facing procuring organizations while contributing to fair competition among the different companies that make up the sector.

Moreover, some industry federations have been key stakeholders in the creation and operation of sectoral R&D centers. In fact, some of them receive a great deal of financing from the companies themselves, such as the *Instituto de capacitación e investigación del plástico y del caucho* ICIPC in Colombia. It is not surprising that these centers have privileged knowledge of the interactions between R&D and go-to-market. To put these specific R&D centers at the heart of PPI-PCP policy (making them the leaders of each project) would be equivalent to replicating Brazil's National Knowledge Platform Program, still with scientists at the center, but exploiting the already deeply rooted relations and information flows between these scientists and the companies.

3

Build strong leadership based on inter-institutional alliances: So far most advances in terms of innovation friendly procurement in LAC countries have been the result of the efforts of a single agency that manages to sporadically convince others to engage in PPI-PCP. As seen in Part One, it is crucial to have leadership that is not subject to political cycles. This is more likely to occur if programs and policies around PPI-PCP (rather than just projects and pilots) are shared between different agencies of the government, especially those that directly benefit from the PCP and PPI process. The creation of expertise centers and helpdesks with the participation of various actors, meant to provide guidance for procuring organizations that embark on PPI-PCP, might also serve this purpose.

4

Build on existing capabilities and strengths at the institutional level: Choosing the right path and the right partners from the beginning can determine the overall success of a PPI-PCP strategy. The recently formed Central Procuring Bodies pose significant advantages for LAC governments that want to engage in PPI-PCP. Specifically, they can become the main support for the determination of the best route for implementation and can also provide support at several places along this route. In fact, not only do they have valuable experience in designing and introducing new mechanisms to enhance value-for-money in public procurement, but also, when they are well positioned, they may reduce uncertainty for procuring organizations (when facing oversight agencies). Furthermore, evidence shows that SOEs are well placed for innovation

procurement and should be part of national strategies, especially those that have better established innovation management models or R&D departments.

Legal Framework

The LAC countries studied in this report have in fact started to move away from a strict cost-effectiveness approach in their respective public procurement framework. Whether it is support for SMEs in Chile, the promotion of sustainable procurement in Colombia, or even the introduction of innovation as a criterion in public procurement in Brazil, all countries have introduced wider social objectives into the public procurement framework. However, advances in public purchases that actually take into account the innovation criteria remain frail in many cases. Furthermore, legal issues are persistently cited by key stakeholders in these countries as one of the main obstacles to the introduction of more complex innovation procurement mechanisms such as PPI and PCP.

For the three countries, the legal hurdle for the implementation of PPI-PCP appears much more important than for more advanced countries. However, it is arguably not the consequence of actual *real* legal barriers as much as it is the cultural perceptions around public procurement that explain this reticence by stakeholders. Nevertheless, addressing the reasons for these barriers is important (regardless of their origin) to foster a PPI-PCP-friendly environment among those who are responsible for planning and executing public procurement.

Specifically, two of the three countries examined have openly stated their interest in searching for a legislative framework that is appropriate for PPI-PCP, despite the fact that PPI-PCP is not per se a new contracting mechanism, as it can be established based on the existing contracting mechanisms. They have even asked for one that is specifically designed for this purpose. This perception is not limited to the agencies that lead these policies. For example, some of the procuring organizations directly involved in the Colombian pilot experience have also indicated that they "need" a legal umbrella that explicitly defines and allows all the elements that are necessary for PPI-PCP (including competitive dialogue). In the same way, in Brazil the de jure legal framework to support PPI-PCP has already been set up. It aims to address issues such as preferential treatment for innovative solutions, legal flexibility for leading research-intensive organizations (typically national champions), and special procurement for projects with large demand (e.g., the Olympics).[101]

This perceived need for a specific legal framework may be related to the traditional positive-law nature of most LAC countries' legal frameworks, which has also been pointed out by interviewees. Reinforced by the justified concern over corruption, this characteristic has contributed to the emergence of many exceptions (i.e., tailor-made public procurement frameworks) to the main public procurement law. Interestingly, while Chile is characterized by having few of these exceptions in comparison to most LAC countries, it has also manifested the need for a legal framework specifically suited to innovation.

In some LAC countries, the timing is not necessarily bad for considering a transformation of the legislative system to explicitly allow for PPI-PCP. As mentioned in the introduction to Part Two, there has been a recent revolution in the public procurement legal framework and

[101] Nevertheless, the actual use of the amended legal frameworks by procurers remains unclear. The recent corruption scandals undoubtedly worsened the prospects of PPI-PCP in Brazil.

organizational arrangements in many LAC countries. In this general atmosphere of change, countries around the world, including LAC, have been consistently re-evaluating existing processes and procedures to increase integrity and efficiency of public procurement (OECD, 2015). Additionally, one of the consequences that has come from these changes, which has particular relevance for the implementation of PPI-PCP, is the establishment of CPBs as centers of procurement expertise and the development of e-procurement solutions that are transforming traditional public procurement practices. Therefore, it is reasonable to expect that changes in the legislative framework should not be impossible, even more so when the leading agency of the PPI-PCP policy is a CPB. But when this is the case, the objective of promoting PPI-PCP can be competing with other core objectives of the CPB in question, such as the simplification of the existent legal framework and the reduction of direct contracting.

Although the existing legal framework may not be a real problem for PPI-PCP, the perception of an insufficient legal framework certainly has real negative consequences. It is therefore imperative not only to identify but to disseminate important elements that are already available in the legal framework and that de facto allow PPI-PCP implementation. In the LAC countries examined, the legislative context favors the introduction of PPI-PCP in many vital respects. For instance, contracting mechanisms such as public-private partnerships (PPPs) and the contracting of science, technology, and innovation (STI) allow for fundamental PPI-PCP elements such as competitive dialogue and admission of unsolicited proposals, without going against the principles of transparency and open competition. However, even though PPPs have been present in the legislative context for a number of years, PPP contracts have just begun to be successfully executed in Colombia with promising results for infrastructure, after three decades of concessions framework evolution; and they remain rare in Brazil. Again, the strong emphasis on fighting corruption that permeates the culture of procuring organizations (far more than saturating the legal framework itself) may be hindering the use of these more complex mechanisms.

In addition, the inappropriate use of traditional contracting procedures undermines the capabilities of procuring organizations to use more complex contracting mechanisms. For instance, in many cases excessive closeness between public buyer and private provider has ended up in corruption scandals (such as in Brazil), leading to the upfront reduction of new channels of communication, rather than pushing toward a more efficient public procurement system.

In conclusion, a national policy to support PPI-PCP that does not address these legal and cultural hurdles in the initial stage may not be effective. In the short run, training of procuring organizations and, to a greater extent, the accomplishment of successful PPI-PCP pilot projects to be later showcased, are needed to change this mentality. However, if possible, changes or at least further clarifications in the legal framework in the long run are still recommended. Although these are obviously harder to attain, they have worked in several countries analyzed in Part One 1: for instance, the EU directives and their later transposition into national legislation have been identified as one of the key drivers of PPI-PCP in EU countries.

5

Advance with the current legal framework but consider transformation in the long run: Not having a tailor-made legal framework creates uncertainty and influences the willingness of key stakeholders to engage in PPI-PCP in LAC. However, this shouldn't be a deterrent from any action toward the implementation of PPI-PCP. As seen in this Part of the report, there are contracting mechanisms that can be used to achieve successes in the short run. However, widespread use of PPI-PCP would certainly be easier with a more explicit PPI-PCP legal framework. It is therefore recommended that the institutions that lead these first initiatives exhaust the possibilities offered by the current framework rather than wait to have one specifically designed for PPI-PCP. In so doing, they would learn lessons for a further improvement of the framework and also demonstrate the limitations of that framework. As seen in the developed country cases of Part One, the development of a specific framework, either to explicitly allow for traditional PPI-PCP key elements or to design more effective but increasingly complex partnerships to develop such projects, has been a determinant in the dissemination of PPI-PCP in leading countries.

Planning

Kick starting PPI-PCP Implementation: Pilots or Policy

Determining if the policy and the corresponding governance should be launched before any pilots take place is not a trivial matter for kick starting PPI-PCP implementation. When choosing to conduct pilots first, the obstacles and successes that the executing agencies experience can provide feedback to the agency that leads the policy design.[102] This feedback is consistent with bottom-up leadership as it contributes to incorporating the needs of the agencies that will have to lead the projects, hence reducing some of the disadvantages of centralized leadership that have been mentioned before. This is the path that Colombia has followed. While the leadership belongs to Colombia's CPB and a comprehensive PPI-PCP policy was announced as the final objective, the pilots that this agency wants to promote are meant to provide feedback to the initial draft of the policy as well as to showcase successful projects. As seen in Part One, this trial-and-error process has proven to be beneficial in some countries, but there is a potential risk, which has in fact materialized in Colombia. Specifically, once pilots had been debated and had encountered obstacles throughout their execution (due to lack of demand planning, legal uncertainties and lack of internal leadership and commitment, among others), some agents labeled PPI-PCP a "difficult practice." This might hinder further efforts in the future.

Brazil, in contrast, has adopted varied approaches (from generic preferential margin for innovative products, to agency/national champion initiatives, and to the recently announced

[102] A further consideration to improve the probability of success of these pilots, is the capability of the procuring organization to perform risk analysis and management. As this aspect has been identified as key in PPI-PCP literature, (see Tsipouri et al., 2010; or Edler et al., 2015 (in Edquist et al.)), several guides upon which LAC government can build are already available. See, for example ICLEI-PIANOo (2014).

PPP initiatives). It has had varied sectoral leaders, and the order between implementation and policy has been consequently diverse.

6

Consider the cost of launching pilots before framing the conditions for success: There can be some advantages to starting with pilots and then following with a comprehensive strategy, such as gathering information about real obstacles and opportunities which can then be included in the design of the policy. However, if pilots are not successful, PPI-PCP can be labeled as difficult or impossible. In a conservative legal culture, as is the case of several LAC countries, this stigma can be particularly hard to overcome. Piloting different PPI-PCP approaches on a very small scale could be a good starting point for developing countries to explore the relative appropriateness and effectiveness of various possibilities, to establish what routes could be the most suitable given their capabilities, and to understand the specific needs for improving those capabilities across the system.

Decisions on Focus and Sectoral Choice

Even if the PPI-PCP policy leadership comes from a centralized agency, vertical interventions, with policy departments or agencies in charge that are responsible for specific policy domains (health, energy, etc.) have proven to be more effective for PPI-PCP (one example is the advances made in Brazil's vertical programs for PPI) and, in general, in demand-side policies. This is related to the fact that innovation processes can be highly differentiated between policy domains.

Having acknowledged that, the discussion about which areas are more suited to kick start PPI-PCP pilots is important, because it depends on each country's circumstances. Still, some general insights can be drawn from the countries analyzed in this study.

Four relatively promising groups of policy domains (that may overlap) for PPI-PCP projects in LAC countries have been identified. Their specific pros and cons should be again analyzed in the specific context of the country, but the main ones are highlighted in Table 12.2. First, there are the policy domains, which are more likely to require solutions with high R&D content: this is an obvious candidate, as the advantages that they pose in terms of knowledge of the sector-specific STI cause them to be the first ones to develop PPI-PCP projects in leading countries analyzed in Part One (for example, defense in the United States).

Secondly, there is the consideration of the convenience of including PPI-PCP in the policy mix that aims to support a country's strategic industrial sectors. These are the sectors that the government identifies as key to the country's development and are characteristic of industrial and STI policy in many LAC countries. In fact, within policy- driven innovation procurement, one can try to single out specific industrial sectors that match, albeit in a very limited way. Identifying these sectors and providing them with sustained support has been an important part of industrial and STI policy in many LAC countries (including the ones reviewed in this study). It is still important to acknowledge, however, that the extent to which these sectors have been systematically supported varies from country to country: Colombia has struggled to either identify or target these industrial sectors in a sustained way. The

sectoral selectivity in Brazil appears better justified. Brazil is competitive in the energy and agriculture sectors primarily owing to its natural endowment and the scale of economy, while it is competitive in aerospace and biopharma because of a deliberate, strategic effort.

Third, social innovation has been identified as a promising field for PPI-PCP.[103] This area ensures the much needed political support. Innovation in LAC countries is seen through the lens of inclusive development (Edler, 2016) as it can address poverty and health issues, and also through the lens of environmental sustainable development, since it can address problems such as pollution and energy provision (Dutta, Lanvin, and Wunsch-Vincent, 2015) which are all compelling needs for most LAC countries. Related to that, PPI-PCP can potentially support nationwide policy initiatives. Nationwide initiatives are common in LAC governments, especially at the beginning of the political cycle: for instance, there are examples of environmental initiatives in Argentina and Peru, and biotech initiatives in Brazil and Colombia, among others. These initiatives are usually problem-oriented toward deeply felt needs (such as increasing education level) or toward improving the utilization of natural endowments or capabilities (such as specific areas of natural resources). They have the distinct advantage of having been endorsed by the highest level of government as well as sending a potentially strong signal to various stakeholders (companies, R&D actors, etc.) about where the public demand would be directed.

[103] Considering the ongoing debate around the definition of social innovation, and for the purposes of this section, the definition used is the one provided in Stanford's Center for Social Innovation: **"**A social innovation is a novel solution to a social problem that is more effective, efficient, sustainable, or just than current solutions. The value created accrues primarily to society rather than to private individuals." Available at http://www.gsb.stanford.edu/faculty-research/centers-initiatives/csi/defining-social-innovation

Table 12.2: Pros and Cons of Policy Domains

Areas	Pros	Cons
Policy domains that are more likely to demand sophisticated R&D	1. More likely to foster "new to the world" innovation 2. Better knowledge of sector-specific STI processes and agents	1. May be ineffective in fostering innovation from a broader spectrum of suppliers (i.e. overcoming granting contracts only to national innovation champions) in areas that require secrecy (e.g. defense) 2. Legal issues and resistance when they are meant to introduce technologies that change status quo (for instance in health) 3. More likely to have high costs and impacts only the long run
Strategic Industrial Sectors	1. Available instruments for coordination 2. Hub for policy discussion and redesign 3. Other complementary capabilities (e.g. Education, favorable tax schemes) might be established or under development 4. Those responsible for delivering policy best placed to understand innovation need and benefit	1. Failed experiences in the past 2. Innovation might not be understood as a central objective: other policies might be more adequate
Social innovation[104]	1. Interest in the subject is a common feature in many LAC countries and has wide political validation (Dutta, Lanvin, and Wunsch-Vincent, 2015) 2. Has areas that require "new to the world" innovation with both high and low R&D content	1. Might contravene traditional conceptions of innovation (i.e. association with R&D), posing challenges for definitions and measurement that are particularly important for PPI (i.e. knowing what constitutes an innovation is vital for legal adequacy of a project)
National Initiatives	1. Usually the hobbyhorse of the high political level 2. Instruments for coordination under development 3. Hub for policy discussion and redesign 4. Specific projects are likely to have been identified and government agencies compete to gain visibility: PPI-PCP might be seen as a useful tool	1. Innovation might not be understood as a central objective or might not be important to achieve the goal 2. Political commitment for the projects might be very dependent on political cycles

[104] For the purposes of this document, social innovation is understood as innovation that is meant to solve a pre-identified social need (mostly those targeted to communities in need) and that may or may not include participatory processes of innovation.

One final issue should be noted, even if the heterogeneity in LAC countries makes it difficult to derive prescriptive generalizations. However tempting "new to the world" innovations are, they entail special risks if pursued through PPI-PCP in LAC countries. In fact, one of the lessons learned from Colombia is that betting on PPI that requires solutions with high R&D content and innovations that are "new to the world" calls for a big commitment as well as considerable knowledge in terms of technological surveillance on the buyers' side. This can reinforce the idea that PPI is too complex. It is an entirely legitimate mechanism for LAC countries to ask for "new to the country" innovation if they are an efficient and effective solution for a public-sector challenge. Solutions may at first be imported, but experience shows that there are numerous local effects through maintenance, local content, and build-up of local expertise. Solutions may also be produced by local producers right away, respecting IPR provisions of foreign suppliers.

7 **Sectoral choice between strategy and opportunism:** Lessons learned about the choice of policy domains point to two conclusions for LAC countries. On the one hand, the choice of policy domain should be shared by key agents of the new PPI-PCP policy. On the other, choice should move between strategy and opportunism. Good international practice points to choosing policy domains or, more specifically, concerns or public challenges that have strategic value for the country in question as well as high technological content, and to identify policy domains with public buyers that can be engaged or are already committed to PPI-PCP and managers capable of leading these first efforts.

8 **Do not set the bar too high:** Failed experiences in PPI-PCP can contribute to a stigmatization that is hard to overcome. In awareness of their capabilities, LAC countries interested in establishing PPI-PCP should consider that at earlier stages, "new to the country" innovations may set the adequate background for more sophisticated PPI-PCP "new to the world." This does not mean that these projects should not be designed to have a large impact. They should indeed tackle important problems, but the solution should not require R&D content that would be particularly hard to develop domestically in the short run.

9 **Develop a suitable evaluation system:** In relation to the points above, it is important to develop metrics that allow governments in the process of PPI-PCP implementation to have an evaluation system that allows monitoring of intermediate steps and milestones. Although subsequent evaluation of the impact of PPI-PCP on innovation capabilities is important, it is equally essential to develop these intermediate indicators not only to improve the policy along the way but also to encourage the stakeholders that are engaged in the implementation.

Execution

Preliminary Steps and Networking Mechanisms

Many of the best practices identified in Part One are related to the importance of supporting tools and mechanisms for PPI-PCP. This is also the case in LAC countries, but there, specific needs should be prioritized.

As seen in Part One, a healthy flow of information between procurer and provider is a basic condition for the implementation of PPI-PCP. In the LAC countries studied, this flow is not only insufficient but is also limited by several structural conditions. On the one hand, even though LAC countries have advanced considerably in the digitalization of information for public auctions, information may still have a strong "audit-oversight" stigma for procuring organizations. This stigma has been worsened by recent initiatives to improve accountability, which entail a change in the way information is communicated and registered. Not surprisingly, in this scenario procurers are less likely to get involved in processes that require even more registration and releases of information. In Chile, however, different conditions that were found may pose an advantage. There, a greater amount of information on public procurement has traditionally been used to enhance decision making and efficiency in general, rather than solely for oversight purposes. Consequently, information registering and release is not necessarily associated with examination by oversight authorities, and is thus not strongly rejected by procurers. In other countries, CPBs can do, and in fact in many cases have already done, a lot to improve this attitude toward information on public procurement. This change, from information solely used for oversight purposes to a more intelligent use of information, is a path that must be followed parallel to the implementation of a PPI-PCP policy.

In addition, there is widespread distrust on the part of the private sector with respect to procuring organizations as intelligent buyers, which perceives public procurement as a very slow and complicated procedure. This might deter the most innovative companies to pursue the public market. Furthermore, the limited knowledge of intellectual property that can be found among most procuring organizations, and a relatively unstable situation in terms of the legal framework for public procurement, may also prevent these companies from sharing their knowledge. Besides improving the practice of both sides in IP management, scenarios for interaction have to be systematically fostered, from innovation platforms to challenge-oriented national debates and consultation events. This would in turn pave the way to the management of unsolicited proposals. Some countries, like Chile, have started to develop this kind of system, but in general it is uncertain how effective it would be without previous and sufficient trust by the private providers in the government.

In relation to this, it is worth recalling that for LAC countries, like for others, it is crucial to give the supply side, industry, due consideration. Policies that take advantage of PPI-PCP are not the exception. Quite the contrary, special attention should be given to the private sector's needs and capacities in this policy, since fostering PPI-PCP projects that do not find the appropriate response on the supply side may have very high institutional costs.

On the other hand, there are capacity issues on the demand side as well. As seen in Part One, the establishment of PPI-PCP projects was hindered by the very low capabilities for early demand planning and the general lack of mechanisms for demand articulation in the public sector. In LAC countries, this is a weakness that has already been identified: in this sense, early fostering of these capabilities can only bode well for the whole PPI-PCP implementation process. In fact, it might even help in generating endogenous interest by procuring organizations in projects that they identify as necessary or could help providers identify technologies that have potential for the public sector. The main issue here, and this comes back to the need to put domain departments and agencies in the driver seat for PPI and PCP measures, is that the expert policy makers responsible for delivering a policy will know best how innovation can support those policies. Thus, it is not the procuring organizations who are responsible for demand articulation and interaction with the supply side, but rather those responsible for achieving the goals of the department or agency.

Procuring organizations need to have the necessary means, incentives, and capabilities to pull through and implement the process technically, but the key players for initiating the process, articulating demand and interact with society and industry are those responsible for the policy of a public body.

10 **Strengthen the role of and coordination with the private sector:** The private sector plays a key role in raising government awareness of the importance of demand-side innovation policies and in proactively delivering proposals for PPI-PCP projects. LAC countries have two weaknesses in this regard: first, there is little trust between the public and private sectors in the procurement area. Second, they have networks of R&D-intensive business, which tend to be the most interested in PPI-PCP. Progress in both areas is a requirement for the consolidation of PPI-PCP policies in the region. Cluster support tools, innovation networks, and public-private partnerships for technology development can contribute to the private sector's capacity to be an interlocutor of the government in PPI-PCP. A starting point is to focus these instruments in sectors that are natural providers to the government and to include PPI-PCP on their agenda.

11 **Kick start tools to provide training and to help articulate and anticipate demand:** According to the experiences reviewed in Part One, one way in which the public sector can address the complexity of PPI is promoting agent articulation instruments and enabling anticipation of demand. The main principle is to have those public-sector actors involved that are responsible for delivering policy, with procurers being important technicians and supporter of the process. There are a range of instruments that are essential to support demand articulation and strategic decision making in PPI-PCP projects, such as training workshops, official guides for procuring organizations, forums for public-private dialogue, innovation platforms, foresight activities, tools for developing technological supply and forward commitment procurement (see United Kingdom country case). All of these can be promoted by the public sector through the development of programs and instruments that can be set up by policy, but ideally in conjunction with private actors such as trade associations.

Financial Features and Incentives for PPI-PCP

By their very nature to support public policy through innovation, PPI-PCP are mechanisms primarily to be mobilized by actors across government, not those responsible for STI policy.

LAC countries lag behind in valuing the STI as a tool to support delivery of policy and solve everyday problems in the public sector. There is also a lingering perception that the solutions found through this process are "more expensive" (this is, in turn, related to the lack of analysis over the whole life cycle of public procurement). It is therefore vital to mobilize those actors responsible for delivering policy and to educate them in the value of innovation for their own purposes. In addition, as PCP and PPI are complex and associated with high learning costs and often produce higher entry costs for the innovation (even when it saves money over time), it is important to create additional incentives to get involved in this practice *and* the financial resources to do so. In keeping with the findings in Part One,

financing schemes for PPI-PCP have emerged to encourage providers and procuring organizations to develop new capabilities that are needed, to reduce the risk in which both suppliers and procuring organizations incur and, in general, to create public demand for R&D and innovation. These schemes can be divided into three main categories (which coincide with the three financing lines for the European Union's H2020 for PPI and PCP). First, some countries have funds available for activities that are meant to consolidate the capabilities for PPI-PCP, such as those that provide interaction spaces for procuring organizations and private providers, specific training for this purpose, electronic platforms to support PPI-PCP, and forward commitment procurement exercises. On the other hand, there are funds for PCP that are executed both for demand induction (in the form of matching grants) and supplier's support in the early stages of the tender. Finally, there are funds available for PPI for both the demand and the supply side but, as expected, these cover a lower percentage (due to the relatively lower risk and to concerns about fair competition).

Although it is tempting to push for establishing a mandatory amount of expenditure on PPI-PCP, this has been difficult to achieve even in countries where there have already been successful cases of PPI-PCP, as seen in Part One. It is therefore advisable to look first into the availability of other funds, such as STI dedicated funds, that have been designed for STI financing and, subsequently, to identify the ways in which they can be redirected toward the three lines of PPI-PCP financing specifically.

With regard to financing mechanisms to support instruments for PPI-PCP, there are two main areas where they can be developed: financing schemes for training and networking (among others mentioned above in preliminary steps and networking mechanisms) and financing or co-financing of the projects themselves. For the first one, CPBs may be the best mechanism. These agencies have established tools such as electronic platforms and spaces for interaction that can be modified or simultaneously used to support PPI-PCP. Similarly, they already finance training for both providers and procurers and provide permanent support for them in specific legal issues through different vehicles (official guides, personalized attention, etc.). Other measures that have been identified as best practices, and that need funding, such as the establishment of a permanent PPI-PCP helpdesk, may find it easier to be embraced in a CPB as they are consistent with its mission.

In the area of co-financing, specifically PCP, in most LAC countries there are STI agencies that have had the traditional mission of funding R&D in early stages and can be reasonably expected to be the best candidates to deliver such an instrument. Notwithstanding the fact that this funding has not been traditionally directed toward a particular need of the public sector, it has used councils and more general concepts of national priorities to design the calls. This is the case of Colciencias. Redirecting a portion of these resources to match other public agencies budget spent in PCP should not find too big resistance.

In this same area, more specifically financing PPI projects, other agencies' experiences and potential are worth considering. Specific agencies in the LAC countries included in this study have started to perform "Catalytic PPI" (as described in introduction chapter). In Brazil, for example, the newly launched PPP schemes, including the general ones and the sector-specific ones (e.g., healthcare), are mainly funded by BNDES, which is a cross-cutting funding agency for broader development issues. This horizontal R&D agency does PPI without intending to use the knowledge/solution that is acquired while encouraging sectoral agencies—in agriculture, health or energy, for example—to do "direct PPI" (i.e., PPI with the intention to use the knowledge that is generated).

In the area of co-financing PPI, it is worth looking at the funds that are already available in specific agencies and that could easily be redirected to this purpose. Reserving a portion of public funds in different agencies to be used for STI activities is an emerging policy in some LAC countries and is intended to increase public expenditure in STI. As seen in Colombia, a percentage of the royalties has to be invested in STI activities chosen by the respective local authority. In the case of Brazil, it is unclear whether the government has imposed R&D spending targets for non-STI agencies. However, there are non-STI agencies that already redirect funds toward this objective. For instance, BNDES is increasingly treating STI as a priority and set aside R$100 million in February 2016 as R&D funds.

Finally, a fixed amount of expenditure on STI that many procuring organizations face in LAC countries can represent a valuable opportunity for PPI-PCP support. In some cases, this fixed amount of expenditure in STI is often perceived as an obstacle to public spending by the procuring organizations. This happens when these organizations lack understanding of the underlying technologies that might serve their purposes, which is commonly the case of local authorities that may lag far behind the technological frontier. Paradoxically, this is an advantage for the development of PPI (and for PCP) because through PPI and PCP these resources can be redirected from something that is perceived as having uncertain or only long-run effects (such as STI, and particularly hard-R&D, in many Latin-American countries) to something more tangible that improves the quality of public services while reducing their cost. As some Colombian interviewees stated when they identified the Royalties STI-Fund as the best source for PPI-PCP funding: local authorities were not elected to invest in hard R&D; they were elected to improve the citizens' lives, and they must spend in areas that are visibly contributing to this purpose. In this sense, PPI-PCP is a good option for local authorities to redirect these STI funds to investments that closely match their interests.

Having said that, and after analyzing the path followed by SBIR/SBRI programs in the United States, the Netherlands, and the United Kingdom, it is reasonable to conclude that it will be easier for LAC countries to institutionalize PCP before they can institutionalize PPI. Surely, it is easier for more mature agencies, such as COLCIENCIAS in Colombia, CORFO in Chile, and the Ministry of Science, Technology and Innovation in Brazil, to launch a PCP program than expect other government entities, traditionally foreign to innovation, to make systematic use of PPI.

In any case, funding should ideally be available at the central government level to support operational needs and training at the first stage of pilots, wherever they take place. Especially in the build-up stage of PCP and PPI, incentives in the form of matching grants, for example, are advisable whenever resources are available, while gradually the logic of PCP and PPI should be disseminated in the system to avoid the need for matching grants, especially for PPI. Furthermore, non-financial incentives, like recognition, have been proven to be successful in specific cases. An example of this is the Procurement of Innovation Platform's Procurement of Innovation Award, which provides yearly recognition to successful public procurement practices around Europe that lead to the purchase of innovative, more effective and efficient products or services. These options should also be considered in accordance with the country's culture.

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Design and implement "plug and play" financing schemes: As suggested in the first part of this report, additional financing is necessary at least in the early stages of PPI-PCP implementation, and for PCP, a permanent separate fund to draw on for competition can be useful. In terms of financing sources, government R&D agencies can contribute to kick start PCP and might be more inclined to do so if they get financial incentives from multilateral banks. On the other hand, a promising option for fostering PPI is to redirect sectoral and regional STI funds toward these projects. It is also important to design and implement financing schemes that are easier to implement and that are more attractive to the private provider. Based on the lessons from advanced economies, SBIR/SBRI schemes are unquestionably promising examples for PCP implementation while Spain's INNODEMANDA-style programs can be a faster track to support PPI.

The Way Forward for LAC Countries and Recommendations for the IDB

This study has contributed to the monitoring of valuable international experiences in the field of PPI-PCP as well as the identification of early PPI-PCP experiences in LAC countries. The consolidation of PPI-PCP policy discussion hubs and platforms contributes to the implementation of PPI-PCP in many aspects: it helps key actors to become familiarized with the potential costs and benefits of these policies and facilitates the adaptation of best practices in a policy area that is still under construction. In this sense, studies in this field should be organized and further exploited in wider scenarios, ideally where other relevant information around PPI-PCP is exchanged between buyers and providers, contributing to the consolidation of relations in a designated setting. This is an essential step to kick off PPI-PCP in LAC countries.

International organizations in Europe have been important for PPI-PCP development. Similarly, international and multilateral organizations with presence in LAC countries can also play a key role in the introduction and development of these policies in their member states. This can be achieved by promoting spaces for PPI-PCP policy discussion and diffusion, by providing customized financing solutions, and by enabling and incentivizing binational projects of PPI-PCP, among others. Additionally, these organizations' profound knowledge of LAC countries can be fruitfully exploited for establishing PPI-PCP It can support initial assessments of the suitability of these countries to access incentives for the development of PPI-PCP. The IDB has great potential to engage in several of these areas to foster PPI-PCP.

Aligned with the recommendations, the Bank could help establish PPI by raising awareness of its potential for changing the way that national public procurement policies are designed, both for the countries' regular public procurement and for projects financed with IDB's resources. In this process, it can also recognize PPI as good international practice and indicate to LAC countries some key elements of the road map that they should consider to implement it at the national level.

The IDB can also support PPI in ways that go beyond awareness raising and a first step to identify them is to review the IDBs own public procurement policies and practices, particularly with the aim of finding areas where innovation can potentially be promoted. The Bank can also contribute to PPI's effective establishment as an advanced innovation policy

in its member countries by aligning IDB operations to the objectives of PPI. By incorporating PPI into its own policies and objectives and those of member countries, the IDB can effectively leverage this policy through monetary and human resources in the many areas where it carries out activities. These incentives for PPI in the member countries could also help build capacity and ensure better conditions for national agencies to embark on PPI projects with their own resources, thus functioning as a trigger of national programs and policies to support PPI.

Consequently, the lessons for the IDB are not only directed at those officials involved in the design of R&D+i operations in the member countries, just as the lessons for LAC governments are not directed only at the people in charge of innovation policies in each country. IDB officials that support the Bank's operations at different levels, their counterparts in member countries, and all actors with decision-making power on procurement plans associated with IDB operations (and agencies related to general public procurement in each government) are key players in the development of strategies from the IDB's side to promote PPI. This is because the definition and implementation of innovation-friendly criteria is one of the main tools available to the IDB to leverage PPI culture and projects. It necessarily involves the understanding and active participation of this varied group of people.

With this in mind, as a promotor of PPI in LAC countries, the IDB should address the following four areas:

1. **Awareness and capability building**

- The Bank should continue to support the work of the Inter-American Network on Government Procurement, in close collaboration with the Organization of American States (OAS). The workshop that took place in El Salvador in July 2016 is proof of the growing interest in PPI and demonstrated the need to achieve cross-learning between countries on this subject. In this sense, this network is key to disseminating the recommendations of this study.
- Additionally, the Bank should disseminate the possibilities of PPI and generate debate among fiduciary procurement specialists in each IDB country office, since they have a key role advising the executing agencies on the procurement processes in Bank-financed operations.

2. **Review of the criteria in Bank procurement policies**

- The Bank has two procurement policies[105] (consulting and public works) that do not proactively include innovation-friendly criteria. Therefore, in cases where a country makes acquisitions according to these rules, it loses the opportunity to do so in an innovation-friendly fashion. As with many national procurement policies, it is not that the law forbids the inclusion of such criteria, but that there is no policy that requires its inclusion. It is not necessary to undertake a thorough review of these policies; rather, it is recommended to use the existing freedom in the definition of selection criteria during the negotiation of transactions and proactively include pro-innovation criteria as much as possible. It is also advisable that the IDB recommend their inclusion in any project that can logically attain them, and we can expect that, as PPI culture is consolidated, countries will be more likely to accept them.

[105] Policies for the Procurement of Goods and Works financed by the Inter-American Development Bank (GN-2349-9) and Policies for the Selection and Contracting of Consultants financed by the Inter-American Development Bank (GN-2350-9).

3. **Support for instruments incorporating demand side in the STI policy mix countries**

- The IDB Division of Innovation and Competitiveness can encourage ministries and innovation agencies in each country to develop PPI support instruments according to the recommendations laid out in this chapter. This Division can actively contribute to the best design of such instruments, which can build on the previous work that has been conducted in each country. As suggested, this should start with a realistic assessment of capabilities and betting on plug and play schemes. It is also imperative to encourage successful implementation of the first pilots, as these can later be showcased. Surely, borrowing members can rely on the IDB's on-the-ground experience in both the assessment and the design of these PCP/PPI instruments.

4. Strengthening and promoting increased use of national public procurement systems in IDB-financed operations

- The Strategy for Strengthening and Use of Country Systems (GN-2538) is a policy that can be considered an indirect measure of PPI promotion once the three steps mentioned above have been implemented. Once these steps have been completed, it is reasonable to believe that PPI will be spread to national policies, both in innovation and public procurement policies, and in IBD projects as well as in locally financed public procurement.
- The IDB should concentrate on supporting pilots to be subsequently showcased by focusing on countries where the national public procurement systems allow the introduction of innovation-friendly procedures and criteria more easily than would be possible with the IDB rules. This could be the case for some of the LAC countries analyzed in this study.

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